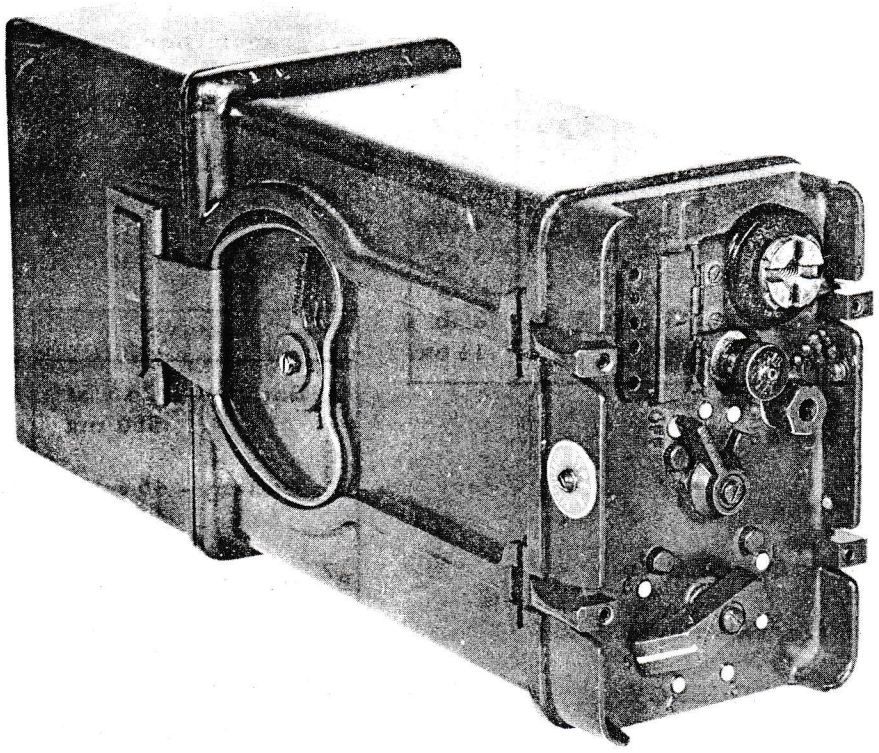
RADIO SET CPRC-26

5820-21-101-1043 Type A
5820-21-101-1046 Type D
5820-21-101-1047 Type E
5820-21-101-1050 Type F

DATA SUMMARY

HQ 6680-1 TD 3014A (7919)



General View of Equipment

INTRODUCTION

PURPOSE

The Radio Set CPRC-26 is a lightweight man-pack radio telephone (RT) set designed for short range combat communication in forward areas. It is normally carried on the body, but can also be used as a ground station or with suitable installation accessories as a vehicular set for use by supporting arms.

DESCRIPTION

The CPRC-26 is a self-contained, battery operated, frequency modulated transceiver operating in the frequency range of 47.0 to 55.4 megacycles. It has six crystal controlled channels each of which may be pre-set to any frequency in the band. Basically, the receiver consists of one stage of RF amplification, a crystal oscillator, mixer, 4 IF stages, limiter, discriminator and an audio amplifier. The transmitter contains a master oscillator, power amplifier and modulator. An automatic frequency control circuit is incorporated in the set to ensure that the operating frequency of the transmitter is correct at all times. To provide the greatest ease of maintenance the set has been designed on the sub-miniature, unitized plug-in principle.

The accessories include a whip antenna, a counterpoise which may be used as a trailing

or invisible antenna, a single earpiece headset, a handset, an instruction plate and canvas bag. Provision is made for the use of a homing antenna which is issued separately upon request.

DATA

PHYSICAL DATA

Unit	Height (in inches)	Width (in inches)	Depth (in inches)	Weight
Complete station	11 1/4	10 1/2	4	10 lb 8 oz
XCVR - Bat	10 3/4	5	3 3/8	6 lb 14 oz
XCVR	10 3/4	5	3 3/8	4 lb 3 oz
Bat	3 3/4	4 3/8	2 5/8	2 lb 11 oz

ELECTRICAL DATA

Frequency Coverage

Frequency - 47.0 to 51.4 mc

Channels - 6 separated by 200 kc

INTERMEDIATE FREQUENCY

4.3 mc

PERFORMANCE

Receiver

Sensitivity: 2 uv for 30 db signal plus noise to noise ratio.

Selectivity:

Times Down	Total Bandwidth in kc
2	65 kc min 85 max
1000	250 kc maximum

Spurious rejection ratio:

Image frequency: greater than 34 db down.

Spurious frequencies: greater than 60 db down.

Intermediate frequency: greater than 90 db down.

Receiver output: 6 mw for a 15 kc deviation.

Transmitter output: 300 mw.

POWER REQUIREMENTS

6135-21-100-1058 Battery, dry, 90, 45, 1.5 and minus 3v, BA-289/U - Qty 1

POWER CONSUMPTION

Receive	Transmit
A Battery - 1.5 v at 550 ma	A Battery - 1.5 v at 850 ma
B^1 Battery - 45 v at 12 ma	B^1 Battery - 45 v at 8 ma
B^2 Battery - 90 v at 3 ma	B^2 Battery - 90 v at 30 ma

SET TYPES

Four different types of sets (A, D, E, F) are available. They differ only in their frequency assignments. Each type must be identified by a coloured disc located on the side of the front panel. The disc colour indicates the type of set, and may be changed if the set is changed from one type to another in the field by changing the crystal bank. The colours assigned to the various types of set A to F are respectively red, yellow, black and orange. A cable assembly, special purpose, electrical, CCX5/CPRC-26 is available on request for adapting battery leads, so that the battery can be carried inside operators' clothing to prevent freezing. A table showing the types and their operating frequencies in megacycles is shown below.

TYPE	CHAN 1	CHAN 2	CHAN 3	CHAN 4	CHAN 5	CHAN 6
A	50.0	50.2	51.6	51.8	52.0	52.2
D	50.0	50.2	50.4	50.6	50.8	51.0
E	50.0	52.4	52.6	52.8	53.0	53.2
F	50.0	53.4	53.6	53.8	54.0	54.2

ELECTRON TUBES

Stock No.	Function	Qty
5960-00-188-8615	PA(3B4) (V1)	1
5960-00-188-8615	MA(3B4) (V2)	1

AUTHORIZED PUBLICATIONS

EME Manual Electrical Z 740 - 749

EME Manual Electrical Z 560 - 569

EME Manual Electrical K 639

END

Duplicate

RADIO SET CPRC-26

Technical Description

TABLE OF CONTENTS

TRANSMITTER

INDEX TO FIGURES

RADIO SET CPRC-26

Technical Description

FUNCTION

1. The Radio Set CPRC-26 is a portable one-man pack set designed to provide voice communication up to 1 mile under normal service conditions for infantry troops in forward areas and between infantry and other supporting troops and their AFVs.

BRIEF ELECTRICAL DESCRIPTION

2. The receiver is a single conversion superheterodyne with an intermediate frequency of 4.3 megacycles, and a crystal-controlled oscillator. Basically, it consists of one stage of radio frequency amplification, a broad band crystal oscillator, a high efficiency mixer, 4 interchangeable IF stages, one stage of limiting, a discriminator and an audio amplifier supplying sufficient power for earphones.

3. The transmitter is of the master oscillator-power amplifier type, frequency modulated at the output signal frequency, with an automatic frequency control circuit consisting of the crystal oscillator, mixer, AFC driver, AFC discriminator and modulator that refers the master oscillator to the crystal oscillator. Audio sidetone is produced by feeding the demodulated output from the AFC discriminator to the audio amplifier. This gives a reasonably definite indication that all stages of the transmitter are functioning properly and that the transmitted signal is close to the correct frequency. When the set is switched to 'send' the receiver RF amplifier, IF amplifiers and limiter are switched off.

BRIEF MECHANICAL DESCRIPTION

4. In the construction of the Radio Set CPRC-26, full use is made of unitized and plug-in sub-assemblies. The major sub-assemblies are as follows:

Control panel
Main chassis
Trimmer panel
Plug-in unit
Set case
Battery case

5. The control panel, main chassis and trimmer panel bolt together to form a strong and rigid assembly supporting the weight of the plug-in units under

severe vibration and shock. The plug-in units are inserted into sockets in the main chassis and are held in place by a unit retainer.

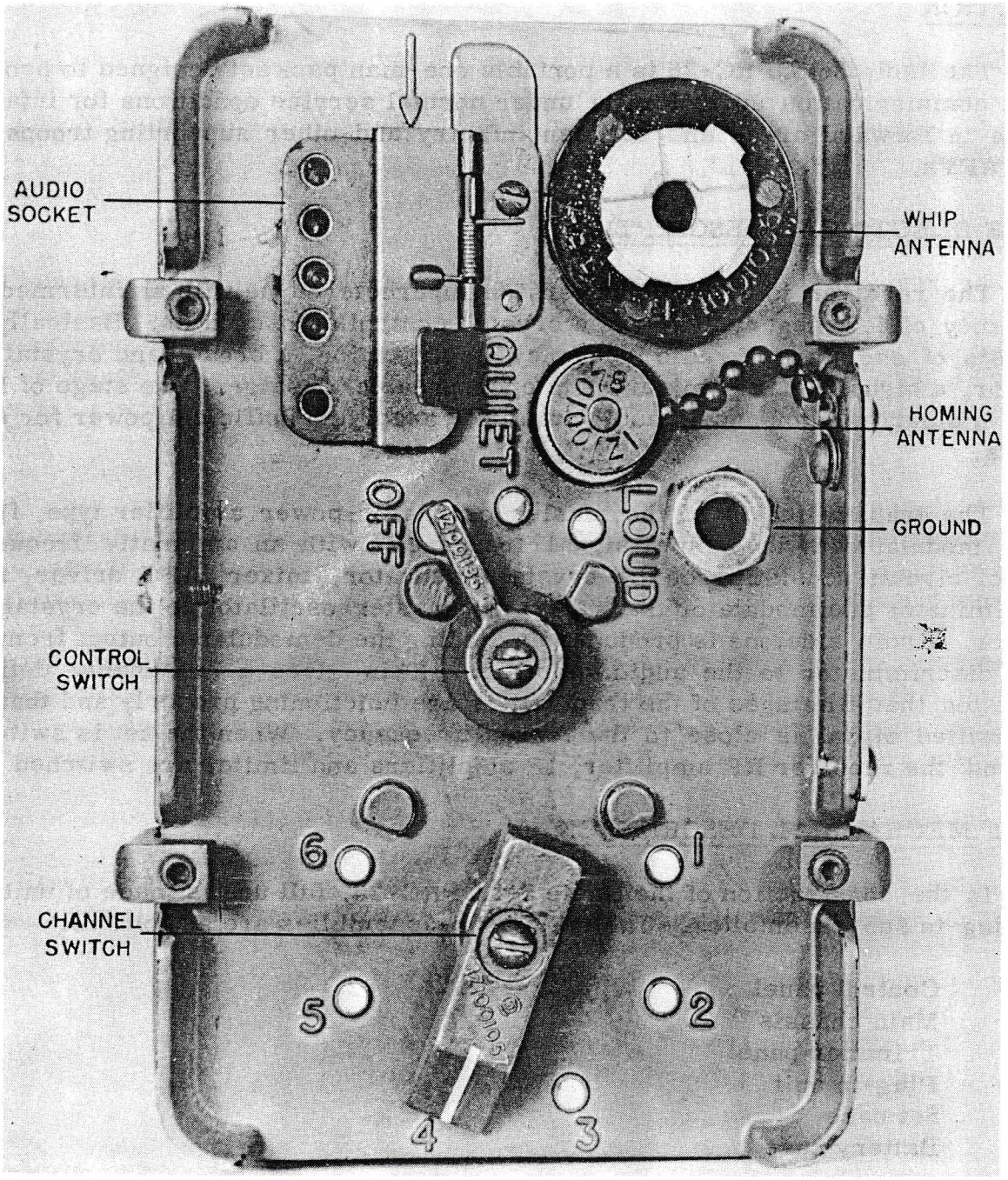


Fig 1 - Control Panel

6. The complete set is mounted into a set case and held there by four screw clamps retaining the control panel against the front edges of the case. Six screws hold the rear of the set to the bottom of the case, exerting pressure between the case and rubber battery connector to form a watertight seal. The battery box is attached to the bottom of the case by two spring clamp mechanisms.

Control Panel

7. The control panel is a die-case magnesium casting, forming the top face of the set and providing rigid support for the following parts:

Channel selector switch knob and shaft
Off-Quiet-Loud switch and knob
Vertical antenna mount
Homing antenna coaxial socket
Audio socket
Ground socket

8. The parts requiring an opening in the panel are provided with rubber seals to ensure a moisture seal. An additional rubber gasket is mounted in a groove on the inside edges of the control panel to form a seal between the panel and the set case. A protective flange around the outside face of the panel is slightly higher than any of the parts mounted on the panel, preventing damage to those parts during use.

Main Chassis

9. The main chassis is a die-cast magnesium casting. Eighteen 7-pin miniature ceramic sockets are mounted in three rows of six specially shaped holes in the chassis, and are held in place by a laminated plastic 'socket retainer'. The plug-in units and transmitter tubes are inserted into these sockets, which are spaced to allow only a small clearance between plug-in units.

10. Wiring connections between the sockets are located on the bottom of the chassis, along with such components as decoupling resistors, capacitors and chokes. Three 'inter-chassis connector' assemblies are mounted from bosses on the bottom of the chassis. These inter-chassis connectors are curved silver-plated copper springs rivetted to a plastic plate and located to make pressure contact with silver terminals on the trimmer panel.

11. On one end of the chassis the battery connector is mounted by two flat springs to a frame screwed to the chassis. The battery connector is a rubber block containing five pins in two rows, and is designed to provide a tight seal around the opening in the bottom of the set case.

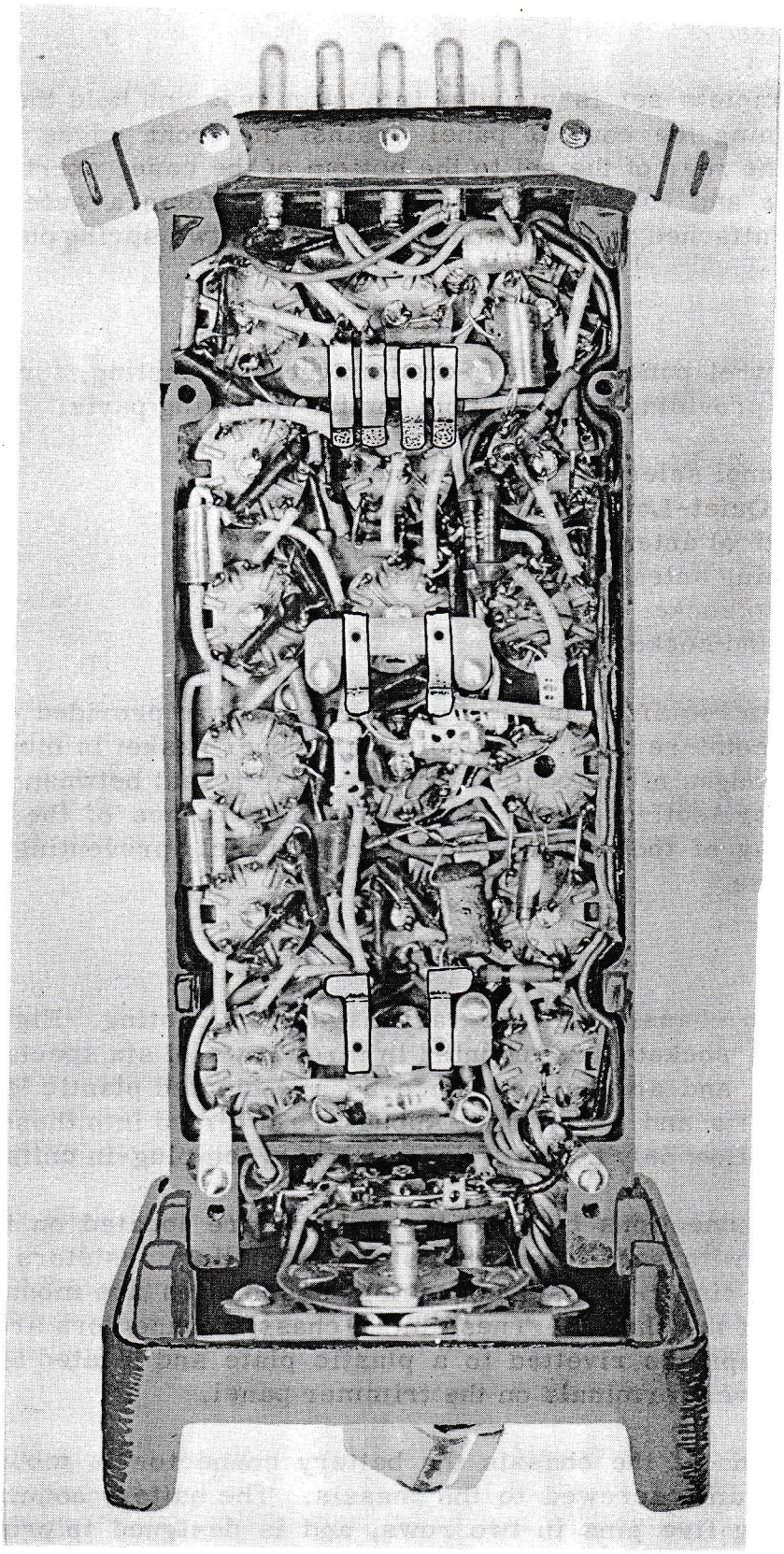


Fig 2 - Chassis Wiring

12. At the other end of the chassis, two bosses enable the chassis to be mounted on the control panel using two steel screws. A laced cable interconnects the chassis and the control panel.

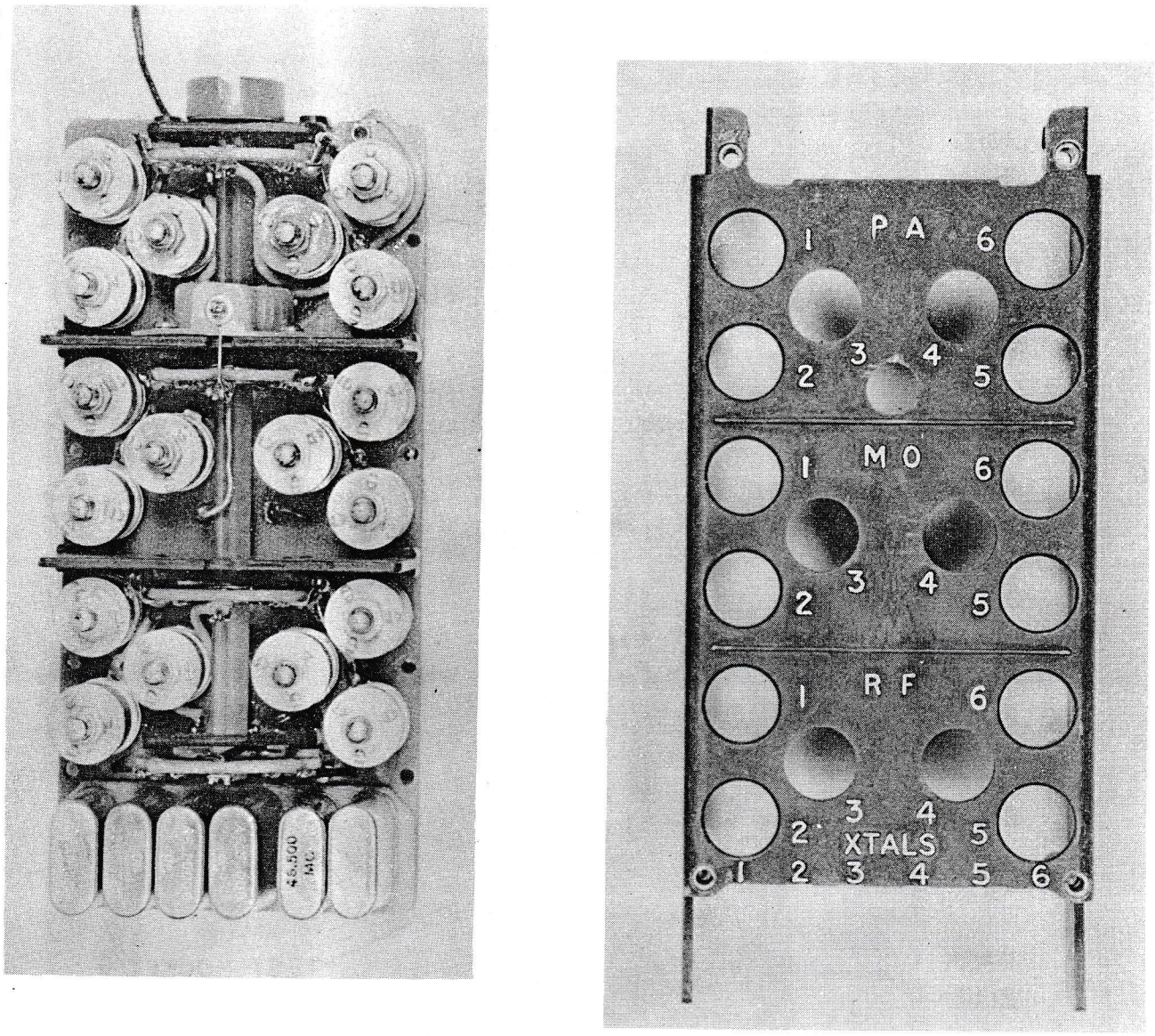


Fig 3 - Trimmer Panel

Trimmer Panel

13. The trimmer panel consists of a laminated fiber glass, silicone impregnated, plate upon which are mounted the following parts:

Eighteen concentric variable air capacitors
The four wafers of the channel selector switch
Power amplifier neutralizing capacitor
Crystal socket for six crystals
Switch wafer support brackets and shield.

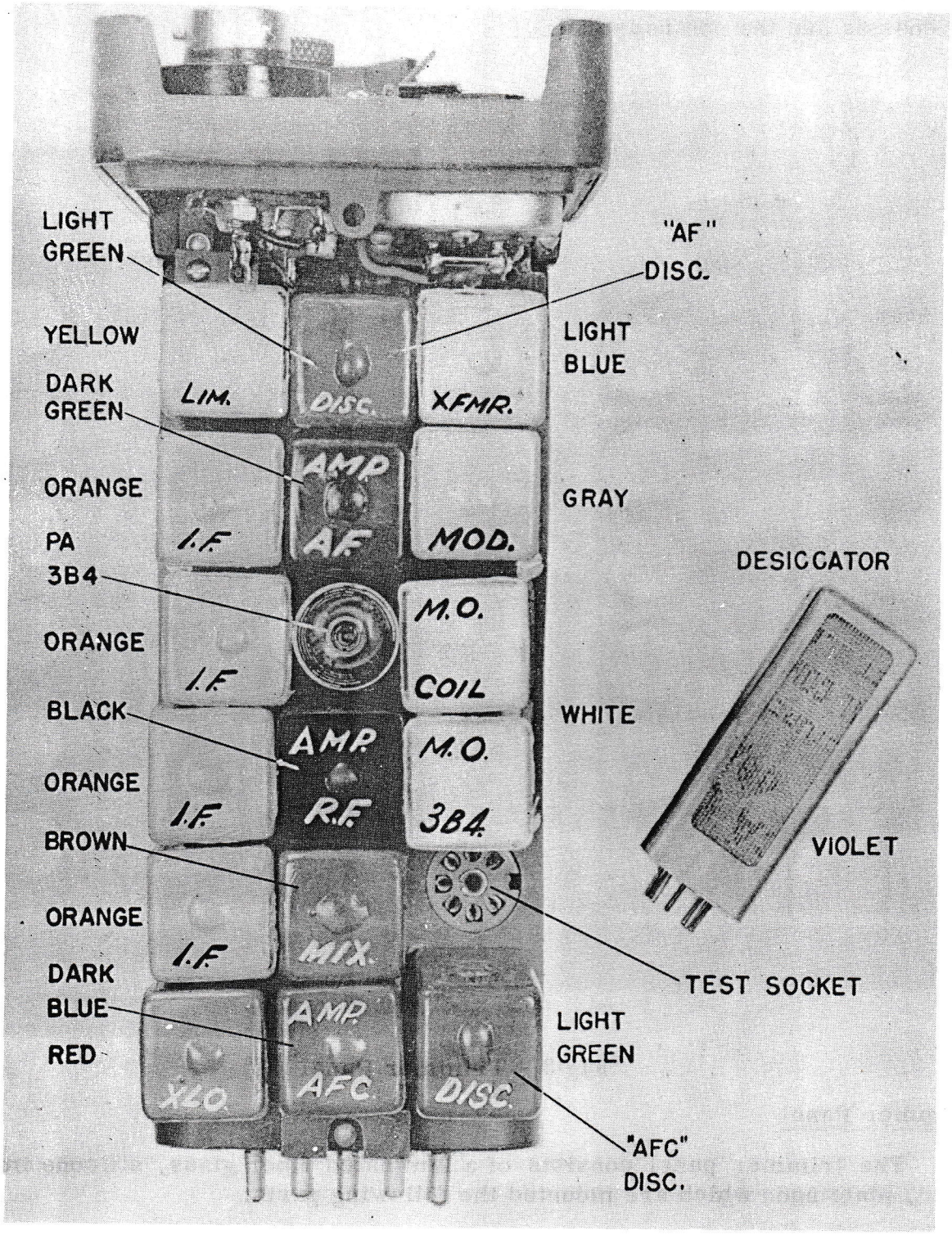


Fig 4 - Plug-in Units and Colour Code

14. The trimmer panel is mounted in a magnesium shield and held in place by six screws. This complete assembly fits tightly against the bottom of the main chassis, being held in position against the chassis by four screws, and is attached to the control panel by two screws through bosses on the control panel and trimmer panel shield. The variable air capacitors are mounted in three groups of six and are separated by magnesium shields, each group being associated with one 6-position wafer of the channel selector switch.

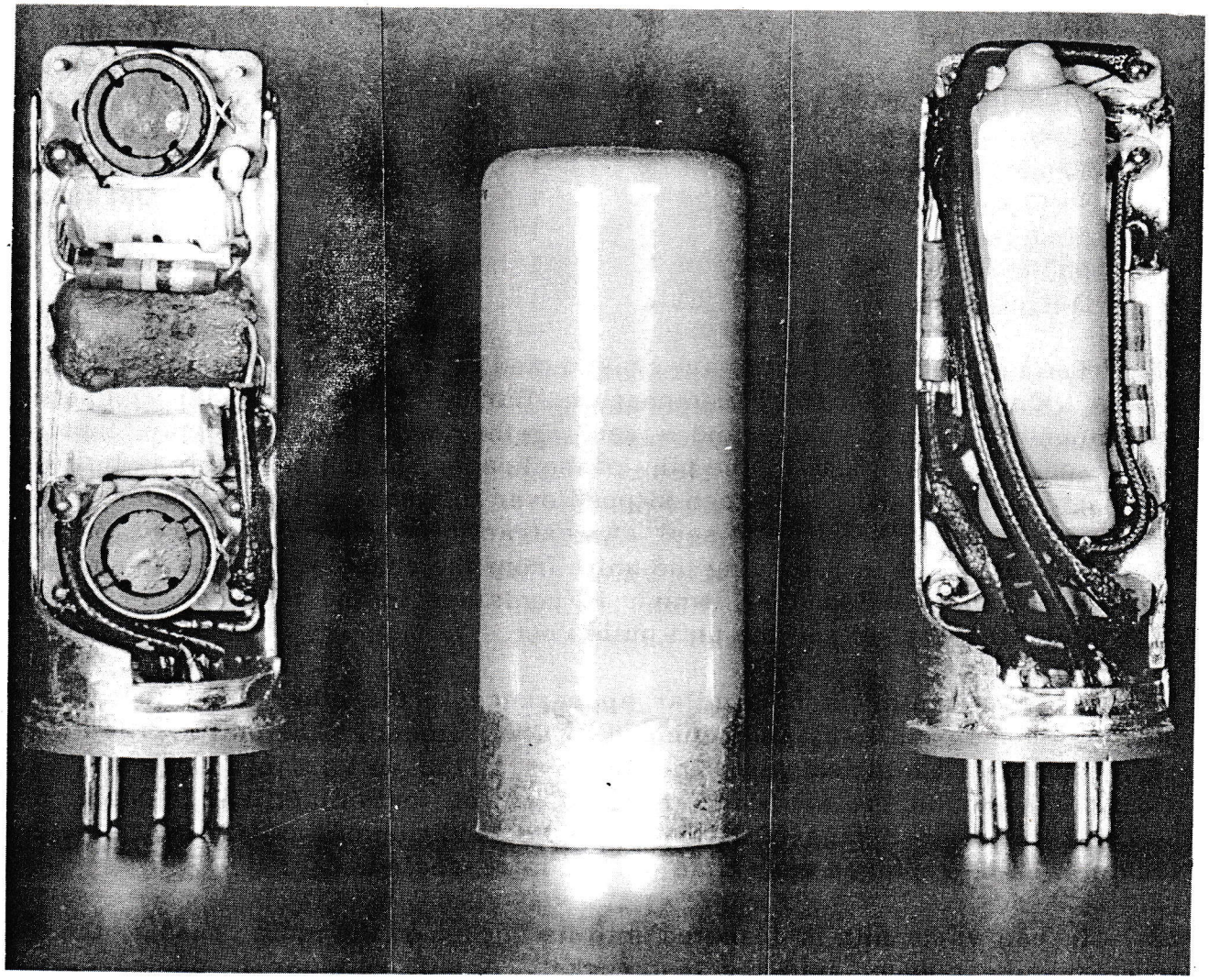


Fig 5 - Plug-in Unit

Plug-in Units

15. The plug-in units contain most of the electrical circuitry and components of the set. In external appearance each unit is a rectangular or cylindrical metal box of dimensions 2-in long, 3/4-in wide, 3/4-in thick, with a 7-pin miniature

glass base at one end. Each unit is painted a colour to differentiate between the various types, as follows:

Unit Type	Qty per Set	Colour
RF amplifier	1	Black
Mixer	1	Brown
Crystal oscillator	1	Red
IF amplifier	4	Orange
Limiter	1	Yellow
Discriminator	2	Light green
Audio amplifier	1	Dark green
Transformer	1	Light blue
AFC amplifier	1	Dark blue
Modulator	1	Grey
MO coil	1	White
Desiccator	1	Violet

16. The majority of the units are constructed of the following basic parts: Can, Header, Chassis, Electrical components, Wiring. The electrical components are mounted on the chassis and wired together with battery supply, input and output connections made to the pins of the header. Each assembly is tuned and thoroughly dried; the can is then slipped over this assembly and soldered to the header to establish a hermetic seal. An extraction washer is soldered to the top of each can to aid in removing the units from the chassis. Whenever units are removed, an extraction tool, which is contained in the test set, is inserted underneath the washer and the unit pulled out.

17. The desiccator is of similar appearance to the other units, but has one side of the can cut away and replaced by a wire mesh. The unit is filled with a desiccant such as silica gel. The purpose of the unit is to absorb any water vapour trapped in the set when it is sealed, or that might leak in during use. Since there is no means of determining the condition of the desiccant, the desiccator will be replaced each time the set is re-sealed.

18. In use each unit is inserted into its socket on the main chassis, the desiccator being plugged into the test socket. A unit retainer is placed over the units to hold them in the sockets. The unit retainer is bolted at the front of the set to a lug on the rear of the control panel and at the rear of the set by an insulated wire clip engaging the battery socket frame. A plastic retainer is cemented on the underside of the unit retainer to hold the plug-in units firmly in place and to prevent them from disengaging from underneath the unit retainer under conditions of severe shock. On the upper side is a chart showing the colour code and location of each plug-in unit.

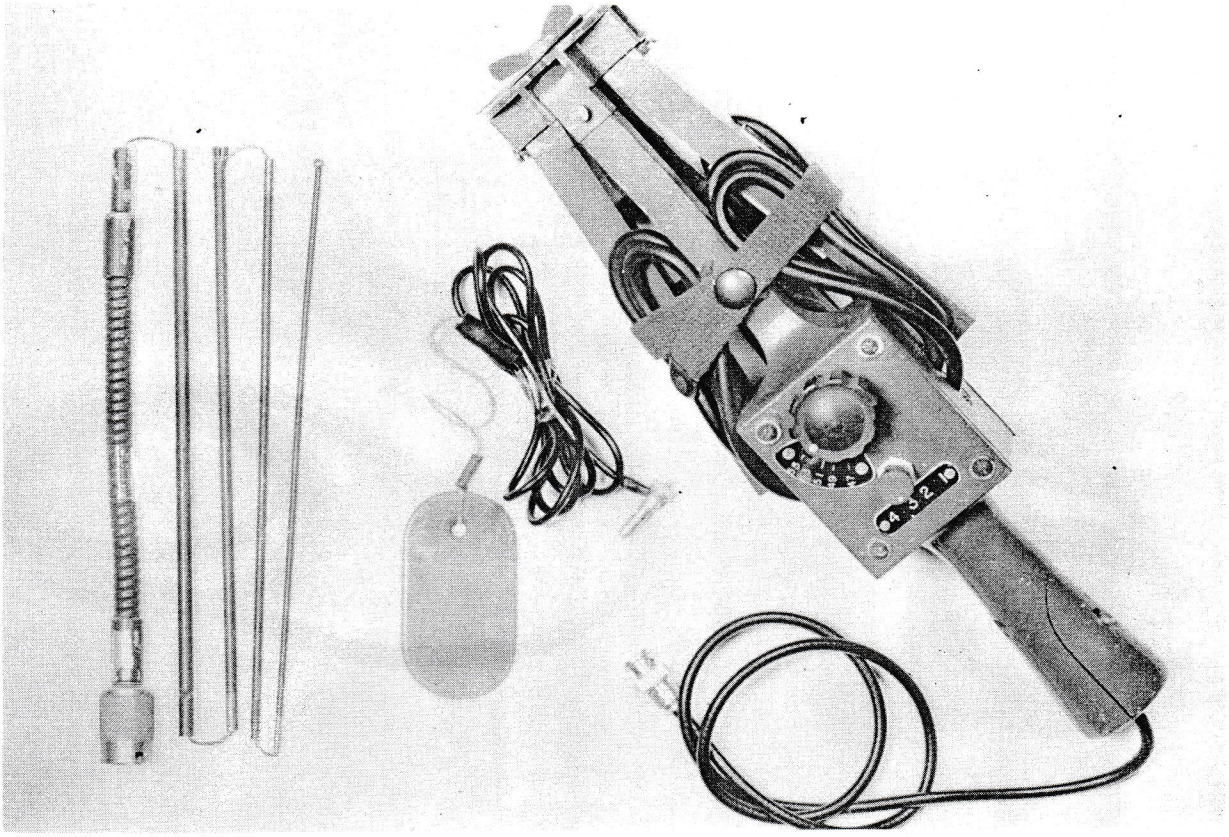


Fig 6 - Antennae

Antennae

19. Four antennae arrangements may be used with the radio set. The 4-ft whip antenna is essentially a Wireless Set 88 (British) antenna modified to give a spring-loaded fastening to the antenna mount on the set. The antenna mount is also provided with a threaded hole to enable connection to certain types of US Army antennae equipped with a 1/4-in x 28 screw base. A 4-ft length of rubber covered wire attached to a split pin plug that fits into both the ground socket and antenna mount is supplied for trailing wire antenna and counterpoise use.

20. The homing loop is the type AT-339/PRC used in the US Army in conjunction with Radio Sets AN/PRC-6 and AN/PRC-10. In use, it is attached to the coaxial socket on the control panel, and the regular antenna is fitted with a shorting cap.

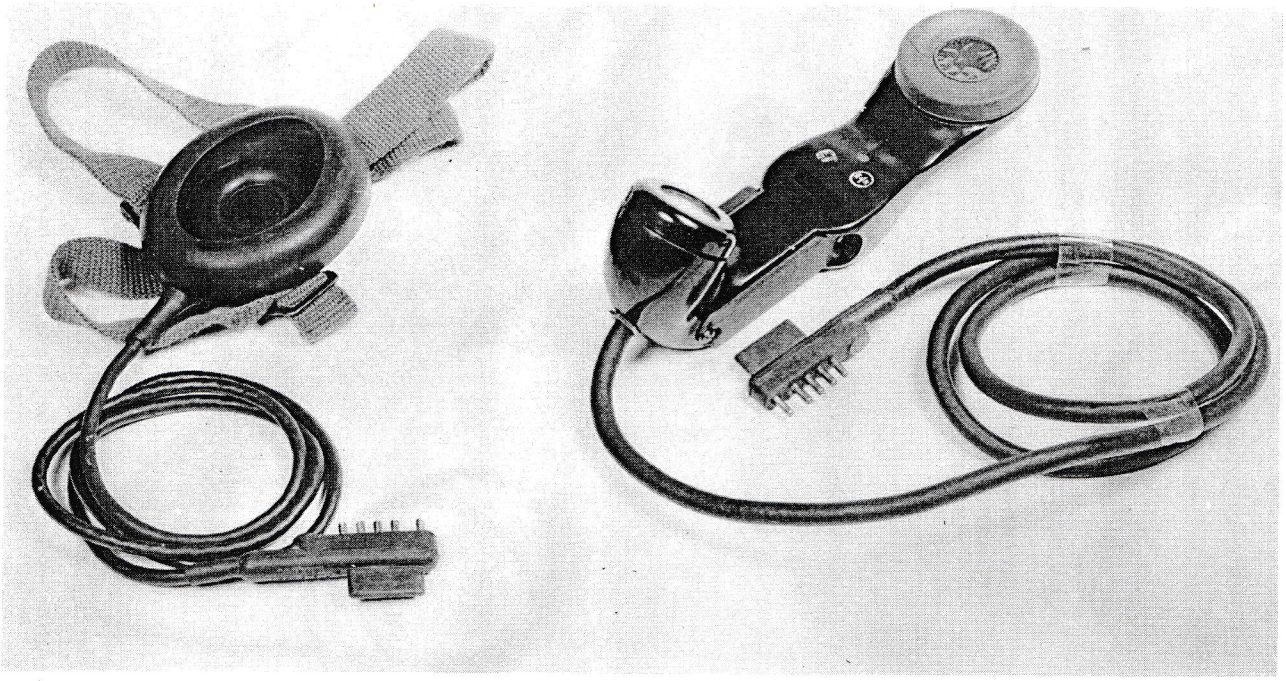


Fig 7 - Headset and Handset

Headset and Handset

21. The Headset H-5002/PRC is a single receiver attached to a nylon headband. It is connected via a 2-conductor cable to a 5-pin rubber plug that mates with the audio socket on the control panel of the transmitter-receiver.

22. The Handset H-5001/PRC or alternative Handset H-5001A/PRC is very similar in construction to the US type H-33/PT and has a single earpiece receiver, carbon microphone and pressel switch contained in a bakelite moulding. It is connected via a 5-conductor cable to a 5-pin rubber plug.

23. The two sections of the audio socket are interconnected so that the headset or handset may be plugged into either section, however, the handset must be plugged in before the operation of the receiver is possible.

TECHNICAL DESCRIPTION

Antenna Circuit

24. The antenna mounts are connected to a tap on the coil L2. The RF tuned circuit, L2 and one of the condensers C3 to C8, acts as the power amplifier

plate circuit on send and as the RF amplifier grid circuit on receive. The whip antenna mount is fed through a loading coil L1 that tunes approximately with the antenna reactance, and then through a blocking condenser C1 to the tap on the tank coil L2. The homing antenna socket is connected directly to the blocking capacitor C1 since the homing antenna impedance is approximately a pure resistance of 50 ohms.

RECEIVER

RF Amplifier

25. The RF amplifier is a self-biased pentode operating into a plate tuned circuit L7, C73, of operating Q approximately 50. The tube is a subminiature type 1AD4 giving a gain of 10 in this circuit. The signal is capacity coupled from the plate of the RF amplifier to the grid of the mixer.

Crystal Oscillator

26. The local oscillator is a six position crystal oscillator designed to provide crystal control of frequency over the 42 to 52 megacycle range simply by switching crystals and with no further re-tuning of the circuit. The crystals employed in the circuit are of the overtone or harmonic type known as CR-23/U and oscillate on their third harmonic. To permit switching without re-tuning, a special bridge type circuit is used. Referring to the simplified schematic it is seen that the bridge circuit and the coupling to the oscillator tube are provided by a small transformer assembly. The transformer is wound on a toroid iron core, the windings so placed as to give high mutual coupling between the primary, secondary and output windings across the frequency band of 42.7 to 51.1 megacycles. Under static conditions the balancing condenser C-38 is adjusted to a point where it balances the stray capacitance of the crystal arm of the bridge. The impedance of each arm will be equal and the bridge balanced. Due to this balanced condition the grid to ground voltage will be approximately zero or of too small a magnitude to cause oscillation. However, the dynamic impedance of the crystal is sufficient to cause an unbalance in the bridge circuit and due to this unbalanced condition the grid to ground voltage now assumes some magnitude and phase which does cause oscillation. The frequency range over which the oscillator will operate is dependent upon the resonant frequency of the bridge and plate circuits and the degree of coupling between them. The upper limit of operation (approx 52 Mcs) is slightly above the series resonant frequency of the bridge circuit, and the lower limit of operation (approx 42 Mcs) is slightly below the resonant frequency of the plate circuit.

27. Due to the fact that the mixer circuit presents a low resistive impedance to the crystal oscillator, inductive coupling must be used and the output of the oscillator is taken from a third winding on the transformer. It is connected between the positive filament lead to the oscillator tube and the filament of the mixer tube.

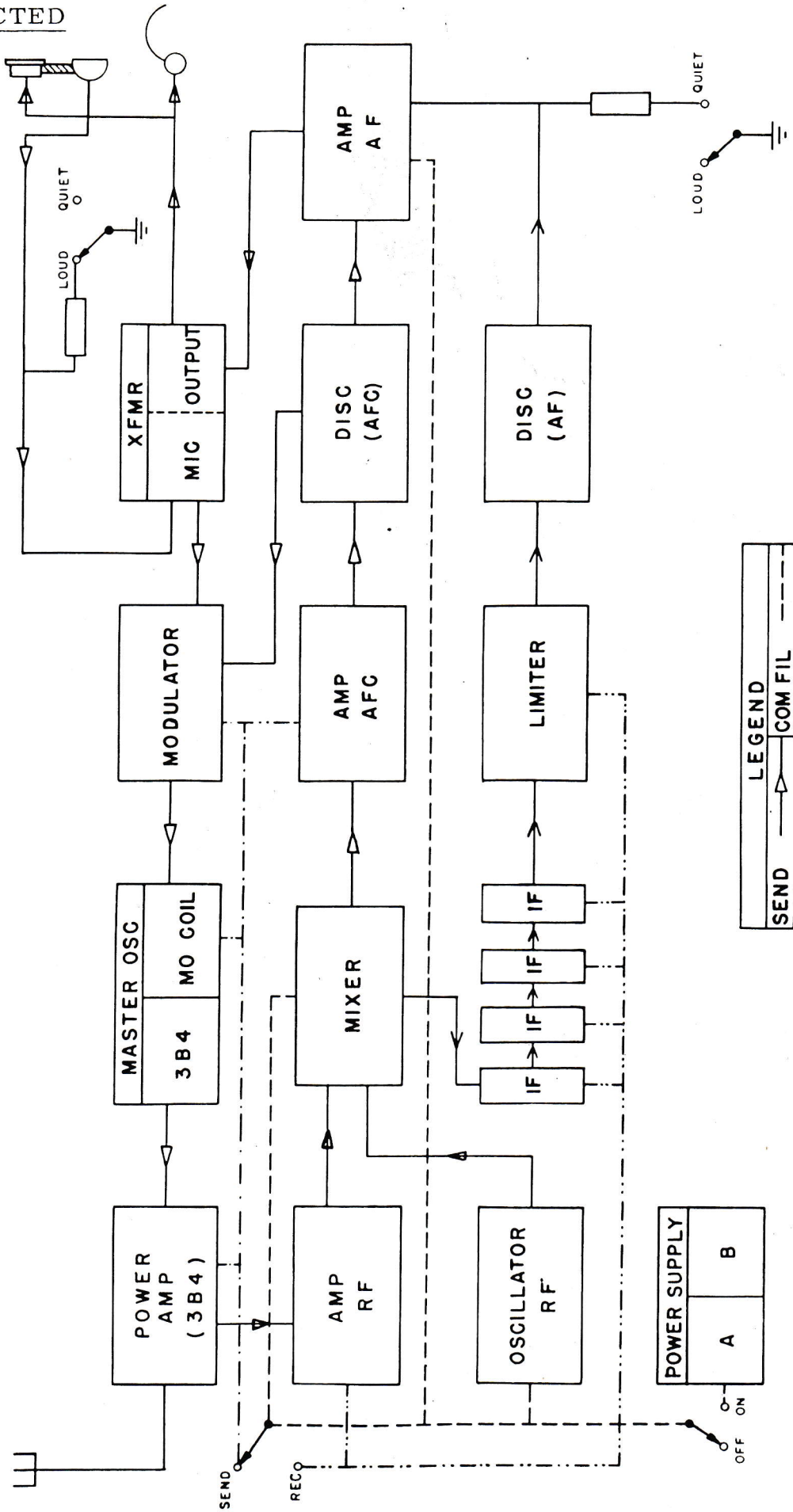


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Fig 8 - Block Diagram

Supersedes pages 15 and 16 of Issue 1 dated 26 Jun 53

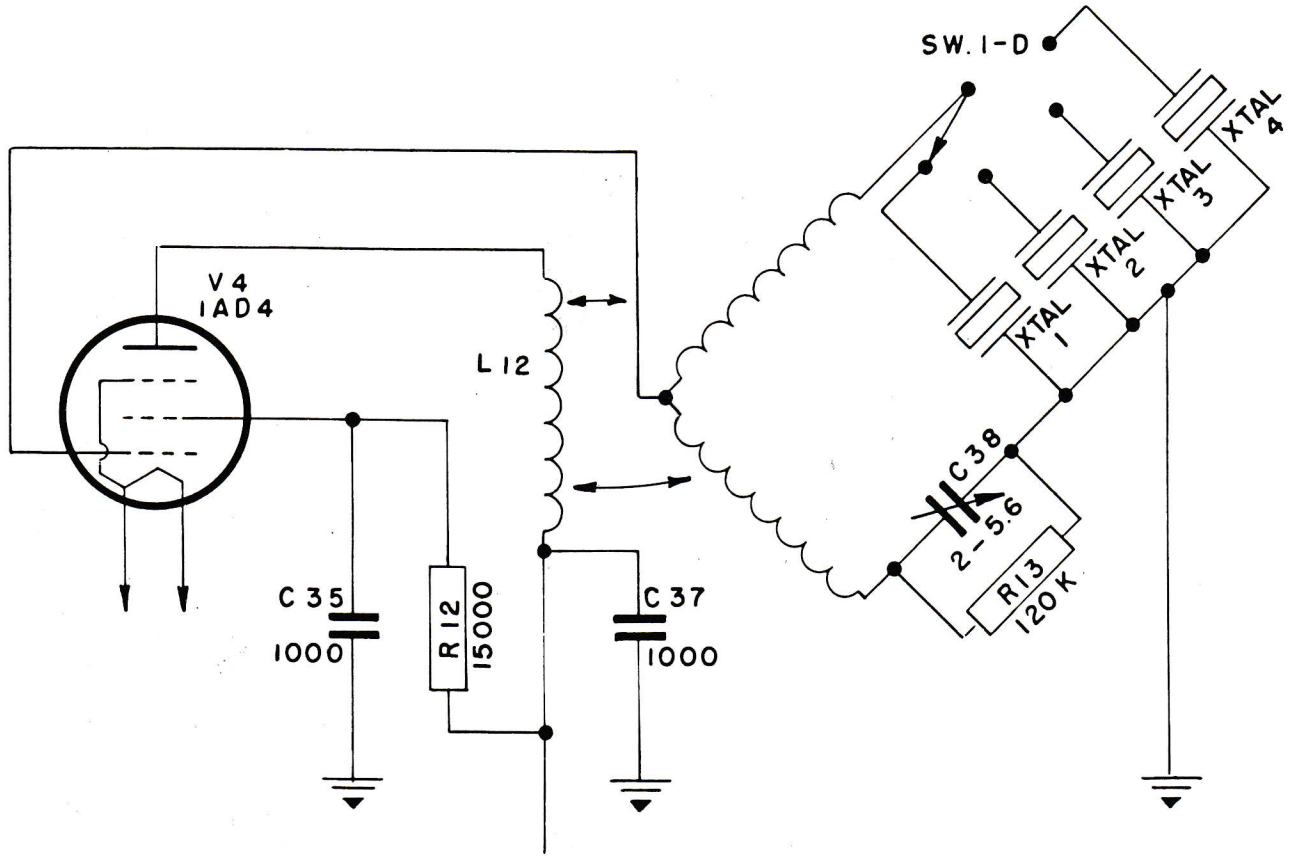


Fig 9 - Crystal Oscillator

28. The oscillator tube is a sub-miniature type 1AD4 operating with approximately 45 volts on the plate and 75 volts on the screen. In use, the crystal oscillator operates on a frequency of 4.3 Mcs, below the signal frequency. For operation of the radio set on channel 1 (50 Mc/s) the frequency of the crystal would be 45.7 Mcs.

Mixer

29. The mixer tube is a sub-miniature pentode type 5678 employing filament injection of the oscillator signal while the received signal is fed to the control grid. In the plate circuit of the mixer tube is the primary of the first double tuned IF transformer. The plate of the mixer is also capacitively coupled to the AFC amplifier input for transmit AFC loop operation.

IF Amplifier

30. Coil L9 with L8 of the previous stage is part of the IF tuned circuit. This coil is tunable by an adjustable core and resonates with capacitor C81 to form the IF secondary circuit. Capacitor C85 and CH4 form and RF filter which decouples the filament from the A-supply for RF. Capacitor C80 and L10 are tuned to the IF frequency. The secondary of L10 is in series with L9 of the following stage.

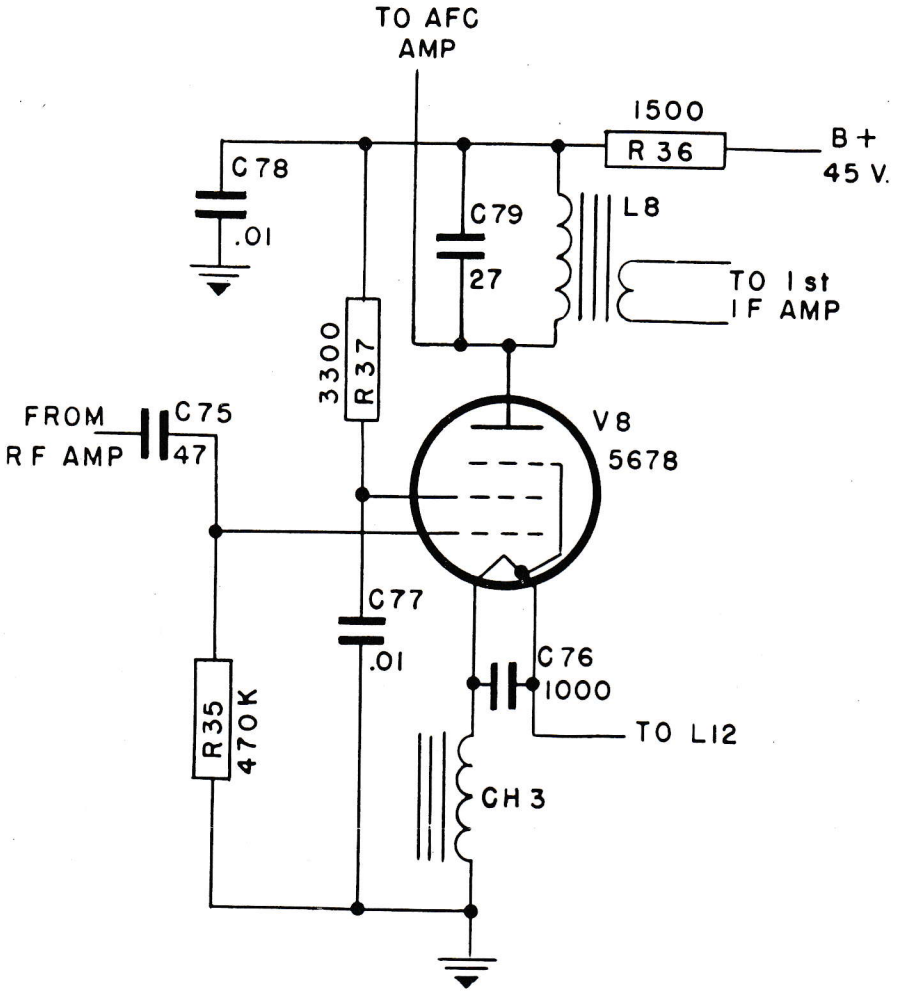


Fig 10 - Mixer

Limiter

31. The limiter stage is identical to the IF stage except for the coupling coil. It has more turns and hence tighter coupling is achieved between the 4th IF stage and the limiter. Grid leak limiting occurs with a signal of approximately 2 volts. The grid circuit time constant is the same in the limiter and IF stage and has been kept to a relatively low value by the use of a 120,000 ohm grid resistor R39 in order to suppress the objectionable effects of impulse noise. B supply is fed from the 90 volt section through a 20,000 ohm resistor R41 resulting in about 65 volts for the plate and screen of the limiter tube. This has been done to increase the audio discriminator output.

Discriminator

32. The audio discriminator is of the Bond type with purely capacitive coupling between primary and secondary. The secondary circuit which establishes the centre frequency of the discriminator has a high ratio of capacitance to inductance to reduce the effects of stray capacitance, the effect of diode loading and

to assist in temperature compensation. For this reason the centre frequency stability is higher than usual for this type of circuit. The primary circuit L5, C45, C46 is more closely link coupled to the limiter plate circuit than the coupling used in the IF stages, and acts largely as an impedance matching network between the limiter plate circuit and the discriminator secondary.

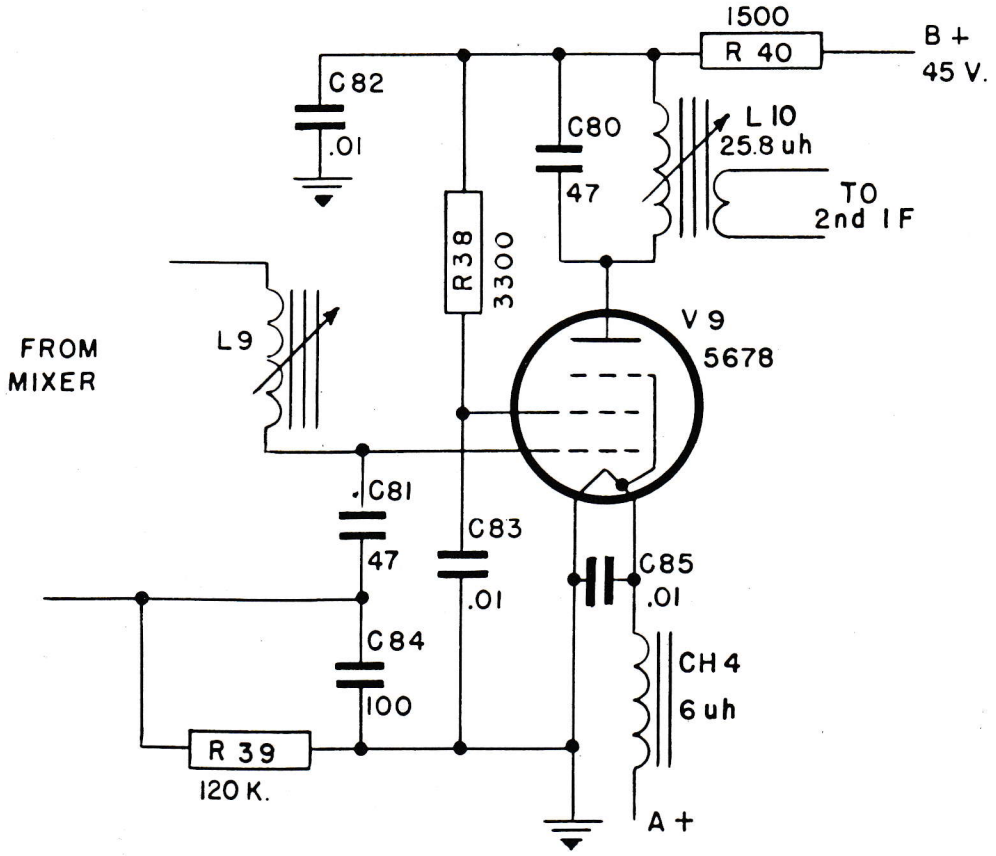


Fig 11 - IF Amplifier

33. Referring to the simplified circuit in Fig 12(b) it will be noted that the secondary circuit is essentially a four arm, four terminal bridge circuit. In this bridge circuit C47 and C48 are of equal value, CR1 represents the capacitance across the diode rectifier RECT 1, CR2 represents the capacitance across the diode rectifier RECT 2 and is shunted by the additional capacitor C49. Since the combination of L6 and C50 of Fig 12(a) resonates well above 4.3 Mcs, it can be represented in Fig 12(b) by an equivalent inductance of different value which is indicated as L'6. Condensers C51 and C95 are omitted from Fig 12(b) because only RF currents are being considered and the reactance of these capacitors in parallel at 4.3 Mcs is negligible.

34. Since C47 equals C48 and CR1 equals CR2 it may be readily seen that if C49 was non-existent, the bridge would be balanced. Under these conditions the currents i_1 and i_2 would be equal, and the voltages across C47 and C48 equal;

therefore, the points c and d would be at the same potential regardless of the frequency of the exciting voltage, in other words Ec=Ed. However, as the combination CR2, C49, has a lower reactance than CR1, the unbalance produced in the bridge circuit will cause current i_2 to exceed i_1. The current i_2 will therefore produce a voltage drop across C48, higher than the drop by the current i_1 flowing through C47. Point c will then be at a higher potential than point d. This exciting voltage at the point c of L'6 is applied to the oscillatory circuit C47, L'6, and C48, and a current i_3 flows through this circuit. This oscillatory current will be additive to the current i_1 and will buck the current i_2. Since the magnitude of the current i_3 depends upon the reactance of L'6 then by proportioning the reactance of L'6 to C47 and C48, at the center frequency, the currents $i_1 + i_3$ will equal $i_2 - i_3$ and the resultant voltages between point c and d to ground become equal.

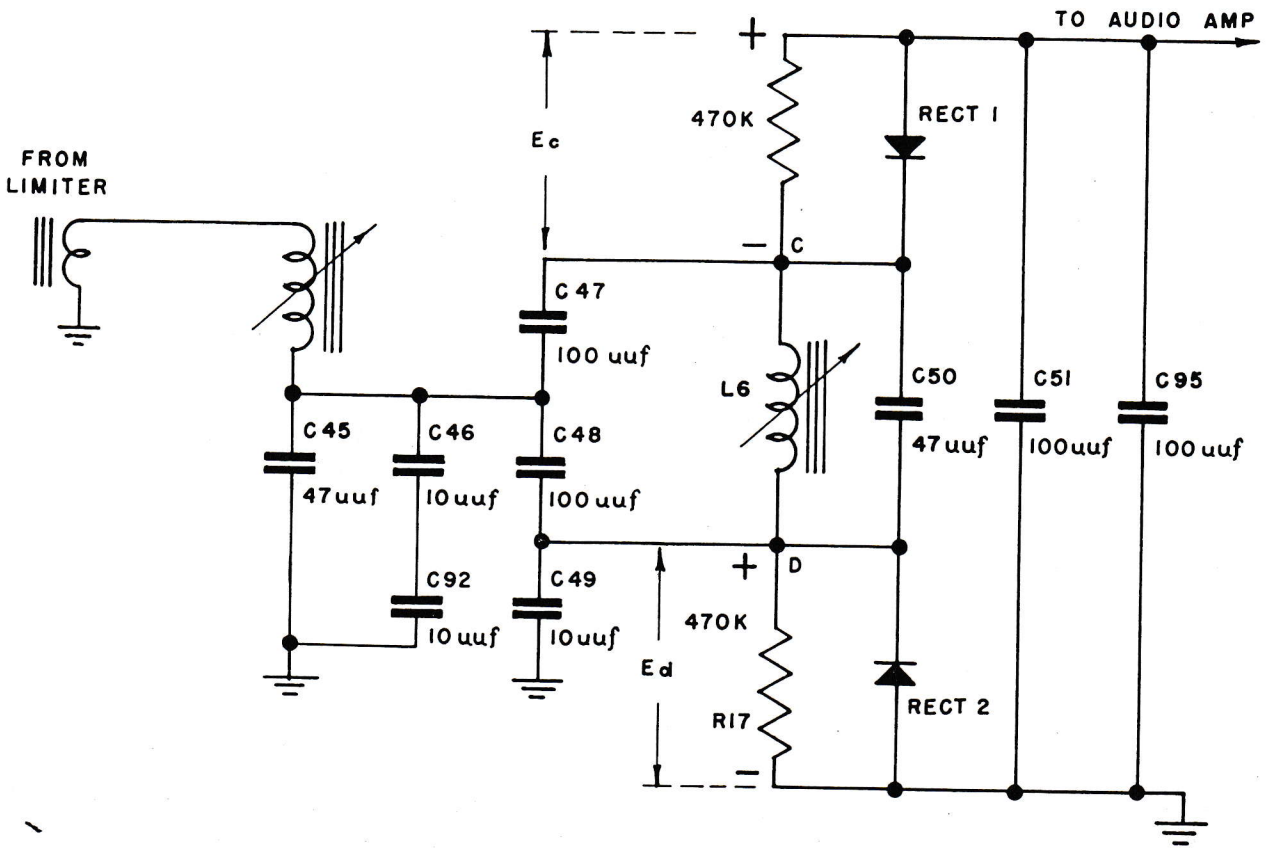
35. With an increase of frequency due to modulation of the signal, the oscillatory current i_3 decreases, resulting in the voltage Ec becoming higher and Ed becoming lower due to a lower additive current to i_1 and a lower bucking current to i_2 than at the centre frequency. If the centre frequency is decreased inversely the voltage Ed is increased and Ec is decreased from their respective value at centre frequency. This increase and decrease of frequency either side of the centre frequency is the audio modulation. The current i_3 follows this change closely and controls the current through each rectifier. The voltage from the point c to ground is demodulated by the parallel rectifying circuit RECT 1, and R16 and produces an audio voltage across the load resistor R16 proportioned to the RF voltage Ec. The voltage from the point d to ground is demodulated in the parallel demodulating circuit RECT 2, R17 and produces and audio voltage across the load resistor R17 proportional to the RF voltage Ed.

36. The reactance L6 is an RF component and offers negligible reactance to the demodulated audio component of the signal thus R17 and R16 become the output load as in Fig 12(a). The voltages Ec and Ed are 180 out of phase and with one increasing and the other decreasing the resultant is an increase of output with an increasing frequency and inversely a decrease of output with a decreasing frequency. Since the carrier is frequency modulated, the frequency of the exciting signal at the output of the limiter will vary at an audio rate around the centre frequency of the discriminator so that its output will depend upon the frequency deviation used.

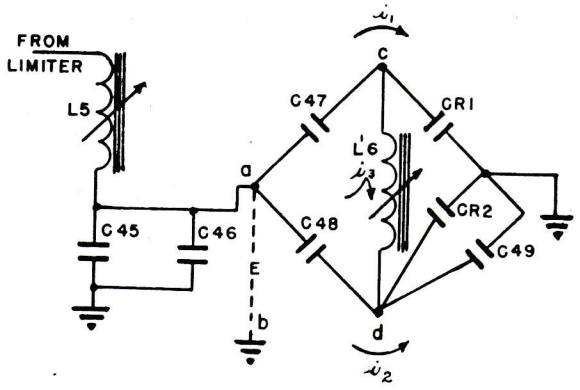
Audio Amplifier

37. The audio output of the discriminator is capacitively coupled to the grid of the amplifier tube through a resistance-capacitive decoupling network, R32, R23, C59, C57, designed to suppress any IF signal at the discriminator output and to assist in producing the desired audio frequency response characteristics. Minus 3 volts bias is fed to the grid through a high resistance R21. The AFC discriminator audio output is also connected through a decoupling circuit C55, R22, C56, C58, to the grid to provide sidetone on transmit.

Supersedes Issue 1, pages 19 and 20 dated 26 Jun 53



(a)



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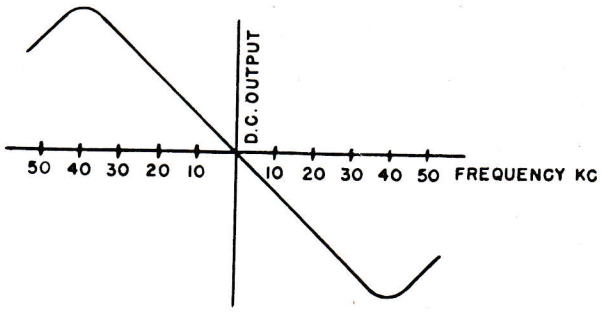

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Fig 12 - Discriminator

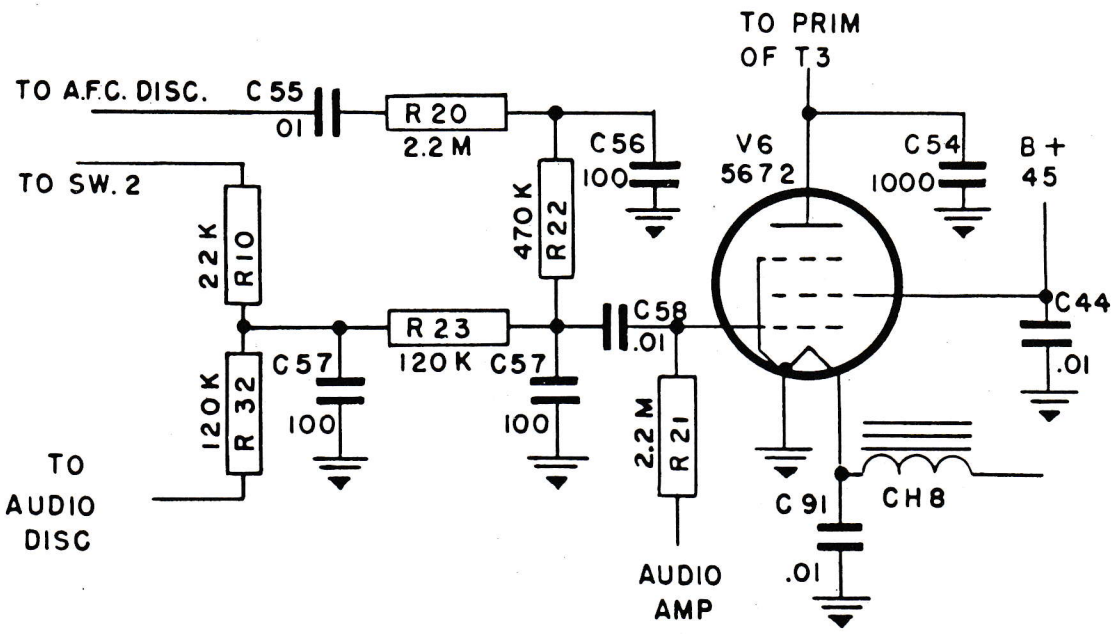

Fig 13 - Audio Amplifier

38. A subminiature pentode type 5672 is used as the amplifier tube and is operated from the 45 volt B supply. The plate of the tube is connected to a subminiature audio transformer T3, located in the transformer plug-in unit. The secondary of the transformer is connected to the audio socket on the control panel. Insertion of a headset or handset plug into the socket places the earphones across the winding.

39. The audio voltage fed from the discriminator to the audio stage is reduced in the QUIET position of the control switch by connecting a 68000 ohm resistor R10 to ground across the audio stage input. This resistor also causes a reduction in the sidetone level in the QUIET position.

TRANSMITTER

Oscillator

40. The master oscillator is a modified Colpitts type using a 3B4 valve. Tuning is accomplished by one of the variable air capacitors switched between the plate of the tube and the 90 volt B supply. RF by-passing of this supply is accomplished by a .01 mfd capacitor C18 located with the oscillator. The tank circuit is completed by a 20 mmfd temperature compensating ceramic capacitor C17 connected between the grid and 90 volt B supply. The reason for connections to the B supply is to reduce the peak voltage across the tuning capacitors. The M0 coil L3 is built into a separate plug-in unit and consists of silver-plated copper wire would on a ceramic form for good stability.

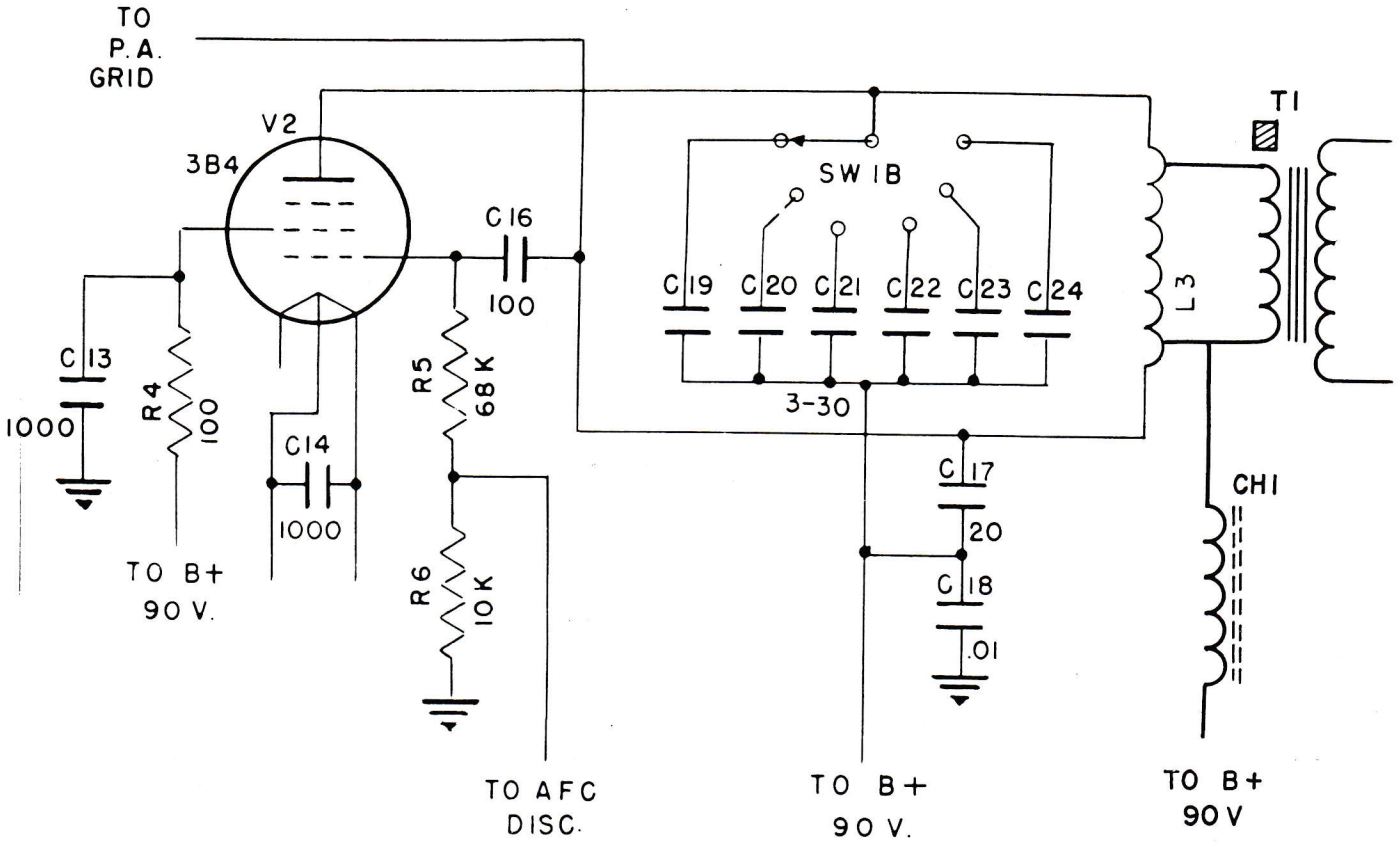

Fig 14 - Master Oscillator

41. The miniature pentode 3B4 has power fed to only half its filament to reduce battery drain. Plate voltage to the tube is fed from the 90 volt battery (B2 section) through an RF choke CH1 to a tap on the MO coil. The tube is operated as a Class B self-biased power amplifier, with approximately 20 volts grid bias.

Power Amplifier

42. The power amplifier tube, also a 3B4 beam power pentode, is driven from the same side of the oscillator tank as in the oscillator tube. It is operated in a Class B self-biased condition into a tank circuit L2, C3-8, which is loaded by the antenna. B supply of 90 volts is fed to the plate through a decoupling circuit R1, C2 and the tank coil L2. The screen is operated at reduced voltage, approximately 15 volts less than the B supply, as sufficient power output is obtained with a saving in battery drain. The voltage drop across the screen resistor R2 is used as a tuning indication for the PA plate circuit. Full filament power is supplied to this tube.

43. Neutralization, based on the Rice method, is accomplished through the small variable capacitor Cn, the MO coil L3 and C12. Capacitor C12 and Cn may

be considered as one in the feedback circuit. The capacitor Cn is specially designed so that it introduces a small amount of capacitance between the rotor of the oscillator switch and the PA rank coil, and is adjusted to compensate for plate-grid feedback in the middle of the frequency band. Neutralization is provided to reduce the effect of antenna circuit variations upon the oscillator frequency.

Modulator

44. The modulator has two functions; it frequency-modulates the transmitter oscillator, and it controls the centre frequency of the transmitter oscillator. Both of these functions are accomplished by the variation in secondary inductance of transformer T1 whose primary is in the plate circuit of the modulator tube V3, while the secondary is connected across part of the MO coil. The manner in which the centre frequency of the transmitter is controlled is explained in the section which describes the AFC circuit.

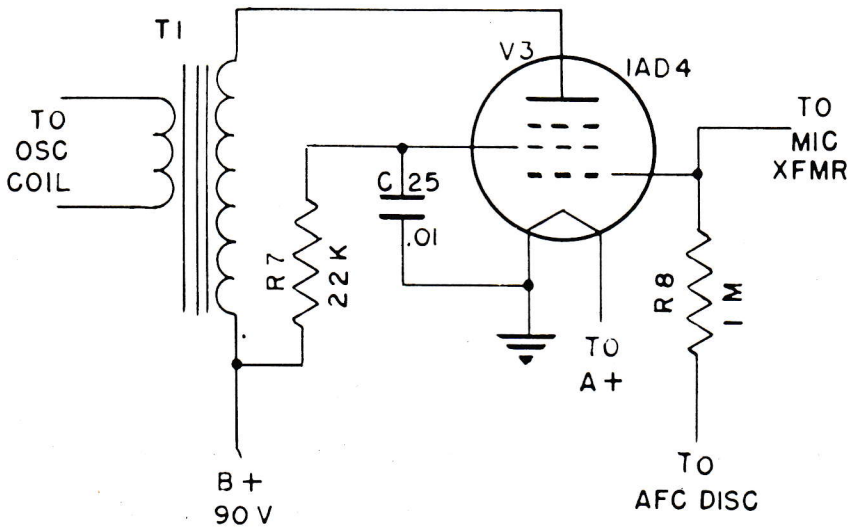

Fig 15 - Modulator

45. Transformer T1 is a specially constructed transformer whose primary winding is wound on audio lamination, while the core of the secondary is made of a special magnetic material called 'ferroxcube'. Ferroxcube has the property of appreciable permeability variation with a change of flux density. The ferroxcube core is placed in the magnetic path of the primary winding with the result that an increase in the primary magnetic flux will tend to saturate the ferroxcube core decreasing its effective permeability and producing a decrease in secondary inductance. Since the primary of transformer T1 is in series with the plate of the modulator tube, changes in plate current will produce changes in magnetic flux through transformer T1 with resulting change in inductance in the secondary winding.

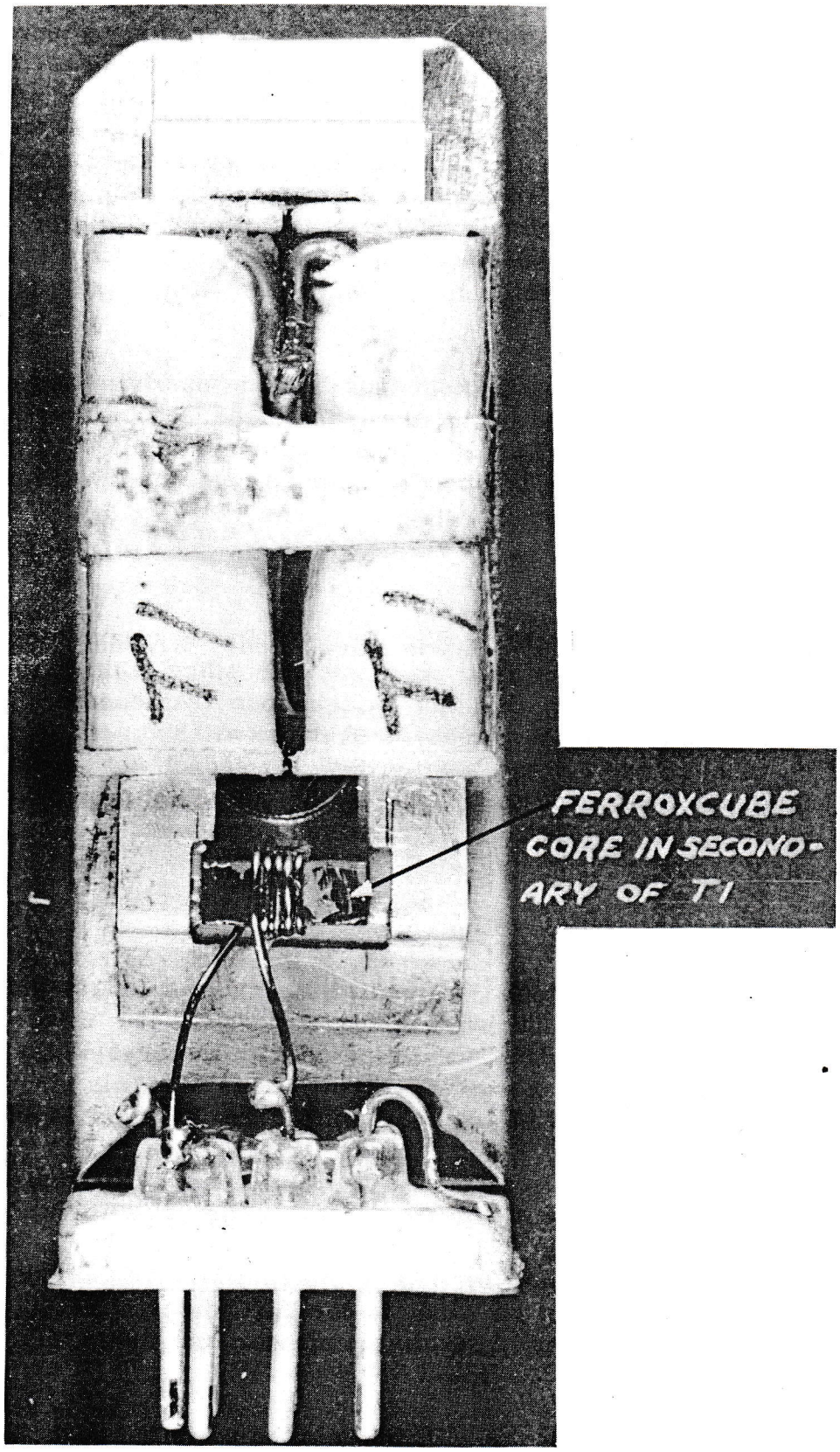

Fig 16 - Ferroxcube in Modulator Unit

46. Voice signals coming from the handset microphone enter the radio receiver-transmitter through its audio socket. From here, they are applied through audio transformer T2 and condenser C26 to the grid of the modulator tube V3. This causes the plate current of the tube to change at an audio frequency, which in turn, causes the flux and the inductance of the windings in transformer T1 to change at an audio frequency. Since the secondary winding of transformer T1 is in the tuned grid circuit of the transmitter oscillator, changes in the value of inductance of L3 produce changes in the transmitter frequency at an audio rate. The transmitter oscillator is, therefore, frequency modulated by the audio signals.

47. A subminiature pentode type 1AD4 is operated as a DC amplifier to produce current in the primary of the transformer T1 proportional to the voltage at the grid of the tube. The 90 volt B supply is applied to the plate and screen, the latter voltage being dropped by a series resistor R7. Bias for the tube is derived from a portion of the MO bias.

Microphone Circuit

48. One side of the carbon microphone is connected to the send filament line to provide the excitation current, the other side being wired to the primary winding of the subminiature microphone transformer T2 located in the transformer unit. A 1-ohm resistor R11 is switched across the primary in the LOUD position of the control switch SW2 to reduce the audio level fed to the transformer. This resistor also has the effect of improving the modulation in high ambient noise level. The transformer secondary is capacitively coupled to the modulator grid.

Automatic Frequency Control

49. On transmit, the transmitter signal is fed to the mixer through the RF amplifier grid-plate stray capacitance. In the mixer, which is operative on 'Send', the transmit signal is mixed with the crystal oscillator output to produce 4.3 mc/s in the mixer plate circuit. This signal is coupled from the plate of the mixer to the grid of the AFC amplifier tube and is of sufficient magnitude to produce grid limiting. A trimmer capacitor C40 is provided across the AFC amplifier input to compensate for variations of the tube input capacitance, being set to make the input capacitance the same value for all AFC amplifier units.

50. The AFC amplifier tube is a subminiature pentode type 1AD4 and operates into tuned circuits coupling to the AFC discriminator, identical to those in the limiter stage. The AFC discriminator and audio discriminator are identical units.

51. The output of the AFC discriminator is fed to the audio amplifier for sidetone, and a parallel DC connection to the modulator made through an RC filter

R18, C52, to provide for slow variation only of transmitter oscillator frequency. The other side of the discriminator output is connected to the transmitter oscillator grid leak which supplies approximately 3 volts bias for the modulator tube. If the 1AD4 were operated at a constant bias, a drop from high to low battery would produce a noticeable change in the uncontrolled MO frequency as well as an objectionable shift from the optimum operating point, ie, the centre of the linear range. A self-adjusting bias source is therefore provided by tapping the MO grid leak resistor in the proper ratio, thus reducing the frequency shift with supply voltage and keeping the reactance tube approximately in the centre of its linear range for different battery conditions.

52. If the transmitter oscillator becomes detuned in frequency by an amount up to a limit of approximately plus or minus 250 kcs, a corrective voltage is created across the discriminator which when added to or substracted from the operating bias returns the frequency to approximately its correct value. The AFC loop gain, which is the ratio between the frequency drift of the transmitter-oscillator without AFC to the frequency error with AFC on, is greater than 30.

Test Socket

53. A 7-pin miniature socket has been provided for use as a test socket with connections to points in the circuit that indicate tuning of the RF circuits and is used when set maintenance is required. This socket is normally used to hold the dessicator unit.

Send-Receive Switching

54. Send-receive switching is accomplished by connecting the A+ battery connection to a single pole double throw pressel switch which is part of the handset. This switch connects the battery A+ to the receiver filaments in the normal, or released position, and to the transmitter filaments in the pressed position. Certain stages of the circuit such as the crystal oscillator that are common to the receiver and transmitter have filaments directly connected to the battery plug.

Off-Quiet-Loud Switch

55. The control switch performs the function of ON-OFF and audio levelling. It is a 3-way, 12-contact wafer switch with 4 of the contacts omitted. The rotor is split into two parts, one of which closes the A+ connection while the other connects the battery common and audio circuits to ground.

56. In both the 'Quiet' and 'Loud' positions the set is turned on. The 'Quiet' position is intended for use only in applications such as patrol, where it is desirable to have low audio output and high modulation gain. This position gives

full modulation at practically a whispering level of speech. In the 'Loud' position the audio output is increased by approximately 20 db and the modulation gain decreased by 20 db. This position appears preferable for normal operation of the set, and enables operation in high noise levels without severe distortion.

Power Supply

57. Power is supplied to the set from a primary Leclanche type dry battery containing 4 sections. The A section, with a nominal voltage of 1.5 volts, is used to power the filaments of the various tubes and to supply microphone current. The B1 section with a nominal voltage of 45 volts, is used for plate and screen voltage of 45 volts on most of the receiver stages and AFC driver. The B2 section in series with the B1 section, with a nominal voltage of 90 volts, supplies plate and screen voltages to the transmitter stages and certain receiver stages. The C section is used as bias for the audio stage.

58. The A+ and common battery connections are broken by the Off-Quiet-Loud switch to turn off the radio set.

RADIO SET CPRC-26

Abridged Specifications

Supersedes Issue 1 dated 25 Jun 54

ELECTRICAL

			A	B1	B2	C
1.	Battery voltages:	Normal	1.25	45	90	-3
		Low	1.05	34	75	-3
2.	Current drains:	Transit	900 ma	8 ma	32.5 ± 3.5 ma	
		Receive	550 ma	14 ma	3.0 ma	

TRANSMITTER

3. Power output: Normal battery 250 mW, low battery 150 mW

4. Loop gain: 35 min
   AFC: ± 250 kc

5. MO bias: 3.25 ± 0.75 V

6. Maximum Tx-Rx difference: 8 kc

7. Transmit frequency: (a) Static ± 8 kc
   (b) Drift 1 kc
   (c) Neutralization 10 kc

8. Dynamic frequency deviation: LOUD 300 mV) into 150 ohm: 7-25 kc
   QUIET 30 mV)

9. Audio response: 250-2000 cps: ± 6 db)
   100 cps: − 10 db) 1000 cps reference
   5000 cps: − 6 db)

RECEIVER (Standard modulation 15 kc @ 1000 cps)

10. Overall) sensitivity: 2 uV giving $\frac{S+N}{N}$ greater than 18 db with normal battery
) bandwidth: 65-85 kc @ - 3 db
    250 kc @ - 60 db

11. Rejection ratios: Image 34 db min
    Spurious 60 db min
    IF 90 db min

12. Limiter characteristic: 3 db from 5-1000 uV

13. IF: Calibration 4.3 Mc ± 5 kc, bandwidth 65 kc @ - 3 db
250 kc @ - 60 db

14. Quieting: 3 uV for noise reduction of 10 db

15. Audio characteristics: 6 mW into 600 ohm for 1000 uV

QUIET output 13 db ± 3 db below LOUD

100 cps - 4 db	250 cps - 6.5 db
2000 cps - 5 db	5000 cps - 8 db

1000 cps reference

END

ARMY
UCTIONS

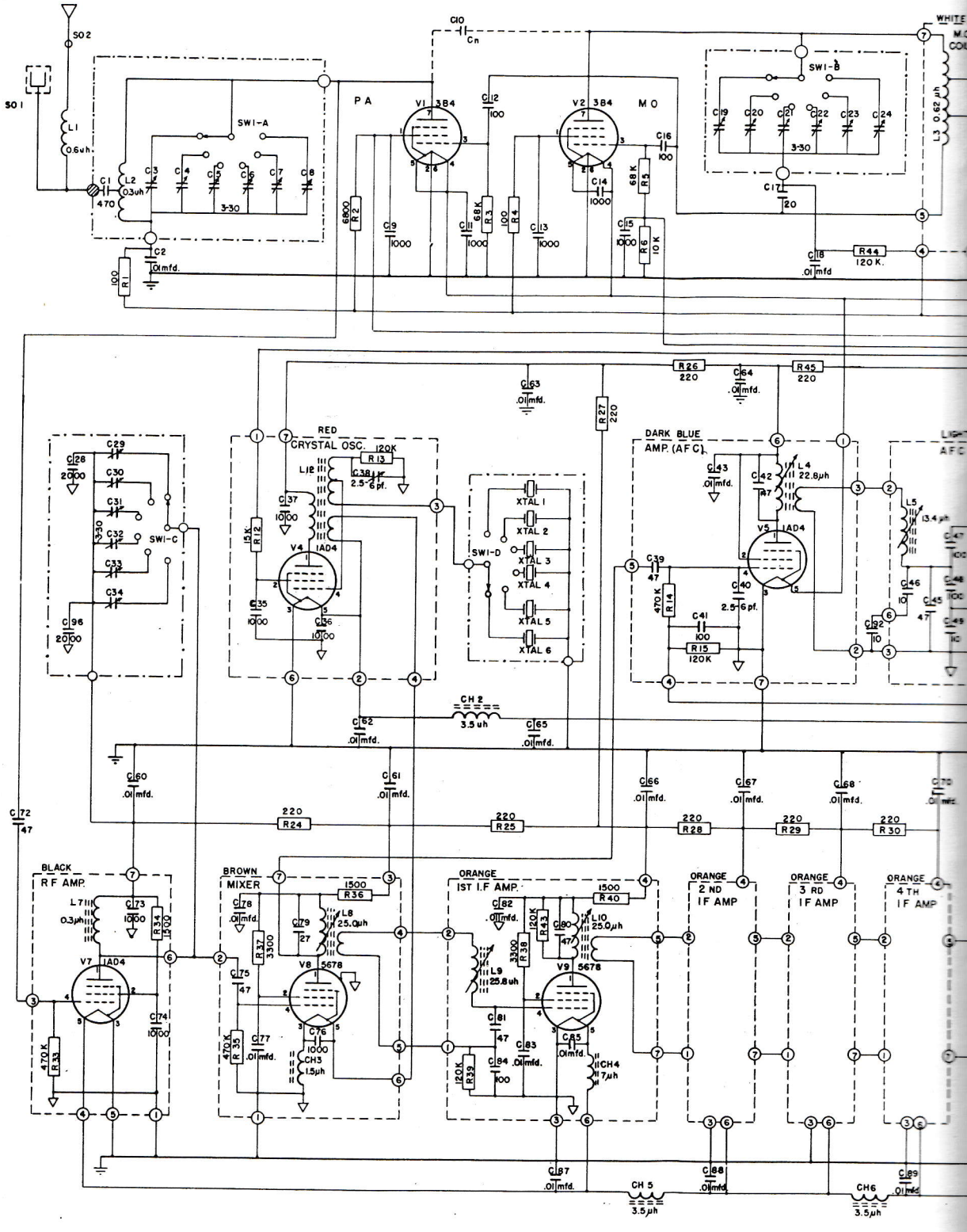

Fig 17 - Main

DEME 87368

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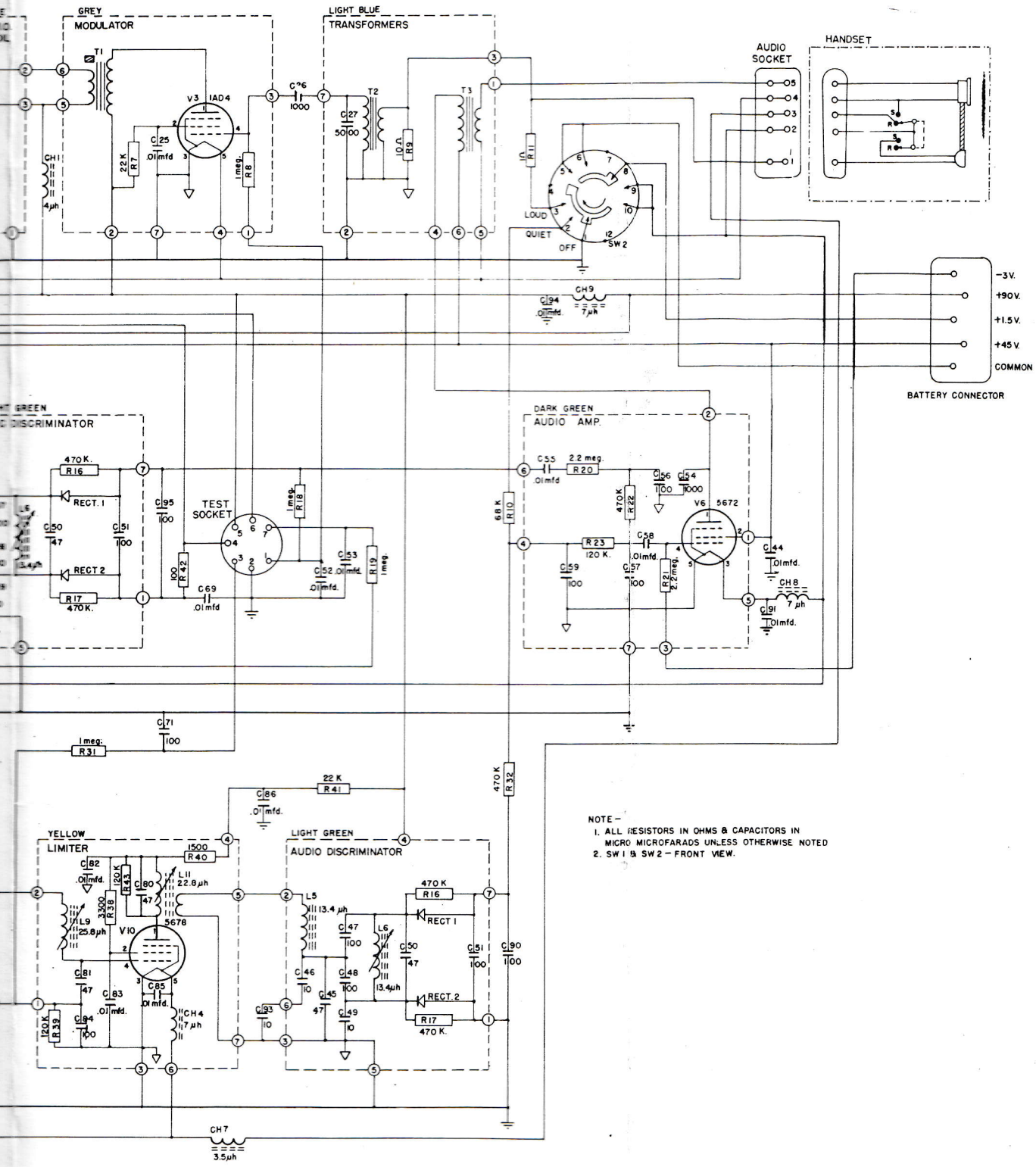

n Schematic Wiring Diagram

END

RESTRICTED