HANDBOOK No. 1048
SECOND EDITION

STR. 9—X
AIRCRAFT RADIO
COMMUNICATION EQUIPMENT

APRIL, 1951

Standard Telephones and Cables Limited

RADIO DIVISION

OAKLEIGH ROAD, NEW SOUTHGATE, LONDON, N.11

FOREWORD

STR.9-X, STR.9-X.1, STR.9-X.2 and STR.9-X.3. AIRCRAFT RADIO COMMUNICATION EQUIPMENTS

The STR.9-X range of Aircraft Radio Communication Equipments are of similar construction but have different frequency ranges as follows:—

STR.9-X	... ...	115-145 Mc/s.
STR.9-X.1	... ...	112-142 Mc/s.
STR.9-X.2	... ...	100-125 Mc/s.
STR.9-X.3	... ...	124.5-156 Mc/s.

This manual deals specifically with the STR.9-X but is applicable to all types mentioned above, providing the difference in frequency range is borne in mind when reading the text. For full details of the differences refer to Appendix 3.

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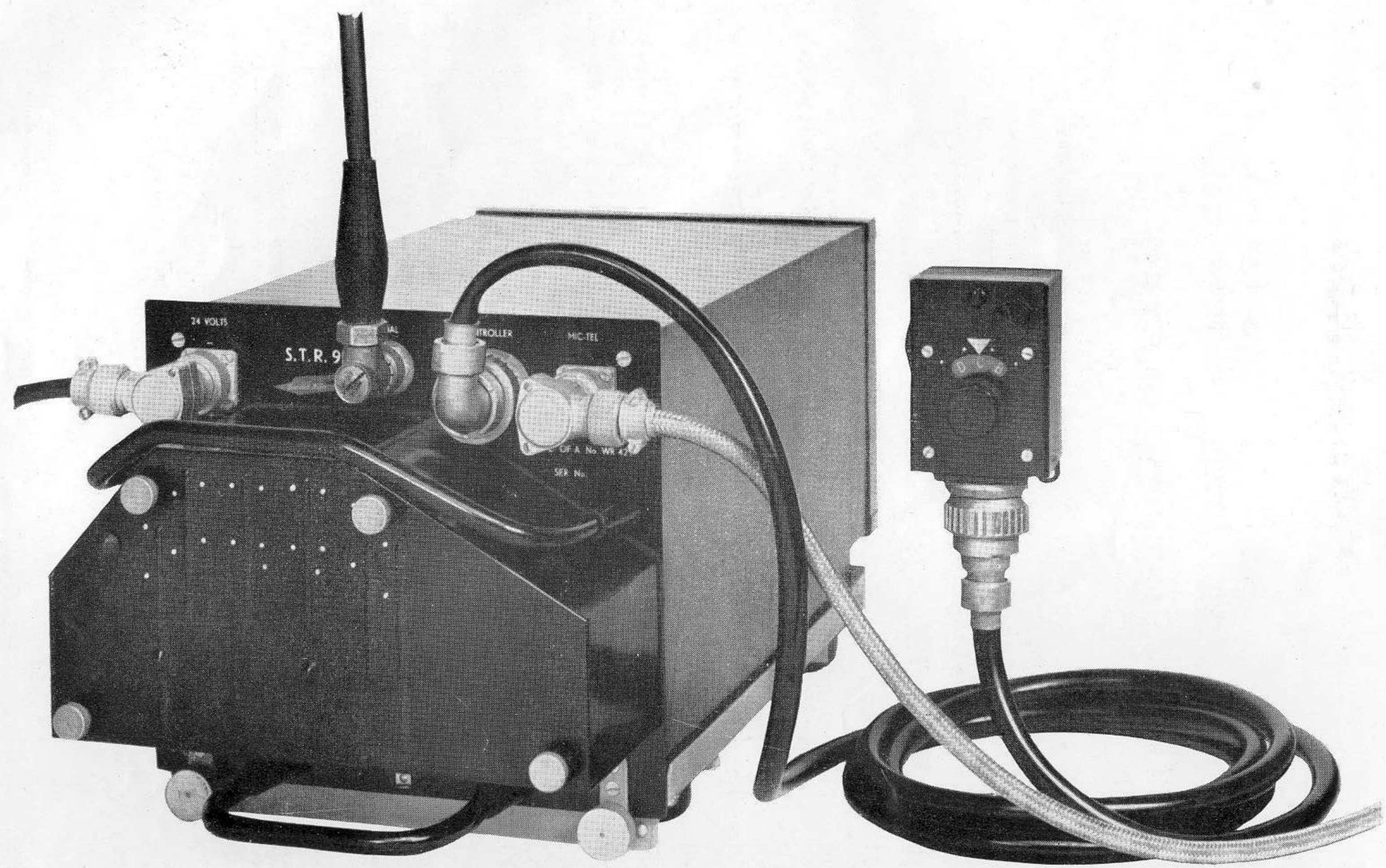
GENERAL VIEW OF STR.9-X



INTRODUCTION

The STR.9-X is a very high frequency receiving and transmitting equipment intended for operation in aircraft. Apparatus used in its construction is of miniature design and is compactly incorporated in two individual units, comprising a main assembly and a control unit. The total weight is 25½ lb.

FREQUENCY, SERVICE AND METHOD OF OPERATION

Ten frequencies are available for transmission and reception within a range of 115 to 145 Mc/s. These frequencies are crystal controlled and are common to both transmitter and receiver. They are pre-set before flight and during flight the operator may instantly select any one or change from one to another.

The equipment is intended for telephonic communication and is provided with a remote control system.

It has a maximum range of approximately 100 nautical miles when used for communication to ground by aircraft flying at 10,000 feet, and a maximum air to air range of 200 miles.

AERIAL

A single vertical aerial only is required for the operation of both transmitter and receiver. A matching unit is used for coupling the equipment to the antenna.

POWER OUTPUT AND POWER SUPPLIES

The power output delivered to the aerial is approximately 4 watts. The equipment is designed to operate on a nominal voltage of 26 volts, and the total power input does not exceed 180 watts for receiving or 210 watts for transmitting.

All valve heaters are fed from the aircraft battery via a carbon pile regulator. Anode and grid bias supplies are obtained by means of a rotary transformer.

COOLING

A forced air cooling system is used in the equipment.

VALVES

21 valves of 7 different types are used.

DESCRIPTION OF EQUIPMENT

The STR.9-X consists of two assemblies as follows :—

Main Assembly

This consists of a main chassis housing five interconnected units. These units are so designed that they may be readily removed from the parent chassis and are :—

Receiver Unit.
Transmitter Unit.
I.F. Amplifying Unit.
Modulator Unit.
Power Unit.

Control Unit Assembly

This assembly incorporates the selector switch for remote control of the equipment and has built-in dial lighting with dimmer control.

PRINCIPAL TECHNICAL FEATURES

General

A main crystal oscillator circuit, capable of operating on any one of ten frequencies, within a range of 5,848 to 7,515.5 kc/s., is incorporated in the equipment as the source of excitation. It controls the transmitter operating frequency and the receiver beat frequency.

The oscillator is built into the receiver unit and is permanently coupled to both transmitter and receiver. Either of these circuits is rendered operative by switching H.T. supplies.

Crystals used in the oscillator have fundamental frequencies lower than the final output frequencies of the equipment, which are achieved by harmonic generation.

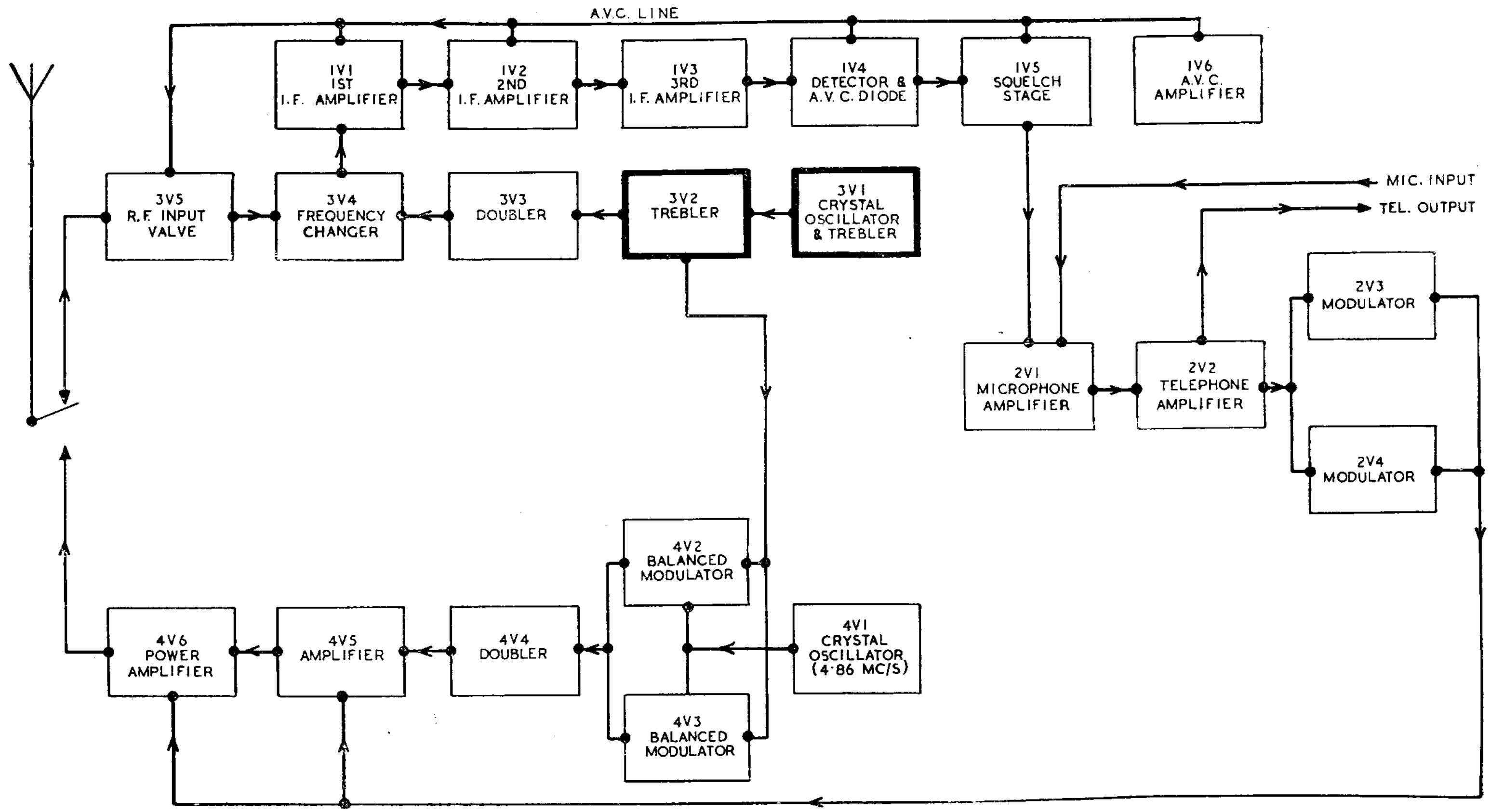
An additional crystal oscillator, operating on a single frequency, is used in the transmitter unit. Its purpose is to compensate for the I.F. frequency difference which occurs between the operating frequencies of transmitter and receiver using a single main oscillatory system.

The design and functions of units mounted in the chassis assembly are briefly described below.

Receiver

The receiver unit incorporates two principal circuits. One consists of an oscillator-harmonic generator chain and the other a receiver input circuit.

Fig. 1. BLOCK DIAGRAM OF STR.9-X



The oscillator and harmonic generator chain comprises a crystal controlled oscillator-trebler stage, followed by an additional trebler stage and a doubler stage. Ten crystals are normally available for use in the oscillator and selection is made on the remote control unit. The output of the harmonic generator chain is applied as a beating frequency to the receiver signal input circuit. The chain is also tapped, at the output circuit of the second trebler stage, to provide an initial frequency for application to the separate transmitter unit. Accordingly, the oscillator output is common to both transmitter and receiver.

The receiver input circuit consists of an R.F. stage with two tuned sub-circuits and a frequency changer stage. Coupling from the frequency changer to the separate I.F. amplifying unit is via a coaxial link.

Both the harmonic generator chain and the receiver input circuit are tuned by a five-gang condenser assembly driven from the channel-change mechanism.

Transmitter

The transmitter has five stages, consisting of an auxiliary oscillator, a balanced R.F. modulator, a doubler, an amplifier, and an output stage.

The auxiliary oscillator is included to compensate for the I.F. frequency difference which occurs between the final R.F. circuits of the transmitter and the local oscillator chain when the latter is used as a common exciting medium.

The auxiliary oscillator output is coupled, together with the output from the second trebler stage in the separate harmonic generator chain of the receiver unit, to a balanced modulator stage, where " mixing " is effected.

The anode circuits of the balanced R.F. modulator stage are connected to a doubler valve which is in turn followed by an amplifier and a final output valve. The penultimate stage is screen modulated, and the final stage anode and screen modulated.

All stages of the transmitter are tuned by a five-gang condenser assembly driven from the channel-change mechanism.

Amplifying Unit

This unit provides three I.F. amplifier stages followed by a diode detector circuit, a " squelch " or audio muting circuit and peak noise limiter, and an A.V.C. amplifier.

Two variable mu H.F. pentodes and one high slope pentode are used for I.F. amplification and are coupled by four band pass circuits.

The detector valve is of the double diode type with delayed A.V.C. and is connected to a Type CV.138 valve operating in a squelch and noise limiting circuit. A.V.C. amplification is obtained via a further type CV.138 valve.

Connection of the audio output is made to the microphone amplifier in the separate modulator unit via a coaxial link.

Modulator

The modulator unit has three stages consisting of a microphone amplifier, a telephone amplifier-driver, and a modulator stage.

The microphone amplifier has a balanced input circuit and is used for amplification of the microphone input and receiver outputs. It is resistance capacity coupled to the telephone amplifier-driver stage.

Transformer coupling is effected between the telephone amplifier stage and the modulator valves. The transformer is also provided with a telephone output winding.

The modulator is push-pull Class B using two Type CV.133 valves transformer coupled to the anode supply circuit of the transmitter output stage. During reception the modulator is rendered inoperative by introducing cathode bias resistance.

Channel-Change Mechanism

The channel-change mechanism provides for the selection by remote control of any one of ten operating frequencies and is mechanically actuated via a reduction gear from the rotary transformer. The gear has a ratio of 480 : 1.

Chapter 1

STATEMENT OF TYPICAL PERFORMANCE

1.0 GENERAL

1.1 Frequency Range

STR.9-X	STR.9-X.1	STR.9-X.2	STR.9-X.3
115-145 Mc/s.	112-142 Mc/s.	100-125 Mc/s.	124.5-156 Mc/s.

1.2 Frequency Stability ± 0.01%.

1.3 Power Consumption

Transmitting :- 210 watts

Receiving :- 180 watts

1.4 Audio Frequency Response Characteristic

Transmitting :-	Within −4 db. to −10 db. at 300 c/s. Within 0 db. to −4 db. at 3,000 c/s.	Relative to output at 1,000 c/s.
Receiving :-	Within 0 db. to −6 db. at 300 c/s. Within 0 db. to −8 db. at 3,000 c/s.	

1.5 Altitude The equipment operates satisfactorily up to an altitude of 40,000 ft.

1.6 Attitude The equipment is designed for continuous operation with the rotary transformer maintained in a horizontal position. It will operate in any other attitude, but for short periods only.

1.7 Temperature, Humidity The equipment is suitable for use under tropical conditions.

2.0 TRANSMITTER CHARACTERISTICS

2.1 R.F. Output Power Nominal 5 watts into a 45-ohm line.

2.2 Percentage Modulation and Harmonic Content Carrier may be modulated up to 100%. The harmonic content is not greater than 15% at 80% modulation.

2.3 Noise Level At least 40 db. below the level corresponding to 100% modulation.

3.0 RECEIVER CHARACTERISTICS

3.1 Sensitivity

The muting will be removed by a carrier input of not more than 10μV.

3.2 Audio Output

The equipment is capable of delivering a total of 150 mW into three pairs of telephones. This is achieved at an input level 6 db above the knee of the a.v.c. with the carrier modulated by 1,000 c/s. to a depth of 70%.

3.3 Signal-to-Noise Ratio

The S/N ratio is not less than 10 db at an input level of 10μV modulated by 1,000 c/s. to a depth of 30%.

3.4 Intermediate Frequency :– 9.72 Mc/s.

3.5 I.F. Bandwidth

For 6 db. down :– Not less than $\pm$ 40 kc/s.

For 40 db. down :– Not more than $\pm$ 140 kc/s.

3.6 Second Channel Suppression

Not less than 35 db.

3.7 Automatic Gain Control

Rise in Input :– 80 db. above 10μV.

Rise in Output :– Not more than 3 db.

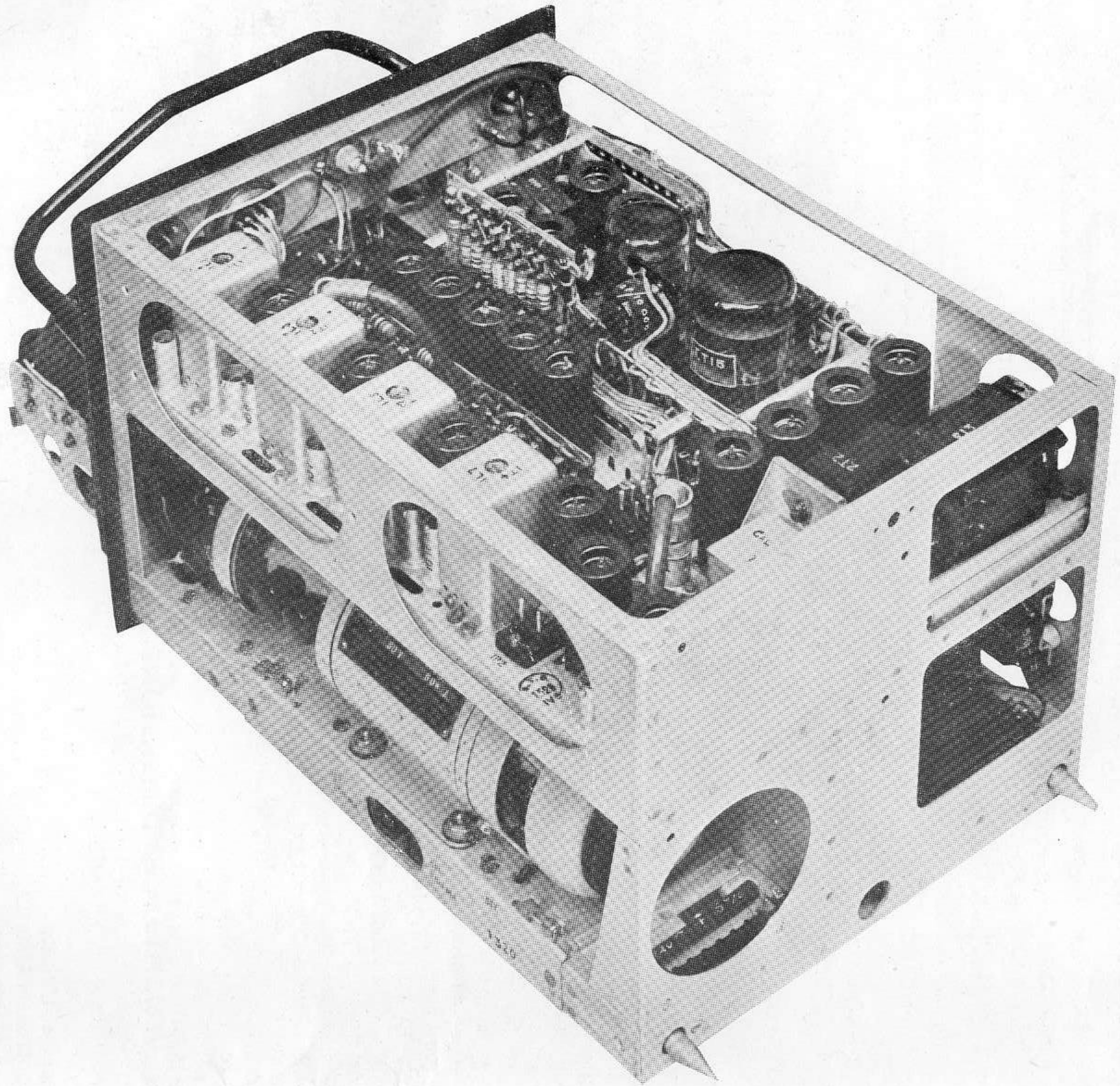
3.8 Audio Output Impedance

The equipment is designed to operate into an impedance of 50 to 150 ohms.

4.0 WEIGHTS AND DIMENSIONS

		Approximate overall dimensions in inches.		
	Weight	Height	Width	Depth
Receiver Unit	1 lb. 13 oz.	5.1	2.0	6.9
Transmitter Unit	2 lb. 10 oz.	6.0	3.25	8.0
I.F. Amplifier Unit	1 lb. 12 oz.	2.9	2.9	10.75
Modulator Unit	1 lb. 12 oz.	2.8	3.1	5.7
Chassis containing channel-change mechanism, carbon pile regulator and rotary transformer	16 lb. 15.5 oz.	7.9	9.0	18.0
Control Unit	9.5 oz.	3.7	2.2	2.8
Total weight, less cables	25 lb. 8 oz.			

MAIN CHASSIS (Cover removed)



Chapter II

DETAILED DESCRIPTION

1.0 DESCRIPTION OF EQUIPMENT

The STR.9-X incorporates the following:—

(*a*) Main Chassis Assembly, *consisting of* Chassis, containing the oscillator-receiver circuits, I.F. and modulator circuits, transmitter circuit, power circuits, and the channel-change mechanism.

(*b*) Control Unit.

2.0 DESCRIPTION OF UNITS

2.1 Main Chassis Assembly

(1) Chassis

(Plates II and III illustrate the chassis.)

(*a*) Construction

The main chassis is rigidly constructed of aluminium alloy. It is provided with a dust cover embodying louvres, air filters and a duct for use in conjunction with the forced air cooling system employed in the equipment. The dust cover slides over the main chassis and is retained in position by DZUS fasteners.

A small compartment, situated on the right-hand side of the chassis, houses the rotary transformer. This compartment is constructed with an aperture which enables the rotary transformer fan to draw adequate supplies of air via the duct and filter in the dust cover. Other apertures in the compartment permit circulation of air through the transmitting and receiving apparatus, and its final expulsion via a remaining filter.

The rotary transformer itself slides into the compartment from the right-hand side of the chassis and is retained in position by accessible screws. Electrical connections to the transformer are made by knife contacts.

The transmitter unit is mounted on the left-hand side of the chassis to which it is secured by four retaining screws accessible from the underside of the deck. Electrical connections to the chassis are by means of a miniature Jones pattern plug and socket.

Situated between the transmitter and the transformer compartment is the receiver, secured and electrically connected to the chassis in a similar manner to the transmitter. Additional supporting spacers are provided between transmitter and receiver, which are also electrically connected by a two-pin plug and socket.

To the rear of the transmitter and receiver units are mounted the carbon pile regulator and the modulator unit. The modulator unit is situated above the regulator which is secured to the chassis deck by retaining screws.

The I.F. amplifier unit occupies the remaining space on the shelf formed by the rotary transformer housing.

On the front panel of the chassis is mounted the channel-change mechanism and crystal panel, the latter being designed to cater for S.T. & C. 4004, 4044 (or American equivalent), or 4046 (HC/6U) crystals; mixed if desired.

Located on the mechanism is a push-pull two-position slide switch for checking receiver and transmitter tuning.

Interchangeable channel designation strips are mounted on top of the mechanism to enable the channel numbering to be identified with the particular lettering scheme adopted (see Chapter V).

A removable dust cover is fitted over the mechanism, and this carries spring loaded rockers to serve as crystal retainers. The slide switch referred to above is restored to normal by the operation of replacing the cover, if it should be accidentally left in an operated position.

The front panel also accommodates the aerial feeder plug, power supply and remote control plugs, carrying handle and guard rail. The carrying handle and guard rail enable the set to be stood on its face when necessary, without risk of damage to the mechanism or crystals if the mechanism cover has been removed.

Underneath the chassis deck in accessible positions are situated miscellaneous relays, resistors and condensers.

The complete chassis is mounted on a tray fitted with cup type shock absorbers and is secured in position by knurled retaining nuts.

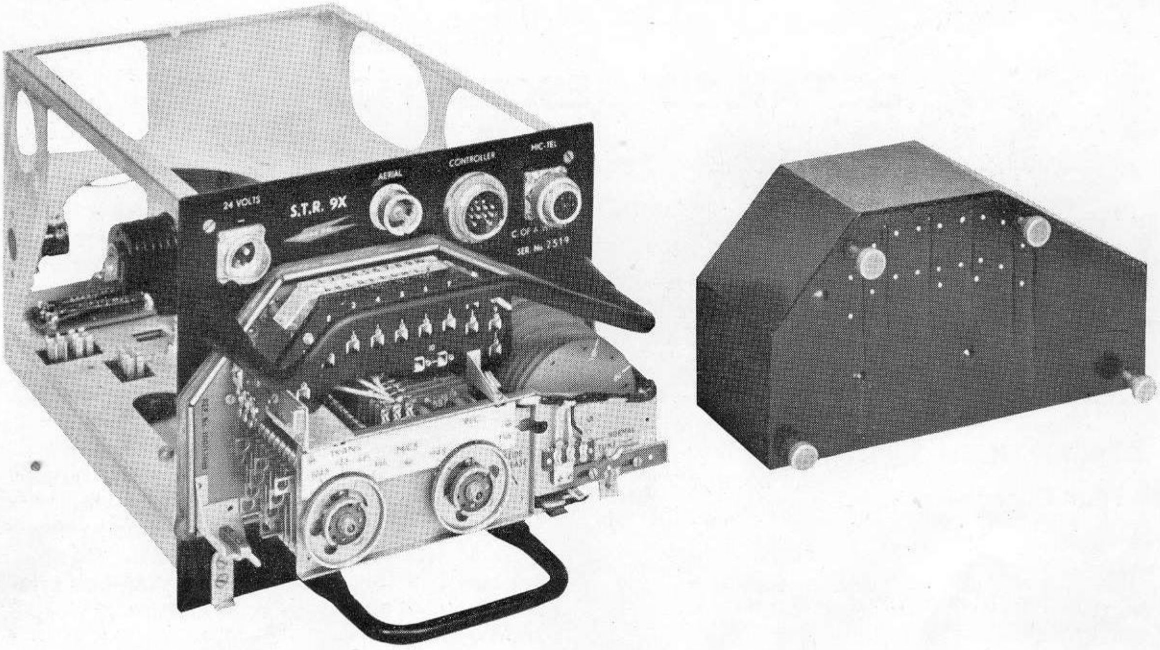
(*b*) Front Panel Fittings

These are shown on Plate III and are :—

Controls

Pull to Tune (transmitter and receiver) switch.
Receiver Tuning Control (pre-set).
Transmitter Tuning Control (pre-set).
Muting Level Control (pre-set).

PLATE III



MAIN CHASSIS (Less units)

Other Fittings

12-pin plug for remote control circuit.
6-pin plug for external mic-telephone fittings.
Aerial Plug.
Power Plug.
Crystals as required.
Channel-change mechanism.

(*c*) Electrical Description of the Chassis

(The circuit diagram is given in Figs. 19 & 22.)

Electrically, the chassis serves as a distribution centre for supplies to the various units.

It also incorporates 5.Rel.1, the starting relay, 5.Rel.2, an H.T. switching relay and 5.Rel.3, a combined aerial changeover and H.T. switching relay. Rotary switch 5S3 is mounted at the rear of the front panel on the chassis and, in conjunction with contacts of 5S4, 5S5, 5S6, electrically controls movement of the channel-change mechanism. A full description of the method of control is given in Section VII of this chapter.

The carbon pile regulator 5.Reg.1 is connected in the L.T. line to maintain the supply at a sensibly constant level.

Grid bias potentiometer 5R1 to 5R5 is connected across the bias winding of the rotary transformer and is suitably tapped to permit application of different bias voltages to the transmitter and receiver circuits.

A 12-pin plug, 5P7, is used for connecting the starting and channel-change circuits to the remote point and a 6-pin plug, 5P8, provides connection for the external microphone, telephone and " Press to Talk " circuits.

L.T. supply is conveyed to the unit from the aircraft battery via a two-pin plug 5P9.

(II) Receiver Unit

(Plates IV and V illustrate the unit.)

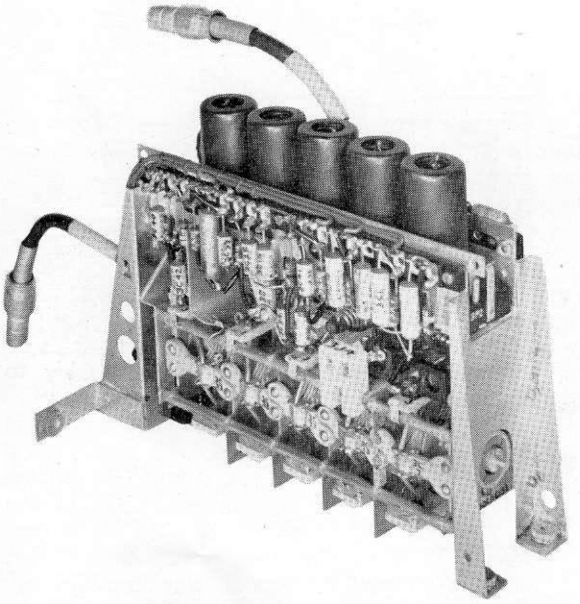
(*a*) Construction

The Receiver Unit consists of a light framework upon which are mounted an oscillator-trebler stage, a trebler stage, a doubler stage, a frequency changer and an R.F. input stage.

The valves performing the above functions are mounted on a platform in the upper section of the framework and are secured in position by spring loaded screening cans. On either side of the valves, and supported by metal screens, are two banks of miscellaneous resistors and condensers. At one end of the valve platform are situated terminal points to permit attachment of a meter for the purpose of measuring grid currents of various valves and immediately beneath the platform are the circuit inductances together with their associated inductance trimmers.

A five-gang condenser occupies the lower half of the framework. During operation this assembly is driven, via flexible couplings, from

PLATE IV



RECEIVER UNIT (General view)

the channel-change mechanism. A small air-dielectric trimmer is provided beneath each section of the gang.

Connection to the main chassis is made via a miniature Jones pattern plug and socket and to the aerial change-over relay and the I.F. stages via plug terminated coaxial cables. A miniature plug and socket is also used for connection of the oscillatory circuit to the transmitter.

The framework is normally secured in its position on the main chassis by four screws, and to the transmitter framework by brackets.

(*b*) Circuit

(The block diagram is given in Fig. 2 and the circuit diagram in Figs. 19 & 30.)

For the purpose of description the overall circuit of the receiver unit may be divided into two circuits as follows :—

(i) The oscillator and harmonic generator circuit.

(ii) The R.F. and frequency changing circuit.

Both of these circuits are described below :—

(i) The oscillator and harmonic generator circuit

The oscillator and harmonic generator circuit incorporating valves 3V1, 3V2, 3V3, consists of a crystal controlled oscillator followed by a series of frequency multiplier stages. The purpose of this circuit is to provide an input at the correct frequency to the receiver frequency changer valve 3V4, or to provide an exciting medium for the transmitter.

The crystal oscillator comprises valve 3V1 with an anode inductance 3L1 and associated resistors and condensers. Ten crystals are available in the oscillator, and any one may be brought in operation by slide bar contacts which are remotely controlled. These slide bar contacts (5S7A to 5S7D) are part of the channel-change mechanism which also adjusts circuit tuning by means of a ganged condenser assembly 3C7-13-21-35-33.

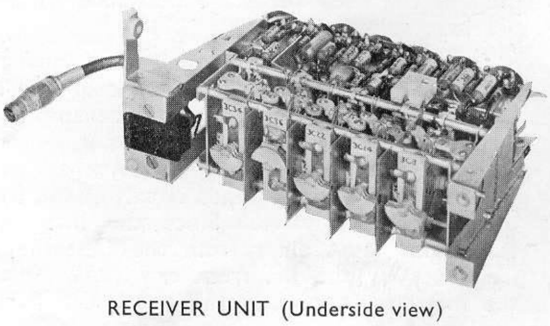
Positive feedback for the oscillator is obtained by connecting the cathode of 3V1 to a point between condensers 3C5 and 3C6, the D.C. path for the cathode being obtained through a high frequency choke 3 H.F.C.1 and resistor 3R3. The oscillator is self biassing but resistor 3R3 is included in the cathode circuit to limit anode and screen current when the crystals are short circuited or open circuited by contacts 5S7A to 5S7D.

A trimming condenser 3C8 is included across the tuned anode circuit and is designed to limit the range of the oscillator to that required. The oscillator anode circuit is tuned to three times the crystal frequency by section 3C7 of the five-gang condenser assembly, which is pre-set for each operating frequency and thereafter has its correct capacity selected by the channel-change mechanism.

Since oscillator valve 3V1 is capacitively coupled to the grid of valve 3V2, Type CV136, via condenser 3C4, an R.F. signal, operating at three times the selected crystal frequency, is applied to this valve. A metering point 3P1/1 is provided for the purpose of checking the grid current of valve 3V2.

The anode circuit of valve 3V2 comprising inductance 3L2 and associated condensers 3C13 and 14 is tuned, by section 3C13 of the five-gang condenser assembly, to nine times the original selected crystal frequency. Accordingly trebling is again effected in this stage.

PLATE V



RECEIVER UNIT (Underside view)

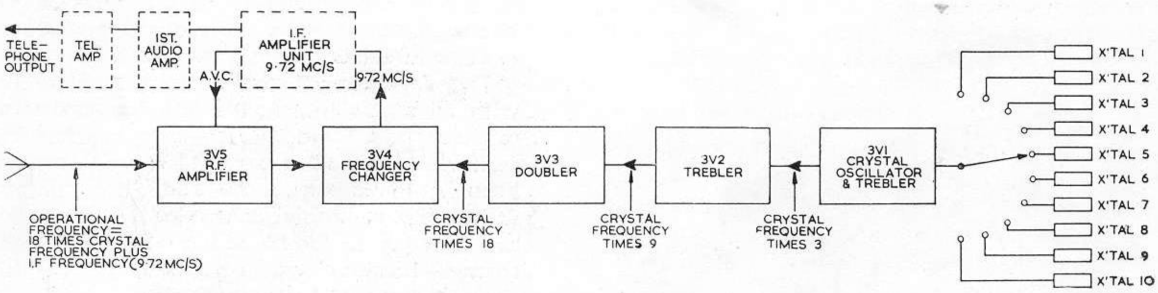


Fig. 2. BLOCK DIAGRAM OF RECEIVER UNIT

Also, the anode of valve 3V2 is capacitively coupled in the grid of valve 3V3, Type CV.138, via condenser 3C18, and inductively coupled to the grid circuits of the balanced modulator stage in the transmitter. (It is not proposed to follow any sequence of transmitter operation at this stage since a full explanation of the subject is given in Section III.)

The grid of valve 3V3 is provided with a grid metering point 3P1/2 and the anode circuit, consisting of inductance 3L3 and associated condensers 3C17, 21 and 22, is tuned to twice the grid input frequency by section 3C21 of the ganged condenser assembly. The frequency of the signal appearing in the anode circuit at this point is eighteen times the original selected crystal frequency. Anode and screen supplies for valve 3V3 are obtained from the H.T. line via resistors 3R7 and 3R21 respectively.

Capacitive coupling is effected between the output circuit of valve 3V3, via condenser 3C47, and the input circuit of the frequency changer valve 3V4. Accordingly the output of the oscillator and harmonic generator chain is available for " mixing " with the incoming signal from the receiver R.F. stage.

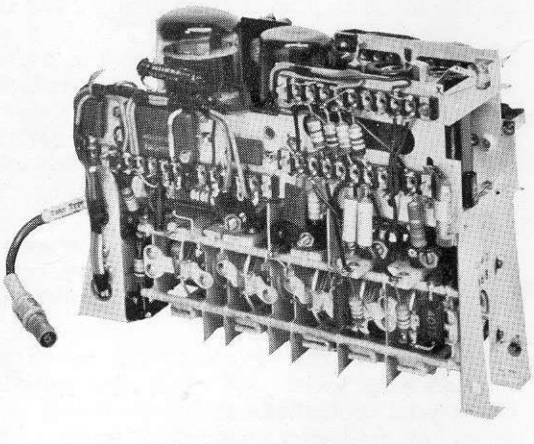
(ii) The receiver R.F. and frequency changing circuit

The incoming frequencies which the receiver will accept are dependent upon the crystals used in the oscillator stage described in the previous sub-section.

If, for example, a crystal with a frequency 6.96 Mc/s. is available in the oscillator and is selected by the channel-change mechanism, a frequency of 125.28 Mc/s. will appear at the termination of the harmonic generator chain and will be applied to the input circuit of the frequency changer valve. Since the incoming R.F. signal must differ from the " Beating " frequency by the I.F. frequency (9.72 Mc/s.) the R.F. circuits are, in the above condition, tuned by the ganged condenser assembly to receive an incoming signal of 135 Mc/s.

The incoming signal is applied via the antenna system, change-over relay 5.Rel.3 and coaxial cable, to the tuned input circuit comprising inductance 3L5 and condensers 3C32, 33 and 34. A resulting voltage is applied via a condenser 3C31 to the grid circuit of the R.F. valve 3V5, Type CV.138, and after amplification, is fed via condenser 3C27 to the grid of the frequency changer valve 3V4. The tuned grid and anode circuits of valve 3V5 are controlled by the common gang condenser assembly and provide the necessary second channel suppression. A.V.C. voltage is applied to the grid of valve 3V5 via resistor 1R14 in the I.F. amplifying unit. After mixing has been effected, the resultant output of the frequency changer valve is fed via a coaxial cable and at the I.F. frequency of 9.72 Mc/s. to the first I.F. transformer 1T1 in the separate I.F. amplifying unit. Its subsequent amplification and rectification is described in Section IV of this chapter.

PLATE VI



TRANSMITTING UNIT (Front view)

(III) Transmitter Unit

(Plates VI and VII illustrate the unit.)

(*a*) Construction

The transmitter unit is of a somewhat similar general construction to the receiver unit, and consists of a light framework containing an auxiliary crystal oscillator stage, a balanced R.F. modulator stage, a doubler stage, and an output amplifier.

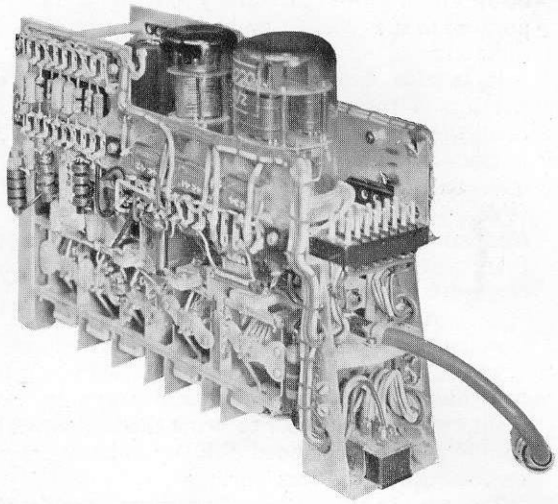
The valves performing the above functions, together with the crystal, are arranged on a small platform incorporated in the framework construction.

On both sides of the valve platform are sheet metal wings supporting various resistors and condensers used in the circuit. A metering point is provided at one end of the platform.

In the lower section of the framework is a five-gang condenser, driven from the channel-change mechanism on the front panel of the main chassis. The condenser shaft is attached to the mechanism via flexible couplings, and air dielectric trimmers are incorporated in each section of the gang.

Connection to the main chassis is made via a miniature Jones plug and socket and to the aerial change-over relay 5.Rel.3 via a coaxial plug-terminated cable. Plug and socket contacts are used to connect the transmitter to the receiver unit.

PLATE VII



TRANSMITTER UNIT (Rear view)

The framework is retained in position on the main chassis by screws and is attached to the receiver unit by spacers.

(*b*) Circuit

(The block diagram is given in Fig. 3 and the circuit diagram in Figs. 19 & 26.)

The transmitter is designed to operate at the same frequencies as the receiver and is

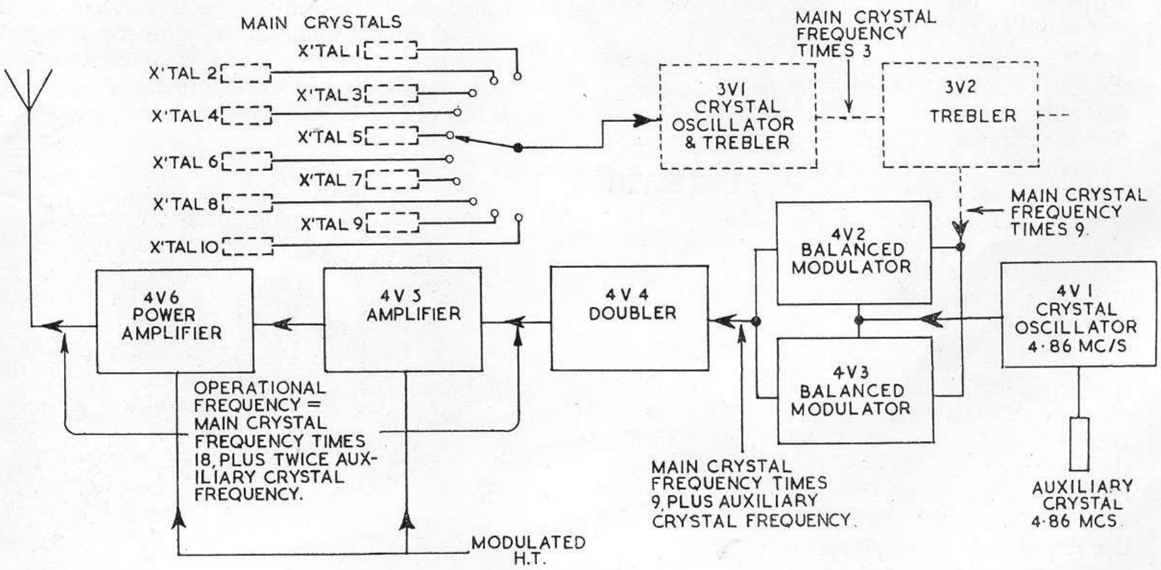


Fig. 3. BLOCK DIAGRAM OF TRANSMITTER UNIT

controlled by an oscillatory circuit common to both units. This oscillatory circuit is incorporated in the receiver unit and is fully described in Section (II) of this chapter.

It is also explained in Section (II) that a portion of the oscillator output is inductively coupled from the output circuit of valve 3V2 in the harmonic generator chain of the receiver unit to the balanced R.F. modulator stage (4V2, 4V3) of the transmitter. The output frequency delivered by valve 3V2 is nine times that of the crystal selected by the channel-change mechanism.

Since the receiver R.F. circuit operates at frequencies eighteen times that of the selected crystals, plus the I.F. frequency (9.72 Mc/s.), it is evident that further adjustments must be made in the transmitter to bring the frequencies applied to the balanced R.F. modulator stage up to those of the receiver.

To assist in this purpose a separate oscillator stage comprising valve 4V1 Type CV.136 is included in the transmitting unit. This oscillator has a single tuned anode circuit designed to operate at one half (4.86 Mc/s.) the I.F. frequency.

The output of the oscillator valve 4V1 is coupled, via the tuned transformer 4L1, to the push-pull connected screens of the balanced R.F. modulator valves 4V2, 4V3, and since a frequency nine times that of the selected crystal is already applied to the control grids of valves 4V2, 4V3 from the receiver unit, " mixing " is effected.

Metering points 4P1/1, 4P1/2 and 4P1/3 are provided in the grid circuits of valves 4V1, 4V2 and 4V3 respectively.

A band pass coupling 4L2, 4L3, tuned by sections 4C15, 4C17 of a ganged condenser assembly and condensers 4C14, 4C18, ensures that the sum of the foregoing frequencies (i.e. nine times the frequency of the selected crystal plus one half of the I.F. frequency) is injected into the grid circuit of valve 4V4 Type CV.136 which functions as a doubler.

Accordingly the frequency appearing in the anode circuit of valve 4V4 is eighteen times that originally provided by the selected crystal in the receiver unit, plus the I.F. frequency of 9.72 Mc/s. and the required frequency adjustment has been achieved.

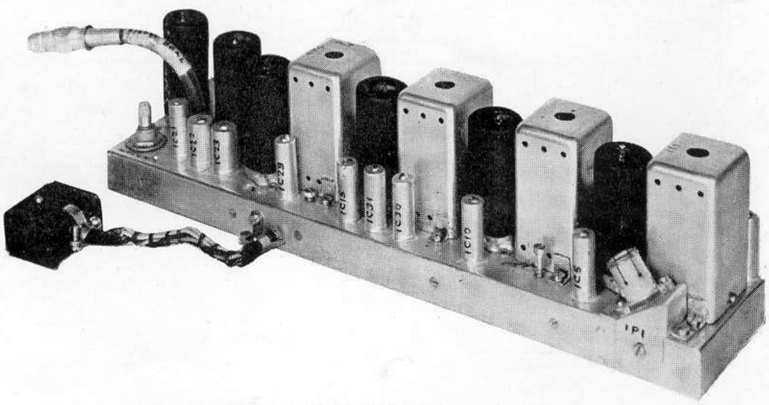
For example :—

A crystal with a frequency of 6.96 Mc/s. in the receiver unit is placed in circuit by the channel-change mechanism. The resulting frequency applied to the balanced R.F. modulator stage of the transmitter, via the output circuit of valve 3V2, is 62.64 Mc/s. After " mixing " with the oscillator output from the transmitter unit the frequency appearing at the input circuit of the transmitter doubler stage (valve 4V4) is 67.50 Mc/s. Therefore the output frequency (transmitter operational frequency) of the doubler stage is 135 Mc/s.

The anode circuit of valve 4V4, tuned by section 4C22 of the ganged condenser assembly and trimming condenser 4C23, is coupled to valve 4V5 via condenser 4C24. Valve 4V5 operates as an amplifier with a modulating voltage applied to the screen, via resistance 4R21, from the separate modulator unit. A grid metering point 4P1/5 is provided for the valve.

The output circuit of valve 4V5 comprising condensers 4C28, 29 and coil 4L5 is tuned, in operation, by section 4C28 of the ganged condenser assembly and is coupled in push-pull via condensers 4C31, 4C32 to the output valve 4V6. This valve is a Type CV.415 Tetrode and is provided with grid metering points, 4P1/6 and 4P1/7, in its respective grid circuits. Bias for these circuits is obtained from the 50-volt supply line of the rotary transformer. Modulation is further effected in the anode and screen circuits of valve 4V6, via the modulation transformer 2T3 in the separate modulator unit. The anode circuit of valve 4V6, comprising condensers 4C37, 4C38 and inductance 4L6, is tuned in operation by section 4C37 of the ganged condenser, and coupling to the aerial changeover relay is made via inductance 4L7 and a screened coaxial cable. A metering point 4P1/8 is provided for the purpose of

PLATE VIII



AMPLIFYING UNIT (General view)

measuring the combined screen current of valve 4V5 and anode and screen currents of valve 4V6. A point is also provided in the screen circuit of valve 4V6 to enable the current to be measured during adjustment for correct modulation conditions (by variation of resistance 4R35).

(IV) Amplifying Unit

(Plates VIII and IX illustrate the unit.)

(*a*) Construction

The I.F. amplifying unit consists of a small oblong chassis mounting four I.F. transformers and six valves above deck and miscellaneous components below.

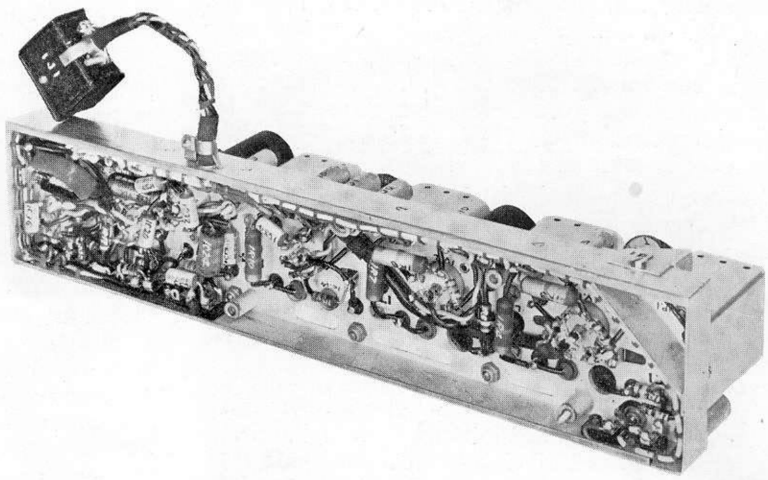
The unit is normally secured to the main assembly by four captive screws and electrical connections are effected via an eight-pin Jones pattern plug and flexible lead. Additional connections to the receiver and modulator units are by means of plug terminated coaxial cables.

All of the four transformers are of similar pattern and may be tuned via holes in the top of each can and in the underside of the chassis.

Decoupling condensers used in the unit are mounted in small metallic tubes projecting above deck, thus ensuring a low inductance earth return and a clean general layout.

Filament leads, H.T. leads and A.V.C. leads are run separately from each amplifier stage and are decoupled at the point where they leave the unit in order to minimise interstage reactance.

PLATE IX



AMPLIFYING UNIT (Underside view)

(*b*) Circuit

(The block diagram is given in Fig. 4 and the circuit diagram in Figs. 19 & 32.)

Input to the I.F. amplifier is fed via a coaxial cable from the frequency changer valve 3V4 in the receiver unit at a frequency of 9.72 Mc/s. This input is applied, via the first I.F. transformer 1T1, to the grid of valve 1V1. Valve 1V1 is coupled to valve 1V2 via the second I.F. transformer 1T2.

Both valves are variable mu H.F. pentodes and have A.V.C. voltage series fed to their respective grids by decoupling filters 1R2, 1C2 and 1R5, 1C7. Bias is obtained via potentiometer 5R4, 5R6 located across the 50-volt negative winding of the rotary transformer, and may be adjusted from the front panel of the main chassis in such a manner as to vary the overall gain.

The A.V.C. voltage applied to the valves is developed across resistors 1R13 and 1R15

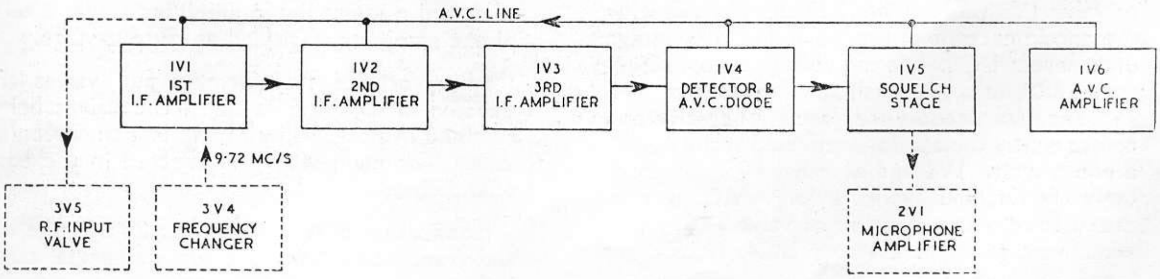


Fig. 4. BLOCK DIAGRAM OF AMPLIFYING UNIT

connected in the bias line, a portion of this voltage being fed via the filter 1R14, 1C23 and 1C37 to the grid of the R.F. amplifier valve 3V5 in the receiver unit. To avoid a rise in screen voltage when the A.V.C. commences to control, the respective valve screens are fed via potentiometers 1R3, 1R25 and 1R6, 1R26, connected across the H.T. line.

Valve 1V2 is coupled via transformer 1T3 to a high slope pentode valve 1V3, Type CV.138, which in turn feeds the diode detector valve 1V4, Type CV.140, through the medium of transformer 1T4. Associated with the detector circuit is a noise limiter and audio muting valve 1V5 and an A.V.C. amplifier valve 1V6.

In the detector circuit condensers 1C17, 1C20 and resistance 1R11 form an I.F. filter and resistors 1R18, 1R19, and 1R23 the diode load. The load is coupled to the anode of valve 1V5, Type CV.138.

The cathode of valve 1V5 is connected to condenser 1C24 and resistance 1R16, via potentiometer 1R24 and resistance 1R28. Potentiometer 1R24 serves as an output point for application of the rectified signal to valve 2V1 in the separate modulator unit. The anode and grid circuits of valve 1V5 are linked by condenser 1C25; this link reduces the series impedance of valve 1V5 to A.C. currents.

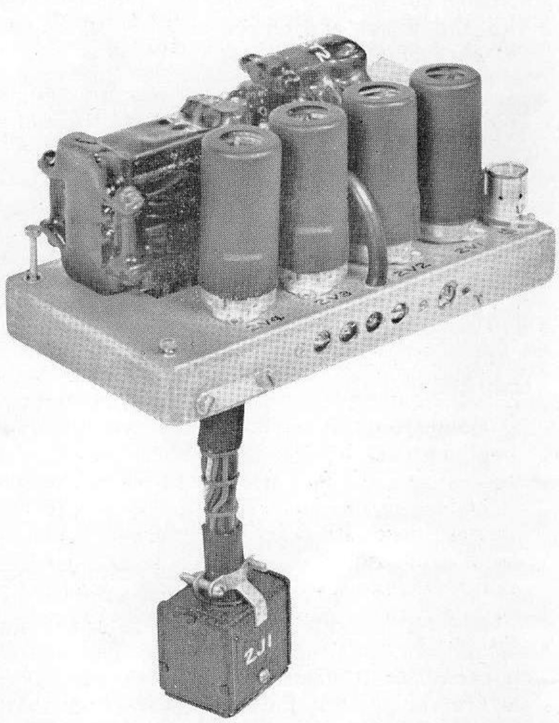
Valve 1V5 is series connected with the audio supply to the A.V.C. amplifier valve 1V6 and audio volts appear across potentiometer 1R24 and resistance 1R28 when conduction is effected in 1V5.

The cathode potentials of valves 1V4, 1V5 and 1V6 are dependent upon the voltage developed across resistance 1R20 which is connected to the 50-volt negative supply line. In turn the voltage across resistance 1R20 is governed by the current consumed in valve 1V6 and accordingly by the grid bias applied to valve 1V6 from the diode load circuit.

Upon receipt of a signal a negative bias is developed across the diode load and applied to valve 1V6 via resistor 1R22 thereby reducing the anode current of the valve and the voltage drop across 1R20. As the voltage across resistance 1R20 becomes small the cathodes of 1V4, 1V5 and 1V6 become increasingly negative and consequently conduction is effected at the A.V.C. diode of valve 1V4 and at valve 1V5. Accordingly the voltage available for A.V.C. is produced by the amplification of valve 1V6. Also audio voltage appears across 1R24, 1R28.

The circuit of valve 1V5 is so arranged that a large incoming noise peak will temporarily

PLATE X



MODULATOR UNIT (General view)

render the anode potential negative with respect to cathode and, since the valve under these circumstances will be non-conductive, the noise will not be applied to the audio channel.

(V) Modulator Unit

(Plates X and XI illustrate the unit.)

(*a*) Construction

The modulator unit is constructed in the form of a small oblong chassis upon which are mounted a microphone amplifier stage, a telephone amplifier stage and an output stage.

All associated transformers and valves are situated on the chassis deck, the valves being retained in position by spring loaded screening cans. The main wiring is effected in the base of the chassis.

Connection of the modulator unit to the I.F. and transmitter units is made via coaxial cable and to the main chassis by means of a twelve-pin miniature Jones plug and socket.

(*b*) Circuit

(The block diagram is given in Fig. 5 and circuit diagram in Figs. 19 & 34.)

Three stages consisting of a microphone amplifier, a driver-telephone amplifier and an output stage are incorporated in the modulator unit.

The microphone is connected via screened cables and terminals 11 and 12 in the unit to the balanced input circuit of transformer 2T1. A bridge circuit is used to connect the output of the I.F. amplifier to the microphone amplifier stage.

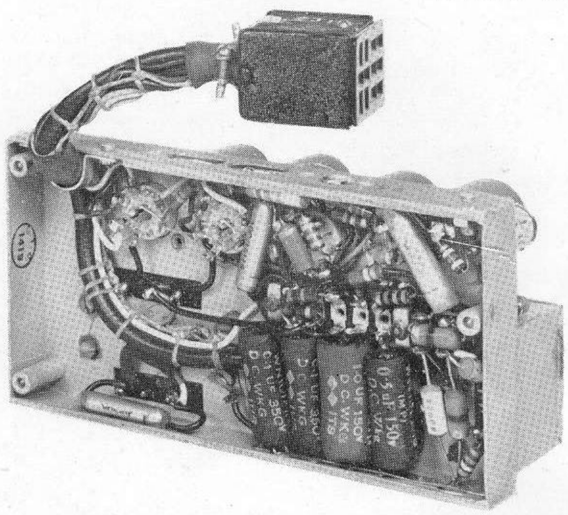
The output of transformer 2T1 is fed to valve 2V1, the latter being resistance capacity coupled, via condenser 2C5, to the grid of the telephone amplifier and driver valve 2V2, Type CV.136. Bias for valve 2V2 is developed across the cathode resistor 2R11 and is applied to the grid via resistance 2R8. To ensure good regulation on the telephone winding of transformer 2T2 and to reduce distortion, negative feedback is applied between the anode of valve 2V2 and the cathode of valve 2V1 via resistance 2R9.

The anode of valve 2V2 is coupled, via transformer 2T2, to the grid circuits of the modulator valves 2V3, 2V4, Type 6C4 operating in push-pull. Telephone output is taken from an individual winding on transformer 2T2 via terminal 9 to the control point.

The grid circuits of valves 2V3, 2V4 receive their bias supply from the rotary transformer via the centre tap of transformer 2T2 and have anode circuits connected in push-pull to the output transformer 2T3.

The secondary winding of 2T3 is series connected in the supply line to the transmitter output stages in the separate transmitter unit via a screened line. Accordingly, modulated H.T. voltage is fed to the transmitter output stages.

PLATE XI



MODULATOR UNIT (Underside view)

(VI) Motor Generator

(Plates XII and XIII illustrate the rotary transformer and the circuit diagram is given in Fig. 6.)

(*a*) Construction

The rotary transformer is of lightweight construction and incorporates features additional to those found in a conventional type.

It is mounted on a sheet metal base underneath which is located a screened compartment housing the filter circuits. The compartment has a detachable cover to permit access to the filters as required.

Situated at one end of the rotary transformer for cooling purposes, is a multi-bladed fan enclosed by a cylindrical shield. The shield is removable and is designed to engage with an air intake channel in the main chassis.

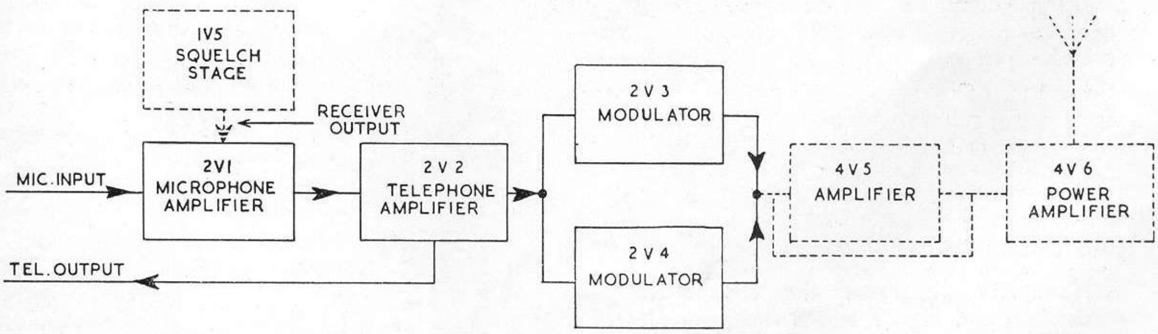
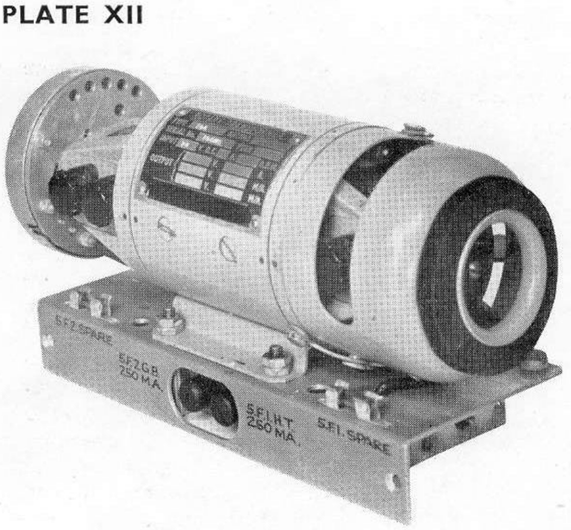


Fig. 5. BLOCK DIAGRAM OF MODULATOR UNIT

PLATE XII



ROTARY TRANSFORMER (General view)

On the remaining end of the rotary transformer is constructed an electrically controlled reduction gear. This gear enables the channel-change mechanism to be mechanically actuated by the motor at a low speed and without appreciably affecting the loading. The ratio of the gearing used is 480 : 1, this large reduction being mainly achieved by a cam actuated pawl and ratchet wheel mechanism.

In effect the cam is attached to the main shaft of the rotary transformer and is arranged to contact a pawl at each revolution of the shaft. When contacted, the pawl receives an upward thrust and, since it is engaged with a ratchet wheel, the latter moves forward one tooth. The ratchet wheel is in turn meshed by conventional reduction gearing to the channel-change mechanism shaft and this is rotated accordingly.

Control of movement is obtained by an electro magnet which is arranged to release the pawl from contact with the cam as required.

Electrically the rotary transformer is of standard design and is intended to operate on a nominal input voltage of 26 volts. It has two secondary windings, one being for the 250-volt H.T. supply and the other the 50-volt grid bias supply.

(VII) Channel-Change Mechanism

(Plate XIV illustrates the channel-change mechanism and Figs. 7 and 8 the principles of operation.)

(*a*) Construction

The channel-change mechanism is mounted on the front panel of the main chassis assembly and has three principal functions to perform as follows :—

(i) Select the appropriate crystal for operation in the receiver unit.

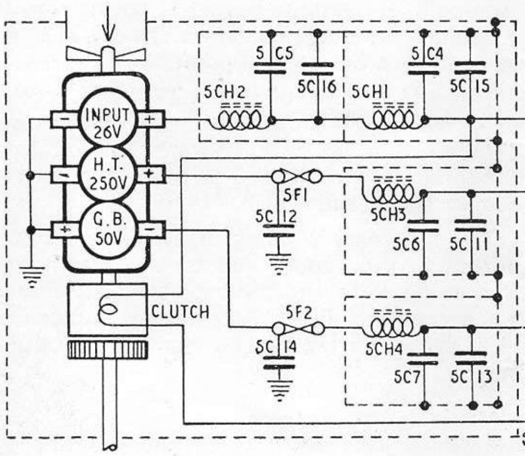
(ii) Set the ganged tuning condenser assembly in the transmitter unit to its correct relative position for a given frequency.

(iii) Set the ganged tuning condenser assembly in the receiver unit to its correct relative position for a given frequency.

Since the equipment is designed to operate on any one of ten frequencies the channel-change mechanism is arranged to carry out the above set of operations in ten combinations.

The mechanism consists of ten spring-returned metal slides mounted in a framework and actuated horizontally by rollers (mounted on the driving spindle assembly) which engage with levers attached to the slides.

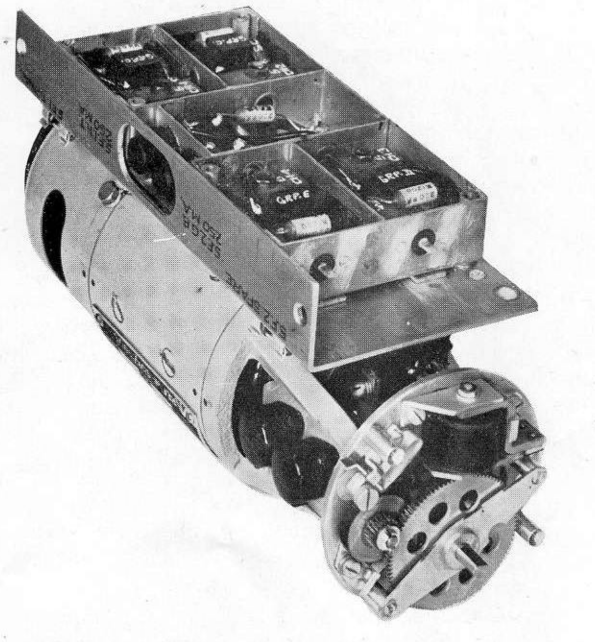
The driving spindle assembly is rotated by the means indicated under VI, and its angular stopping positions, corresponding to the opera-



5C4	0·5 MFD	5CH1	46·5μH
5C5	0·5 MFD	5CH2	46·5μH
5C6	0·1 MFD	5CH3	1350μH
5C7	0·1 MFD	5CH4	1350μH
5C11	220 PFD		
5C12	220 PFD		
5C13	220 PFD		
5C14	220 PFD		
5C15	220 PFD	5F1	250 mA
5C16	220 PFD	5F2	250 mA

Fig. 6. CIRCUIT DIAGRAM OF ROTARY TRANSFORMER

PLATE XIII



ROTARY TRANSFORMER (Filter Compartment and Reduction Gear)

tion of particular slides, is determined by the setting of the switch in the remote control box.

Each slide is responsible for selecting one preset frequency, and is moved into its setting position (extreme left) by its appropriate roller and lever mechanism, and is retained there until a different frequency is selected by remote control.

An aperture (see Fig. 7) permits each slide to move freely in a horizontal direction across the extensions of the transmitter and receiver tuning condenser assembly shafts which protrude through the slides.

Attached to each ganged condenser shaft extension is a bank of ten cams (see Fig. 8), each cam being free to take up a different relative position on the shaft to any other unless locked by a knurled fitting on the front of the assembly.

Mounted on each slide (see Fig. 7) are locating spring "fingers" which are designed to engage with the appropriate cams on the extension shafts of the two condenser assemblies.

In so doing they move their respective cams to a common plane, and since each cam may be initially set up in a different relative position to the condenser vanes, the condenser shafts will move to different positions as the slides are individually actuated.

Each slide carries a striker which operates its own crystal switch forming part of a bank of switches mounted immediately above the slides, thus bringing the appropriate crystal into circuit when a slide is operated.

For initial setting up purposes the slides may be manually placed in the operating position and locked by means of a manual control situated on the right hand side of the assembly.

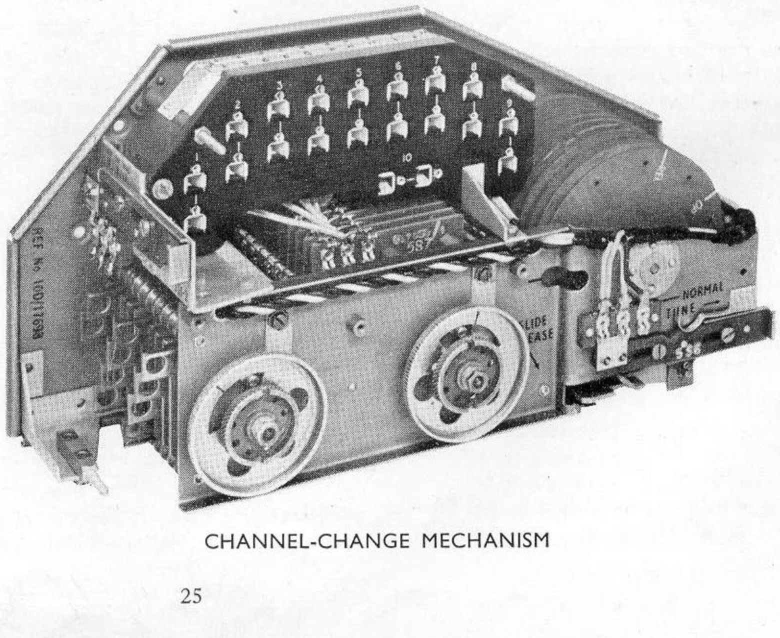
Located above the channel change mechanism is the crystal panel (carrying duplicate sockets for the different types of crystal) and a push-pull slide switch for tuning the transmitter and receiver during frequency alignment.

(*b*) Electrical Circuit

(The circuit diagram is given in Fig. 9.)

As explained in the previous sub-section, the mechanical slides used in the channel-change apparatus are operated by rollers located on a bank of composition discs driven by the rotary transformer. The mechanical principles of the reduction gear used in the drive are detailed in Section (VI) of this chapter and need no further explanation here. It is, however, necessary to explain the control mechanism responsible for starting and stopping the drive from the remote point.

PLATE XIV



CHANNEL-CHANGE MECHANISM

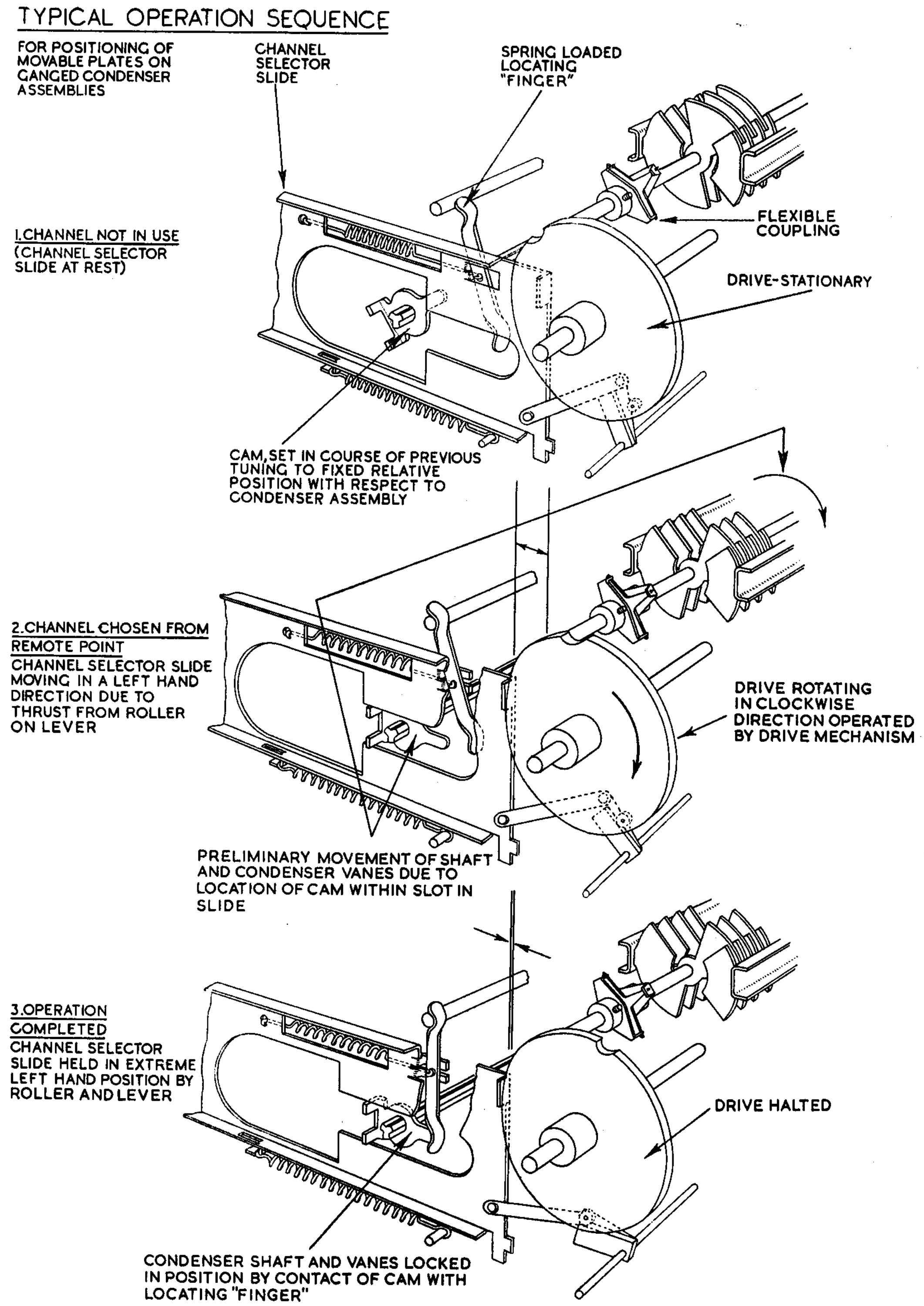


Fig. 7. CHANNEL-CHANGE MECHANISM

It will be observed in Fig. 9 that the movable section of switch 6S1, in the control unit, has an open segment and that contact will be broken at the point where this segment rests. In the diagram the switch is shown in the OFF position. When, for example, the switch on the control unit is placed to frequency position B, the lines from terminals 1 and 2 on plug 6P1 in the control unit are short circuited, causing relay 5.Rel.1 in the main chassis assembly to close and start up the equipment.

Simultaneously, the circuit is completed to the magnet coil in the clutch mechanism of the rotary transformer reduction gear via switch 6S1 and terminal 3 on plug 6P1 in the control unit, fixed contact A and the rotary arm and wiper blade of switch 5S3 and the closed contacts of the manually operated switch 5S6 (in the NORMAL position).

When energization of the magnet coil is effected the reduction gear engages the rotary transformer shaft and the bank of discs in the channel-change mechanism commence to rotate.

Mechanically operated by 10 evenly spaced segments on two of the discs are two sets of contacts 5S4 and 5S5. At the commencement of rotation contacts 5S5 are closed and are synchronised to re-open briefly on each occasion that the rotary arm of switch 5S3 reaches the fixed contact points (1-10). If the fixed contact points are connected to the supply line, via switch 6S1 in the control unit, the supply to the magnet coil will remain unbroken and the bank of discs will continue to rotate. When, however, a contact point is reached where the supply is disconnected by virtue of the position of switch 6S1, i.e. in this case, due to the contact connected to 4 (of 6P1) being open, the current will be broken and the motor will disengage. The timing of the break contacts (5S5) is so arranged that a positive halt of the discs in correct relation to the position of the slides in the channel-change mechanism is obtained.

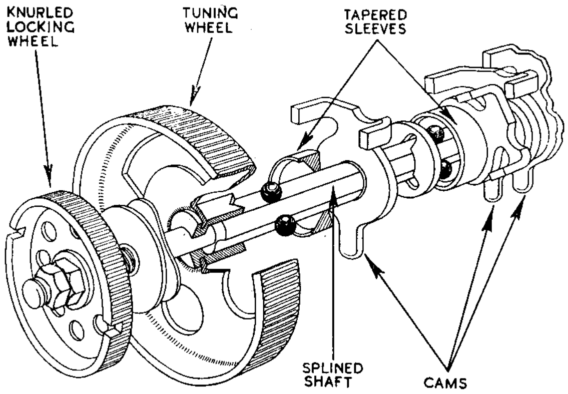


Fig. 8. CAM LOCKING DEVICE

As previously explained, contacts 5S4 are mechanically operated by a segmented disc, but it should be noted that these contacts are only used for local operation of the channel-change mechanism.

For example, when, during normal service, a channel-change slide has been driven to the operated position it may be electrically "homed" by moving the manual switch 5S6 to TUNE (i.e. connecting the magnet coil to switching contacts 5S4). This switch completes the magnet coil circuit via contacts 5S4 which are automatically re-opened when the slide returns to the non-operating condition.

2.2 **Control Unit**

Construction

The control unit consists of a small black-finished aluminium-alloy box containing a miniature rotary switch for starting up the equipment and for simultaneously selecting the required frequency.

The switch shaft carries a dial made up of a front disc of dense white opal Perspex cemented to a back disc of translucent coloured Perspex. The front disc is finished black except for the channel letterings, which in daylight will therefore show up as white letters on a black ground. When illuminated from behind, the letters will show the colour of the coloured back disc. Internal lighting is provided by means of a miniature screw lamp which is carried in a removable holder having a coil-slotted head. This inserts and withdraws at the left side of the unit by a 90° rotation of the lamp holder.

The intensity of illumination of the dial is controlled by means of a dimmer knob operating a potentiometer which gives

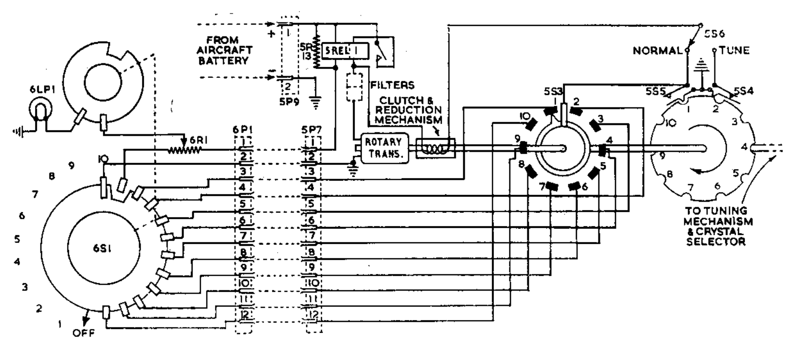


Fig. 9. DIAGRAM OF CHANNEL-CHANGE CIRCUITS

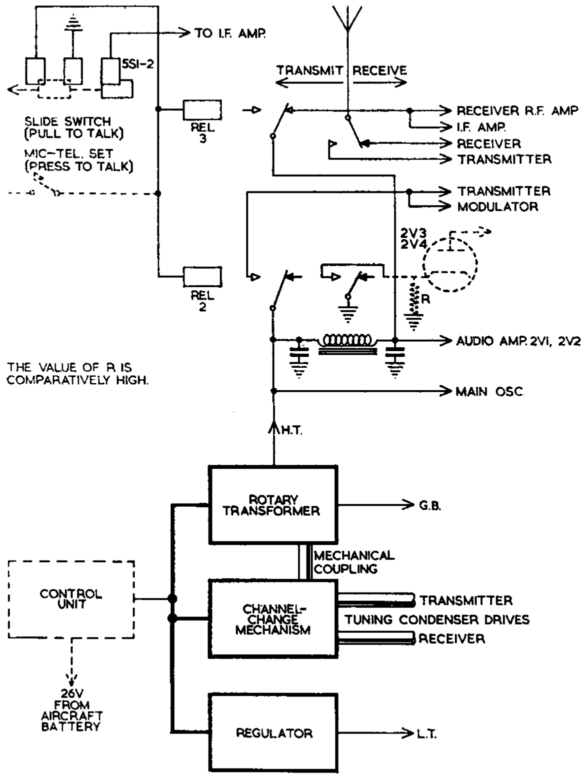


Fig. 10. SIMPLIFIED DIAGRAM OF CONTROL CIRCUITS

a range from maximum to zero illumination.

The dial is covered by a detachable front plate having a Perspex window which displays the selected channel letter and one on either side of it.

At the rear of the box is fitted a spare dial with alternative channel lettering, which can be used to replace the dial normally fitted if desired.

Mounting centres for the unit are the same as for the earlier four-channel STR.9 equipments. This is a useful feature when it is desired to replace an existing STR.9 installation by an STR.9-X.

At the base of the unit is a twelve-way plug for connections to the main unit.

3.0 CONTROL SYSTEM

(A simplified diagram of the control circuit is given in Fig. 10.)

The field circuit of the starting relay 5.Rel.1, in the main chassis assembly, is connected to the L.T. supply via switch 6S1 in the control unit when the latter is in any one of the ten frequency selection positions. It will be noted that the lamp and potentiometer are in the starting lead circuit in series with 5.Rel.1, which itself is shunted by a resistance 5R13 in order to pass enough current for the control-unit dial lamp.

On the closing of the relay contacts, a secondary field of the relay is series connected in the supply line to the rotary transformer. This additional field is only effective during the initial surge caused by starting of the motor and is designed to prevent the possibility of the relay falling off through momentary decline in potential.

In addition to connecting the supply to the motor the relay also places all valve heaters in circuit via the carbon regulator 5.Reg.1 and resistance 5R7, 5R8. Simultaneously the supply is connected to the magnet coil of the channel-change mechanism and to one side of relays 5.Rel.2 and 5.Rel.3. The circuits of both relays are simultaneously completed by the operation of the " Press to Talk " button at the remote point. A local " Pull-to-Tune " slide switch 5S1-2 is provided for setting-up purposes. When pulled out to its full extent, it connects ground to the windings of relays 5.Rel.2 and 5.Rel.3 and puts the equipment into the " transmit " condition.

On closing, relay 5.Rel.2 removes the H.T. from the I.F. and receiver circuits and applies it to the modulator and transmitter circuits. Simultaneously 5.Rel.3 applies H.T. to the modulator circuit and changes over the aerial connections. It also short circuits a high resistance 2R10 in the modulator unit, thus permitting valves 2V3, 2V4 to become operative.

The slide switch 5S1-2, when operated to its first click position, connects the cathodes of valves 1V4, 1V6, in the I.F. amplifier unit, to earth, via resistance 5R12, and permits the receiver to be locally tuned for " noise."

4.0 VALVES USED

(The filament circuit diagram is given in Fig. 11.)

The following table summarises the arrangement of the stages and shows the valves used :—

Unit	Stage	Type of Valve
Transmitter	Oscillator	CV136
	Balanced R.F. Modulator	(2) CV138
	Doubler	CV136
	Amplifier	CV309
	Output	CV415
Receiver Unit	Oscillator-Trebler	CV136
	Trebler	CV136
	Doubler	CV138
	Frequency Changer	CV138
	R.F. Input	CV138
Amplifier	First I.F. Amplifier	CV131
	Second I.F. Amplifier	CV131
	Third I.F. Amplifier	CV138
	Diode Detector	CV140
	Noise Limiter and Output	CV138
	A.V.C. Amplifier	CV138
Modulator	Microphone Amplifier	CV131
	Telephone Amplifier	CV136
	Modulator	(2) CV133
Total number of valves used		21
Number of different types used		7

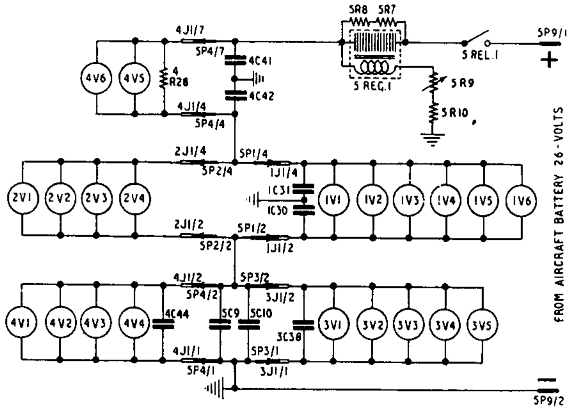


Fig. 11. DIAGRAM OF FILAMENT CIRCUITS

Chapter III

INSTALLATION

1.0 GENERAL

Since installation of the STR.9-X is not confined to one particular type of aircraft, layout will vary according to loading problems and space available. Accordingly, only general suggestions are incorporated in the following chapter for the guidance of those responsible for decisions regarding individual layouts. All screened cables, the mounting tray, antenna and matching unit, are normally supplied separately and are installed by the aircraft manufacturer. Cable lengths will vary according to the type of aircraft to be fitted.

After unpacking the equipment from its transit case and prior to installation it should be thoroughly inspected for possible damage.

2.0 INSTALLING THE MAIN CHASSIS ASSEMBLY

(Chassis dimensions are given in Fig. 12.)

The main chassis assembly must be installed in a horizontal position and the location chosen should be accessible to permit ease of inspection and frequency setting which will, in most cases, only be effected when the aircraft is on the ground.

Sufficient clearance must be left to enable the unit to be withdrawn from the mounting tray and for it to move freely on its shock absorber mountings. Provision must be made for four cable runs to the front of the unit, one from the power supply, one from the control unit, one from the mic-telephone headset, and the other from the aerial.

The mounting tray into which the main chassis assembly slides is fitted with cup type shock absorbers which are secured to the airframe by four bolts per absorber. The earthing strap on the mounting tray should be connected to the airframe in aircraft of metallic construction, or to the bonding system of aircraft of wooden construction.

3.0 INSTALLING THE CONTROL UNIT

(Control unit dimensions are given in Fig. 12.)

The control unit should be installed in such a manner as to give the operator access to the controls during flight without moving from his station.

The unit has a three-point mounting designed to bolt directly to the airframe. No form of shock absorption is necessary with this mounting. The same mounting centres are used as for the original STR.9 type control unit and therefore the control units are easily interchangeable if required.

Sufficient clearance must be left for a cable entry at the base of the unit, the actual amount being dependent on the shape of the cable termination (i.e. " right angle " or " straight " fitting).

Access should also be provided at the left of the unit to enable the dial-lamp to be replaced.

4.0 SCREENING AND BONDING

Screening of the aircraft ignition system and any other likely source of electrical interference is absolutely necessary.

The bonding of the aircraft should be in good condition.

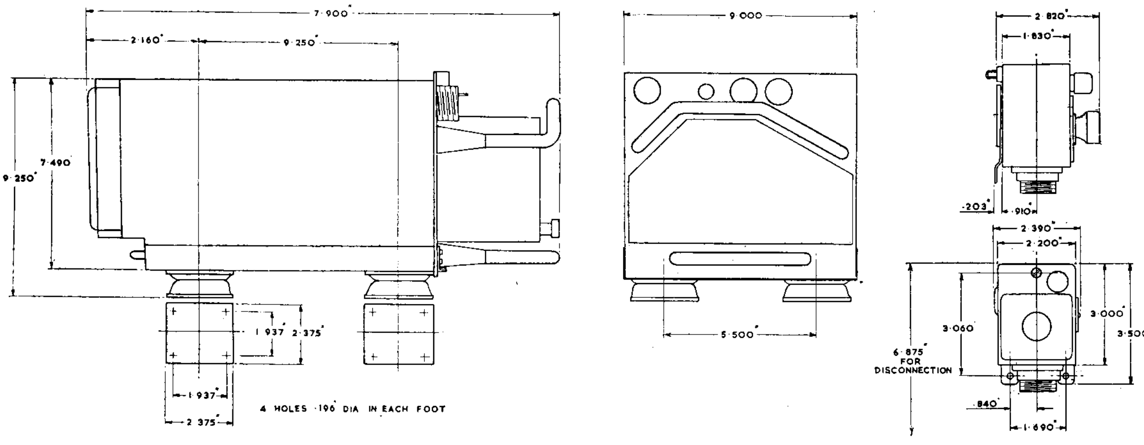


Fig. 12. DIMENSIONS OF UNITS

Chapter IV

INITIAL ADJUSTMENT

1.0 GENERAL

Lining up the STR.9-X after installation and preparatory to operating involves the following actions :—

(*a*) Setting the R.F. circuits for the required working frequencies.

(*b*) Setting the muting level control on the main chassis assembly for the required condition.

(*c*) Checking the general functioning of the equipment.

These actions also apply to lining up from time to time on new working frequencies and checking that the equipment is functioning properly. The following is a general explanatory description of the procedure involved.

2.0 ADJUSTMENT OF R.F. CIRCUITS

Fig. 13 illustrates the channel-change mechanism with a slide withdrawn preparatory to adjustment.

2.1 General

The ten spot operational frequencies within the possible range of 115 to 145 Mc/s. are selected in such a manner that each frequency is separated from the others by at least 180 kc/s. Each crystal used should have a fundamental frequency 0.54 megacycles less than one eighteenth that of the particular operational frequency required.

With the front cover plate removed from the channel-change mechanism on the main chassis assembly, the crystals are inserted in their holders, care being taken to observe their correct relation to control unit switching.

It will be seen that twin sets of crystal sockets are provided on the crystal panel for crystals having .125″ dia. pins on .500″ centres, and for the miniature type having .050″ dia. pins on .486″ centres. The crystal sockets and corresponding channel slides are numbered 1-10, and this numbering is shown on a designation-strip-

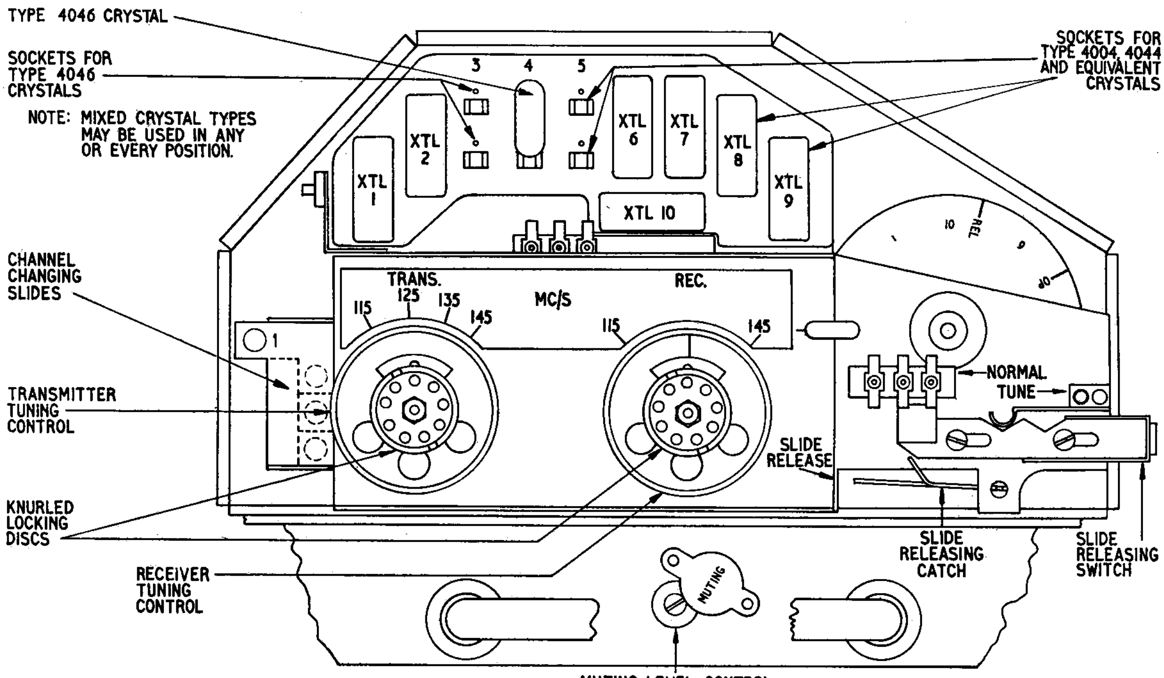


Fig. 13. CHANNEL-CHANGE MECHANISM (Slide withdrawn for alignment)

mounting fitted above the crystal panel. The mounting carries a reversible designation strip lettered A-J on one side and K-T on the other, giving a ready cross-reference between channel designations and slide and crystal numbering.

The designation strip should be reversed if necessary to conform with the use of the alternative spare dial fitted at the rear of the control unit, depending on the channel lettering system preferred.

The equipment is switched on by means of the control unit. The slide releasing switch on the channel-change mechanism is then withdrawn in a right-hand direction to the extent of its travel.

* The knurled locking discs on the transmitter and receiver tuning controls are loosened, and the front slide (corresponding to channel A or K) withdrawn to the extreme left. These knurled discs should not be slacked off further than is necessary to permit smooth turning of the tuning controls in the operations described below.

The slide-switch 5S1-2 is then pulled out to the first click position and the receiver is tuned for maximum noise by varying the receiver tuning control.

When this condition is obtained the transmitter may be tuned by pulling out the slide switch to its full extent and varying the transmitter tuning control for maximum aerial output, as indicated by a field strength meter placed in the vicinity of the aircraft or an artificial aerial attached to the output circuit.

Return switch 5S1-2 to the mid-position.

At the conclusion of these operations the stop on the slide releasing switch is operated to permit the front slide to " home " and then the whole of the foregoing procedure is repeated with the remaining slides, thus setting all ten frequencies. The slides should not be electrically operated during adjustment in order to avoid the risk of disturbing frequency settings.

When all slides have been released the transmitter and receiver tuning controls are locked by tightening the inner knurled discs mounted thereon. It is now safe for the slides to be operated electrically.

The MUTING LEVEL control is, within reason, set as required but should not be adjusted to such an extent as to overcome the audio muting effect of the receiver. It should be set when all ten channels have been tuned, in the manner previously described, preferably when the aircraft engines are running, and checked with the aircraft in flight. In general, it will be found that the control may be left in a fully clockwise position, i.e. for maximum gain.

* SPECIAL NOTE—Do not force the inner knurled disc against the small locked nuts, otherwise serious damage may be caused to the mechanism.

Slides should never be operated manually to the extreme left position with switch 5.S.6. in the " NORMAL " position, otherwise they may fail to release. If however this should happen, the slide should be released manually by slight upward pressure on the associated link below the driving disc assembly.

Chapter V

OPERATING

1.0 GENERAL

This chapter describes the general procedure for operating the STR.9-X. It is assumed that the equipment has already been adjusted for the required working frequencies as described in Chapter IV.

2.0 OPERATING

(Fig. 14 illustrates the control unit.)

Operation of the STR.9-X is carried out from the remote control unit.

A single switch mounted on the remote control unit permits simultaneous starting of the equipment and selection of any one of four spot frequencies.

As the frequencies are normally pre-set before flight it is only necessary for the operator to be aware of their allocation with regard to the channel letters shown on the control unit dial.

When switched on, the equipment is automatically in the " Receive " condition. It is changed to the "Transmit" condition by manual operation of a " Press to Talk " button provided at the remote point.

Fig. 14. CONTROL UNIT

3.0 DIAL LIGHTING

The dial lamp bulb can be removed for replacement or inspection by a 90° turn of the coin-slotted lamp holder at the left-hand side of the unit. The lamp holder itself is slotted and sprung to prevent the lamp from being loosened by vibration. Care should be taken to see that the lamp is screwed well home.

The dial lighting intensity is set as required to suit particular conditions by means of the top right-hand knob. Maximum clockwise rotation gives maximum illumination, and in the reverse direction the lamp can be dimmed completely out.

Changing the Dial.

If it is desired to use the alternative channel-lettering scheme K to T, proceed as follows:—

Remove switch knob.

Remove four screws securing detachable front plate and remove plate.

Shake out bent spring washer and dial.

Interchange dials.

Fit bent spring washer with concave side to front of unit.

Refit front plate and knob.

NOTE.—In refitting detachable front plate, the two shorter screws must be used in the *top* fixings, as the longer screws would foul the lamp holder.

Chapter VI

MAINTENANCE

1.0 GENERAL

The term " maintenance " is here used to denote the day-to-day upkeep of the equipment by the normal staff working on a routine basis. It does not embrace the diagnosis and clearance of faults other than the most simple ones. The more serious faults are dealt with in a series of fault charts.

" Maintenance " of the equipment is therefore considered to comprise the following :—

(*a*) Checking the general functioning of the equipment.

(*b*) Reducing chances of failure by regular inspection and attention.

(*c*) Locating and clearing the simple faults, including replacement of valves.

If desired, the main unit can safely be stood on its face after removal of the front dust cover, the guard rail and handle being sufficient protection for the mechanism.

2.0 FACILITIES NEEDED

2.1 Number of Personnel

No maintenance operation requires more than one man.

2.2 Space, Layout

For examination of and attention to the equipment when removed from its mounting, it would be a convenience to have a bench with an approximate surface of 3ft. × 2ft. or larger.

2.3 Equipment

(1) Tools and Materials

1 — 6-in. Screwdriver *needed for* releasing dust cover catches.
1 — 3-in. Screwdriver for general use.
1 pair 6-in. Combination Pliers for general use.
1 Dusting Brush for general use.
Soft lint-free cloth for cleaning purposes.

(2) Test Gear

Avometer Model 7 or other suitable continuity tester, complete with flex leads.

3.0 WORK TO BE CARRIED OUT

3.1 Regular Duties

(1) Daily Inspection

(*a*) The connections to the aircraft supply battery should be checked.

(*b*) Connections to the mic-telephone headset and to the aerial should be checked as items most likely to become damaged or worn.

(*c*) Finally the equipment should be run up on all ten frequencies to see that it is functioning properly.

(2) 30-hour Inspection

After every period of 30 flying hours, a general mechanical check of the installation should be made verifying that :—

(*a*) Shock absorbers are in good order.

(*b*) The main chassis assembly is secure in its mounting.

(*c*) The control unit is securely mounted and that the dial lighting is functioning.

(*d*) Cable connections are screwed tight.

(*e*) The aerial is in good condition.

(*f*) The brushes and commutator of the rotary transformer are in good condition.

(*g*) The Vokes air filters in the rear of the main chassis assembly are free from dust. This can be loosened by tapping, when it can be shaken out. The filter surfaces should not be brushed, as this tends to drive loose dust into the surfaces.
Refit filters in the same attitude as removed, i.e. with the clean side facing inward.

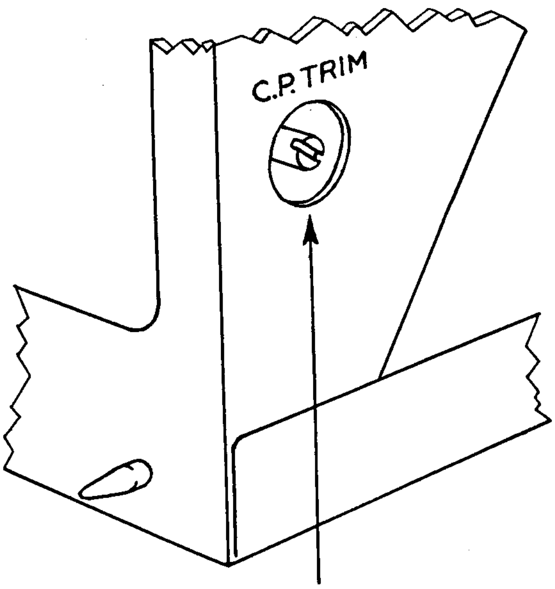


Fig. 15. CARBON PILE REGULATOR ADJUSTMENT

(*h*) The general condition of the units is satisfactory and that relay contacts show no sign of burning.

(*i*) With an input of 27 volts check that a potential of 18.9 volts exists between point 5P4/7 on the chassis assembly and earth. If necessary vary the adjusting screw on the carbon pile regulator for this condition. (See Fig. 15.)

(3) **180-hour Inspection**

The opportunity should be taken when the aircraft is undergoing 180 hours overhaul to inspect and clean the equipment in the following manner:—

(*a*) The pins on the cable terminations should be examined and, if dirty, cleaned.

(*b*) The bonding of the installation should be carefully examined.

(*c*) Remove the units from the aircraft and pass them to a W/T workshop for examination and test even if they appear to be still functioning satisfactorily. (Procedure to be followed by personnel in the W/T workshop on equipment passed in for examination is given in Section 4.0.)

3.2 **Handling of Faults**

From the viewpoint of maintenance faults may be considered to fall into three classes:—

(*a*) Failure of items external to the units, i.e. battery supply, cables and cable connections.

(*b*) Failure of consumable items in the units, i.e. valves and fuses.

(*c*) Failure of items in the units other than valves and fuses.

It is recommended that faults found in classes (*a*) or (*b*) should be cleared by the maintenance crew. Faults found in class (*c*) should not be repaired by the maintenance crew but the unit in which the fault occurs should be replaced and passed to a suitable organization for repair.

4.0 WORKSHOP PROCEDURE

The procedure in the W/T workshop should be to give the units a general examination, carrying out any re-alignment found necessary.

(If during the tests a fault is discovered, it should be remedied. A series of fault charts are provided for detailed fault location.)

In carrying out the general examination the following points should be attended to:—

(*a*) Blow out any dust and dirt.

(*b*) Examine valve pins for cleanliness.

(*c*) Examine brushes and commutators of rotary converter.

(*d*) Examine channel-change reduction gear mechanism.

(*e*) Examine channel-change slides and lever-roller mechanism.

(*f*) Examine flexible couplings on condenser driving shafts.

(*g*) Check channel-change mechanism, by remote switching, for smooth working.

(*h*) Look for broken wiring or joints and for broken components.

(*i*) Look for any shorting connections and for frayed or chafed insulation.

(*j*) Look for any signs of charring or overheating.

(*k*) Check that no component or assembly is working loose on its mounting.

(*l*) Check that all miniature Jones plugs are firmly home in their respective sockets.

(*m*) Check the condition of the Vokes air filters and the condition of the gaskets in the dust cover of the main assembly. See also 2 (*g*).

5.0 ROTARY TRANSFORMER MAINTENANCE

After 1,000 hours, inspect the ball races and if necessary, lubricate with an anti-freeze grease, conforming to DTD specification No. 577. A suitable lubricant, approved by the British Air Ministry, is "Esso" Aviation Low Temperature Grease, which can be obtained in handy 4-oz tubes.

Remove accumulations of carbon dust around the brush holders either by blowing with an air gun or by washing with carbon tetrachloride applied with a soft brush.

Inspect the brushes and, if badly worn, replace. Take care that brushes are returned to the holders from which they were removed. Information for re-ordering spares is given below.

Polish the commutators, if dirty, with fine glass-paper, grade F or OO: glass-paper boards as used in manicure are very convenient for this purpose. Emery or carborundum paper or cloth must *not* be used.

NOTE.—Skimming of commutators or changing of ballraces is not considered part of maintenance routine, but rather of general overhaul. It may be carried out either locally, or by the manufacturer, as convenient.

Details of Brush Assemblies

Circuit.	Quantity.	Size.	Grade.	Manufacturer's Drawing No.
Input	2	$\frac{1}{4}'' \times \frac{1}{4}''$	Morgan CM3H	B.2585–4
Output No. 1 ...	2	3/16″×3/16″	,, IM.7	B.2589–3
Output No. 2 ...	2	3/16″×3/16″	,, IM.7	B.2591–4

Chapter VII

FAULT LOCATION AND REPAIR

1.0 FAULT LOCATION

During service, faults of varying description are liable to occur in any part of the equipment.

Since it is manifestly impossible to tabulate a complete list of causes of failure, a circuit tracing procedure has been outlined which takes the form of a series of fault charts. These charts are located at the end of the manual.

Individual charts covering the various units have been included and it is anticipated that personnel following the suggestions outlined in these charts will find little difficulty in clearing the faults.

It may, under certain conditions, be necessary to operate either the transmitter or receiver when removed from the main chassis assembly. This condition is likely to arise when access is required to certain components. For this purpose extension leads suitably terminated with plugs and sockets will be necessary to complete the continuity of the circuits. No attempt must be made to align the equipment when the units are operated out of the main chassis.

Owing to the diminutive size of the components in the equipment it is not possible to provide many of them with identification markings and to overcome this difficulty an identification letter has been placed, where possible, near banks of components. Similarly, on the circuit diagrams, points have been marked, for example A5, A6, etc. To identify these points, and consequently the terminations or junctions of a resistor or condenser for testing purposes, it is necessary to count along the bank of components, away from the identification letter, until the number (and consequently the required point) shown on the circuit diagram is reached.

2.0 REPAIR

2.1 General

The following sections are intended to provide guidance in the dismantling and re-assembly of component parts of the STR.9-X. Such dismantling may be necessitated by the development of serious faults in, or injury to, the equipment.

Since faults or damage may occur in any part of a particular unit, a general description of dismantling procedure has been given and application will depend upon individual circumstances.

A considerable amount of wiring in the equipment is insulated by Poly-vinyl-chloride sleeving. When making repairs to wiring covered with this form of insulation excessive heat from a soldering iron will result in the destruction of the covering. Accordingly care should be exercised to avoid this danger by adopting the following procedure:

(1) Pull back the sleeving on the wire to be soldered as far as possible from the wire termination. Do not strip off the sleeving.

(2) Clean and rapidly tin the wire termination.

(3) Clean and tin the soldering tag or other point to which the wire is to be attached.

(4) Wrap the wire round the tag, or position the wire as required and solder as rapidly as possible to avoid conduction or excessive heat.

(5) Wait for the wire and soldering point to cool, then release the sleeving which will tend to move towards the soldered joint if the procedure has been correctly carried out.

2.2 Workshop Facilities Needed

(1) Tools

The following minimum number of tools are required:—

1 — 6-in. Screwdriver.
1 — 3-in. Screwdriver.
1 — Soldering Iron.
1 pair 5-in. Round-nose Pliers.
1 pair 6-in. Combination Pliers.
1 pair Sidecutters.
1 Complete set 0 to 8 B.A. Box Spanners.
1 Complete set 0 to 8 B.A. Flat Spanners.

(2) Materials

Fine-grade glasspaper.
Carbon tetrachloride.
Resin-cored solder.
Soft lint-free cloth.

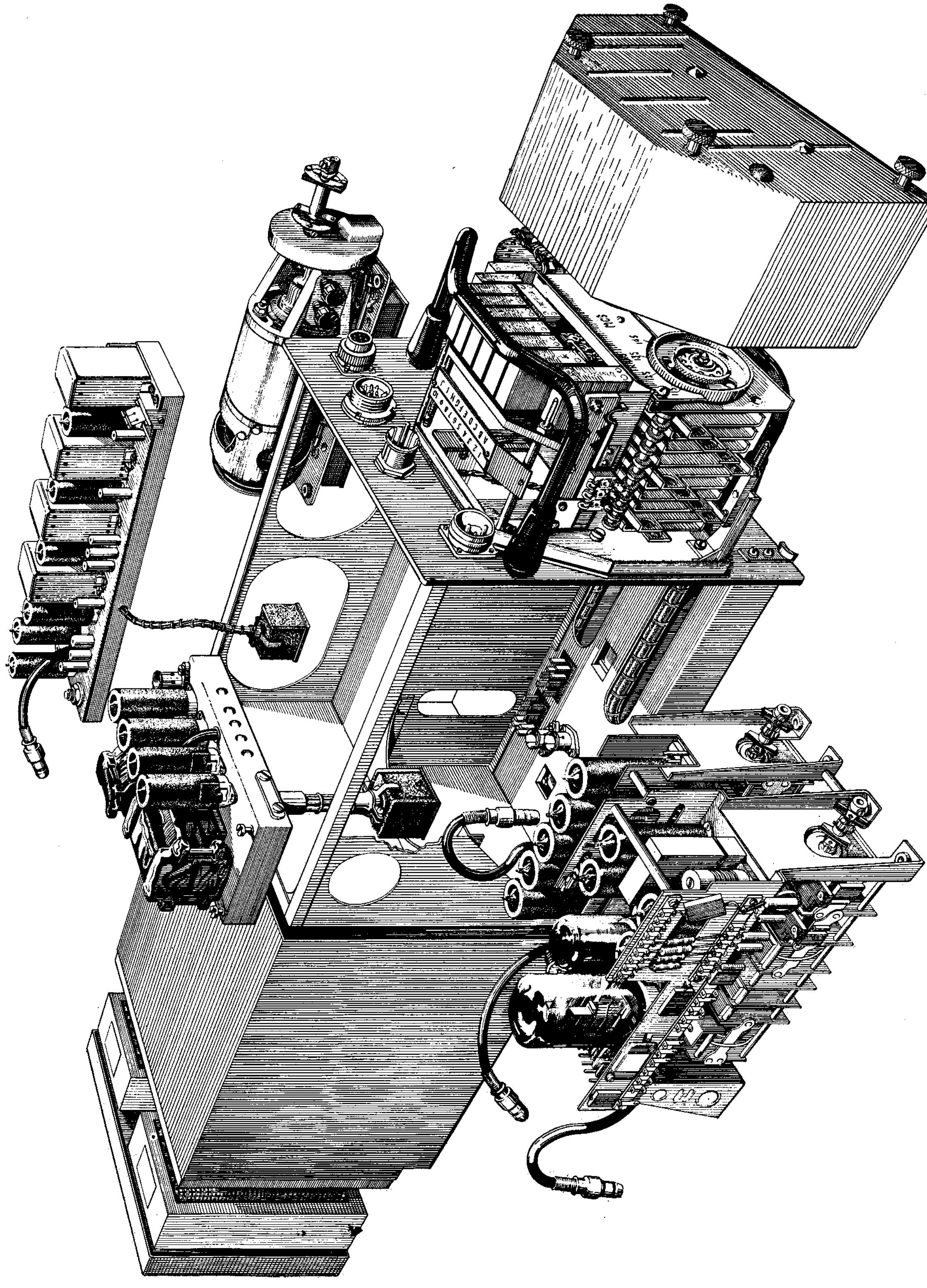
2.3 Removing the Units from the main chassis assembly

(i) Removing the rotary transformer

(Fig. 16 illustrates the rotary transformer removed from the chassis assembly.)

When the main chassis assembly has been withdrawn from its dust cover the motor generator may be removed from the chassis by releasing four main retaining screws and the flexible coupling on the channel-change mechanism driving shaft.

Fig. 16. WITHDRAWAL OF UNITS FROM MAIN CHASSIS



The retaining screws secure the rotary transformer mounting plate to the chassis. They are accessible from the right-hand side of the assembly and from the underside of the chassis deck. The screws are indicated by red paint.

Since it may be necessary to rotate the rotary transformer slightly to obtain free access to the grub screws on the flexible coupling, a small lever has been fitted on the circular case housing the reduction gear. Pressure on this lever disengages the gear and permits the armature shaft of the rotary transformer to be manually revolved as required.

H.T. and grid bias fuses are mounted in the filter compartment situated beneath the transformer and are accessible, for replacement purposes, from the side of the assembly. The spare fuses are located on the transformer base plate.

Access to the filter itself may be obtained by the removal of four screws. These screws retain a cover plate in position and are indicated by red paint.

Should it become necessary to make repairs or adjustments to the reduction gear, it may be exposed by the withdrawal of the circular cover plate. This plate is retained in position by two screws only.

(ii) Removing the transmitter and receiver units from the main chassis assembly

(Fig. 16 illustrates the transmitter and receiver removed from the chassis assembly.)

When it is proposed to carry out work that requires complete access to either of the above units it is advisable to remove them simultaneously from the chassis assembly.

To achieve this purpose the coaxial links connecting the units to the remainder of the chassis assembly should be uncoupled, together with the plugs and sockets.

The grub screws on the flexible couplings, connecting the ganged condenser assemblies to the channel-change mechanism, should be loosened. Finally eight screws securing the units to the chassis deck should be released and the units carefully withdrawn.

When the units are clear of the main chassis the interconnecting brackets may be removed if required.

When re-assembling the two units they should be coupled together before being replaced in the chassis assembly. Care should be taken to observe that the rotating plates on the ganged condenser assemblies are in correct relation to the tuning controls on the channel-change mechanism. In this respect the condensers should be in a position of minimum capacity when the tuning controls are turned to their fullest extent in a clockwise direction. When the correct condition is obtained the grub screws, on the flexible couplings linking the condenser shafts to the channel-change mechanism, may be tightened up.

(iii) Removing the I.F. amplifying unit

(Fig. 16 illustrates the unit removed from the chassis assembly.)

The I.F. amplifying unit is secured to the chassis deck by captive screws, all of which are indicated by red paint.

Before removal it is necessary to uncouple the coaxial connections from the amplifier to the modulator unit and to the receiver unit. Also the Jones pattern plug connecting the amplifier to the main chassis assembly should be detached. The retaining screws may then be released and the amplifier withdrawn.

(iv) Removing the modulator unit

(Fig. 16 illustrates the unit removed from the chassis assembly.)

The modulator unit is retained in position by captive screws marked in the characteristic manner.

When removing the unit the coaxial cable from the receiver should be disconnected together with the 12-pin Jones pattern plug to the main chassis assembly. The retaining screws should then be released and the modulator unit detached.

(v) Removing the carbon pile regulator

Should it become necessary to remove the carbon pile regulator the operation may be effected by disconnecting the associated wiring and releasing two retaining screws. These screws are accessible from the underside of the chassis deck.

(vi) Removing the channel-change mechanism

It is not intended that the channel-change mechanism should be removed from the chassis unless complete replacement becomes necessary, since in addition to the removal of various nuts and screws, it is also necessary to unsolder several electrical connections.

The mechanism is secured to the front of the chassis by six screws and two nuts (the latter inside the chassis) and the following soldered connections are involved:—

- (*a*) Two wires soldered to terminals mounted on a terminal board directly behind the crystal panel of the mechanism.
- (*b*) Two wires soldered to terminals on a terminal strip located under the I.F. deck inside the rotary transformer compartment of the main chassis.

(c) Ten wires soldered to terminals on the rotary switch at the rear of the mechanism driving spindle.

If all these wires, nuts and screws are removed, the mechanism can be withdrawn complete, after releasing the two condenser couplings and the main driving coupling, and unplugging the twin connector from the mechanism to the front of the receiver unit. The twin connector is fixed to a supporting strip, from which it should be detached.

Great care should be taken in soldering operations owing to the tendency of the PVC covering of the wires to run back.

In refitting the mechanism (or a new one), it is essential to re-align the ganged condenser assemblies in correct relation to the tuning controls in the manner described in sub-section (ii) of this chapter.

(vii) Removing the ganged condenser assembly from the receiver unit

(Plate XV illustrates the ganged condenser assembly removed from the receiver unit.)

Damage may necessitate the removal of the ganged condenser assembly from the receiver unit. This operation may be accomplished after the unit has been detached from the chassis assembly, by unsoldering interconnecting wires between the main body of the receiver and the ganged condenser assembly, then releasing retaining screws at each end of the sub-chassis. Four of these screws are located on the front member of the sub-chassis and one only on the rear member.

It is essential, following the replacement of a ganged condenser assembly, to re-align the receiver circuits.

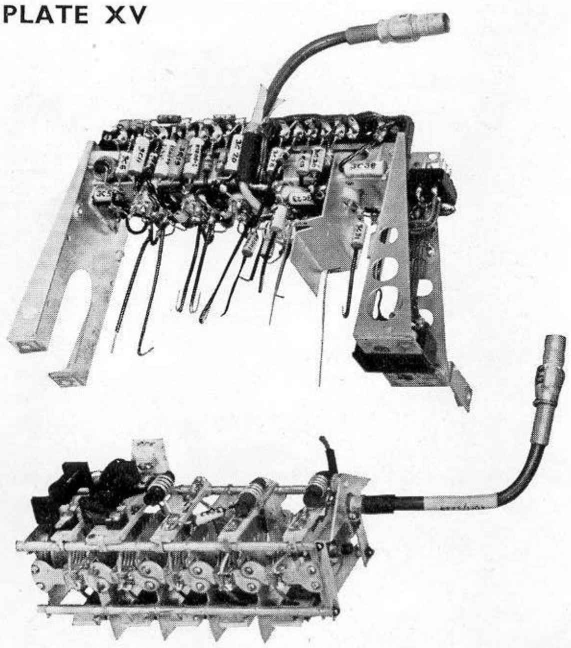
(viii) Removing the ganged condenser assembly from the transmitter unit

(Plate XVI illustrates the ganged condenser assembly removed from the transmitter unit.)

The method of anchoring the ganged condenser assembly to the transmitter chassis differs slightly from that adopted in the case of the receiver, and accordingly the procedure for removal varies.

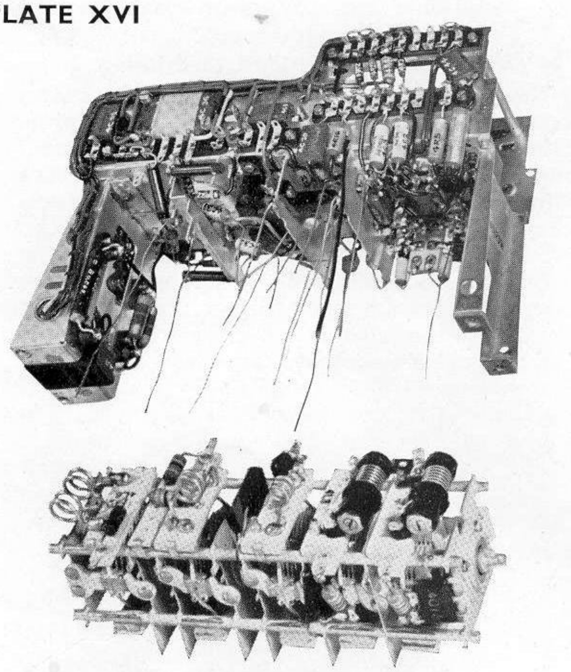
Interconnecting wires between the main body of the transmitter and the ganged condenser assembly must first be unsoldered. Retaining screws securing the ganged condenser to the front member of the transmitter chassis must then be removed. Finally two pins holding the rear portion of the ganged assembly to a support bracket mounted on the transmitter chassis must be unsoldered and withdrawn. The ganged condenser may then be detached from the main body. As in the case of the receiver, re-alignment of the transmitter circuit is essential following removal of a ganged condenser assembly.

PLATE XV



GANGED CONDENSER ASSEMBLY
(Removed from Receiver Unit)

PLATE XVI



GANGED CONDENSER ASSEMBLY
(Removed from Transmitter Unit)

2.4 Adjusting the reduction gear for the channel-change mechanism

(The reduction gear is illustrated in Fig. 17.)

The reduction gear, mounted on the rotary transformer, should only require adjusting if trouble is experienced through wear on the detent spring and the pawl. If such wear occurs the pawl wheel may fail to rotate correctly and accordingly the mechanism will cease to function. If this trouble is suspected it will be necessary to obtain access to the pawl wheel by first removing the transformer from the chassis assembly then detaching the circular cover plate from the reduction gear mechanism.

at the tip of the pawl spring as measured with a tensioning tool should be 30 to 40 grammes. If such a tool is available and the tension is incorrect carry out the necessary adjustment by carefully bending the pawl spring. Check that the pawl engages correctly with the pawl wheel teeth.

Finally lubricate the mechanism with anti-freeze grease if necessary, set the socket and pawl to the top of its stroke, fit the mechanism cover and check that, when the pawl stop spring is operated, it is possible to turn the pawl wheel forward by rotating the final drive spindle clockwise (as seen from the front).

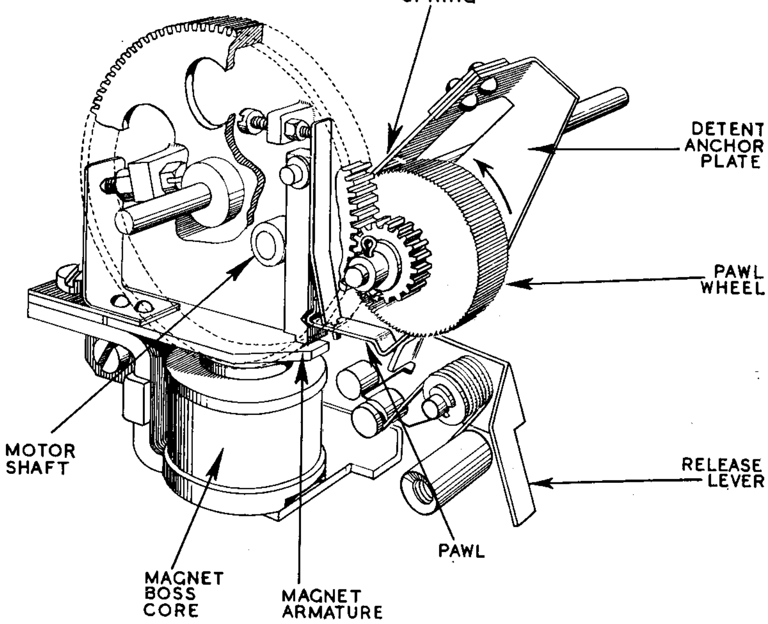


Fig. 17. REDUCTION GEAR MECHANISM

When this condition has been obtained disengage the magnet armature from the socket, place the thumb on the pawl wheel in such a manner as to pull against the stroke of the pawl and turn the armature spindle slowly. Observe the stroke of the pawl, which should travel approximately one and one half teeth.

Set the detent spring by means of the fixing screw in the detent anchor plate so that each stroke of the pawl pushes the pawl wheel approximately the same fraction of a tooth beyond the detent spring as the pawl itself retracts beyond the tooth tip on its return stroke. The tension

3.0 CIRCUIT ALIGNMENT

3.1 General

When lining up the STR.9-X equipment it is essential to commence with the I.F. circuits, follow with the receiver unit alignment (since the latter unit contains oscillatory circuits common to both transmitter and receiver) and conclude with the transmitter unit alignment.

Accordingly, the procedure given below should be adopted where major repairs have been effected or where performance figures fall below those given in Section 4.0 of this chapter.

It is necessary that the L.T. input voltage to the equipment should be correct (27 volts) during alignment, and that the H.T. voltage be checked at test points, and the carbon pile regulator adjusted for an 18.9-volt output. It is also advisable to ascertain before commencing any re-alignment that possible poor performance is not due to faulty valves or other components.

Since inductance trimming slugs in the equipment are sealed on assembly in the factory, to prevent movement due to vibration, it will be necessary to exercise care when first unlocking the trimmers, and the application of methylated spirit to the sealing compound will be essential to bring about release of the locknuts.

Before re-alignment, the equipment should be switched on and allowed a warming-up period of at least fifteen minutes.

3.2 I.F. Alignment

Remove the dust cover from the chassis assembly of the STR.9-X. Pull out slide switch 5S1-2 to its first click position. Remove the mic-telephone cable socket from plug 5P8 on the front panel of the chassis assembly and connect an output meter to pins 1 and 4 on the plug. Set the output meter for an impedance of 50 ohms.

Release the four red-capped holding down screws on the I.F. Amplifying Unit and tilt the unit in such a manner as to obtain free access to its upper and lower surfaces for trimming purposes. Set the volume control 1R.24 on the unit in a maximum clockwise position. Switch on the equipment.

Connect the output leads of a Marconi Signal Generator Type TF144G (or equivalent) between the grid of valve 1V3 and chassis on the amplifying unit. Keep the connecting leads to an absolute minimum length (less than 1½ inches) in this and all following operations. Set the signal generator for a frequency of 9.72 Mc/s. modulated at 400 to 1,000 c/s. to a depth of 30%. The output of the signal generator should be controlled in such a manner as to maintain the receiver output as indicated by the output meter at a reasonable level. It may be necessary, therefore, to commence operations with a fairly large signal generator output and to reduce this progressively as circuits are brought into alignment.

Using a non-metallic tool, trim the primary of transformer 1T4, on the I.F. amplifier unit, for maximum output as indicated by the output meter. Access to the trimmer associated with the primary of transformer 1T4 may be had from the top of the associated screening can.

Adjust the secondary of transformer 1T4, via the associated trimmer (which is accessible from the underside of the I.F. amplifying unit chassis), for maximum output as indicated by the output meter.

Attach the output lead of the signal generator to the anode of valve 1V2 via a .01μF (350 volt working) condenser. Adjust the trimmer on the secondary winding of transformer 1T3 for maximum output as indicated by the output meter. (The trimmer is situated on the underside of the amplifier chassis.)

Attach the output lead of the signal generator to the grid of valve 1V2, via the .01 condenser, and tune the primary circuit of transformer 1T3 for maximum output. (The primary trimmer is accessible from the top of the associated screening can.)

Attach the output lead of the signal generator to the anode of valve 1V1, via the .01μF condenser, and adjust the trimmer on the secondary winding of transformer 1T2 for maximum output. (The trimmer is located on the underside of the sub-chassis.)

Attach the output lead of the signal generator, via the condenser, to the grid of valve 1V1 and trim the primary circuit of transformer 1T2 for maximum output (via the trimmer located in the top of the associated screening can).

Remove the coaxial link between the amplifying unit and the receiver unit and attach the output lead of the signal generator, via the .01 condenser, between the centre and outer contacts of plug 1P1. Adjust the trimmer associated with secondary winding of transformer 1T1 for maximum output (the trimmer is accessible from the underside of the chassis). Replace the coaxial link.

Remove valve 3V4 from the receiver unit and attach the signal generator output leads, via the .01μF condenser, between the anode terminal on the valve socket and chassis. Adjust the signal generator output as required and vary the trimmer on the primary winding of transformer 1T1, in the I.F. amplifier unit, for maximum output as indicated by the output meter.

Replace the slide switch to the " In " position and check that a signal generator input of not greater than 800μV will open the muting.

This completes the alignment of the I.F. Amplifying Unit.

3.3 Alignment of the Receiver Unit

The alignment of the receiver unit must be effected at the two extreme ends of the frequency range, i.e. 115 and 145 Mc/s. Accordingly, crystals with frequencies of 5,848.8 kc/s. and 7,515.6 kc/s. should be obtained and inserted in crystal holders 1 and 10 respectively, on the front panel of the main chassis assembly.

Set trimming condensers 3C8, 3C14, 3C22, 3C36 and 3C34, on the receiver ganged condenser assembly, to positions of mid-capacity. Access to these trimming condensers may be had via the underside of the main chassis assembly.

Remove the rotary transformer from its position in the chassis assembly and electrically reconnect it to the assembly via extension leads. This procedure will permit access to various inductances in the receiver while carrying out circuit alignment, since apertures, suitably designed to permit the insertion of a trimming tool, are provided on the inner wall of the generator compartment.

At the conclusion of the above operations set the trimming slugs on inductances 3L1, 3L2, 3L3, 3L4 and 3L5, on the receiver unit, to mid-position, i.e. symmetrical with relation to their respective coils.

Connect an 0 to 1 mA meter via extension leads to meter point 3P1/1 in the receiver unit. Check that the receiver tuning dial is unlocked.

Switch on the equipment and withdraw the slide releasing switch, on the channel-change mechanism, to its extreme right hand position. Pull channel-change slide 10 (rear slide) to the maximum extent of its travel in a left hand direction. Turn the receiver tuning control in a fully clockwise direction (i.e. to a position of minimum capacity for the ganged condenser assembly). Adjust trimming condenser 3C8 on the receiving unit for maximum current as indicated by the milliammeter attached to point 3P1/1.

Depress the release lever on the slide releasing switch permitting channel-change slide 10 to "home."

Withdraw slide 1 to the extent of its travel in a left-hand direction. Turn the receiver tuning control in a maximum anti-clockwise direction (i.e. for maximum capacity of the ganged condenser assembly). Vary the trimming slug on inductance 3L1 for maximum current as indicated by the milliammeter attached to point 3P1/1. Depress the release lever on the slide releasing switch. At the conclusion of the above operation repeat the sequence of instructions described for trimming, with slide 10 in position, afterwards returning to slide 1 and again repeating the trimming operation for this latter slide. The procedure should be continued until no further increase of current can be obtained on the milliammeter when trimming with either slide in the operating position. As each slide is placed in the operating position the receiver tuning control must, on every occasion, be turned in the direction indicated, i.e. the ganged condensers must be in a position of minimum capacity while trimming condenser 3C8 at the upper end of the band, and in a position of maximum capacity while trimming inductance 3L1 at the lower end of the band.

When the above instructions have been carried out the alignment of the oscillator circuit may be considered as completed. Accordingly the milliammeter should be attached, via its extension leads, to plug 3P1/2 and the alignment of the circuit associated with valve 3V2 commenced.

The procedure to be followed in this alignment differs from that used for the oscillator circuit only so far as the capacitive and inductive trimmers requiring adjustment are concerned. In this respect capacitive trimmer 3C14 must be adjusted at the upper end of the frequency range for maximum current as indicated by the milliammeter and the inductance trimmer 3L2 at the lower end of the range. Care must be taken, as before, to place the receiver tuning control in a position of minimum capacity when trimming at the upper end of the range and at a position of maximum capacity when trimming at the lower end of the range.

When the foregoing operations have been successfully carried out the circuit immediately associated with valve 3V3 should be adjusted. For this purpose it is necessary to attach a Marconi Type TF801 Signal Generator (or equivalent) between the centre and outer contacts of the aerial plug 5P10 (the generator output termination should be arranged for an impedance of 45 ohms). The generator should be tuned to the testing frequencies in the manner described below and the signal should be modulated to a depth of 30% at a frequency between 400 and 1000 c/s. The output of the generator should be controlled as required.

The slide switch 5S1-2 on the mechanism of the STR.9-X should be pulled out to the first click position and the volume control (1R24) on the I.F. amplifier unit should be in a maximum clockwise position.

With the slide releasing switch on the channel-change mechanism withdrawn to the right-hand position, pull out slide 10 to the maximum extent of its travel in a left-hand direction, and turn the receiver tuning control in a fully clockwise direction. This procedure does not differ from that previously described for the adjustment of the oscillator stage.

When slide 10 has been withdrawn in the manner stated above adjust the signal generator frequency control in the vicinity of 145 Mc/s. for maximum receiver output as indicated by the output meter. Adjust trimmer condensers 3C22, 3C34 and 3C36, on the receiver unit, in the order given, for maximum output as indicated by the output meter.

Then retrim condensers 3C22 and 3C36 in that order for maximum output as before, repeating these latter trimming operations as necessary, since "pulling" effect is experienced between the stages due to coupling.

When the foregoing trimming condensers have been satisfactorily adjusted permit slide 10 to "home" and withdraw slide 1. Place the receiver tuning control in a maximum anti-clockwise direction (i.e. to a position of maximum capacity). Vary the signal generator frequency control at a frequency of approximately 115 Mc/s. for maximum receiver output as indicated by the output meter.

Adjust inductance trimming slugs 3L2, 3L5 and 3L4, in that order, for maximum receiver output as indicated by the output meter, then retrim the slugs on inductances 3L3 and 3L4 in the manner described for adjustment of the associated trimming condensers. At the conclusion of the above operation release slide 1, withdraw slide 10 and repeat the trimming procedure, for both slides, until no additional output can be obtained by adjustment of capacitive or inductive trimmers. This operation concludes circuit trimming of the receiver and it is merely necessary to seal the inductance trimmers with a suitable compound and to check the receiver sensitivity in the manner described in sub-section 4.3.

NOTE.—The Muting Level control may require re-adjustment when the equipment is re-installed in the aircraft if it is found that external engine or other interference is breaking through. Under these circumstances, turn the control in an anti-clockwise direction until satisfactory conditions are obtained.

3.4 Alignment of the Transmitter Unit

As previously stated alignment of the transmitter unit must be undertaken subsequent to alignment of the receiver unit. It must be carried out on the frequencies used for receiver alignment, i.e. 115 and 145 Mc/s. and crystals with frequencies of 5,848.8 kc/s. and 7,515.6 kc/s. must be inserted in crystal holders 1 and 10 respectively on the front panel of the main chassis assembly. Also, a crystal, with a frequency of 4.86 Mc/s., must be inserted in the crystal holder fitted to the transmitter unit. Trimming condensers 4C14, 4C18, 4C23 and 4C29 must be set to a mid-capacity position and condenser 4C38 slightly towards a position of minimum capacity. Similarly, trimming slugs on inductances, 4L2, 4L3, 4L4 and 4L5 must be placed to mid-position in relation to their respective coils. Access to the trimming condensers may be had via the underside of the chassis assembly and to the trimming slugs via the left-hand side of the transmitter unit. The position of the condenser plates of the ganged assembly must be checked in relation to the position of the transmitter tuning control, care being taken to observe that the movable plates are fully out when the tuning control is in a maximum clockwise position.

When the above operations have been completed, switch on the equipment, place the slide releasing switch in its extreme right-hand position and manually withdraw channel-change slide 10 (rear slide) to the extent of its travel in a left-hand direction. Turn the receiver tuning control in a fully clockwise direction, checking that the receiver is tuning for maximum noise at this point. Lock the receiver tuning control. Turn the transmitter tuning control in a clockwise direction exactly to the 145 Mc/s. mark on its dial. Pull out the slide switch 5S1-2 to the full extent of its travel.

Connect an 0-1 milliammeter, via flexible leads and the socket provided, to plug 4P1/2 where a current of approximately 700 μA should be indicated. Repeat the procedure, attaching the meter to plug 4P1/3. This action serves to establish that R.F. energy is being fed to the grids of valves 4V2 and 4V3 from the oscillator in the separate receiver unit.

If doubt still exists as to the functioning of the oscillator in the receiver, withdraw the 7,515.6 kc/s. crystal from its holder, when the current indicated at plugs 4P1/2 and 4P1/3 should fall sharply. Replace the crystal.

When the above condition has been obtained attach the 0-1 milliammeter via its flexible lead to plug 4P1/1 in the transmitter, and commence alignment of the auxiliary oscillator (4V1). With the transmitter in the operating condition, adjust the trimming slug on transformer 4L1 for maximum grid current as indicated by the milliammeter. If the slug has been previously set and sealed with compound, care should be taken when releasing the seal and fresh compound should be placed on the adjustable core. Detune the circuit by turning the trimming slug in an anti-clockwise direction until the grid current level is reduced by 10%.

Attach the milliammeter to plug 4P1/4, via its flexible leads, and adjust trimming condensers 4C14 and 4C18 for maximum current in the grid circuit of valve 4V4. During this, and subsequent trimming adjustments, circuit alignment will be greatly accelerated if the fixed and movable plates of the trimming condenser in the stage following the one under adjustment are short circuited, in this particular case, condenser 4C23. The reason for this operation is to minimize the effects of interstage coupling. The short circuiting operation may most easily be effected with an insulated tool into the end of which a metal top has been fitted, the top being carefully held across the condenser during adjustments. A small screwdriver may also be used for this purpose but its use incurs a risk of short circuiting the condenser to chassis and also the danger of personal shock from the H.T. supply. It is emphasized that the operation must be carried out in a delicate manner to avoid risk of damaging the condenser plates.

Remove the milliammeter from plug 4P1/4 and attach it to plug 4P1/5. Short circuit condenser 4C29 in the manner previously described (if this form of procedure has been adopted) and adjust condenser 4C23 for maximum current as indicated by the milliammeter.

Attach the milliammeter to plug 4P1/6 and short circuit condenser 4C38. Adjust condenser 4C29 for maximum current as indicated by the milliammeter. When this condition has been obtained change the milliammeter connections to plug 4P1/7 and check if the current indicated at this point is approximately equal to that given at point 4P1/6. (During all trimming operations allowance must be made for the capacitive effect of the trimming tool. Such an allowance will, in practice, be readily assessed.) Remove the milliammeter.

Connect a 50 ohm artificial aerial (of the lamp load pattern) to plug 5P10, on the front panel of the main chassis assembly, and tune condenser 4C38 for maximum aerial output, i.e. maximum brilliance of the lamp load. If necessary loosen the retaining screws securing the mounting of inductance 4L7 to the transmitter chassis uprights and vary the coupling between this inductance and 4L6 for maximum power output.

Release channel-change slide 10 and manually withdraw channel-change slide 1 in a maximum left-hand direction. Turn the transmitter tuning control in an anti-clockwise direction exactly to the 115 Mc/s. mark.

Attach the milliammeter to plug 4P1/4 and, short circuiting the fixed and movable plates of condenser 4C23, adjust the trimming slugs on inductances 4L2 and 4L3 for maximum current as indicated by the milliammeter.

Remove the milliammeter from plug 4P1/4 and connect it to plug 4P1/5. Short circuit the fixed and movable plates of condenser 4C29 in the manner previously described and adjust the trimming slug on inductance 4L4 for maximum current as indicated by the meter.

Attach the milliammeter to plug 4P1/6 or 4P1/7, short circuit the fixed and movable plates of condenser 4C38 in the manner previously described and adjust the trimming slug on inductance 4L5 for maximum current as indicated by the milliammeter.

If an inductance testing tool is available, i.e. a piece of insulated rod with a copper insert at one end and an iron dust insert at the other, the tuning of inductance 4L6 may be checked. For this purpose it is necessary to first insert one end of the tool into the coil 4L6 then the other end, meanwhile watching the brilliance of the lamp in the artificial aerial. The brilliance of the lamp should diminish equally as either end of the tool is inserted. If the brilliance of the lamp increases when the end of the tool with the iron dust insert is placed in the coil this indicates that added inductance is required and that it will be necessary to close the coil turns of 4L6 slightly to effect tuning. If on the other hand the lamp increases in brilliance when the end of the tool containing the copper insert is placed in the coil, it will be necessary to open the coil turns slightly. It should be emphasised, however, that this operation is of an extremely delicate nature and should not be undertaken unless the coil tuning is very badly out, a condition which should only occur at rare instances, since all coils are set for the correct condition during the course of production. Over or incautious adjustment of this coil will render trimming at the high frequency end of the range impossible, so every care must be exercised during the operation.

If necessary re-adjust the coupling of inductance 4L7 for maximum aerial output.

Repeat the procedure detailed in the foregoing instructions for alignment at the 145 Mc/s. and 115 Mc/s. points until no increase in output can be obtained from any stage. Several operations with both capacitive and inductive trimmers will be necessary for satisfactory alignment. During the final trimming operations all lock nuts on the inductance trimming slugs should be tightened with a special locking tool and suitably sealed.

Connect an 0-1 milliammeter (75 ohms resistance) to plug 4P1/8 and note the current registered by the meter, which should be approximately 0.70 mA. If greatly excessive current is indicated, the drive from the previous stage should be reduced slightly by detuning, to ensure that the outgoing signal is correctly modulated.

4.0 CHECKING THE OVERALL PERFORMANCE

4.1 General

If repairs have been made to the equipment or its operation is questionable, performance checks should be made in accordance with the procedure detailed below. Figures resulting from these checks should not fall below those specified.

The equipment should be allowed a short warming-up period (approximately five minutes) before performance checking is effected and should be run at the correct input voltage (27 volts, as measured at the equipment).

4.2 Checking the I.F. Sensitivity, Audio Frequency Power Output, and I.F. Bandwidth

(i) Checking the I.F. Sensitivity

Remove valve 3V4 from the receiver unit and attach the output leads of a Marconi Signal Generator Type TF144G, via a .01 μF condenser, between the anode terminal of the valve base and chassis.

Set the generator for a 30% modulated signal of 9.72 Mc/s. and, with the receiver operating, check that a generator output of not greater than 800 μV is required to overcome the muting effect.

(ii) Checking the Audio Frequency Power Output

With the signal generator connected as for the previous test, increase its output to 2 mV.

Check that the receiver audio output, as indicated by an output meter, connected between terminals 4 and 1 on plug 5P8 and set for an impedance of 50 ohms, is not less than 15mW at maximum receiver sensitivity (i.e. with the volume control 1R24 on the I.F. amplifier unit and the muting level control on the front panel of the main chassis assembly, turned in a fully clockwise direction).

Increase the modulation depth of the signal generator to 80% and check that an output of not less than 100 mW is indicated by the output meter.

(iii) Checking the I.F. Bandwidth

With the signal generator coupled as before and with a suitable ranged microammeter connected to plug 1P2 (2nd detector current) on the I.F. chassis, pull out the slide switch 5S1-2 to the first click position. Offset the signal generator frequency control by 40 kc/s. on each side of the initial frequency of 9.72 Mc/s., noting that in both cases the increased input required to maintain the detector level is not more than 8 db. An initial level of 50 microamps should be used for this measurement.

Repeat the general procedure but offset the signal generator frequency control 140 kc/s. on each side of 9.72 Mc/s. and note that the increased input required to maintain the level is not less than 30 db.

4.3 Checking the Receiver Sensitivity and S/N Ratio

Connect the output circuit of a Marconi Type TF801 Signal Generator (or equivalent) via a 45-ohm line between the centre and outer contacts of aerial plug 5P10. Set the signal generator for a 30% modulated output of approximately 50 μV at a frequency of 115 Mc/s.

Plug the 5,848.8 kc/s. crystal into socket 1. Place the slide releasing switch in its extreme right-hand position and withdraw the channel-change slide 1 to the extent of its travel in a left-hand direction.

Withdraw the slide switch 5S1-2 to the first click position and vary the receiver tuning control for maximum noise output. Restore switch 5S1-2.

Vary the frequency control of the signal generator for maximum output. Decrease the input from the generator, keeping the generator in tune all the time by re-adjustment (this is necessary on most generators due to shift of frequency with attenuator setting) and note the input level at which the muting begins to operate. This should be not more than 10 μV.

With a 10 μV signal input note the difference in output with the generator modulation (30% at 1,000 c/s.) on and off. This should be not less than 8 db.

Repeat the above operations at three other frequencies in the frequency range, for example at 125 Mc/s., 135 Mc/s. and 145 Mc/s., inserting the appropriate crystals in the holders on the front panel of the main chassis assembly.

4.4 Checking Second Channel Suppression

Connect the output circuit of a Marconi Signal Generator Type TF801 (or equivalent) via a 45 ohm line to aerial plug 5P10 on the equipment. Set the signal generator for a 30% modulated output at the required testing frequency and for a receiver output of 10 mW as indicated by an output meter (set for an impedance of 50 ohms) attached between terminals 4 and 1 on plug 5P8 (the socket must be removed). Vary the receiver tuning dial for maximum receiver output, if necessary again reducing this output to a level of 10 mW by adjustment of the signal generator input level.

Turn the frequency dial on the signal generator to the second channel frequency, i.e. the testing frequency minus 19.44 Mc/s. Increase the signal generator output until the original receiver output of 10 mW is indicated by the output meter. Note the increase in output of the signal generator necessary to obtain this condition. The increase should be at least 30 db. for all testing frequencies.

4.5 Checking the A.V.C.

Attach the output circuit of a Marconi Signal Generator Type TF801 (or equivalent) via a 45 ohm line to aerial plug 5P10 on the equipment.

Set the signal generator for a 30% modulated output of 10 μV at a frequency of 125 Mc/s. Insert the appropriate crystal in the receiver and withdraw the correct channel-change slide.

Vary the receiver tuning dial for maximum receiver output as indicated by the output meter connected between terminals 4 and 1 on plug 5P8. (The socket must be removed to permit this connection and the output meter must be set for an impedance of 50 ohms.) Note the receiver output obtained.

Increase the signal generator output to 100,000 μV and check that the receiver output as indicated by the output meter does not rise by more than 4 db.

4.6 Checking Transmitter Output

Attach an artificial aerial load (consisting of a 2 volt lamp series connected with a 50 ohm, non inductive, 5 watt resistor) across the contacts of plug 5P10 on the front panel of the main chassis assembly. Fit a similar lamp in close proximity to the aerial load, and arrange for it to be fed, via a variable resistor, from a low voltage D.C. source.

Switch on the STR.9-X and place the transmitter in the operating condition.

Observe the strength of illumination given by the lamp in the transmitter artificial load. Vary the series connected resistor in the circuit of the D.C. energized lamp for equal illumination.

Knowing the supply voltage for the D.C. illuminated lamp and the amount of resistance in circuit, calculate the power consumed. This will give the equivalent output of the transmitter into a 50 ohm aerial.

Modulate the transmitter by speech or a beat frequency oscillator, and note if the brightness of the lamp in the transmitter artificial aerial increases during modulation periods. Check if transmitter sidetone is available.

APPENDICES

(1) LIST OF COMPONENTS

(2) MISCELLANEOUS INFORMATION

(3) STR.9-X, STR.9-X.1, STR.9-X.2 AND STR.9-X.3 EQUIPMENTS

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When ordering a spare component, the component designation shown on the circuit diagram (e.g. 3C41) should be quoted together with the full description given in the list of components.

LIST OF COMPONENTS

I. AMPLIFYING UNIT. Type 28-LU-222A (CIRCUIT DIAGRAM FIG. 32)

Cans, Screening

Description and/or Manufacturers' Reference
Valve Cans S.T.C. Code LP.133357

Condensers

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
IC1	0.01 μF	350	T.C.C. CP.32N
IC2	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2.
IC3	10 μμF	500	C.C.B.100K. RCL.130.31, Issue I, Size I
IC4A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC4B	10 μμF	500	C.C.B.100K. RCL.130.31, Issue I, Size I
IC5	0.01 μF	350	T.C.C. CP.32N
IC6	0.01 μF	350	T.C.C. CP.32N
IC7	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
IC8A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC8B	10 μμF	500	C.C.B.100K. RCL.130.31, Issue I, Size I
IC9A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC9B	10 μμF	500	C.C.B. 100K. RCL.130.31, Issue I, Size I
IC10	0.01 μF	350	T.C.C. CP.32N
IC11A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC11B	10 μμF	500	Ceramic, tubular, C.C.B.100K
IC12A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC12B	10 μμF	500	Ceramic, tubular, C.C.B.100K
IC13	0.01 μF	350	T.C.C. CP.32N
IC14	0.01 μF	350	T.C.C. CP.32N
IC15	0.01 μF	350	T.C.C. CP.32N
IC16	0.01 μF	350	T.C.C. CP.32N
IC17	47 μμF	500	Erie N.750K; C.C.B.470K
IC18A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC18B	10 μμF	500	Ceramic tubular, C.C.B.100K
IC19A	75 μμF	350	S.T.C. Code R.L. Spec. 7002–118
IC19B	10 μμF	500	C.C.B.100K. RCL.130.31, Issue I, Size I
IC20	47 μμF	500	Erie N.750K; C.C.B.470K
IC21	0.01 μF	350	T.C.C. CP.32N
IC22	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
IC23	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
IC24	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
IC25	0.005 μF	350	T.C.C. CP.31N
IC26	0.01 μF	350	T.C.C. CP.32N
IC27	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
IC28	0.01 μF	350	T.C.C. CP.32N
IC29	0.01 μF	350	T.C.C. CP.32N
IC30	0.01 μF	350	T.C.C. CP.32N
IC31	0.01 μF	350	T.C.C. CP.32N
IC32	220 μμF	300	Erie K.1200K; RCL.130.71M, Issue I, Size I
IC33	220 μμF	300	ditto ditto
IC34	220 μμF	300	ditto ditto
IC35	220 μμF	300	ditto ditto
IC36	220 μμF	300	ditto ditto
IC37	220 μμF	300	ditto ditto

APPENDIX I

Connector

Component Number	Description and/or Manufacturers' Reference
1J2	Miniature co-axial connector. Type 1405/3. Ref. 10H/5228

Plug

Component Number	Description and/or Manufacturers' Reference
1P1/1	Miniature co-axial. Type 582. Ref. 10/4175
1P2	Two-pin plug, S.T.C. Code LP.133349

Resistances

Component Number	Resistance Value (ohms)	Wattage	Description and/or Manufacturers' Reference
1R1	10,000	$\frac{1}{2}$	RCJ.103K
1R2	100,000	$\frac{1}{2}$	RCJ.104K
1R3	47,000	$\frac{3}{4}$	RCH.473K
1R4	15,000	$\frac{3}{4}$	RCH.153K
1R5	100,000	$\frac{1}{2}$	RCJ.104K
1R6	47,000	$\frac{3}{4}$	RCH.473K
1R7	15,000	$\frac{3}{4}$	RCH.153K
1R8	330	$\frac{1}{2}$	RCJ.331K
1R9	68,000	$\frac{1}{2}$	RCJ.683K
1R10	15,000	$\frac{3}{4}$	RCH.153K
1R11	33,000	$\frac{1}{2}$	RCJ.333K
1R12	10,000	$\frac{1}{2}$	RCJ.103K
1R13	10,000	$\frac{1}{2}$	RCJ.103K
1R14	100,000	$\frac{1}{2}$	RCJ.104K
1R15	47,000	$\frac{1}{2}$	RCJ.473K
1R16	220,000	$\frac{1}{2}$	RCJ.224K
1R17	4.7 meg.	$\frac{1}{2}$	RCJ.475K
1R18	22,000	$\frac{1}{2}$	RCJ.223K
1R19	47,000	$\frac{1}{2}$	RCJ.473K
1R20	47,000	$\frac{1}{2}$	RCJ.473K
1R21	33,000	$\frac{1}{2}$	RCJ.333K
1R22	1 meg.	$\frac{1}{2}$	RCJ.105K
1R23	1,000	$\frac{1}{2}$	RCJ.102K
1R24	330,000	$\frac{1}{10}$	Morganite type BJNAR/33450 Dim. "A" 9/16" with screw-driver slot
1R25	68,000	$\frac{1}{2}$	RCJ.683K
1R26	68,000	$\frac{1}{2}$	RCJ.683K
1R27			Deleted
1R28	680,000	$\frac{1}{2}$	RCJ.684K
1R29	4.7 meg.	$\frac{1}{2}$	RCJ.475K

Socket

Component Number	Description and/or Manufacturers' Reference
1J1	8-way miniature, Painton S.308 C.C.T.

Transformer Units (complete)

Component Number	Description and/or Manufacturers' Reference
IT1	S.T.C. Code 20.LU.175 Gr. A
IT2	S.T.C. Code 20.LU.175 Gr. B
IT3	S.T.C. Code 20.LU.175 Gr. C
IT4	S.T.C. Code 20.LU.175 Gr. D

Valves and Valve Holders

Component Number	Valves	Holders
	Description and/or Manufacturers' Reference	Description and/or Manufacturers' Reference
IV1	CV131	Carr. Fastener 75/833 (B.7G)
IV2	CV131	ditto ditto
IV3	CV138	ditto ditto
IV4	CV140	ditto ditto
IV5	CV138	ditto ditto
IV6	CV138	ditto ditto

2. CHASSIS ASSEMBLY, Type 395-LU-3D, and POWER UNIT, Type 125-LU-29A (CIRCUIT DIAGRAM FIG. 22)

Chokes

Component Number	Inductance Value	Description and/or Manufacturers' Reference
5CH1	46.5 μH	S.T.C. Code LP129765
5CH2	46.5 μH	S.T.C. Code LP129765
5CH3	1350 μH	S.T.C. Code LP129766
5CH4	1350 μH	S.T.C. Code LP129766
5CH5	3H	S.T.C. Code BQ4400 Grp. 2

Condensers

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
5C1	0.1 μF	150	RCL.130.61M, Issue 1, Cat. B. Sched. 2
5C2	1.0 μF	350	RCL.130.61M, Issue 1, Cat. B. Sched. 2
5C3	1.0 μF	350	RCL.130.61M, Issue 1, Cat. B. Sched. 2
5C4	0.5 μF	150	RCL.130.61M, Issue 1, Cat. B. Sched. 2
5C5	0.5 μF	150	RCL.130.61M, Issue 1, Cat. B. Sched. 2
5C6	0.1 μF	350	RCL.130.61M, Issue 1, Cat. B. Sched. 2

Condensers—*continued*

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
5C7	0.1 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
5C8	0.5 μF	150	RCL.130.61M, Issue I, Cat. B. Sched. 2
5C9	0.01 μF	350	T.C.C. CP.32N
5C10	0.01 μF	350	T.C.C. CP.32N
5C11	220 μμF	300	RCL.130.71M, Issue I, Size I
5C12	220 μμF	300	ditto ditto
5C13	220 μμF	300	ditto ditto
5C14	220 μμF	300	ditto ditto
5C15	220 μμF	300	ditto ditto
5C16	220 μμF	300	ditto ditto
5C17	220 μμF	300	ditto ditto
5C18	220 μμF	300	ditto ditto
5C19	220 μμF	300	ditto ditto
5C20A	1500μμF	300	RCL.130.71M, Issue I, Size 2
5C20B	1500μμF	300	RCL.130.71M, Issue I, Size 2
5C21	1500μμF	300	RCL.130.71M, Issue I, Size 2

Couplings

Description and/or Manufacturers' Reference
Flexible drive. Two spring blades coupled by tube. S.T.C. Code LP.133050

Drives, Flexible

Description and/or Manufacturers' Reference
Flexible spring coupling. S.T.C. Code LP.133090

Drive Unit Mechanism

Description and/or Manufacturers' Reference
Circular plate mounting eccentric bush, coil, mechanism and gearings. With cover. S.T.C. Code 327-LU-7A

Fuses

Component Number	Rating	Description and/or Manufacturers' Reference
5F1	250 mA	Belling Lee Type L.562/250
5F2	250 mA	Belling Lee Type L.562/250

Fuse Holders

Description and/or Manufacturers' Reference
Belling Lee. Type L.575

Plugs

Component Number	Description and/or Manufacturers' Reference
5P1	8-way Miniature Jones pattern. Painton P.308AB
5P2	Painton P.312AB
5P3	8-way Miniature Jones pattern. Painton P.308AB
5P4	8-way Miniature Jones pattern. Painton P.308AB
5P5	Miniature co-axial plug. Type 582. Ref. 10H/4175
5P6	Miniature co-axial plug. Type 582. Ref. 10H/4175
5P7	12-way Plessey Type CZ.61807.
5P8	Now 5J2 (see "Sockets" below)
5P9	2-way. F. & E. Ltd. Type EM.3/14
5P10	Co-axial plug. Type 552. Ref. 10H/3930

Regulator (Carbon Pile)

Component Number	Description and/or Manufacturers' Reference
5 Reg. 1	Includes 30-ohm potentiometer and 33-ohm fixed resistor Newton Bros. Type 40

Relays

Component Number	Description and/or Manufacturers' Reference
5 Rel. 1	S.T.C. Code 4181AX or 4182EX
5 Rel. 2	S.T.C. Code 4181CM or 4189GD
5 Rel. 3	S.T.C. Code 4181CM or 4189GD

Resistances

Component Number	Resistance Value (ohms)	Wattage	Description and/or Manufacturers' Reference
5R1	390	1	Welwyn AW.3101. RCL.110.13M, Issue 1, Size 2
5R2	360	1	Welwyn AW.3101. RCL.110.13M, Issue 1, Size 2
5R3	160	1	Welwyn AW.3101. RCL.110.13M, Issue 1, Size 2
5R4	47	1	Welwyn AW.3101. RCL.110.13M, Issue 1, Size 2
5R5	27	1	Welwyn AW.3101. RCL.110.13M, Issue 1, Size 2
5R6	75	1	Colvern Potentiometer CLR.1106/7S
5R7	3	7½	Painton P.302
5R8	3	7½	Painton P.302
5R9	30	1	Colvern Potentiometer CLR.1106/7S
5R10	33	2	Welwyn AW.3115 wirewound
5R11			Deleted
5R12	47	1	Welwyn AW.3101. RCL.110.13M, Issue 1, Size 2
5R13	120	7½	Painton P.302

Sockets

Component Number	Description and/or Manufacturers' Reference
5J1	2-pin S.T.C. Code LP.183252
5J2	6-way. F. & E. Ltd. Type EM.6/13

Switches

Component Number	Description and/or Manufacturers' Reference
5S1	LP.183213 operating Slide Assembly
5S2	LP.183213 operating Slide Assembly
5S3	S.T.C. Code RL.7088-2
5S4	S.T.C. Code LP.183246 Contact Assembly
5S5	S.T.C. LP.183246 Contact Assembly
5S6	S.T.C. Code LP.183296
5S7	S.T.C. Code 112.LRU.65A

Transformer, Rotary

Description and/or Manufacturers' Reference
Mortley Sprague. Type 106. S.T.C. Code RL. Spec. 7001-42

Tuning Unit (Channel-Change Mechanism)

Description and/or Manufacturers' Reference
Sub-chassis unit containing selector mechanism and contacts S.T.C. Code 2-LRU-36A

3. CONTROL UNIT. Type I-LRU-119B (CIRCUIT DIAGRAM FIG. 19)

Dials

Description and/or Manufacturers' Reference
S.T. & C. Codes: A to J LP.183314, K to T LP.183315

Lamp

Description and/or Manufacturers' Reference
G.E.C. 2.5 volt, 0.5 watt M.E.S. Type. Bulb diameter 11 mms. × 23 mms. O/A

Lamp Holder

Description and/or Manufacturers' Reference
S.T. & C. Code: LP.183328

Plug

Component Number	Description and/or Manufacturers' Reference
6P1	12-way Plessey Type CZ.61807

Potentiometer

Description and/or Manufacturers' Reference
Colvern Type CLR.1106/269 to RL.7007—69A

Switch

Component Number	Description and/or Manufacturers' Reference
6S1	11-position S.T.C. Code RL. Spec. 7016/210A

4. MODULATOR UNIT. Type 28-LU-221D (CIRCUIT DIAGRAM FIG. 34)

Cans, Screening

Description and/or Manufacturers' Reference
S.T.C. Code LP.133357

Condensers

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
2C1	0.01 μF	350	T.C.C. CP.32N
2C2	0.5 μF	150	RCL.130.61M, Cat. B, Sched. 2
2C3	0.1 μF	350	RCL.130.61M, Issue 1, Cat. B, Sched. 2
2C4	0.1 μF	350	RCL.130.61M, Issue 1, Cat. B, Sched. 2
2C5	4700 μμF	300	Erie K.1200M, RCL.130.71M, Issue 1, Size 3
2C6	0.005 μF	350	T.C.C. CP.31N
2C7	1.0 μF	150	RCL.130.61M, Issue 1, Cat. B. Table 2
2C8	0.005 μF	350	T.C.C. CP.31N
2C9	220 μμF	300	RCL.130.71M, Issue 1, Size 1
2C10	220 μμF	300	RCL.130.71M, Issue 1, Size 1

Plug

Component Number	Description and/or Manufacturers' Reference
2P1	Miniature Co-axial. Type 582. Ref. 10H/4175

Resistances

Component Number	Resistance Value (ohms)	Wattage	Description and/or Manufacturers' Reference
2R1	330,000	½	RCJ.334K
2R2	680	½	RCJ.681K
2R3	330	½	RCJ.331K
2R4	470,000	½	RCJ.474K
2R5	1 meg.	½	RCJ.105K
2R6	10,000	½	RCJ.103K
2R7	220,000	½	RCJ.224K
2R8	330,000	½	RCJ.474K
2R9	680,000	½	RCJ.684K
2R10	68,000	½	RCJ.683K
2R11	1,200	½	RCJ.122K
2R12	2,700	¾	RCH.272K
2R13	330,000	½	RCJ.334K
2R14	2.2 meg.	½	RCJ.225K
2R15	2.2 meg.	½	RCJ.225K
2R16	470,000	½	RCJ.474K

APPENDIX I

Socket

Component Number	Description and/or Manufacturers' Reference
2J1	12-point miniature Jones pattern. Painton S.312 CCT.

Transformers

Component Number	Description and/or Manufacturers' Reference
2T1	Miniature, S.T.C. Code Cal.42120/1
2T2	Miniature, S.T.C. Code BQ.4300/3
2T3	Miniature, S.T.C. Code AM.4300/4

Valves and Valve Holders

Component Number	Valves	Holders
	Description and/or Manufacturers' Reference	Description and/or Manufacturers' Reference
2V1	CV131	Carr. Fastener 75/833 (B.7G)
2V2	CV136	ditto ditto
2V3	CV133	ditto ditto
2V4	CV133	ditto ditto

5. **RECEIVER UNIT. Type 3-LU-76A (CIRCUIT DIAGRAM FIG. 30)**

Chokes

Component Number	Description and/or Manufacturers' Reference
3HFC1	S.T.C. Code LP.133293
3HFC2	S.T.C. Code LP.133365

Condensers

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
3C1	1500 $\mu\mu$F	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 2
3C2	1500 $\mu\mu$F	300	ditto ditto
3C3	—	—	Deleted
3C4	100 $\mu\mu$F	500	Erie N.750L. RCL.130.31, Issue 1, Size 2 Cat. CCB.101K
3C5	12 $\mu\mu$F	500	Erie N.750K. RCL.130.31, Issue 1, Size 1, Cat. CCB.120K
3C6	47 $\mu\mu$F	500	Erie N.750K. RCL.130.31, Issue 1, Size 1, Cat. CCB.470K
3C7	—	—	Section of ganged condenser assembly
3C8	—	—	Trimmer associated with 3C7
3C9	1500 $\mu\mu$F	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 2
3C10	1500 $\mu\mu$F	300	ditto ditto
3C11	1500 $\mu\mu$F	300	ditto ditto
3C12	1500 $\mu\mu$F	300	ditto ditto
3C13	—	—	Section of ganged condenser assembly
3C14	—	—	Trimmer associated with 3C13
3C15	220 $\mu\mu$F	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 1
3C16	220 $\mu\mu$F	300	ditto ditto

Condensers—*continued*

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
3C17	1.5 μμF	500	Erie P.100K. RCL.130.31, Issue 1, Size 1, Cat. CCD.1R5D
3C18	8.2 μμF	500	Erie P.100K. RCL.130.31, Issue 1, Size 1, Cat. CCD.8R2K
3C19	1500 μμF	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 2
3C20	1500 μμF	300	ditto ditto
3C21	—	—	Section of ganged condenser assembly
3C22	—	—	Trimmer associated with 3C21
3C23	220 μμF	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 1
3C24	220 μμF	300	ditto ditto
3C25	220 μμF	300	ditto ditto
3C26	65 μμF	350	RCL.130.22, Issue 1, Size 10
3C27	39 μμF	500	Erie N.750K. RCL.130.31, Issue 1, Size 1, Cat. CCB.390K
3C28	220 μμF	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 1
3C29	220 μμF	300	ditto ditto
3C30	220 μμF	300	ditto ditto
3C31	10 μμF	500	RCL.130.31, Issue 1, Size 1, Cat. CCB.100K
3C32	3.3 μμF	500	Erie P.100K. RCL.130.31, Issue 1, Size 1, Cat. CCD.3R.3D
3C33	—	—	Section of ganged condenser assembly
3C34	—	—	Trimmer associated with 3C33
3C35	—	—	Section of ganged condenser assembly
3C36	—	—	Trimmer associated with 3C35
3C37	—	—	Deleted
3C38	1500 μμF	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 2
3C39	220 μμF	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 1
3C40	220 μμF	300	ditto ditto
3C41	220 μμF	300	ditto ditto
3C42	47 μμF	500	RCL.130.31, Issue 1, Size 1 Cat. CCB.470D
3C43	—	—	Deleted
3C44	—	—	Deleted
3C45	1.5 μμF	500	Erie P.100K. RCL.130.31, Issue 1, Size 1, Cat. CCD.1R.5D
3C46	0.01 μF	350	T.C.C. CP.32N
3C47	5.6 μμF	500	Erie P.100K. RCL.130.31, Issue 1, Size 1, Cat. CCD.5R.6K

Condenser Unit

Description and/or Manufacturers' Reference
Ceramic, Air Dielectric, 5 gang, with coils. S.T.C. Code 41.LU.24.A

Connectors

Component Number	Description and/or Manufacturers' Reference
3J2	Miniature co-axial. Type 1405/3. Ref. 10H/5228
3J3	,, ,, Type 1405/3. Ref. 10H/5228

APPENDIX I

Inductances

Component Number	Description and/or Manufacturers' Reference
3L1	S.T.C. Code LP.133417
3L2	S.T.C. Code LP.133423
3L3	S.T.C. Code LP.133427
3L4	S.T.C. Code LP.133432
3L5	S.T.C. Code LP.133437

Plugs

Component Number	Description and/or Manufacturers' Reference
3P1	6-pin plug. S.T.C. Code LP.133631
3P2	2-pin plug. S.T.C. Code LP.133387

Resistances

Component Number	Resistance Value (ohms)	Wattage	Description and/or Manufacturers' Reference
3R1	1,000	½	RCJ.102K
3R2	100,000	½	RCJ.104K
3R3	2,200	½	Erie RMA.9
3R4	1,000	½	RCJ.102K
3R5	47,000	½	RCJ.473K
3R6	1,000	½	RCJ.102K
3R7	1,000	½	RCJ.102K
3R8	33,000	½	RCJ.333K
3R9	1,000	½	RCJ.102K
3R10	—	—	Deleted
3R11	47,000	½	RCJ.473K
3R12	100,000	½	RCJ.104K
3R13	47,000	½	RCJ.473K
3R14	10,000	½	RCJ.103K
3R15	1 meg.	½	RCJ.105K
3R16	68,000	½	RCJ.683K
3R17	8.3	1	Welwyn AW.3110. RCL.110.13M, Issue 1, Size 2
3R18	100,000	½	RCJ.104K
3R19	3,300	¾	RCH.332K
3R20	150	½	RCJ.151K
3R21	47,000	½	RCJ.473K

Socket

Component Number	Description and/or Manufacturers' Reference
3J1	Jones pattern, Miniature 8-pin, Painton S.308.AB

Valves and Valve Holders

Component Number	Valves	Holders
	Description and/or Manufacturers' Reference	Description and/or Manufacturers' Reference
3V1	CV136	Carr. Fastener 75/833 (B.7G)
3V2	CV136	ditto ditto
3V3	CV138	ditto ditto
3V4	CV138	ditto ditto
3V5	CV138	ditto ditto

6. SMOOTHING UNIT

Description and/or Manufacturers' Reference
S.T.C. Code 7.LU.21A. For use with Rotary Converter Type 106

7. TRANSMITTER UNIT. Type 4-LU-41D (CIRCUIT DIAGRAM FIG. 26)

Cans, Screening

Description and/or Manufacturers' Reference
S.T.C. Code LP.133357

Chokes

Component Number	Inductance Value	Description and/or Manufacturers' Reference
4CH1	1350 μH	S.T.C. Code LP.133294
4CH2	330 μH	S.T.C. Code LP.133284
4CH3	330 μH	S.T.C. Code LP.133284
4CH4	62 μH	S.T.C. Code LP.133280
4CH5	13 μH	S.T.C. Code LP.133279
4CH6	13 μH	S.T.C. Code LP.133279
4CH7	13 μH	S.T.C. Code LP.133279
4CH8	13 μH	S.T.C. Code LP.133279

Condensers

Component Number	Capacity	Working Voltage	Description and/or Manufacturers' Reference
4C1	500 μμF	350	T.C.C. CM.20. RCL.130.23, Issue 2 Size V
4C2	1500 μμF	300	Erie K.1200L. RCL.130.71M, Issue 1, Size 2
4C3	1500 μμF	300	ditto ditto
4C4	0.01 μF	350	T.C.C. CP.32N. Tubular paper
4C5	75 μμF	750	Silvered mica, U.I.C. SMP.101
4C6	75 μμF	750	Silvered mica, U.I.C. SMP.101
4C7	0.01 μF	350	Tubular paper, T.C.C. CP.32N
4C8	47 μμF	500	RCL.130.31, Issue 1, Size 1, Cat. CCB.470D.
4C9	47 μμF	500	ditto ditto
4C10	47 μμF	500	Erie N.750K, RCL.130.31, Cat. CCB.470J
4C11	300 μμF	350	T.C.C. Type CM.20; RCL.130.23 Size V
4C12	47 μμF	500	Erie N.750K. RCL.130.31, Cat. CCB.470J
4C13	500 μμF	350	Moulded mica, RCL.130.23, Issue 2, Size V
4C14	—	—	Trimmer associated with 4C15
4C15	—	—	Section of ganged condenser assembly
4C16	500 μμF	350	Moulded mica, RCL.130.23, Issue 2, Size V
4C17	—	—	Section of ganged condenser assembly
4C18	—	—	Trimmer associated with 4C17
4C19	500 μμF	350	T.C.C. CM.20. RCL.130.23, Issue 2, Size V
4C20	500 μμF	350	ditto ditto
4C21	—	—	—
4C22	—	—	Section of ganged condenser assembly
4C23	—	—	Trimmer associated with 4C22
4C24	47 μμF	500	Erie 750K. RCL.130.31, Cat. CCB.470J
4C25	47 μμF	500	ditto ditto
4C26	100 μμF	750	Silvered mica, U.I.C. SMP.101
4C27	10 μμF	500	C.C.D. 100D. Erie P.100
4C28	—	—	Section of ganged condenser assembly
4C29	—	—	Trimmer associated with 4C28
4C30	500 μμF	350	T.C.C. CM.20, RCL.130.23, Issue 2, Size V
4C31	47 μμF	500	RCL.130.31, Issue 1, Size 1 Cat. CCB.470D
4C32	47 μμF	500	ditto ditto
4C33	500 μμF	350	T.C.C. CM.20, RCL.130.23, Issue 2, Size V
4C34	500 μμF	350	ditto ditto
4C35	—	—	Deleted
4C36	3000 μμF	750	T.C.C. M.3U, Moulded mica; RCL.130.23, Patt. BW, Size X
4C37	—	—	Section of ganged condenser assembly
4C38	—	—	Trimmer associated with 4C37
4C39	300 μμF	350	T.C.C. Type CM.20, RCL.130.23, Size V
4C40	—	—	Deleted
4C41	500 μμF	350	T.C.C. CM.20, RCL.130.23, Issue 2, Size V
4C42	500 μμF	350	ditto ditto
4C43	—	—	Deleted
4C44	500 μμF	350	T.C.C. CM.20, RCL.130.23, Issue 2, Size V

Condenser Unit

Description and/or Manufacturers' Reference
Tuning, 5-gang variable, ceramic, metal plates air dielectric, 2.5 to 21.5 μμF swing maximum section. Wired with fixed resistor, condenser coils and choke. S.T.C. Code 41-LU-24H

Crystal

Component Number	Description and/or Manufacturers' Reference
4XL1	4.86 Mc/s. S.T.C. Code 4004

Inductances

Component Number	Description and/or Manufacturers' Reference
4L1	S.T.C. Code LP.133058
4L2	S.T.C. Code LP.133215
4L3	S.T.C. Code LP.133218
4L4	S.T.C. Code LP.133221
4L5	S.T.C. Code 20.LU.174B
4L6	S.T.C. Code 20.LU.174A
4L7	S.T.C. Code 45.LU.29A

Plugs

Component Number	Description and/or Manufacturers' Reference
4P1	S.T.C. Code LP.133630
4P2	S.T.C. Code LP.133447

Resistances

Component Number	Resistance Value (ohms)	Wattage	Description and/or Manufacturers' Reference
4R1	47,000	½	RCJ.473K
4R2	100	½	RCJ.106K
4R3	560	½	RCJ.561K
4R4	68.000	½	RCJ.683K
4R5	3,300	¾	RCH.332K
4R6	33,000	½	RCJ.333K
4R7	100	½	RCJ.101K
4R8	10,000	½	RCJ.103K
4R9	100	½	RCJ.101K
4R10	10,000	½	RCJ.103K
4R11	2,000	½	RCJ.222K
4R12	680	½	RCJ.681K
4R13	68,000	½	RCJ.683K
4R14	560	½	RCJ.561K
4R15	0.75	1	Wire-wound Welwyn AW.32111
4R16	33,000	½	RCJ.333K
4R17	680	½	RCJ.681K
4R18	47,000	½	RCJ.473K
4R19	330	½	RCJ.331K
4R20	330	½	RCJ.331K
4R21	56,000	½	RCJ.563K
4R22	680	½	RCJ.681K
4R23	47,000	½	RCJ.473K
4R24	680	½	RCJ.681K
4R25	47,000	½	RCJ.473K
4R26	12,000	½	RCJ.123K
4R27	3,900	2½	Painton P.306; RCL.110.13M, Issue 1, Size 3
4R28	63	1	RCS.110.13M, Issue 1, Size 2
4R29	330	½	RCJ.331K
4R30	330	½	RCJ.331K
4R31	22,000	½	RCJ.223K
4R32	56	½	RCJ.560K
4R33	12,000	½	RCJ.123K
4R34	10,000	½	RCJ.103K
4R35	10,000	2	Wire-wound Painton Type CV2 variable

APPENDIX I

Socket

Component Number	Description and/or Manufacturers' Reference
4J1	Miniature Jones pattern 8-pin, Painton S.308AB.
4J2	Miniature co-axial Type 1405/3. Ref. 10H/5328

Valves and Valve Holders

Component Number	Valves	Holders
	Description and/or Manufacturers' Reference	Description and/or Manufacturers' Reference
4V1	CV136	Carr. Fastener 75/833 (B.7G)
4V2	CV138	ditto ditto
4V3	CV138	ditto ditto
4V4	CV136	ditto ditto
4V5	CV309 or CV1510	Type 337 (B.9G)
4V6	CV415	ditto

RESISTANCE COLOUR CODE

Carbon resistors coded by the standard method carry colours placed so as to indicate ohmic value, tolerance and grade. The three common types are illustrated by the diagrams below. Grade I resistors are of high stability whilst Grade II resistors are of a lower degree of stability. Unless marked by a salmon-pink band all resistors are Grade II.

The ohmic value and tolerances are indicated by four colours placed in the positions A, B, C and D as shown in the diagrams and are interpreted according to the following table :—

Colour	" A "	" B "	" C "	" D "
Brown	1	1	X10	
Red	2	2	X100	
Orange	3	3	X1000	
Yellow	4	4	X10000	
Green	5	5	X100000	
Blue	6	6	X1000000	
Violet	7	7		
Grey	8	8		
White	9	9		
Black		0	X1	
Gold			X0.1	5%
Silver			X0.01	10%
None				20%

Colour " A " gives the first significant figure of the resistance value, colour " B " the second significant figure, and colour " C " indicates the number of " noughts " which follow " B," i.e. " C " is a multiplying factor.

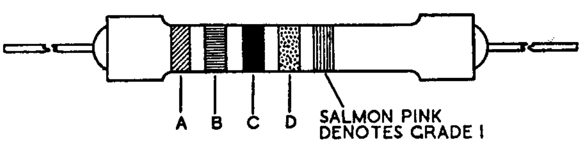
If a dot is omitted it is the same colour as " A ", and the same applies when " B " appears to be missing. It is also possible for " A," " B " and " C " all to be the same colour.

Colours must always be read in the proper order, viz. : Body, Tip, Dot, or in bands starting at the end nearest to the connecting wire.

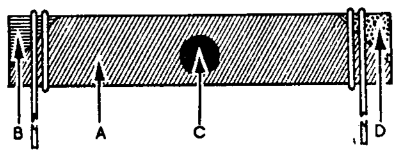
Examples of the colour coding system are given below :—

" A " Colour	" B " Colour	" C " Colour	" D " Colour	Salmon-Pink Band	Ohms	Tolerance
Blue	Black	Black	Gold	Yes	60	5% High Stability
Blue	Black	Brown	Silver	No	600	10%
Violet	Blue	Red	None	No	7,600	20%
Red	Blue	Orange	None	No	26,000	20%
Brown	Brown	Yellow	Silver	No	110,000	10%
Blue	Blue	Blue	Gold	Yes	66 megohms	5% High Stability
Brown	Black	Gold	None	No	1	20%
Green	Black	Silver	None	No	0.5	20%

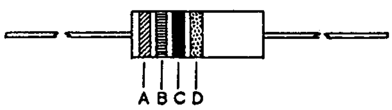
GRADE I CARBON



GRADE II CARBON



GRADE II CARBON



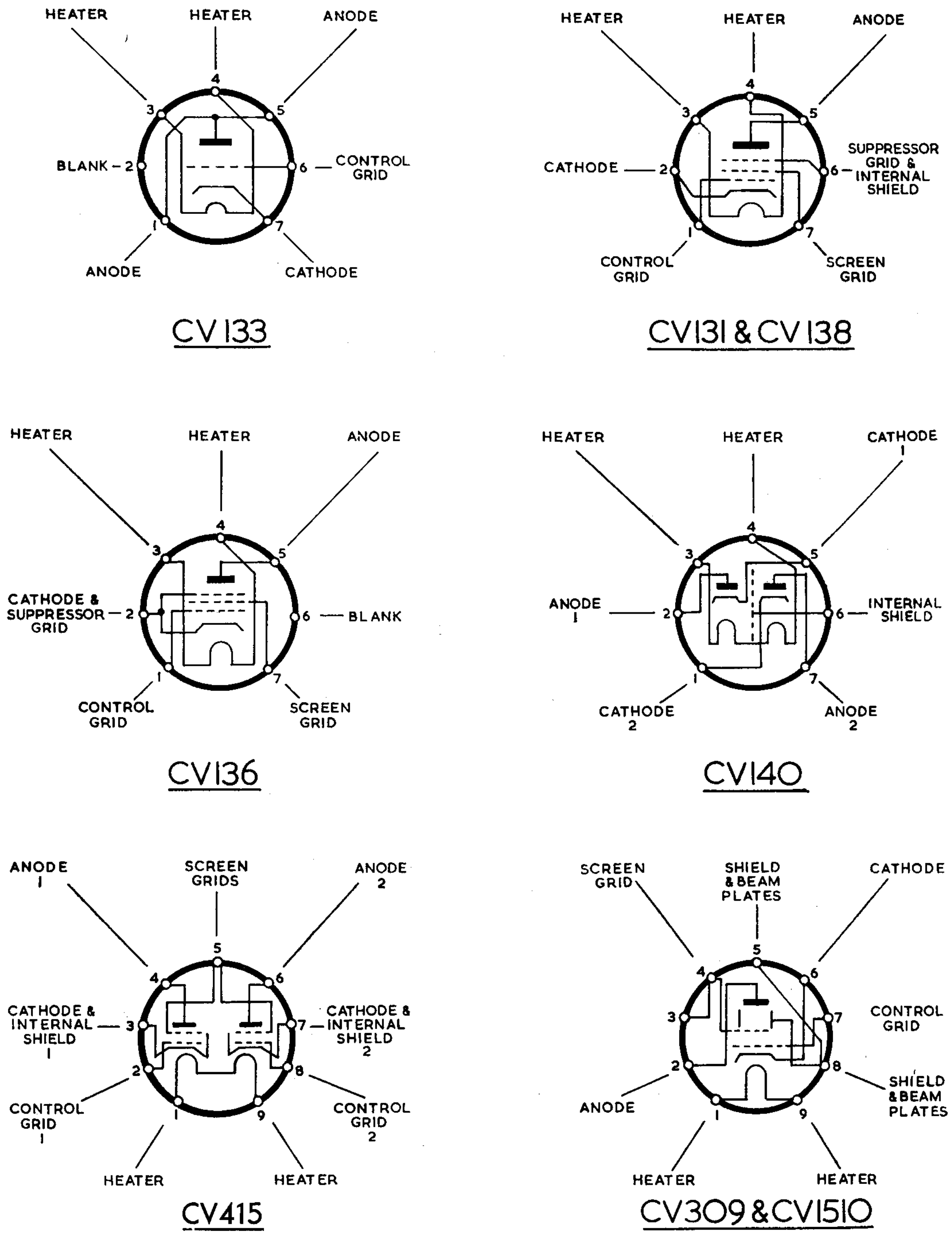


Fig. 18. VALVE BASE CONNECTIONS (Viewed from underside)

STR.9-X, STR.9-X.1, STR.9-X.2 AND STR.9-X.3 EQUIPMENTS

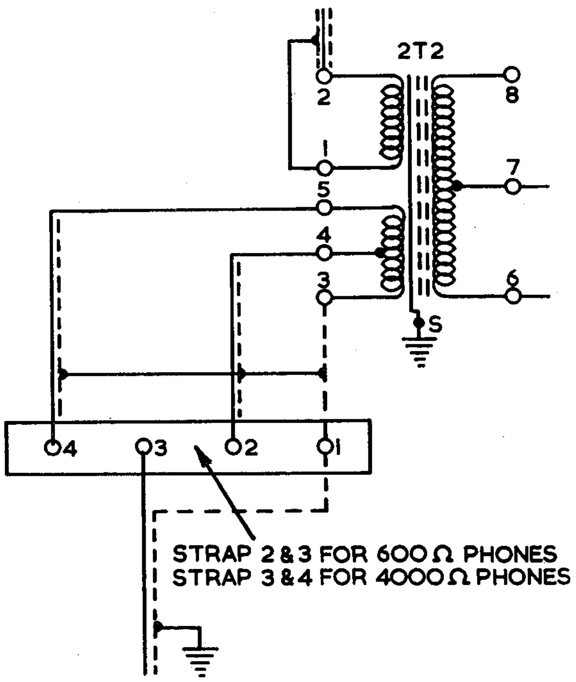
This Appendix details the differences between the above equipments.

Crystals used in the STR.9-X have fundamental frequencies between 5,848 kc/s. and 7,515.5 kc/s. as compared with those used in the STR.9-X.1 which range between 5,682.2 kc/s. and 7,348.9 kc/s. The STR.9-X.2 employs crystals ranging between 5,015 kc/s. and 6,404.4 kc/s. and the STR.9-X.3 range of crystals is 6,376.67 kc/s. to 8,126.67 kc/s.

The output impedance of the STR.9-X.1 is 600 to 4,000 ohms and that of the STR.9-X, STR.9-X.2 and STR.9-X.3, 50 to 150 ohms. Accordingly, reference numbers of the modulator unit and transformer 2T2, quoted on pages 56 and 58, respectively, do not apply to the STR.9-X.1. Coding for these STR.9-X.1 components should be as follows:—

Page	Unit or Component	Change coding to
56	Modulator Unit	28-LU-221C
58	Transformer	BQ.4300 Group 4

In addition, connections to transformer 2T2, shown on circuit diagrams, Figs. 19 and 34, should conform with those given below. Fig. 33 should include an extra tagboard for transformer connections.



APPENDIX 3

This appendix details the differences between the four groups of the STR.9 equipment together with component changes (additions, deletions, etc.) applicable to each.

	STR.9-X	STR.9-X.1	STR.9-X.2	STR.9-X.3
	115-145 Mc/s.	112-142 Mc/s.	100-125 Mc/s.	124.5-156 Mc/s.
Crystal Frequencies.	5,848-7,515.5 kc/s.	5,682.2-7,348.9 kc/s.	5,015-6,404 kc/s.	6,376.67-8,126.67 kc/s.
Output Impedance.	50 ohms	600 and 4,000 ohms	50 ohms	50 ohms
Additional Components.			3C3 (3.3 pf) across 3L1.	3C3 (1.5 pf) across 3L1.
			3C44 (1.5 pf) across 3L2.	4C46 (1.5 pf) across 4L5.
			5C22 (0.01 mfd) 5P3/3 to earth.	4C47 (3.3 pf) across 4C18.
			5C24 (1,500 pf) 5R1-5R2 to earth.	4C48 (3.3 pf) across 4C14
			5C23 (1,500 pf) 5P2/6 to earth.	4C45 coupling 4L2 to 4L3.
Deletions.				3C45.
Change of Values.			3C42 (56 pf). 3R12 (1,000 ohms).	3C42 (33 pf).

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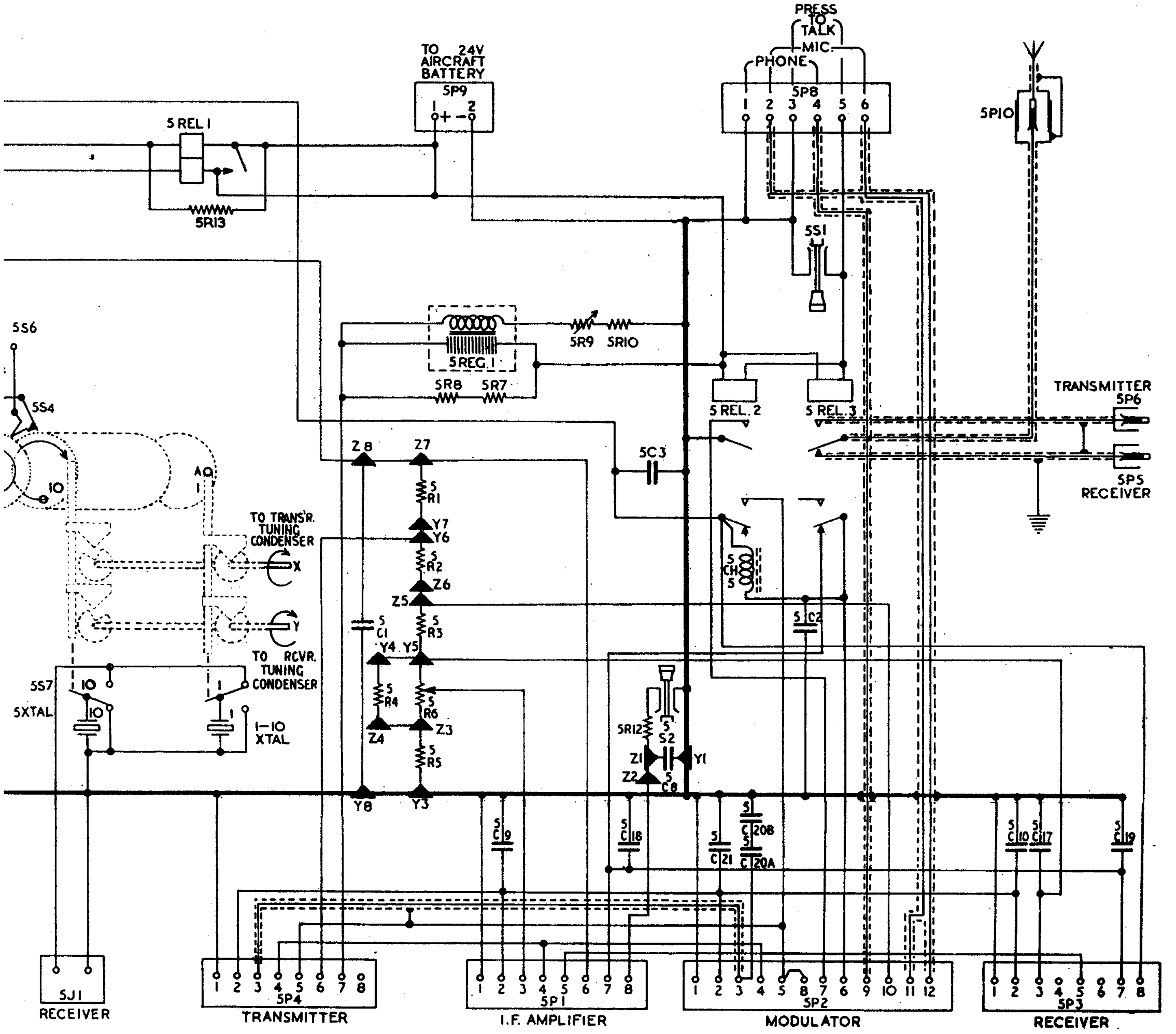


5R1 .... 390 OHMS
5R2 .... 360 OHMS
5R3 .... 160 OHMS
5R4 .... 47 OHMS
5R5 .... 27 OHMS
5R6 .... 75 OHMS
5R7 .... 3 OHMS
5R8 .... 3 OHMS
5R9 .... 55 OHMS
5R10 .... 33 OHMS
5R11 .... NOT USED

5R12 .... 47 OHMS

5XTAL 1 TO 5XTAL 10 ... CRYSTALS AS REQUIRED

5REL.1 ...... RELAY, 1-N/C
5REL.2 .. RELAY, 1-N/O, 1-C/O
5REL.3 ...... RELAY 2-C/O

5CH1 .... 46·5 μH
5CH2 .... 46·5 μH
5CH3 .... 1350 μH
5CH4 .... 1350 μH
5CH5 .... 3 H

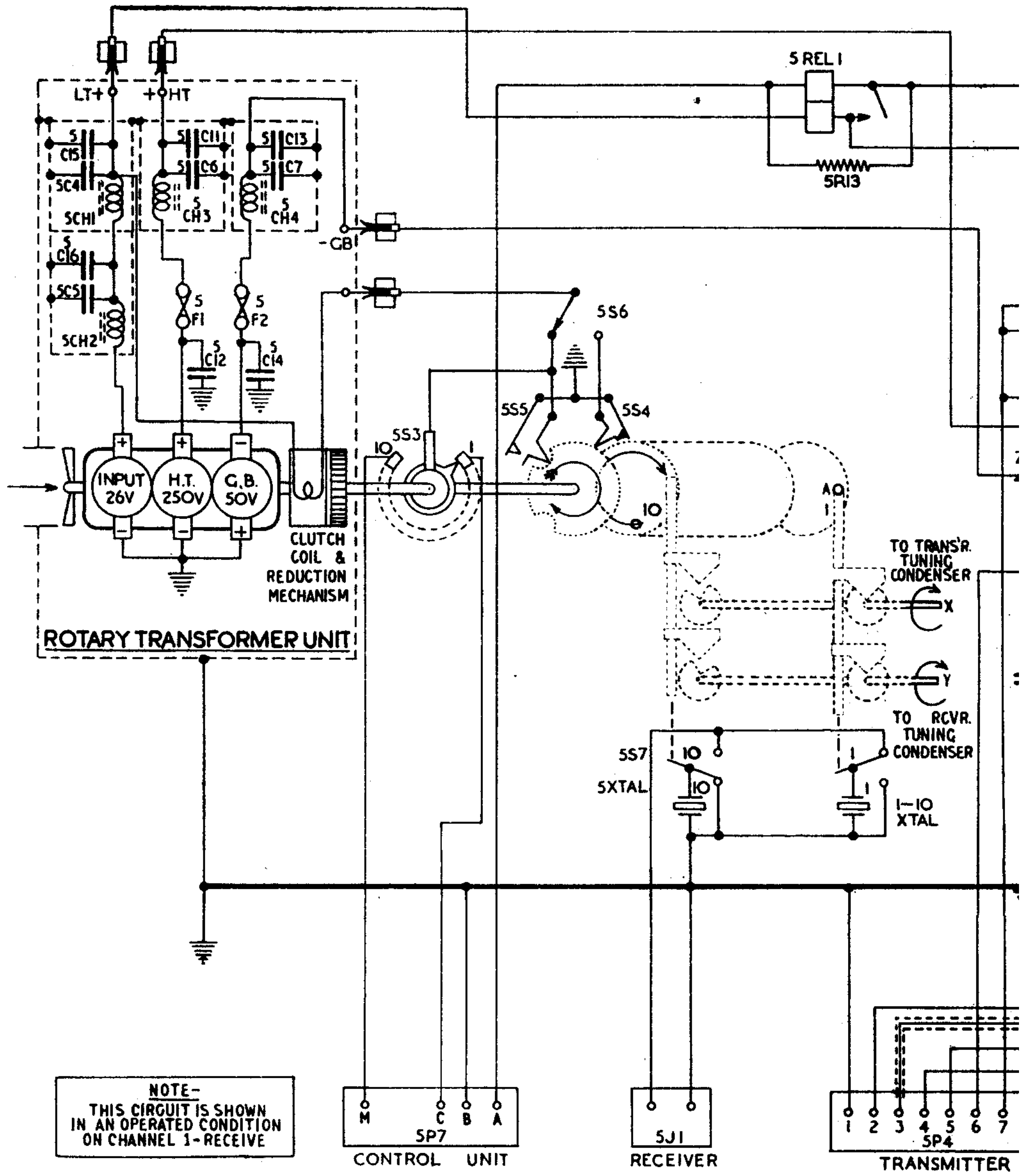
5F1 .... 250 mA
5F2 .... 250 mA

5J1 ...... 2 WAY SOCKET

5P1 .... 8 WAY PLUG
5P2 .... 12 WAY PLUG
5P3 .... 8 WAY PLUG
5P4 .... 8 WAY PLUG
5P5 ...... CO-AXIAL PLUG
5P6 ...... CO AXIAL PLUG
5P7 .... 6 WAY PLUG
5P8 ... 6 WAY OFF-SET PLUG
5P9 .... 2 WAY PLUG
5P10 ...... CO-AXIAL PLUG

5S1 ... N/O PRESS SWITCH
5S2 ... N/O PRESS SWITCH
5S3 .. MECH. 4 WAY ROTARY
5S4 ... MECHANICAL N/O
5S5 ... MECHANICAL N/O
5S6 .... S.P. C/O
5S7 .... 4 P. C/O

5REG.1 .... CARBON PILE



5C1 . . . . 0·1 MFD
5C2 . . . . 1 MFD
5C3 . . . . 1 MFD
5C4 . . . . 0·5 MFD
5C5 . . . . 0·5 MFD
5C6 . . . . 0·1 MFD
5C7 . . . . 0·1 MFD
5C8 . . . . 0·5 MFD
5C9 . . . . 0·01 MFD
5C10 . . . . 0·01 MFD
5C11 . . . . 220 PFD

5C12 . . . . 220 PFD
5C13 . . . . 220 PFD
5C14 . . . . 220 PFD
5C15 . . . . 220 PFD
5C16 . . . . 220 PFD
5C17 . . . . 220 PFD
5C18 . . . . 220 PFD
5C19 . . . . 220 PFD
5C20A . . . . 1500 PFD
5C20B . . . . 1500 PFD
5C21 . . . . 1500 PFD

5R1 . . . . 390 OHMS
5R2 . . . . 360 OHMS
5R3 . . . . 160 OHMS
5R4 . . . . 47 OHMS
5R5 . . . . 27 OHMS
5R6 . . . . 75 OHMS
5R7 . . . . 3 OHMS
5R8 . . . . 3 OHMS
5R9 . . . . 55 OHMS
5R10 . . . . 33 OHMS
5R11 . . . . NOT USED

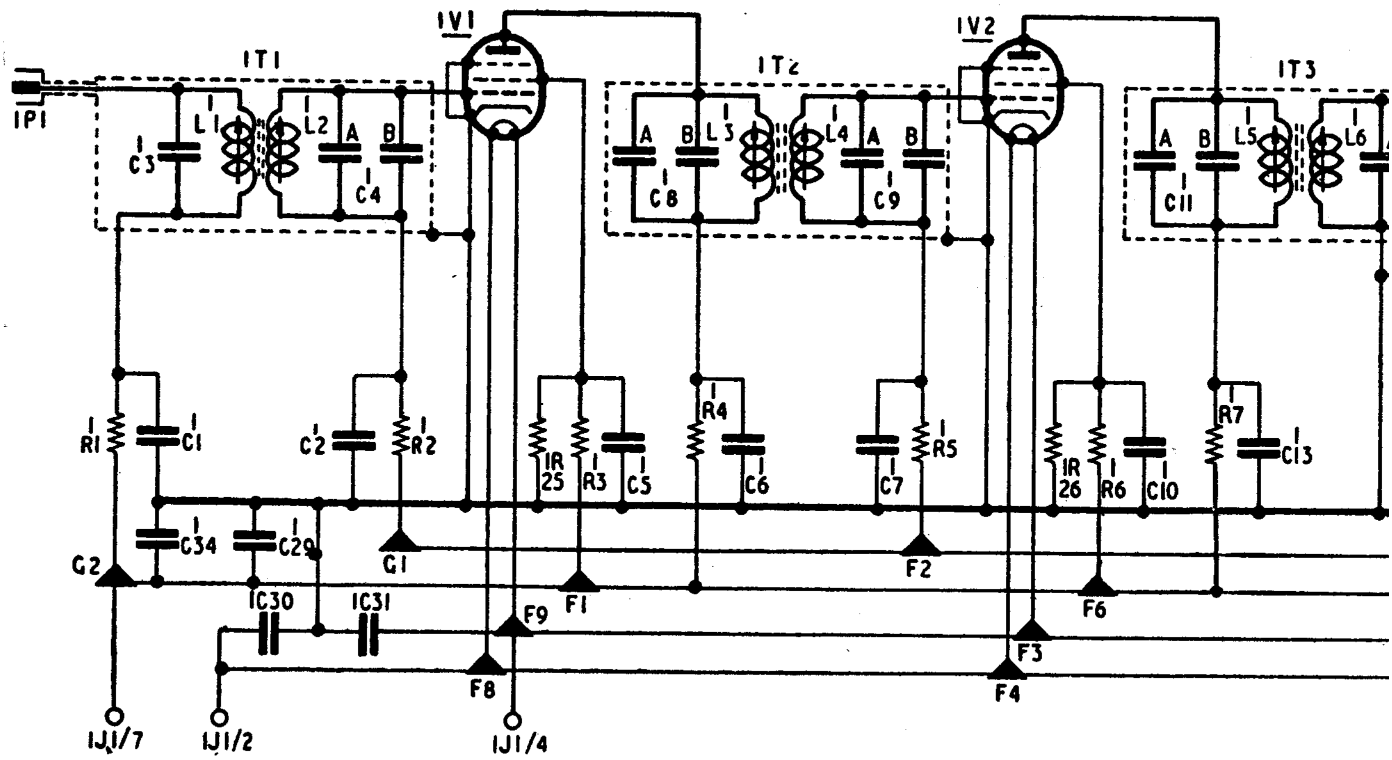
5R12 . . . .

5XTAL 1

TO

5XTAL 10

5REL1 . . . . . R
5REL.2 . . RELAY
5REL.3 . . . . . R

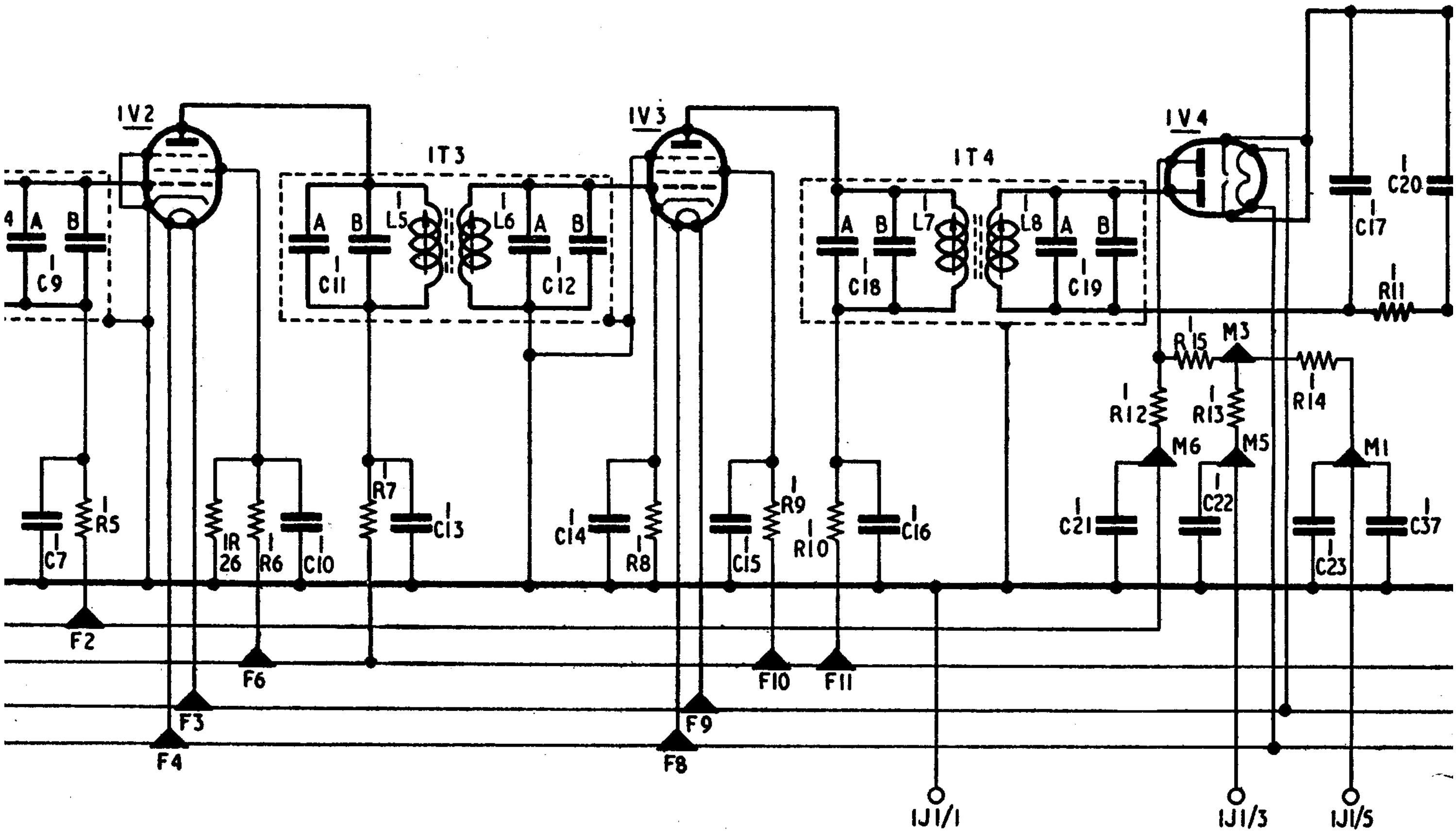


IC1 . . . . .0·01 MFD
IC2 . . . . .0·1 MFD
IC3 . . . . .10 PFD
IC4A . . . . .75 PFD
IC4B . . . . .10 PFD
IC5 . . . . .0·01 MFD
IC6 . . . . .0·01 MFD
IC7 . . . . .0·1 MFD
IC8A . . . . .75 PFD
IC8B . . . . .10 PFD
IC9A . . . . .75 PFD

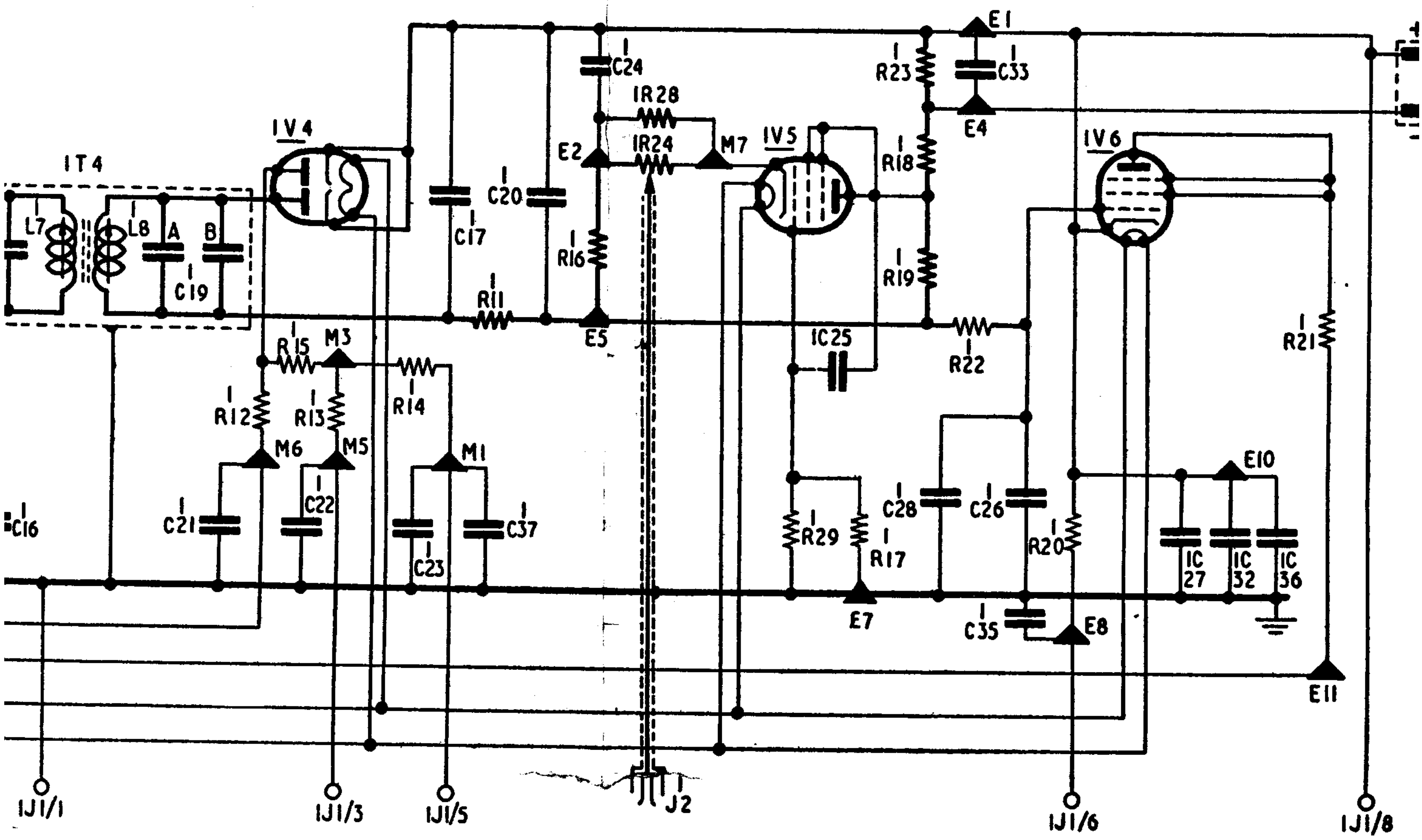
IC9B . . . . .10 PFD
IC10 . . . . .0·01 MFD
IC11A . . . . .75 PFD
IC11B . . . . .10 PFD
IC12A . . . . .75 PFD
IC12B . . . . 10 PFD
IC13 . . . . .0·01 MFD
IC14 . . . . .0·01 MFD
IC15 . . . . .0·01 MFD
IC16 . . . . .0·01 MFD
IC17 . . . . 47 PFD

IC18A . . . . .75 PFD
IC18B . . . . .10 PFD
IC19A . . . . .75 PFD
IC19B . . . . .10 PFD
IC20 . . . . .47 PFD
IC21 . . . . .0·01 PFD
IC22 . . . . .0·1 MFD
IC23 . . . . .0·1 MFD
IC24 . . . . .0·1 MFD
IC25 . . . . ·005 MFD
IC26 . . . . .0·01 MFD

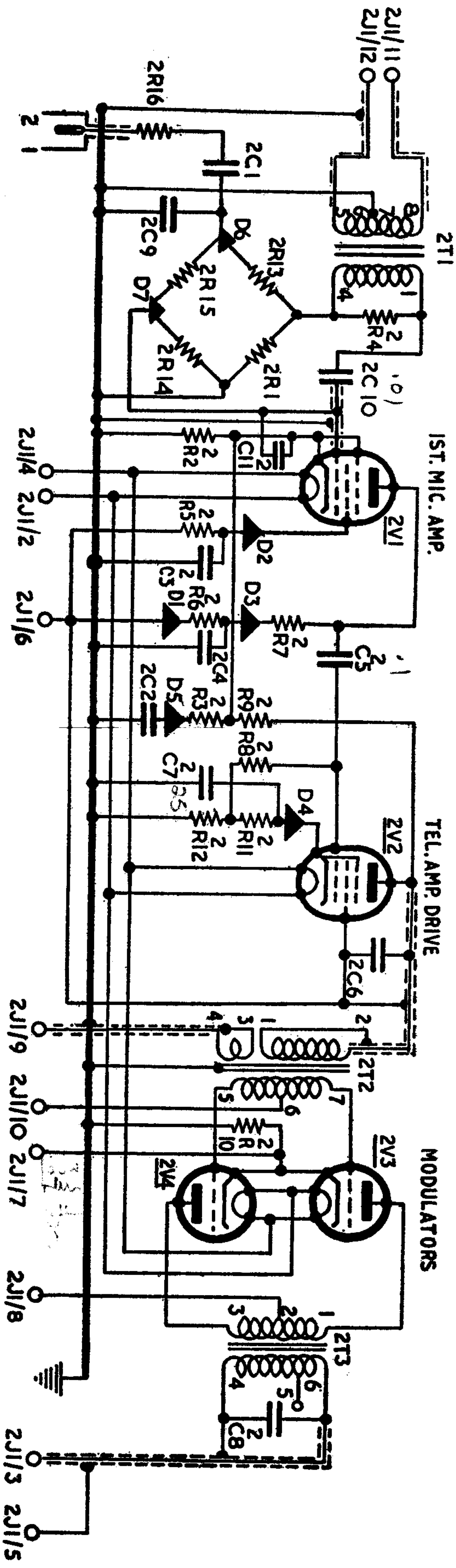
IC27 . .
IC28 . .
IC29 . .
IC30 . .
IC31 . .
IC32 . .
IC33 . .
IC34 . .
IC35 . .
IC36 . .
IC37 . . .



IC18A . . . . 75 PFD	IC27 . . . . 0·1 MFD	IR1 . . . . 10,000 OHMS	IR12 . . . . 10,000 OI
IC18B . . . . 10 PFD	IC28 . . . . 0·01 MFD	IR2 . . . . 100,000 OHMS	IR13 . . . . 10,000 OI
IC19A . . . . 75 PFD	IC29 . . . . 0·01 MFD	IR3 . . . . . 47,000 OHMS	IR14 . . . . 100,000 OI
IC19B . . . . 10 PFD	IC30 . . . . 0·01 MFD	IR4 . . . . . 15,000 OHMS	IR15 . . . . . 47,000 OI
IC20 . . . . 47 PFD	IC31 . . . . 0·01 MFD	IR5 . . . . 100,000 OHMS	IR16 . . . 220,000 OI
IC21 . . . . 0·01 PFD	IC32 . . . . 220 PFD	IR6 . . . . . . 47,000 OHMS	IR17 . . . . . . 4·7 MEGO.
IC22 . . . . 0·1 MFD	IC33 . . . . 220 PFD	IR7 . . . . . . 15,000 OHMS	IR18 . . . . 22,000 OI
IC23 . . . . 0·1 MFD	IC34 . . . . 220 PFD	IR8 . . . . 330 OHMS	IR19 . . . . 47,000 OI
IC24 . . . . 0·1 MFD	IC35 . . . . 220 PFD	IR9 . . . . 68,000 OHMS	IR20 . . . . 47,000 OI
IC25 . . . . .005 MFD	IC36 . . . . 220 PFD	IR10 . . . . 15,000 OHMS	IR21 . . . . 33,000 OI
IC 26 . . . . 0·01 MFD	IC 37 . . . . 220 PFD	IR11 . . . . 33,000 OHMS	IR22 . . . . 1 MEGC



...10,000 OHMS	IR12.... 10,000 OHMS	IR23.....1,000 OHMS	IV1............CV 131
..100,000 OHMS	IR13.....10,000 OHMS	IR24..330,000 OHMS	IV2............CV 131
...47,000 OHMS	IR14....100,000 OHMS	IR25...68,000 OHMS	IV3............CV 138
....15,000 OHMS	IR15.....47,000 OHMS	IR26...68,000 OHMS	IV4.............CV140
..100,000 OHMS	IR16... 220,000 OHMS	IR28.. 680,000 OHMS	IV5............CV 138
...47,000 OHMS	IR17......4·7 MEGOHMS	IR29....4·7 MEGOHMS	IV6............CV 138
...15,000 OHMS	IR18.....22,000 OHMS		
......330 OHMS	IR19.....47,000 OHMS	IT1	
..68,000 OHMS	IR20.....47,000 OHMS	IT2	
...15,000 OHMS	IR21.....33,000 OHMS	IT3	
...33,000 OHMS	IR22........1 MEGOHM	IT4	



2C1	0·01 MFD
2C2	·05 MFD
2C3	0·1 MFD
2C4	0·1 MFD
2C5	4,700 PFD
2C6	5,000 PFD
2C7	1·0 MFD
2C8	5,000 PFD
2C9	220 PFD
2C10	220 PFD
2C11	33 PFD

2R1	330,000 OHMS
2R2	680 OHMS
2R3	330 OHMS
2R4	470,000 OHMS
2R5	1 MEGOHM
2R6	10,000 OHMS
2R7	220,000 OHMS
2R8	330,000 OHMS
2R9	680,000 OHMS
2R10	68,000 OHMS
2R11	1,200 OHMS
2R12	2,700 OHMS
2R13	330,000 OHMS
2R14	2·2 MEGOHMS
2R15	2·2 MEGOHMS
2R16	470,000 OHMS

2T1	MIC TRANSFORMER
2T2	DRIVER TRANSFORMER
2T3	MODULATION TRANS'R

2V1	CV131
2V2	CV136
2V3	CV133
2V4	CV133

2P1	CO-AXIAL PLUG
2J1	12 WAY SOCKET

NOTE 1.—Transformer 2T2 is supplied in two types, one marked with a yellow spot and the other unmarked. If the marked type is installed in an equipment or supplied as a replacement, transformer connections are terminated as shown in this diagram. If the unmarked type is supplied, connections are terminated as illustrated in Fig. 19.

NOTE 2.—Condenser 2C11, value 33 PFD, has been added between terminals 1 and 2 of valve 2V1.

FIG. 34. CIRCUIT DIAGRAM OF MODULATOR UNIT (showing Test Points)

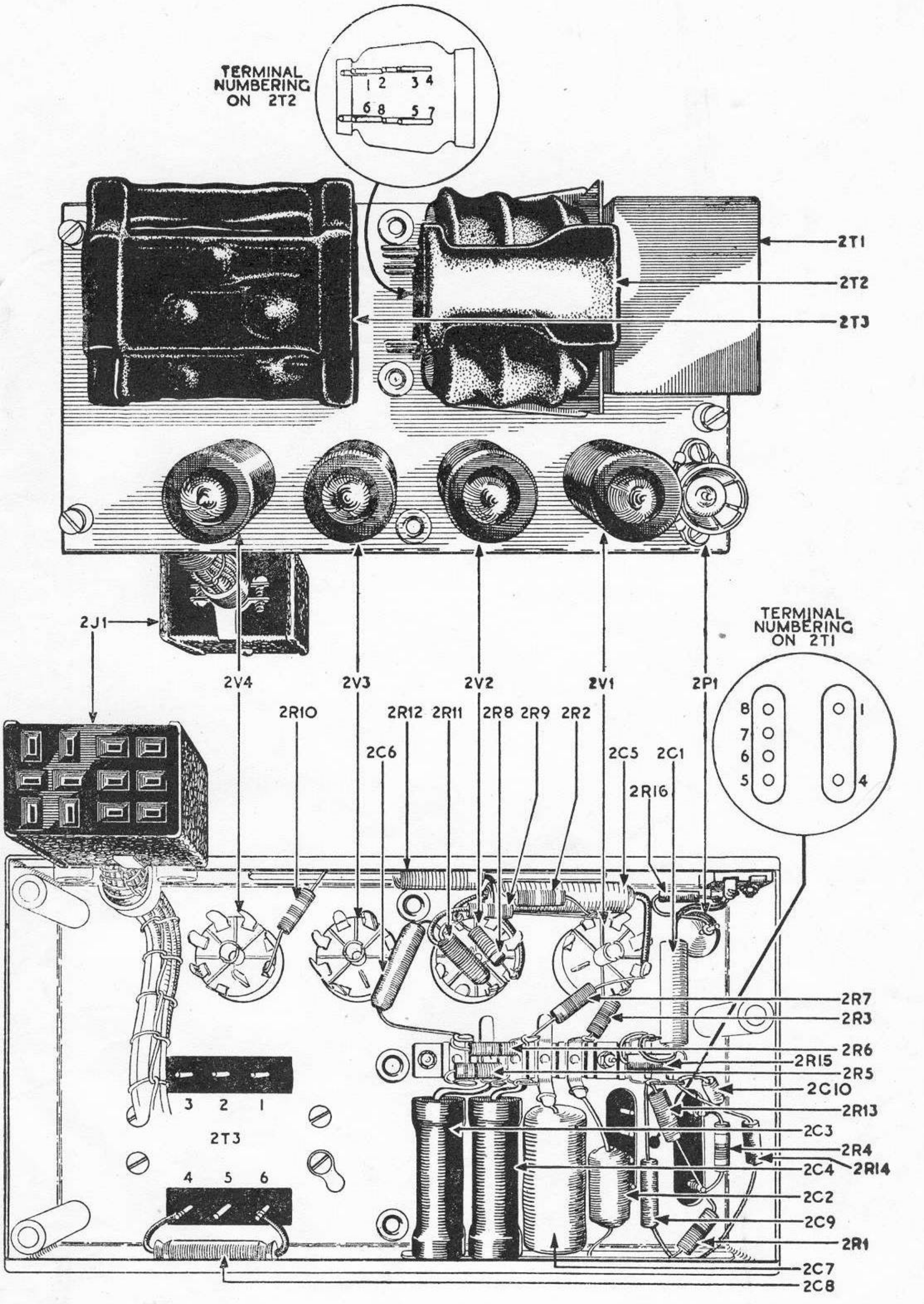
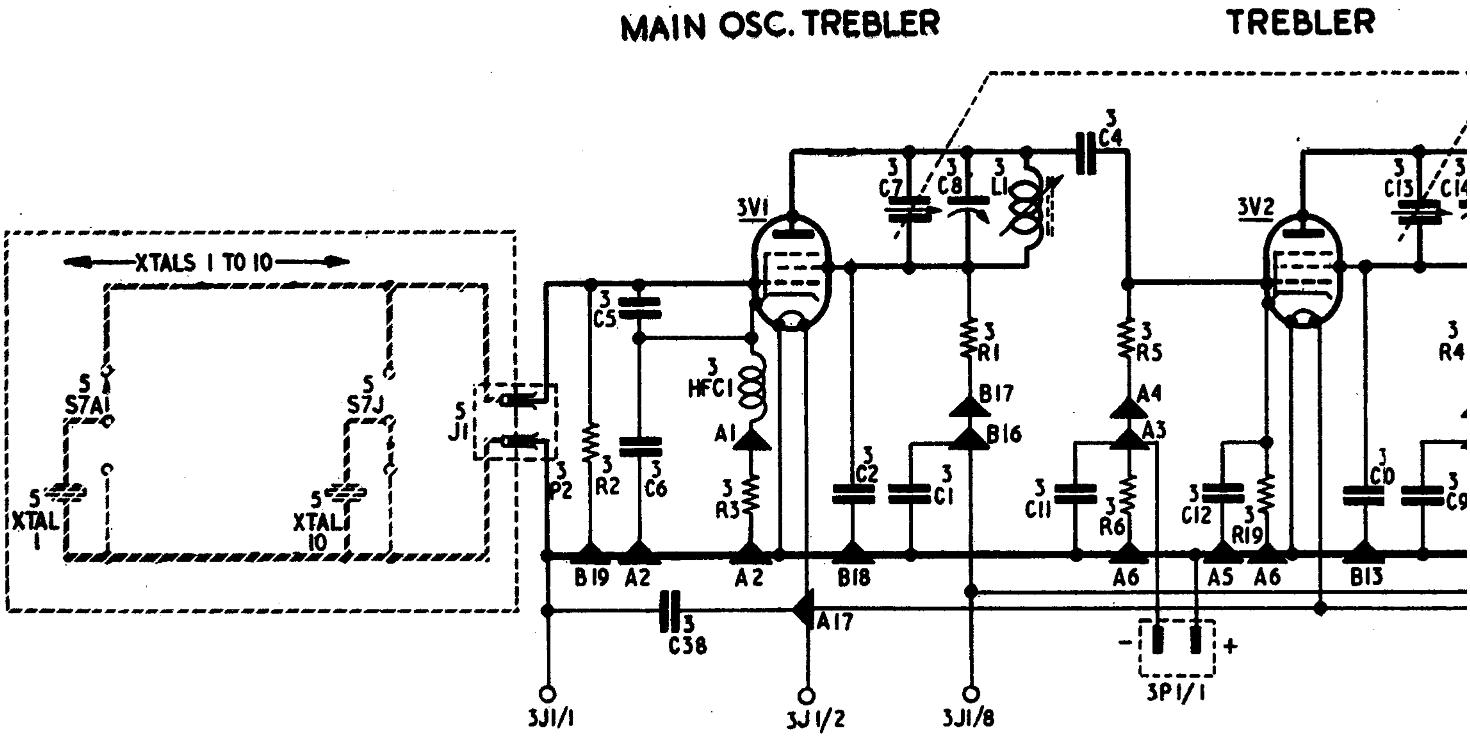
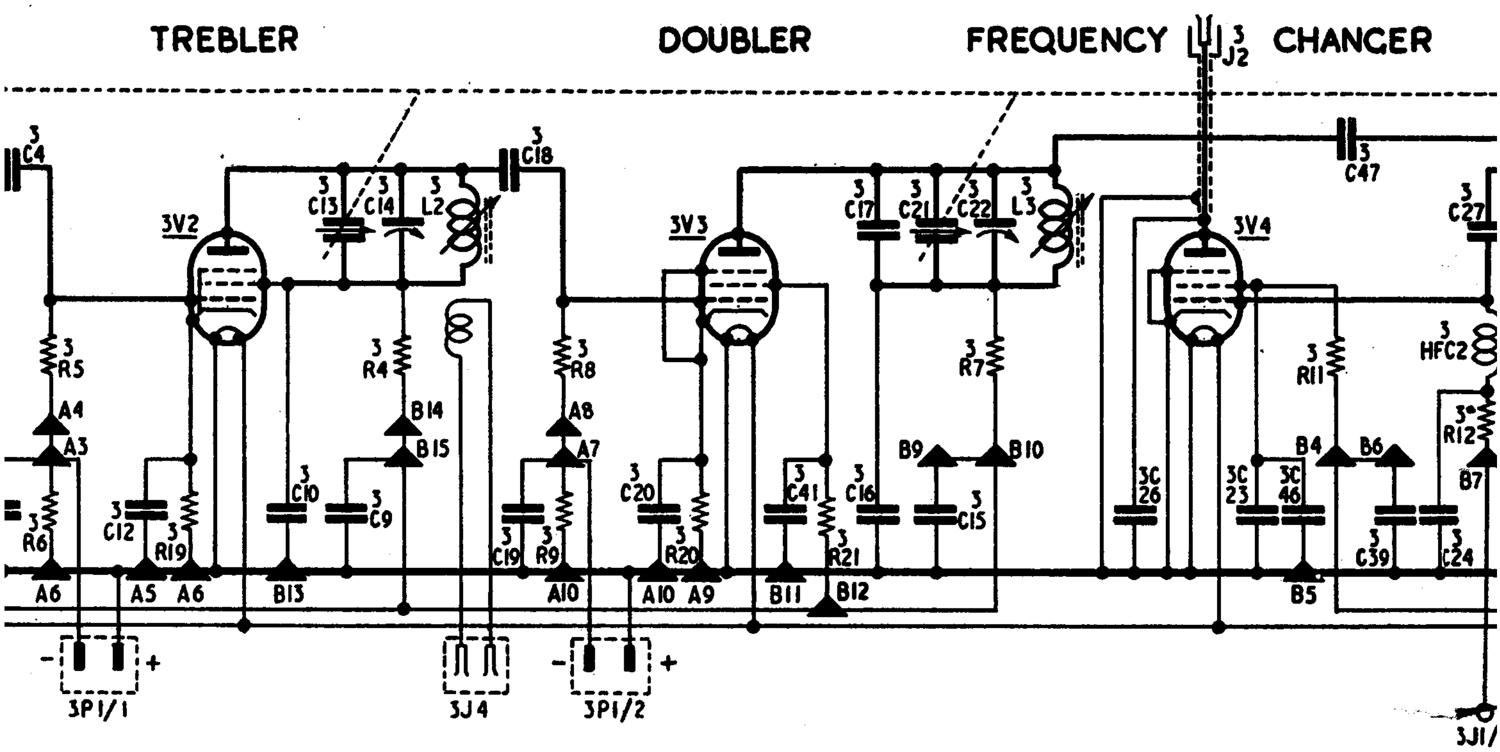


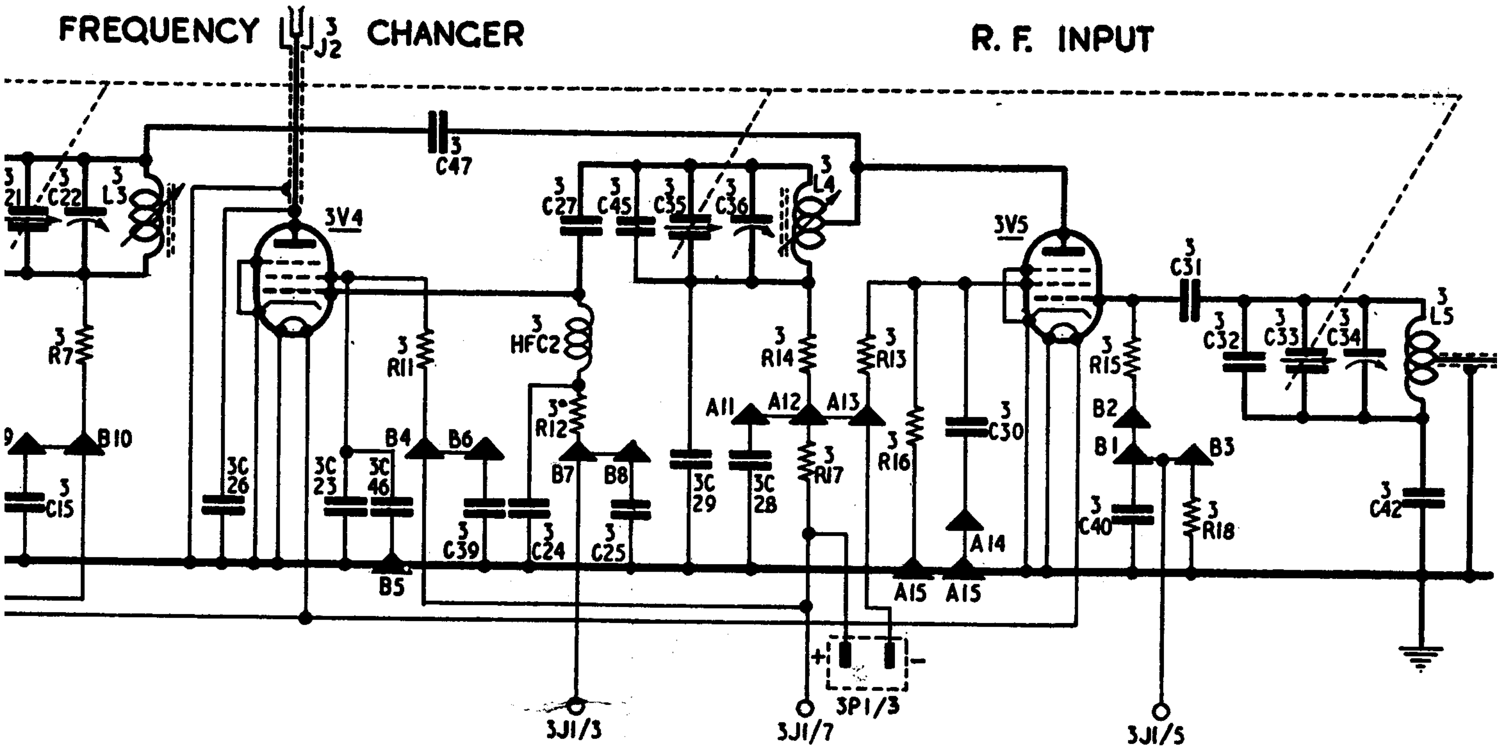
FIG. 33. MODULATOR UNIT (Component Identification)



3C1	1,500 PFD	3C12	1,500 PFD	3C23	
3C2	1,500 PFD	3C13	★	3C24	
3C3	NOT. USED	3C14	SPEC. TRIMMER	3C25	
3C4	100 PFD	3C15	220 PFD	3C26	
3C5	12 PFD	3C16	220 PFD	3C27	
3C6	47 PFD	3C17	1·5 PFD	3C28	
3C7	★	3C18	8·2 PFD	3C29	
3C8	SPEC. TRIMMER	3C19	1,500 PFD	3C30	
3C9	1,500 PFD	3C20	1,500 PFD	3C31	
3C10	1,500 PFD	3C21	★	3C32	
3C11	1,500 PFD	3C22	SPEC. TRIMMER	3C33	



...1,500 PFD	3C23........220 PFD	3C34...SPEC. TRIMMER	3C47..........5·6 PFD	3R11....4
....★	3C24........220 PFD	3C35..........★		3R12...10
EC. TRIMMER	3C25........220 PFD	3C36...SPEC. TRIMMER	3R1........1,000 OHMS	3R13....4
..220 PFD	3C26..........65 PFD	3C38......1,500 PFD	3R2...100,000 OHMS	3R14....1
...220 PFD	3C27..........39 PFD	3C39........220 PFD	3R3......3,300 OHMS	3R15..
....1·5 PFD	3C28........220 PFD	3C40........220 PFD	3R4......1,000 OHMS	3R16...6
....8·2 PFD	3C29........220 PFD	3C41........220 PFD	3R5....47,000 OHMS	3R17....
..1,500 PFD	3C30........220 PFD	3C42..........47 PFD	3R6......1,000 OHMS	3R18..10
..1,500 PFD	3C31..........10 PFD	3C44........NOT USED	3R7......1,000 OHMS	3R19....
....★	3C32..........3·3 PFD	3C45..........1·5 PFD	3R8....33,000 OHMS	3R20....
EC.TRIMMER	3C33..........★	3C46........0·01 MFD	3R9......1,000 OHMS	3R21...4



3C47..........5·6 PFD

3R1.......1,000 OHMS
3R2...100,000 OHMS
3R3.....3,300 OHMS
3R4......1,000 OHMS
3R5.....47,000 OHMS
3R6......1,000 OHMS
3R7......1,000 OHMS
3R8....33,000 OHMS
3R9......1,000 OHMS

3R11....47,000 OHMS
3R12...100,000 OHMS
3R13....47,000 OHMS
3R14....10,000 OHMS
3R15......1 MEGOHM
3R16....68000 OHMS
3R17.........12 OHMS
3R18..100,000 OHMS
3R19.....3,300 OHMS
3R20.......150 OHMS
3R21...47,000 OHMS

3V1...........CV 136
3V2...........CV 136
3V3...........CV 138
3V4...........CV 138
3V5...........CV 138

★..........PART OF GANGED CONDENSER

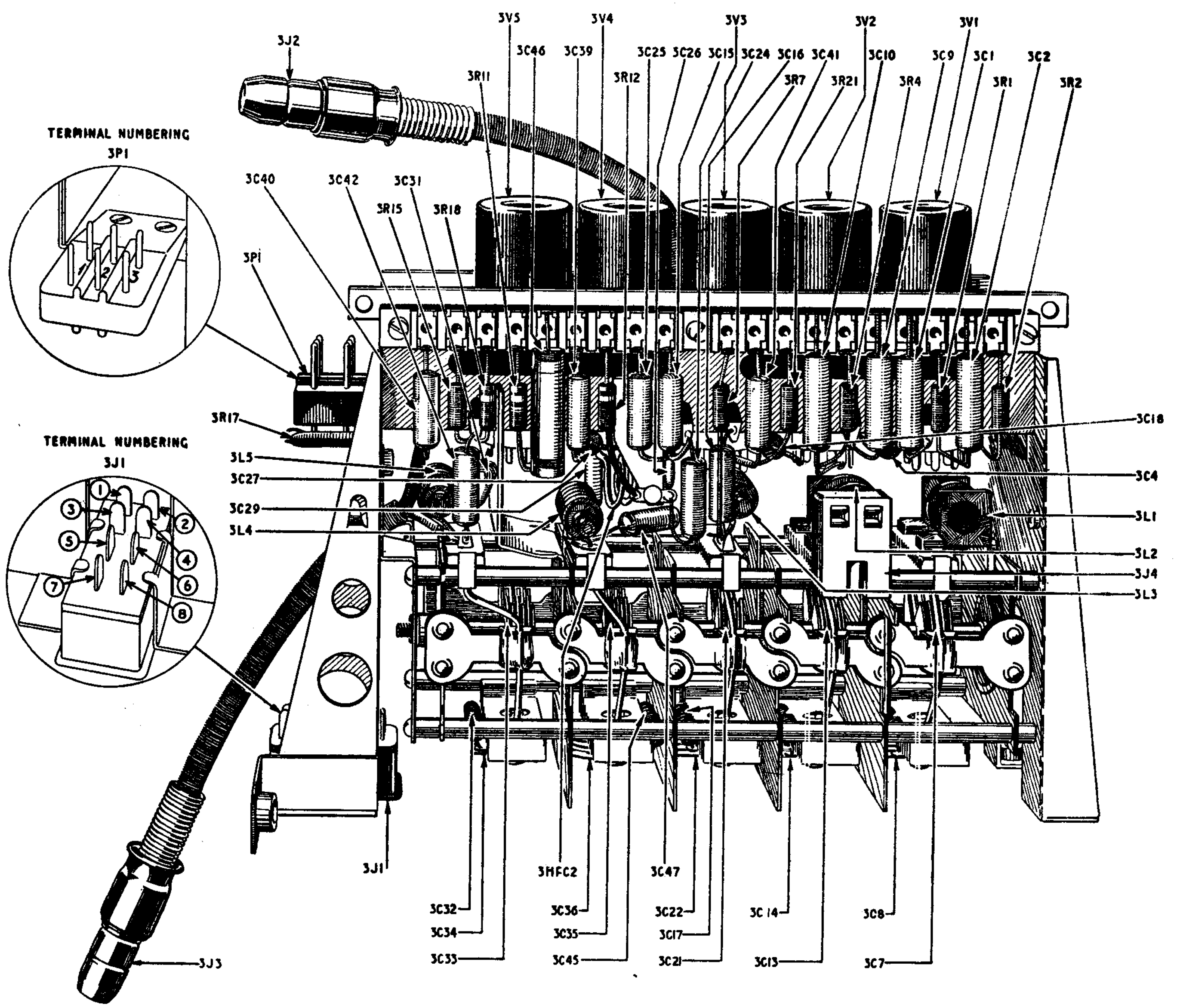


FIG. 28. RECEIVER UNIT (Component Identification, left side)

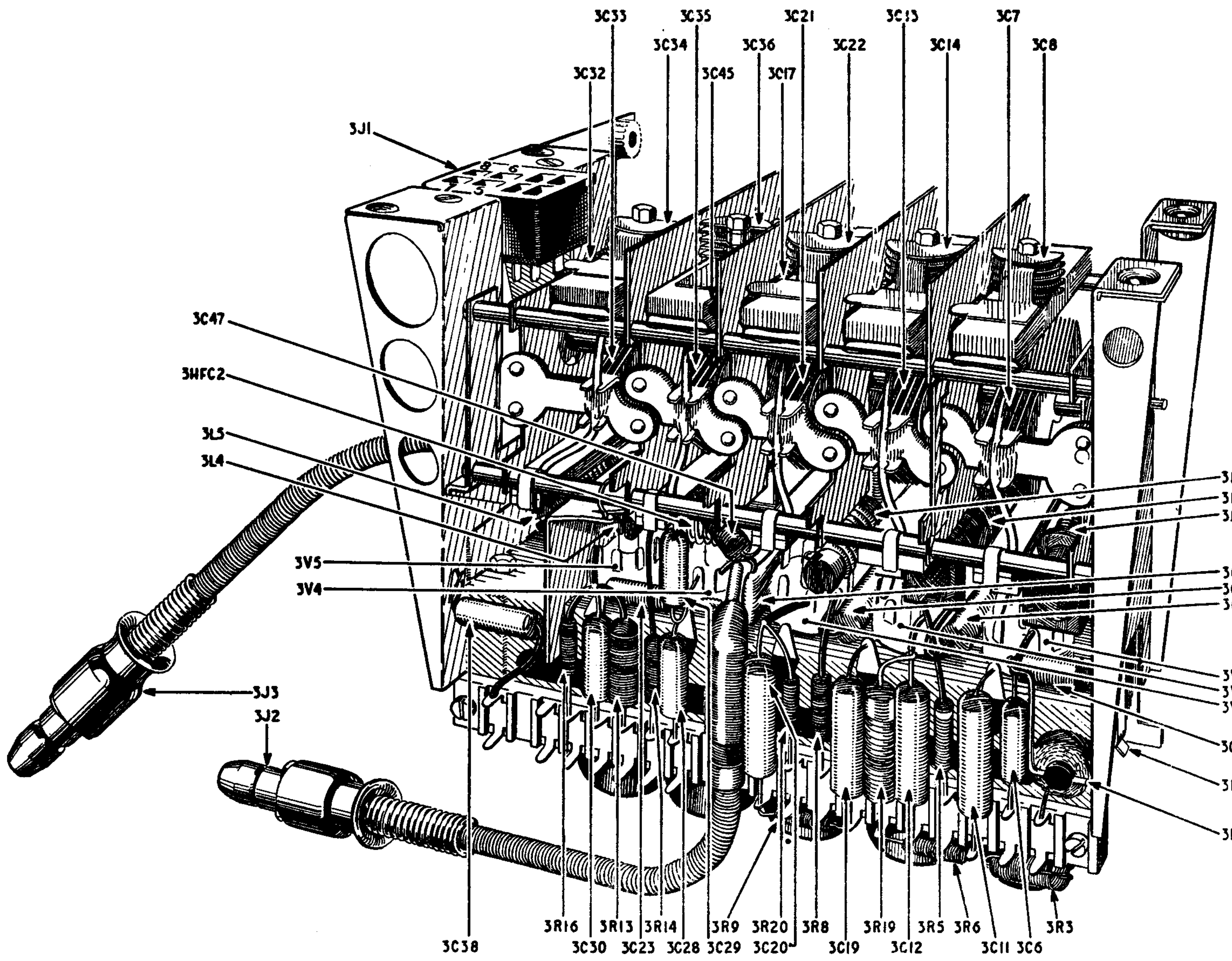


FIG. 29. RECEIVER UNIT (Component Identification, right side)

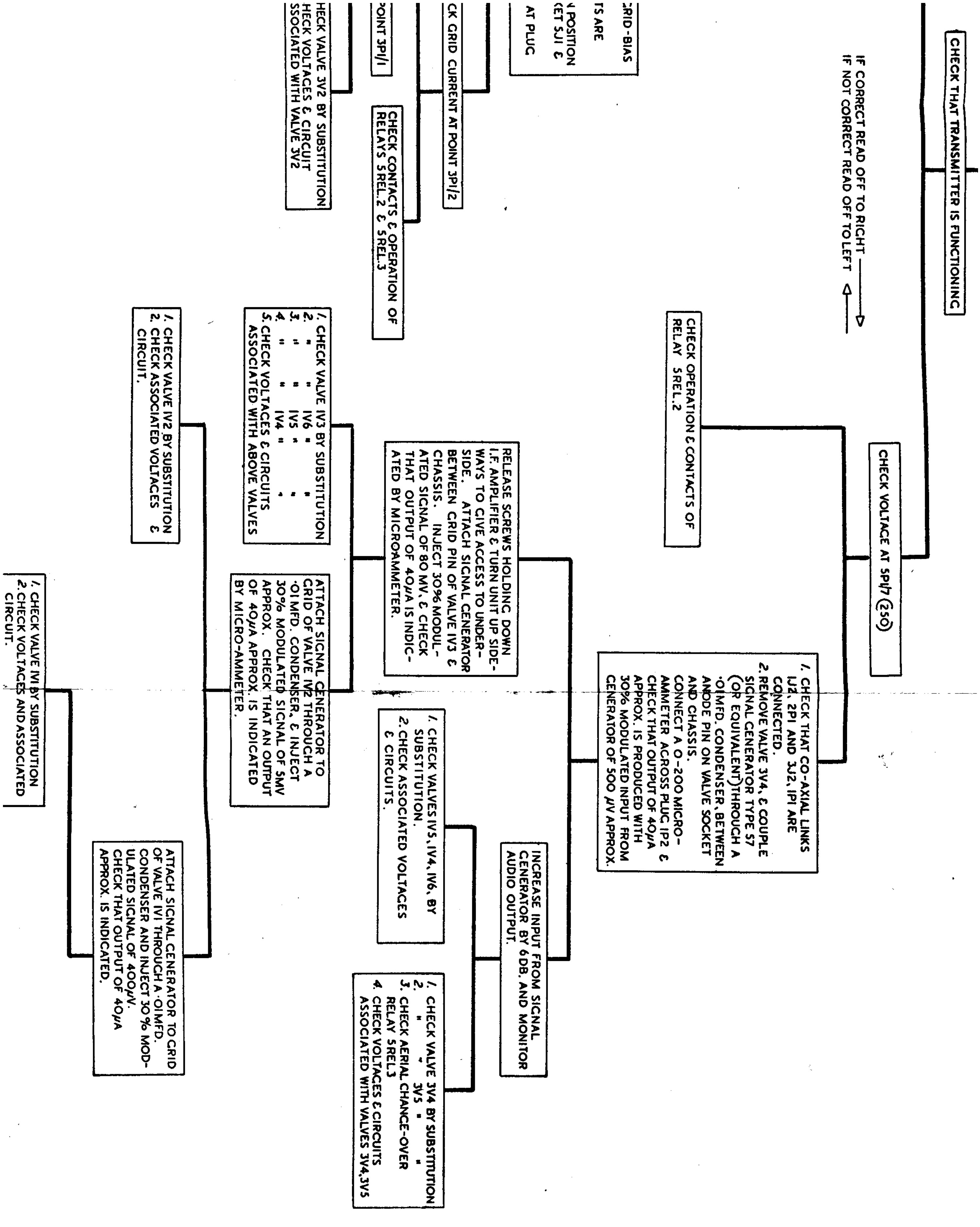
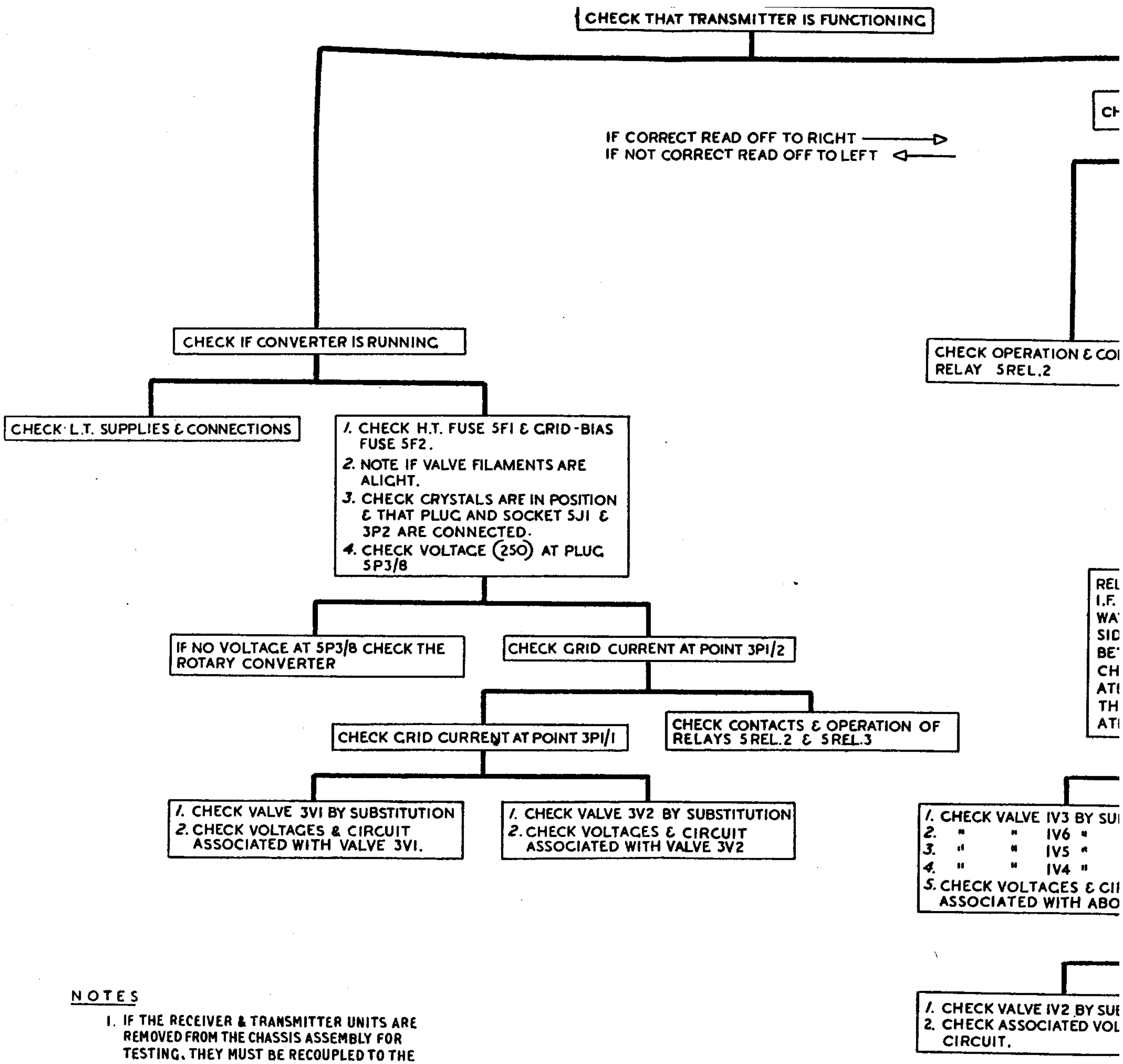


FIG. 27. FAULT LOCATION CHART FOR RECEIVER UNIT



NOTES

1. IF THE RECEIVER & TRANSMITTER UNITS ARE REMOVED FROM THE CHASSIS ASSEMBLY FOR TESTING, THEY MUST BE RECOUPLED TO THE CHANNEL-CHANGE MECHANISM IN THE MANNER DESCRIBED IN CHAPTER VII.

2. SUGGESTIONS FOR FAULT LOCATION ARE MADE ON THE ASSUMPTION THAT CIRCUIT ALIGNMENT IS CORRECT.

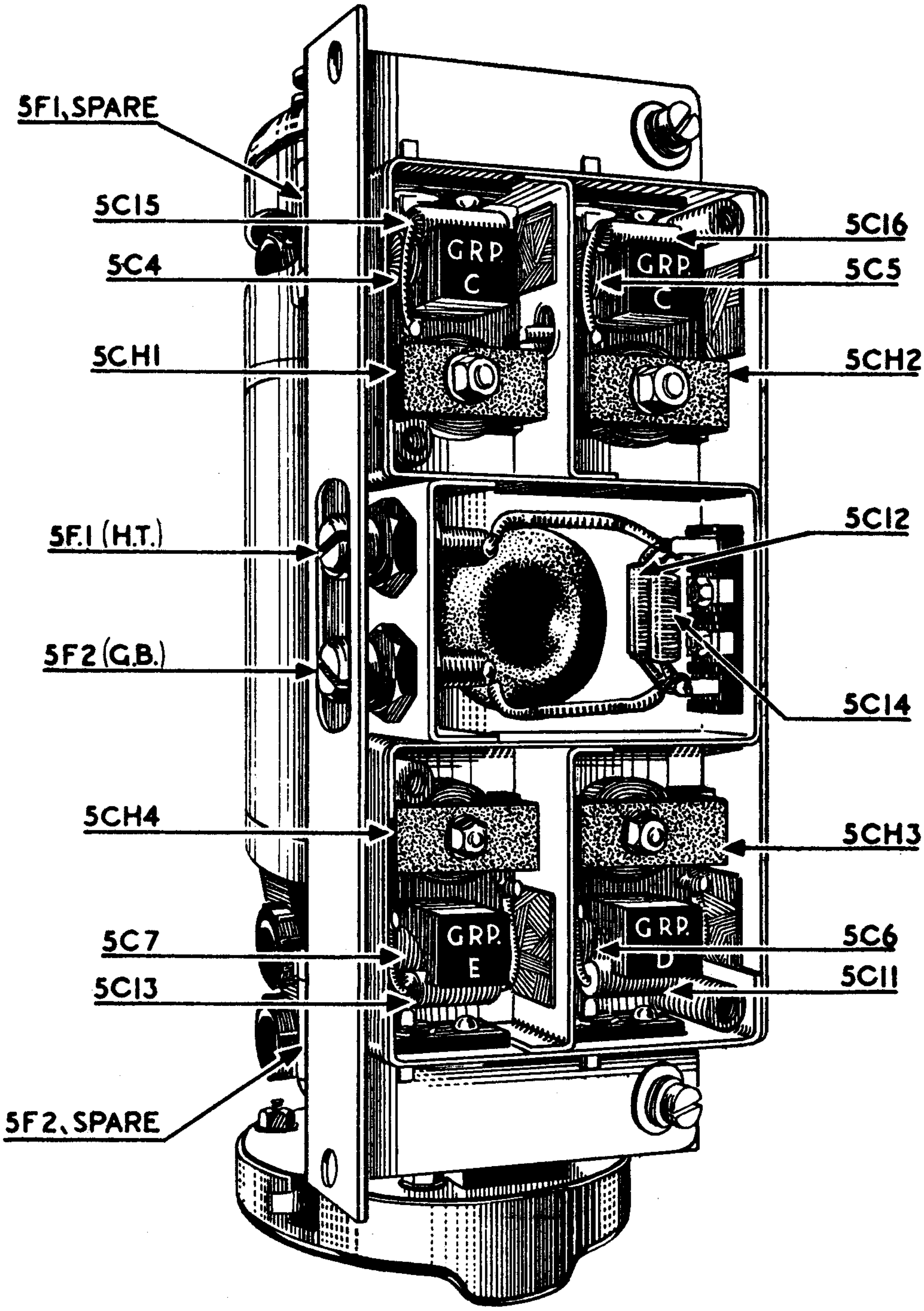
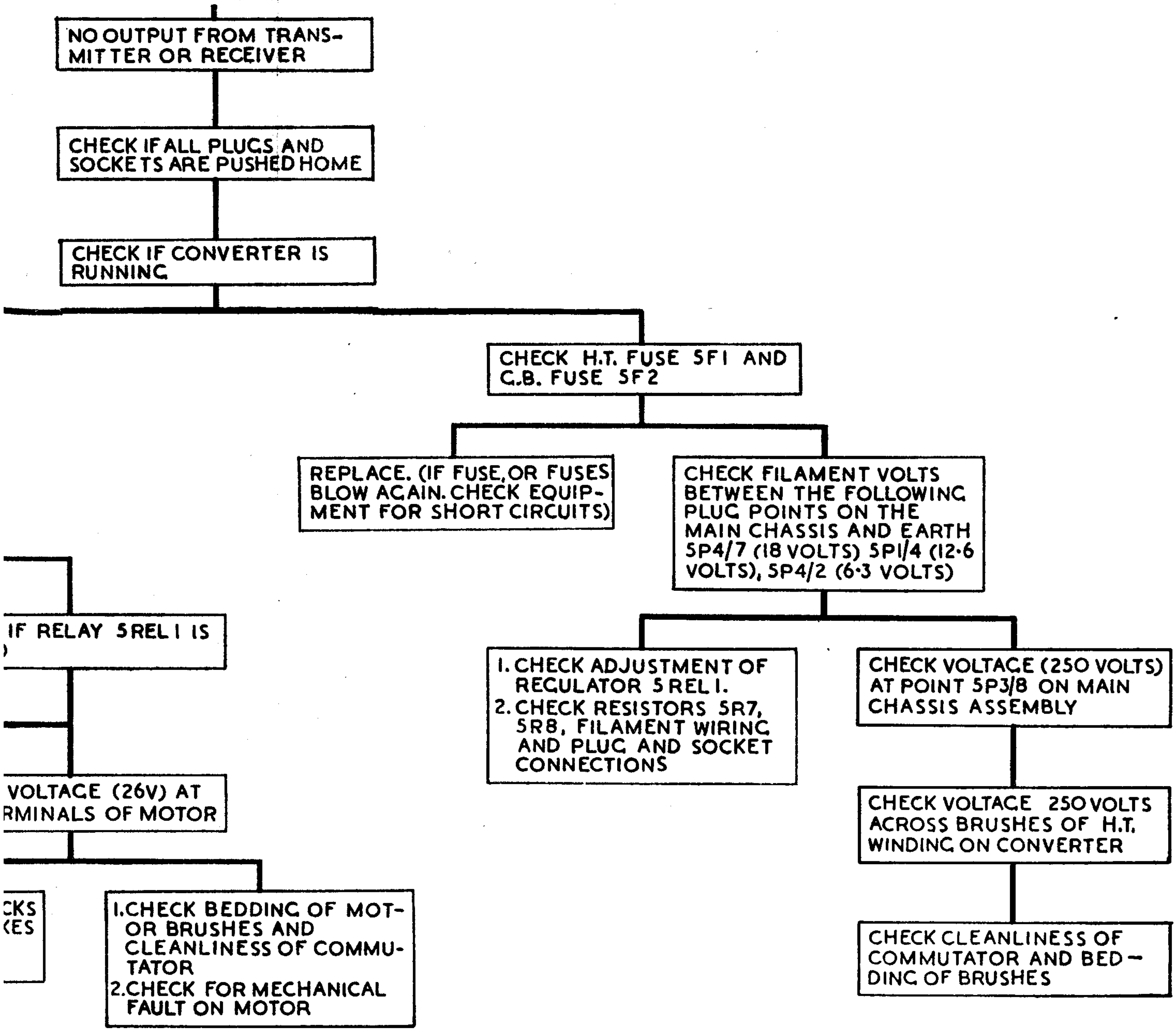


FIG. 20. ROTARY TRANSFORMER (Component Identification)

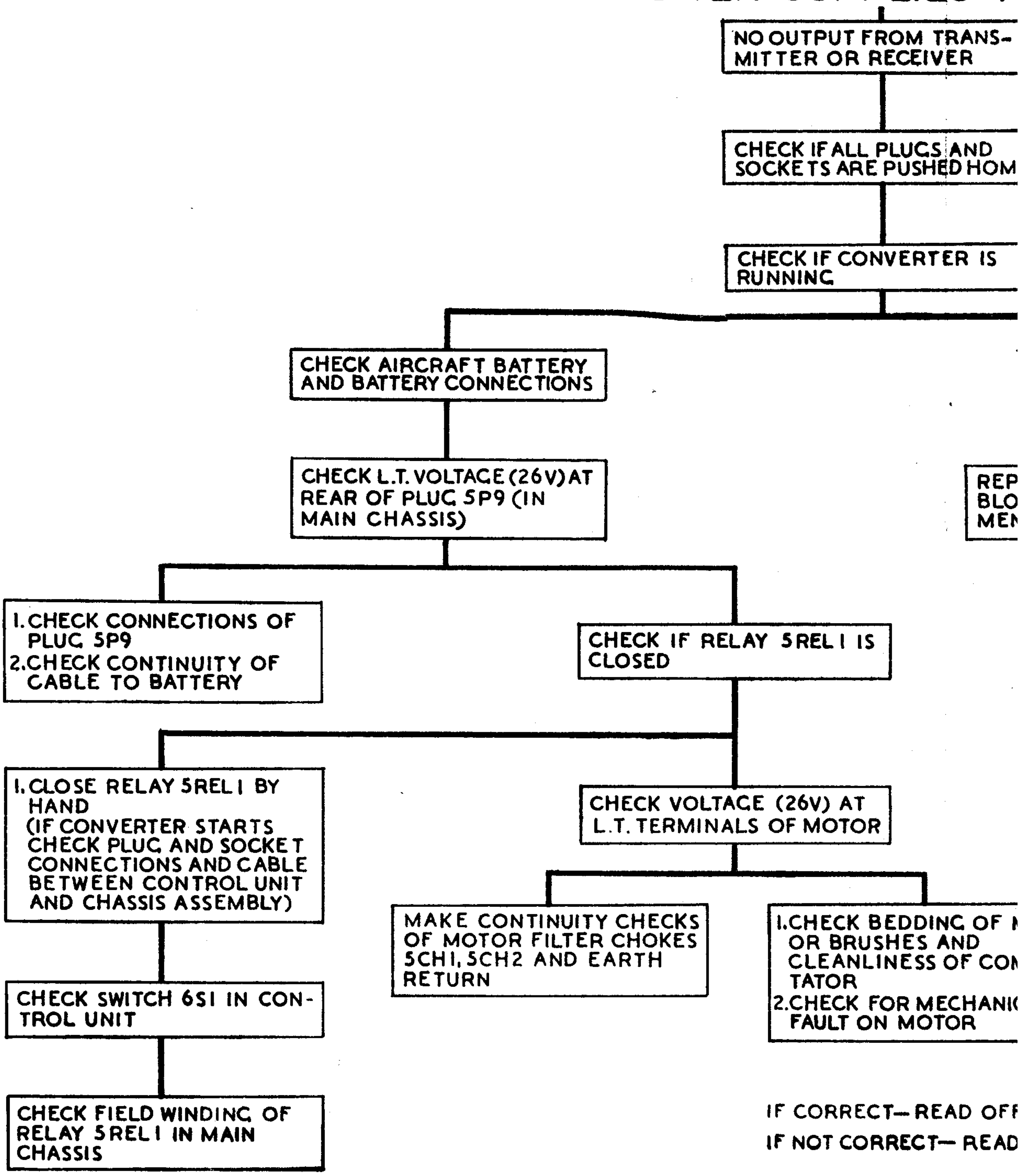
)WER SUPPLIES FAULTY



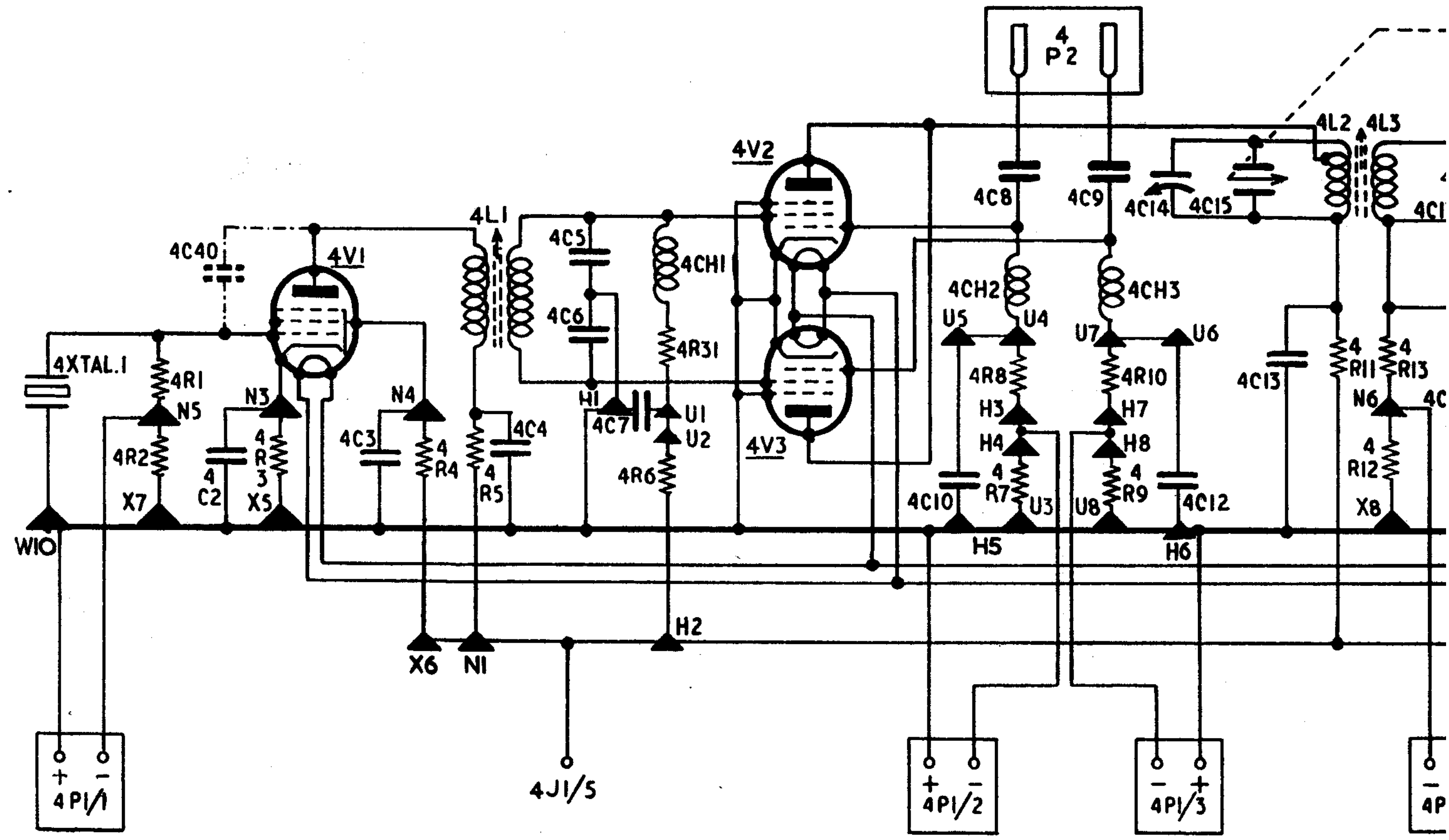
IF CORRECT— READ OFF TO RIGHT ⟶

IF NOT CORRECT— READ OFF TO LEFT ⟵

POWER SUPPLIES F

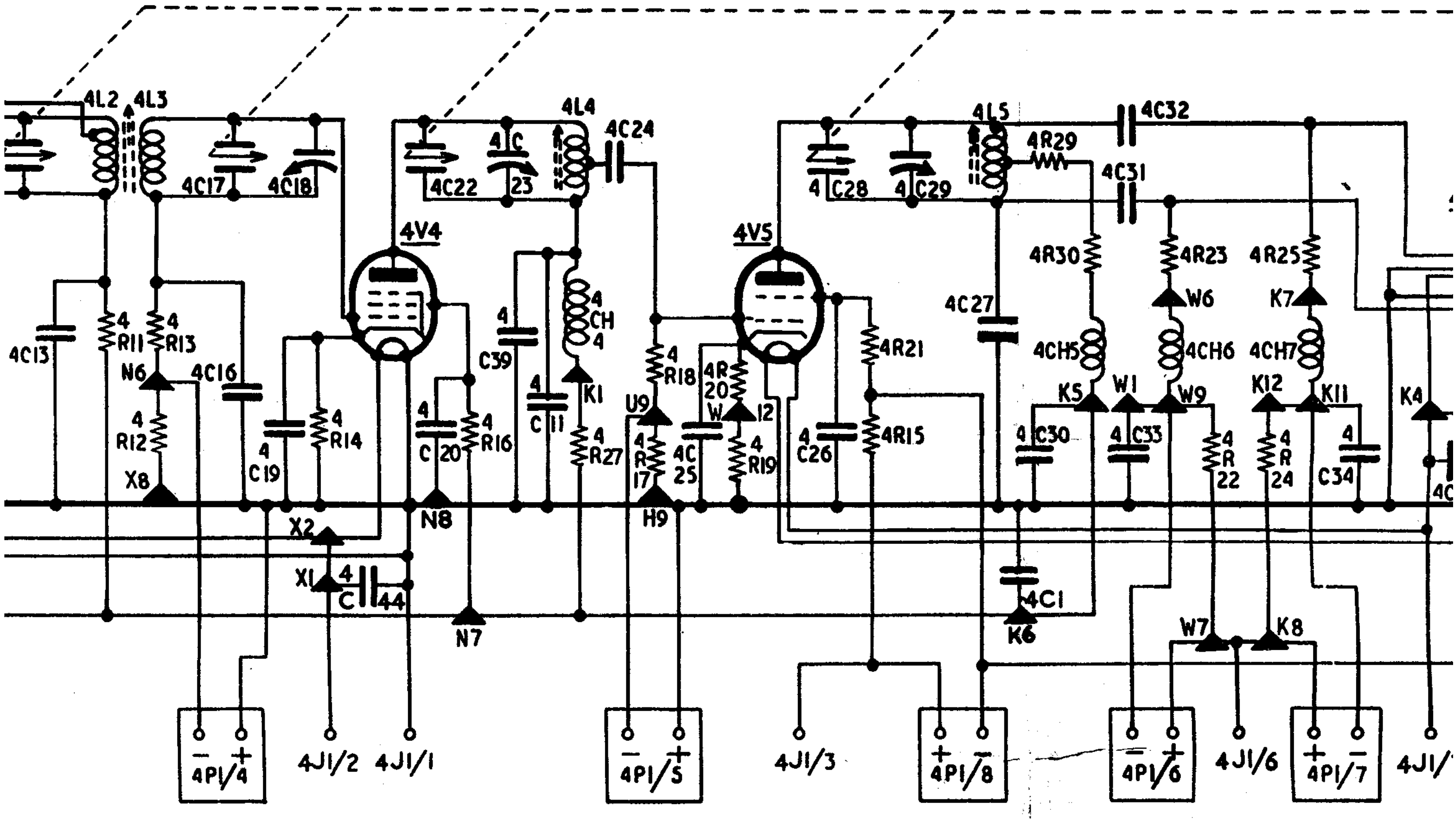


COMP. OSC. BALANCED R.F. MOD.



4C1	500 PFD	4C16	500 PFD	4C31	47 PFD	4R1	4'
4C2	1500 PFD	4C17	PART OF GANG	4C32	47 PFD	4R2	
4C3	1500 PFD	4C18	TRIMMER	4C33	500 PFD	4R3	
4C4	0·01 MFD	4C19	500 PFD	4C34	500 PFD	4R4	68
4C5	75 PFD	4C20	500 PFD	4C35	NOT USED	4R5	
4C6	75 PFD	4C21	NOT USED	4C36	3000 PFD	4R6	3
4C7	0·01 MFD	4C22	PART OF GANG	4C37	PART OF GANG	4R7	
4C8	47 PFD	4C23	TRIMMER	4C38	TRIMMER	4R8	1(
4C9	47 PFD	4C24	47 PFD	4C39	300 PFD	4R9	
4C10	47 PFD	4C25	47 PFD	4C40	CAPACITY BETWEEN VALVE HOLDER PINS	4R10	10
4C11	300 PFD	4C26	100 PFD			4R11	
4C12	47 PFD	4C27	TRIMMER	4C41	500 PFD	4R12	
4C13	500 PFD	4C28	PART OF GANG	4C42	500 PFD	4R13	6
4C14	TRIMMER	4C29	TRIMMER	4C43	NOT USED	4R14	
4C15	PART OF GANG	4C30	500 PFD	4C44	500 PFD	4R15	

DOUBLER PEN. AMPLIFIER OU



4R1 . . . . 47,000 OHMS
4R2 . . . . 100 OHMS
4R3 . . . . 560 OHMS
4R4 . . . . . . 68,000 OHMS
4R5 . . . . 3,300 OHMS
4R6 . . . . 33,000 OHMS
4R7 . . . . 100 OHMS
4R8 . . . . . . 10,000 OHMS
4R9 . . . . 100 OHMS
4R10 . . . . . 10,000 OHMS
4R11 . . . . 2,200 OHMS
4R12 . . . . 680 OHMS
4R13 . . . . . . 68,000 OHMS
4R14 . . . . 560 OHMS
4R15 . . . . 0·75 OHM

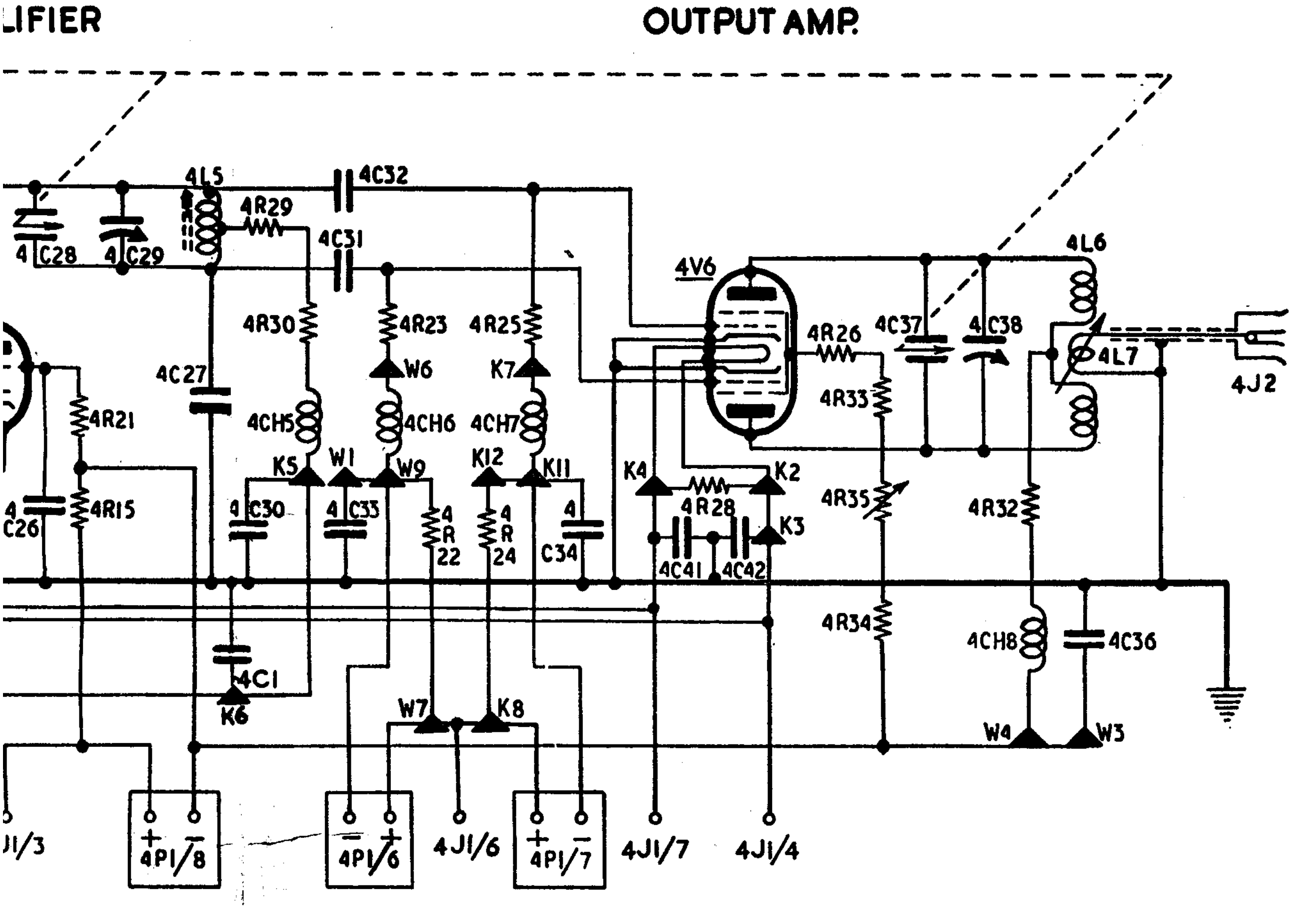
4R16 . . . . . . 33,000 OHMS
4R17 . . . . 680 OHMS
4R18 . . . . 47,000 OHMS
4R19 . . . . 330 OHMS
4R20 . . . . 330 OHMS
4R21 . . . . . 56,000 OHMS
4R22 . . . . 680 OHMS
4R23 . . . . . . 47,000 OHMS
4R24 . . . . 680 OHMS
4R25 . . . . . 47,000 OHMS
4R26 . . . . . 12,000 OHMS
4R27 . . . . 3,900 OHMS
4R28 . . . . 63 OHMS
4R29 . . . . 330 OHMS
4R30 . . . . 330 OHMS

4R31 . . . 22,000 OHMS
4R32 . . . . 56 OHMS
4R33 . . . . 12,000 OHMS
4R34 . . . . 10,000 OHMS
4R35 . . . . 10,000 OHMS

4L1 . . . . H.F. TRANS'R
4L2 } BAND-PASS TRANS'R
4L3 }
4L4 . . ANODE TUNING COIL
4L5 ANODE TUNING COIL
4L6 ANODE TUNING COIL
4L7 . . . . . . OUTPUT COIL

4CH1 . . . .
4CH2 . . . .
4CH3 . . . .
4CH4 . . . .
4CH5 . . . .
4CH6 . . . .
4CH7 . . . .
4CH8 . . . .

4XTAL1 . . .



4R31 . . . 22,000 OHMS
4R32 . . . . 56 OHMS
4R33 . . . . 12,000 OHMS
4R34 . . . . 10,000 OHMS
4R35 10,000 OHMS

4L1 . . . . H.F. TRANSʹR
4L2 } BAND-PASS TRANSʹR
4L3
4L4 . . ANODE TUNING COIL
4L5 ANODE TUNING COIL
4L6 ANODE TUNING COIL
4L7 . . . . OUTPUT COIL.

4CH1 . . . . 1350 μH
4CH2 . . . . 330 μH
4CH3 . . . . 330 μH
4CH4 . . . . 62 μH
4CH5 . . . . 13 μH
4CH6 . . . . 13 μH
4CH7 . . . . 13 μH
4CH8 . . . . 13 μH

4XTAL1 . . . . 4·86 MC/S

4V1 . . . . CV 136
4V2 . . . . CV 138
4V3 . . . . CV 138
4V4 . . . . CV 136
4V5 . . . . CV 309
4V6 . . . . CV 222

4P1 . . . . 8-PAIR TEST PLUG
4P2 . . . . 2 PIN PLUG

4J1 . . . . 8 PIN SOCKET
4J2 . . . . COAXIAL SOCKET

FIG. 26. CIRCUIT DIAGRAM OF TRANSMITTER UNIT (showing Test Points)

TYPICAL VALVE VOLTAGES & CURRENTS OF TRANSMITTERS

VALVE		CURRENTS		VOLTAGES (TO CHASSIS)			SUSPECTED COMPONENTS IF VOLTAGE INCORRECT	
	TESTING POINT	GRID CURRENT	COMBINED SCREEN & ANODE CURRENTS	H.T. SUPPLY	ANODE	SCREEN	ANODE	SCREEN
4V1	4P1/1	·30MA TO ·60MA	———	256 V	220 V	125 V	4C4 • 4R5 • 4L1	4C3 • 4R4
4V2	4P1/2	·30MA TO 1·0MA	———	255 V	230V	100V	4R11 • 4C13 • 4L2	4C7 • 4R6 • 4R31 • 4CH1
4V3	4P1/3	·30MA TO 1·0MA	———	255 V	230V	100V	4R11 • 4C13 • 4L2	4L1
4V4	4P1/4	·30MA TO ·60MA	———	255 V	195V	162V	4L4 • 4CH4 4C11 • 4C39 • 4R27	4C20 • 4R16
4V5	4P1/5	·10MA TO ·50MA	———	255V	235V	135V	4CH5 • 4R29 • 4R30 • 4L5	4C36 • 4C26 • 4R21 • 4R15
4V6	4P1/6	·10MA TO ·50MA	———	225V	220V	110V	4C32 • 4CH8 • 4C36	4R26 • 4R33 4R34 • 4R35 • 4R36
4V6	4P1/7	·10MA TO ·50MA	———	225V	220V	110V		
4V5 & 4V6	4P1/8	———	0·70 MA	—	—	—		

N.B. VOLTAGES ARE MEASURED WITH A 1,000 OHM PER VOLT METER; VARIATIONS OF ±20% ARE NOT NECESSARILY INDICATIVE OF FAULT CONDITIONS

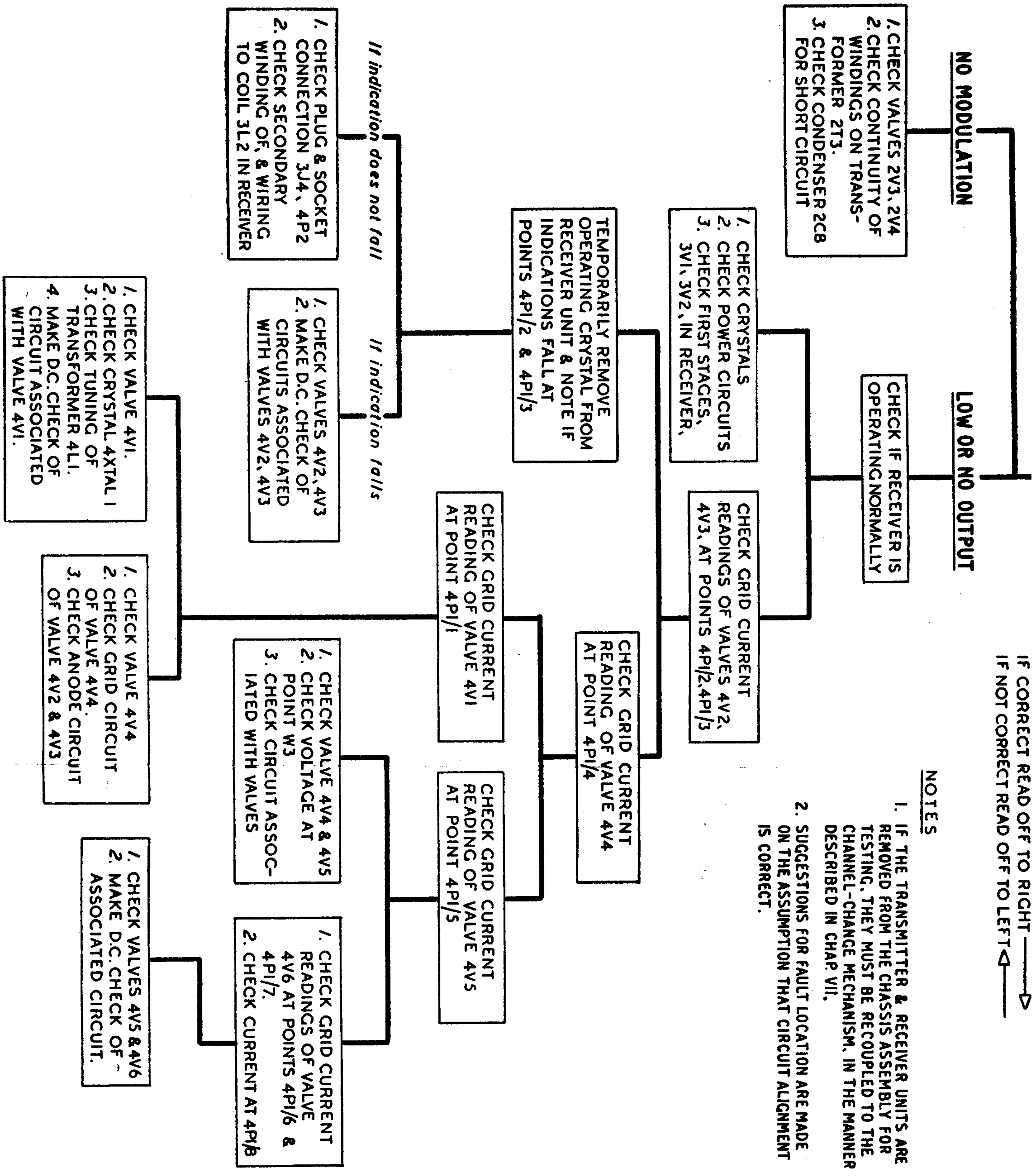


FIG. 23. FAULT LOCATION CHART FOR TRANSMITTER UNIT

TYPICAL VALVE VOLTAGES & CURRENTS OF TRANSMITTERS

VALVE		CURRENTS		VOLTAGES (TO CHASSIS)			SUSPECTED COMPONENTS IF VOLTAGE INCORRECT	
	TESTING POINT	GRID CURRENT	COMBINED SCREEN & ANODE CURRENTS	H.T. SUPPLY	ANODE	SCREEN	ANODE	SCREEN
4V1	4P1/1	·30MA TO ·60MA	——	256 V	220 V	125 V	4C4 • 4R5 • 4L1	4C3 • 4R4
4V2	4P1/2	·30MA TO 1·0MA	——	255 V	230V	100V	4R11 • 4C13 • 4L2	4C7 • 4R6 • 4R31 • 4CH1
4V3	4P1/3	·30MA TO 1·0MA	——	255 V	230V	100V	4R11 • 4C13 • 4L2	4L1
4V4	4P1/4	·30MA TO ·60MA	——	255 V	195V	162V	4L4 • 4CH4 4C11 • 4C39 • 4R27	4C20 • 4R16
4V5	4P1/5	·10MA TO ·50MA	——	255V	235V	135V	4CH5 • 4R29 • 4R30 • 4L5	4C36 • 4C26 • 4R21 • 4R15
4V6	4P1/6	·10MA TO ·50MA	——	225V	220V	110V	4C32 • 4CH8 • 4C36	4R26 • 4R33 4R34 • 4R35 • 4R36
4V6	4P1/7	·10MA TO ·50MA	——	225V	220V	110V		
4V5 & 4V6	4P1/8	——	0·70 MA	——	——	——		

N.B. VOLTAGES ARE MEASURED WITH A 1,000 OHM PER VOLT METER; VARIATIONS OF ±20% ARE NOT NECESSARILY INDICATIVE OF FAULT CONDITIONS

TYPICAL VALVE VOLTAGES & CURRENTS OF RECEIVING SYSTEM

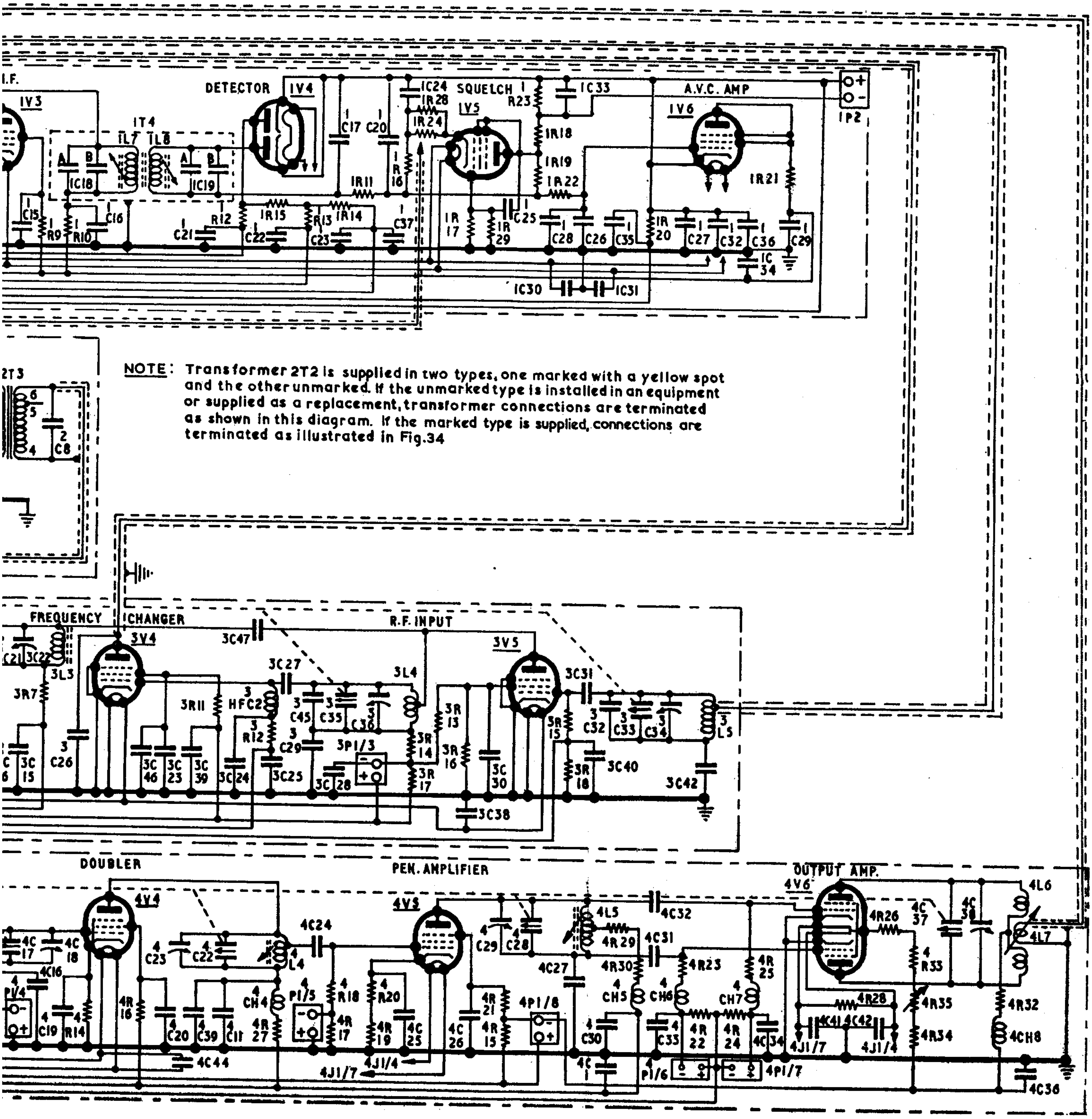
VALVE	MEASURED BETWEEN	VOLTAGE	SUSPECTED COMPONENTS IF VOLTAGES ARE INCORRECT	UNIT
1V1	SCREEN & CHASSIS ANODE & CHASSIS	135V 185V	1R25 • 1R3 • 1C5 1R4 • 1C6	I.F. AMPLIFIER
1V2	SCREEN & CHASSIS ANODE & CHASSIS	135V 185V	1R6 • 1R26 • 1C10 1R7 • 1C13	
·1V3	CATHODE & CHASSIS SCREEN & CHASSIS ANODE & CHASSIS	2·2V 200V 210V	1C14 • 1R8 1R9 • 1C15 1R10 • 1C16	
1V6	CATHODE & CHASSIS ANODE & CHASSIS	80V ※ 140V ※	1R20 • 1C27 • 1C32 • 1C36 1R21 • 1C29	
2V1	CATHODE & CHASSIS SCREEN & CHASSIS ANODE & CHASSIS	1·0V 25V 20V	2R2 2R5 • 2C3 2R6 • 2R7 • 2C4	MODULATOR
2V2	CATHODE & CHASSIS SCREEN & CHASSIS ANODE & CHASSIS	10·5V 250V 250V	2R11 • 2R12 • 2C7 2T2 2T2	
3V1	CATHODE & CHASSIS SCREEN & CHASSIS ANODE & CHASSIS	40V 270V 270V	3R3 • 3C6 3R1 • 3C2 3R1 • 3C2 • 3L1	RECEIVER
3V2	CATHODE & CHASSIS SCREEN & CHASSIS ANODE & CHASSIS	40V 270V 270V	3R19 • 3C12 3R4 • 3C10 3R4 • 3C10 • 3L2	
3V3	CATHODE & CHASSIS SCREEN & CHASSIS ANODE & CHASSIS	1·5V 175V 270V	3R20 • 3C20 3R21 • 3C41 3R7 • 3C16 • 3L5	
3V4	SCREEN & CHASSIS ANODE & CHASSIS	220V 230V	3R11 • 3C46 • 3C23 3C26 • 1R1 • 1C1 • 1L1	
3V5	SCREEN & CHASSIS ANODE & CHASSIS	150V 200V	3R13 • 3R16 • 3C30 3R14 • 3R17 • 3C29	

GRID CURRENT (AT OPERATING FREQUENCY OF 115 KC/S.)	GRID CURRENT (AT OPERATING FREQUENCY OF 145 KC/S.)	MEASURED AT
·3 M.A.	·3 M.A.	3P1/1
·6 M.A.	·6 M.A.	3P1/2

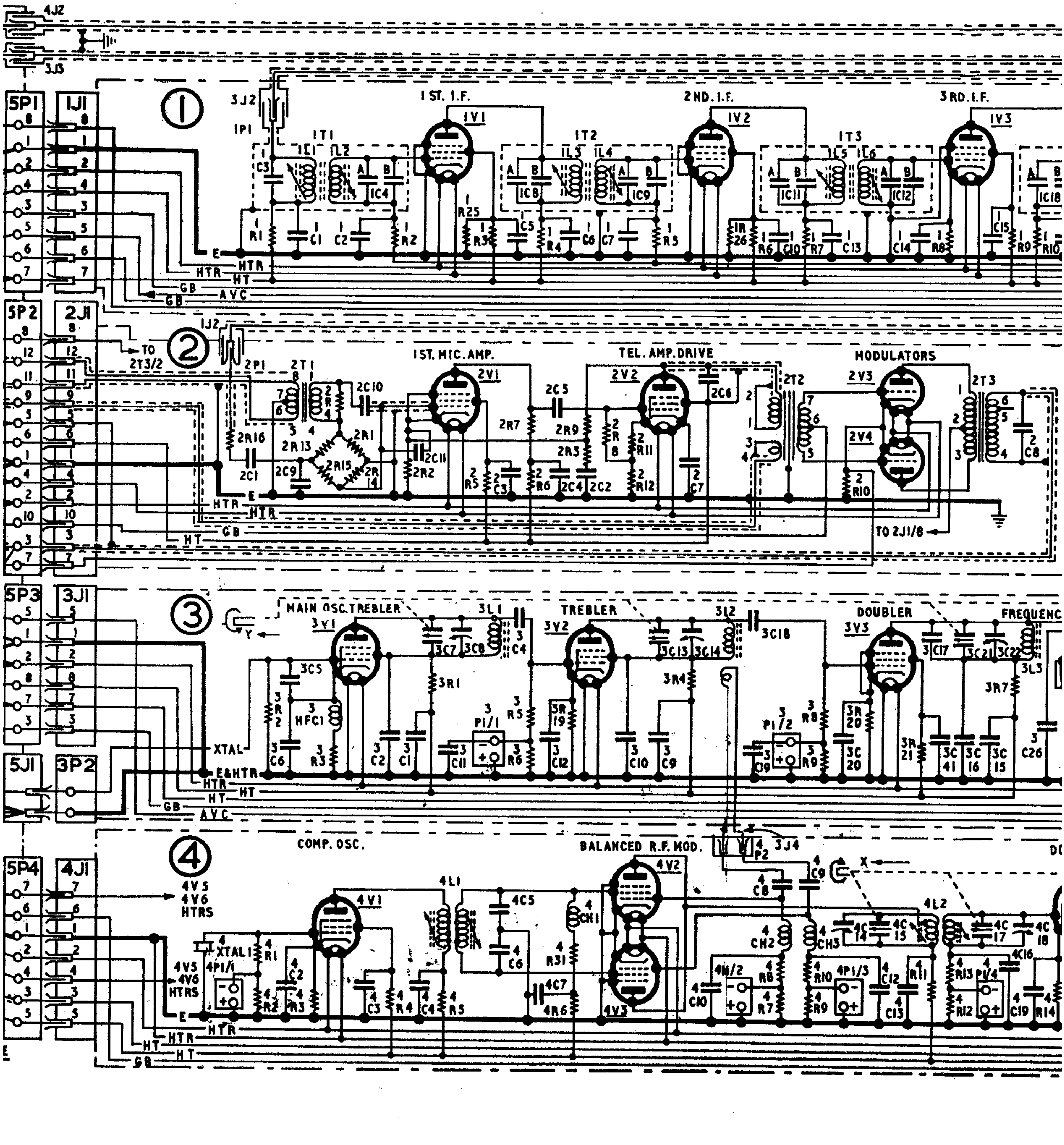
GRID DRIVE CURRENT MEASURED BY AN 0-1·0 M.A., 75 OHM METER.

※NO SIGNAL CONDITION

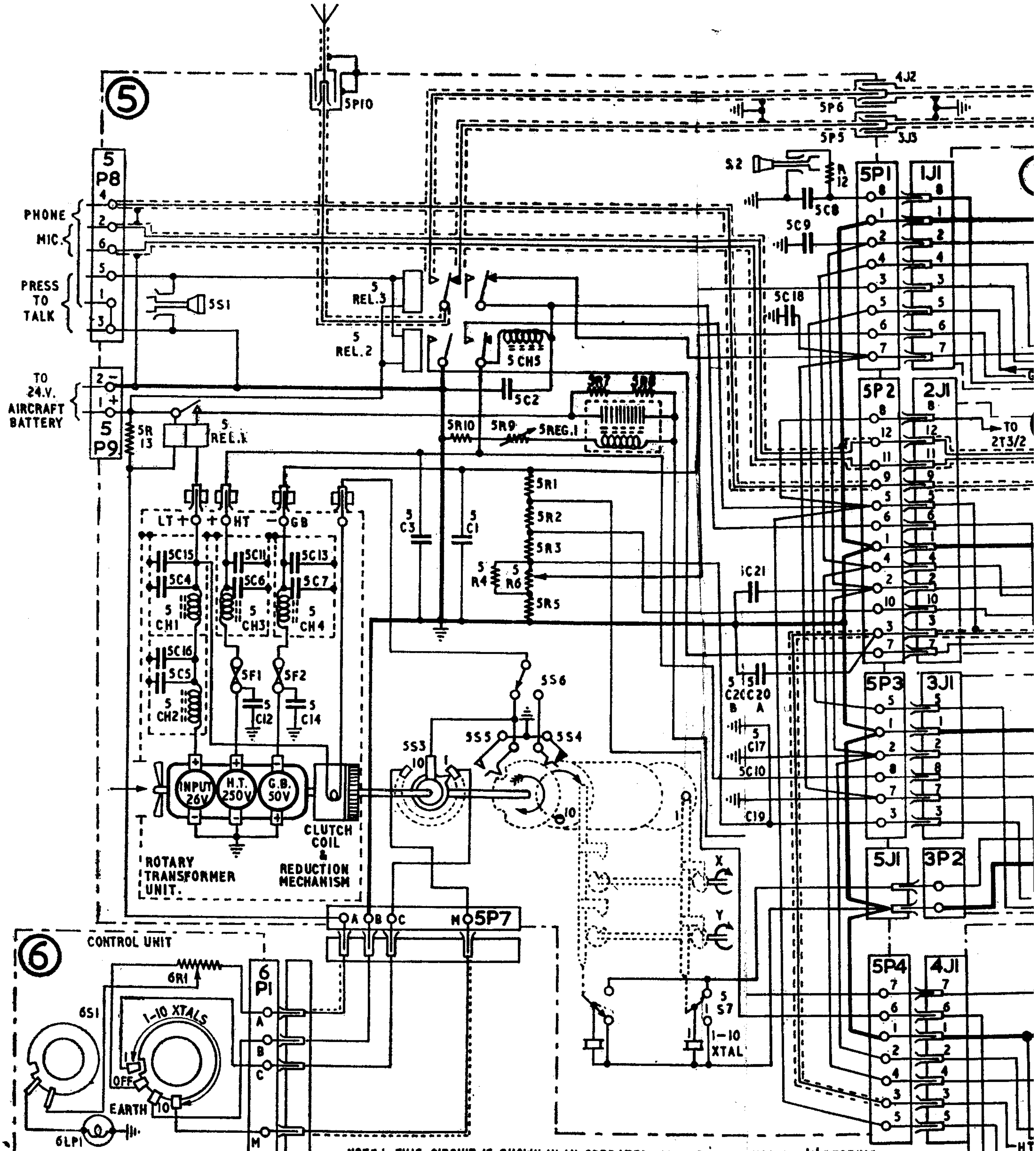
N.B. THESE VOLTAGES ARE MEASURED WITH A 1,000 OHM PER VOLT METER. VARIATIONS OF ± 20% ARE NOT NECESSARILY INDICATIVE OF FAULT CONDITIONS.



NOTE: Transformer 2T2 is supplied in two types, one marked with a yellow spot and the other unmarked. If the unmarked type is installed in an equipment or supplied as a replacement, transformer connections are terminated as shown in this diagram. If the marked type is supplied, connections are terminated as illustrated in Fig.34



1ST. I.F.
2ND. I.F.
3RD. I.F.
1ST. MIC. AMP.
TEL. AMP. DRIVE
MODULATORS
TO 2T3/2
TO 2J1/8
MAIN OSC. TREBLER
TREBLER
DOUBLER
COMP. OSC.
BALANCED R.F. MOD.
4V5 4V6 HTRS
XTAL
E&HTR
HTR
HT
GB
AVC



NOTE :- THIS CIRCUIT IS SHOWN IN AN OPERATED CONDITION ON CHANNEL '1' RECEIVE