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ADMIRALTY PATTERN. S.S. 106A.

BOOK OF INSTRUCTIONS

FOR

D/F OUTFITS FM11 & FM12

(D/F RECEIVERS FMA AND FMB)

ADMIRALTY SIGNAL ESTABLISHMENT

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(D/F RECEIVERS FMA AND FMB)

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The frequency range of the receiver is covered in five overlapping bands by means of a range switch operating a turret drum containing the R/F and beat oscillator coils and trimming condensers. Tuning within each range is effected by means of a single tuning control operating a five-gang condenser.

The receiver itself comprises three stages of R/F amplification with tuned transformer coupling, a leaky-grid detector, beat oscillator and one stage of A/F amplification. All five tuned circuits, including that of the beat oscillator, are matched and are tuned by the five-gang tuning condenser. The tuning dial, coupled by gear wheels to the condenser gear box, rotates past a fixed cursor, and is calibrated in approximate frequencies for each of the five ranges. The scale for the range in use is illuminated by a dial light.

Volume control is effected by means of a knob controlling a potentiometer, which alters the gain of the second and third R/F stages.

Arrangements for searching, sense finding and zero sharpening are included in the receiver and, in addition, a variable noise-suppressor for operation with an R.I.S. outfit in ships in which this is fitted, is included in the second R/F stage.

The receiver comprises a built-in loudspeaker, which is controlled by means of a switch on the top panel, and provision is also made for connecting an external loudspeaker of either high or low resistance and for the connection of telephones to the set.

A meter is mounted at the centre of the tuning dial. This meter can be connected as an output meter to assist in the determination of the sense of a signal (when this cannot readily be determined aurally) and may also be connected by means of a switch to read the anode currents of the R/F, detector and A/F valves.

3. CONTROLS.

The controls of the D/F Receivers FMA and FMB (See Figs. 10 & 10A respectively) may be divided into three groups, as follows:-

Front Panel, Upper.

Top left-hand corner	... Gyro Motor "ON-OFF" switch (156).
Bottom left-hand corner ...	... Gyro Scale Reset (push in to engage) (163).
Centre left-hand	... Radiogoniometer. (11).
Bottom left-hand	... Volume Control (57).
Top Centre	... Range Switch (161).
Bottom Centre	... Motor Switch (144).
Bottom right	... Tuning Control (162).
Bottom right corner	... B.F.O. "ON-OFF" switch (115).

Front Panel, lower.

Above, left	... Aerial Switch (24).
Below, left	... Sense Input Control (12).
Centre, left	... Semi-Circular Corrector (19).
Centre, right	... Inductance Corrector Switch (9).
Centre, extreme right ...	... Loops Switch (10).
Below right (Receiver FMA only)	... Matching Transformer (168).

Top of Receiver (See Fig. 12).

Reading from left to right:-

230-volt A.C. supply "ON-OFF" switch (147).
Suppressor Input Control (59).
Sense Aerial Relay Switch (31).
Sense Aerial Earthing Switch (32).
Internal Loudspeaker "ON-OFF" Switch (134).

4. CONSTRUCTION.

The receiver is built in a sheet metal cabinet, the upper part of the front panel being sloped backwards in order to allow the tuning dial and radiogoniometer to be more easily read. A number of the minor controls are grouped at the back of the top cover of the cabinet, which also contains the access door through which all valves (except the sense valve) are reached. The sense valve is accessible through a cover plate at the bottom left-hand corner of the front panel.
The overall dimensions and weight of the receiver are as follows:-

Width	25 ins.
Height	2 1/2 ins.
Depth	18 ins.
Weight	2 cwt. 11 lbs.

The receiver is mounted on a shock-absorbing mounting designed for bench mounting. It has detachable front, side and rear cover plates which may be removed when access to components of the receiver other than the valves is required. No components are fitted to the cover plates and special provision is made to facilitate the easy removal of all knobs.

The interior of the receiver is arranged as a number of self-contained units, i.e., Sense Box, Power Pack, etc., all connections between these units being made by leads terminating in plugs and sockets. These have been colour-coded so that the removal and replacement of a defective unit is a simple matter.

In certain classes of ships the gyro motor (157) will have to be changed. A universal 2BA box spanner will be found in the tool box. This spanner is provided to facilitate the removal of the three motor securing bolts.

A small box spanner for removing the tubular condensers and a bottle of switch cleaning fluid complete with brush are also provided. In the event of any switch making bad contact, a small quantity of the fluid should be applied to the switch contacts while the switch is being operated. (See A.F.O. 2322/45 Radio Apparatus - Lubricant for switches).

Note A:- ON NO ACCOUNT may emery paper or a file be applied to any switch contact.

Note B:- It is of great importance that the mechanical system of the gyro drive to the Dial Bearing Indicator be kept clear of dust and dirt. Gearing should be lubricated at intervals with light oil. The correct indication of gyro bearing depends on careful maintenance.

Figures 10 to 18 are photographs showing the construction of the set.

5. ADDITIONAL UNIT FOR SUBMERGED RECEPTION (RECEIVER FMA ONLY).

General. Receiver FMA only is provided with an input terminal box (170) located at the bottom front of the instrument.

Top of Receiver (See Fig. 12).

Reading from left to right:-

230-volt A.C. supply "ON-OFF" switch (147).
Suppressor Input Control (59).
Sense Aerial Relay Switch (31).
Sense Aerial Earthing Switch (32).
Internal Loudspeaker "ON-OFF" Switch (134).

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The receiver is built in a sheet metal cabinet, the upper part of the front panel being sloped backwards in order to allow the tuning dial and radiogoniometer to be more easily read. A number of the minor controls are grouped at the back of the top cover of the cabinet, which also contains the access door through which all valves (except the sense valve) are reached. The sense valve is accessible through a cover plate at the bottom left-hand corner of the front panel.
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The interior of the receiver is arranged as a number of self-contained units, i.e., Sense Box, Power Pack, etc., all connections between these units being made by leads terminating in plugs and sockets. These have been colour-coded so that the removal and replacement of a defective unit is a simple matter.

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Note A:- ON NO ACCOUNT may emery paper or a file be applied to any switch contact.

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Figures 10 to 18 are photographs showing the construction of the set.

5. ADDITIONAL UNIT FOR SUBMERGED RECEPTION (RECEIVER FMA ONLY).

General. Receiver FMA only is provided with an input terminal box (170) located at the bottom front of the instrument.

This box takes the two cable ends of the jumping wire loop used for submerged reception.

From this box (170) two connectors run into the loop aerial matching transformer box which contains a transformer (167) for matching the receiver input impedance to the jumping wire loop impedance.

Details. (See Fig. 1).

(a) The aerial matching transformer mentioned above is controlled by a five-pole, two-position switch (168), with knob and red indicator lamp on the front lower panel of the receiver.

(b) With knob in the left-hand, "ON", position, the red indicator lamp lights up, and the jumping wire loop aerial is connected in place of the goniometer search coil which is at the same time switched out, thereby breaking the D/F loop input circuits.

(c) With the knob in the right-hand, "OFF", position, the indicator lamp goes off; the primary and secondary of the matching transformer are open-circuited and the two sides of the input from the loop aerial are earthed. At the same time the search coil is re-connected to the coupling windings in the sense box and thence to the primary winding (25) of the first tuned circuit of the receiver.

Figure 5(c) shows the equivalent input circuits when the Matching Transformer Switch (168) is in the "ON" position.

CHAPTER 2.

CIRCUIT DETAILS.

1. GENERAL.

D/F Receivers FMA and FMB cover nominal frequency ranges of 15 to 580 and 42 - 1060 kc/s. respectively. The frequency range of each Receiver Unit is covered in five overlapping frequency bands, as follows:-

	Range.	Frequency Range.	
D/F Receiver FMA	0	15 - 30 kc/s.	D/F Receiver FMB.
	1	42 - 98 kc/s.	
	2	90 - 180 kc/s.	
	3	160 - 320 kc/s.	
	4	290 - 580 kc/s.	
	5	530 - 1060 kc/s.	

These frequency bands are selected by means of a range switch (161), which rotates a turret containing the four R/F transformers and trimming condensers, etc., for each range, together with the Beat Oscillator transformer and trimming condenser.

Tuning within each frequency band is effected by means of a single tuning control which operates a tuning condenser consisting of five 437·5 mmfd. sections. A scale operated by the tuning control is calibrated in approximate frequencies and rotates past a fixed cursor. The scale light is changed by the action of the range switch so as to illuminate the appropriate calibration for the range in use.

2. INPUT CIRCUITS.

(The circuit diagrams of Receivers FMA and FMB are shown in Figs. 1 and 1A respectively).

The arrangement of the input circuits of the receiver is determined by the setting of the Aerial Switch (24). This switch has four positions marked "Search", "Loops", "Corr.", and "Sense" respectively. The circuit arrangements for each position of the switch are described below with reference to Fig. 5.

Figure 5(a) shows the equivalent input circuits when the aerial switch is in the "Search" position. The Sense/Search aerial is connected to the grid of the first R/F valve (2) through a 0.002 mfd. series condenser (23), and a combination of condensers connected in parallel inside the coil turret. These condensers (27)(28)(29) vary in the different ranges and are enumerated in Schedule II Figures 7 and 9. In all other positions of the Aerial Switch the "aerial" side of these condensers is earthed, thus connecting the condensers in parallel with the 1st. R/F tuning condenser (30).

Figure 5(b) shows the equivalent input circuit when the Aerial Switch is in the "Loops" position. The Sense/Search aerial is disconnected and earthed, the radiogoniometer search coil is permanently connected to the primary winding (25) of the input R/F transformer so that bearings and reciprocals can be taken in the ordinary way.

Figure 5(c) shows the equivalent input circuits when the Aerial Switch is in the "Corr." position. The Sense/Search aerial is connected to the moveable winding (19) of the semi-circular corrector through the aerial series condenser (23) and a 100 mmfd. preset condenser (16), which has a 75 mmfd. fixed condenser (22) in parallel with it. The other end of the winding (19) is earthed. With the switch in this position, correction for a blurred zero due to the semi-circular effect of the ship's field may be obtained by adjustment of the semi-circular corrector control.

Figure 5(d) shows the equivalent input circuits when the Aerial Switch is in the "Sense" position. The Sense/Search aerial is connected to the grid of the sense valve (1) via the aerial series condenser (23) and the sense input differential condenser (12). The sense valve has coils (18) and (20) connected in its anode circuit. These are coupled to the search coil circuit inductances (17)(21) of the semi-circular corrector so as to inject into the search coil circuit a signal in phase or in anti-phase with that obtained from the radiogoniometer and enables the true direction of the transmitting station to be obtained by use of the cardioid characteristic thus obtained.

3. FIRST R/F AMPLIFIER.

The first R/F amplifier stage uses an NR64 R/F pentode valve (2). The tuned circuit, which is connected between grid and earth, consists of the secondary winding (26) of the input R/F transformer shunted by one 437·7 mmfd. section (30) of the tuning condenser. The preset trimming condenser (27) of the range in use (and fixed trimmers when used) is connected in parallel with the tuning condenser when the aerial switch (24) is in the "Loops", "Corr." or "Sense" position.

The anode of the valve is connected to the H.T. supply line through the primary winding (47) of the second R/F transformer, a 10,000 ohm decoupling resistance (39) and a 200 ohm meter shunt resistance (38). The junction of the two resistances is connected to the meter switch (144). The junction of the winding (47) and resistance (39) is connected to earth through a 0·1 mfd. condenser (40) and, on ranges 1, 2 or 3, to the cathode of the valve through a resistance (50), the value of which is given in Table I. This resistance, with the cathode bias resistance (41), forms a potentiometer which brings the stage gain on the first three ranges into conformity with that on the other ranges.

The screen grid of the valve is connected to the H.T. supply line by means of a potential divider consisting of two 100,000 ohm resistances (37) (45) connected in series between H.T. and earth. The junction of the two resistances is connected to the screen grid and to earth through a 0·1 mfd. condenser (46).

The cathode of the valve is connected to earth through a 300 ohm resistance (41) which is shunted by three condensers (42) (43) and (44).

4. SECOND R/F AMPLIFIER.

The second R/F amplifier uses a 6K8G triode-hexode valve (3), with the triode grid and anode strapped together. This gives a connection to the injector grid of the hexode portion of the valve, which is internally connected to the triode grid.

The tuned circuit is connected between the signal grid of the valve and earth and consists of the secondary winding (48) of the second R/F transformer shunted by one 437·5 mfd. section (51) of the tuning condenser. In parallel with the tuning condenser are connected the trimming condenser (49) of the range in use and, on ranges 3, 4 and 5, a fixed 50 mmfd. condenser (52).

The anode of the valve is connected to the H.T. supply line through the primary winding (70) of the third R/F transformer, a 10,000 ohm decoupling resistance (68) and a 300 ohm meter shunt resistance (67). The junction of the winding (70) and the resistance (68) is connected to earth through a 0.1 mfd. condenser (69) and, on ranges 1, 2 and 3, to the cathode of the valve through a resistance (73), the value of which is given in Table I. This resistance, with the cathode decoupling resistance (62) and volume control potentiometer (57),

forms a potentiometer which brings the stage gain on ranges 1, 2 and 3 into conformity with the gain on the other ranges.

The screen grid of the valve is connected to the H.T. line through a 22,000 ohm resistance (53) and to earth through a 0·1 mfd. condenser (54). The cathode is connected to the slider of the R/F volume control potentiometer (57) through a 200 ohm resistance (62) and to earth through three 0·1 mfd. condensers (63)(64)(65) in parallel.

The injector grid (triode grid and anode strapped together) is connected to the bias line through a 500,000 ohm resistance (66) and to the slider of the 100,000 ohm suppressor control potentiometer (59) through a 50,000 ohm grid stopper resistance (61) and a 0·025 mfd. condenser (60). The potentiometer (59) is connected between the terminal "P" (to which noise suppression voltages are applied from an R.I.S. outfit in ships where one is fitted) and earth.

5. THIRD R/F AMPLIFIER.

The third R/F amplifier stage employs another NR64 valve (4) with the tuned circuit connected between grid and earth. The tuned circuit consists of the secondary winding (71) of the third R/F transformer shunted by one 437·5 mmfd. section (74) of the tuning condenser. In parallel with the tuning condenser are connected the trimming condenser (72) of the range in use and, on ranges 3, 4 and 5, a 50 mmfd. fixed condenser (75).

The anode of the valve is connected to the H.T. line through the primary winding (87) of the fourth R/F transformer, a 10,000 ohm decoupling resistance (84) and a 200 ohm meter shunt resistance (82). The junction of the two resistances is connected to the meter switch. The junction of the winding (87) and the resistance (84) is connected to earth through a 0·1 mfd. condenser (85) and, on ranges 1 and 2, to the cathode of the valve through a resistance (90), the value of which is given in Table I. This resistance, with the cathode decoupling resistance (76) and volume control resistance (57) forms a potentiometer which brings the stage gain on ranges 1 and 2 into conformity with the gain on the other ranges.

The screen grid of the valve is connected to the H.T. supply line through a 100,000 ohm resistance (83) and to earth through another 100,000 ohm resistance (80), which is shunted by a 0·1 mfd. condenser (81).

The suppressor grid of the valve is connected to the cathode through a 100,000 ohm resistance (86), the cathode in turn being connected to the volume control bias line through a 300 ohm resistance (76) and to earth through three 0·1 mfd. condensers (77)(78)(79) connected in parallel. The output of the beat oscillator valve (6) is taken to the suppressor grid of the valve (4) through a 0·002 mfd. coupling condenser (93).

6. DETECTOR.

The detector stage employs an NR64 valve (5) with the tuned circuit connected between grid and cathode. The tuned circuit consists of the secondary winding (88) of the fourth R/F transformer shunted by one 437·5 mmfd. section (91) of the tuning condenser. In parallel with the tuning condenser are connected the trimming condenser (89) of the range in use, and, on ranges 3, 4, and 5, a 50 mmfd. fixed condenser (92).

The anode of the valve is connected to the H.T. supply line through a 50,000 ohm filter resistance (101), 200,000 ohm anode load resistance (100), 50,000 ohm decoupling resistance (98) and 300 ohm meter shunt resistance (97). The two ends of the filter resistance (101) are connected to earth through 0·001 mfd. condensers (102) (103), the junction of the filter and load resistances (101) (100) being connected to the grid of the A/F amplifier valve (7) through a 0·005 mfd. condenser (120) and a 10,000 ohm grid anti-parasitic resistance (123).
The junction of the anode load and decoupling resistance (100) (98) is connected to earth through a 8 mfd. condenser (99), while the junction of the decoupling and meter shunt resistance (98) (97) is connected to the meter switch (144).

The screen grid of the valve is connected to the H.T. supply line through a 2 megohm resistance (104) and to earth through a 0·1 mfd. condenser (105). The suppressor grid is connected to the cathode, which is earthed.

7. BEAT OSCILLATOR.

The beat oscillator stage employs a 6J5G triode valve (6) with tuned circuit connected between grid and cathode and using mutual inductive feed-back to render the circuit self-oscillatory. The tuned circuit consis of secondary winding (107) of the feed-back transformer shunted by one 437·5 mmfd. section (110) of the tuning condenser, in series with which (on range 0 only) is a 0·01 mfd. condenser (109). The tuning condenser is shunted by the trimming condenser (108) of the range in use and, on ranges 3, 4 and 5, a 50 mmfd. fixed condenser (111).

The anode of the valve is taken to the H.T. supply line through a 75,000 ohm load resistance (118), 22,000 ohm decoupling resistance (117) and beat oscillator switch (115). When this switch is in the "OFF" position the anode of the valve is not connected to the H.T. line; the next position, "1", of the switch connects the top of the decoupling resistance directly to the H.T. line, while the third position, "2", connects the top of the decoupling resistance to the H.T. line through a 750,000 ohm resistance (55).

The anode of the valve is also connected to the primary winding (106) of the feedback transformer through a 0·002 mfd. condenser (112), and to the suppressor grid of the 3rd R/F valve (4) through a 0·002 mfd. condenser (93) when the beat oscillator switch is in position "1". Condenser (164) is fitted in FM1 only (see Fig. 1). When the B.F.O. switch is turned to No. 2 position it provides extra capacitive coupling between the B.F.O. and the suppressor grid of the 3rd R/F valve (4).
The primary winding of the feedback transformer is shunted by a 10,000 ohm resistance (159) and a 100 mmfd. condenser (160) in parallel.

The junction of the load and decoupling resistances (118) (117) is connected to earth through a 0·1 mfd. condenser (116).

The grid of the valve is connected to the tuned circuit through a 0·0005 mfd. condenser (113) and to earth through a 100,000 ohm grid leak resistance (114). The cathode of the valve is connected to earth through an undecoupled 1,000 ohm resistance (119), which provides a degree of negative feedback and thus improves the linearity of the oscillator.

8. A/F AMPLIFIER.

The A/F amplifier stage employs a 6V6G tetrode valve (7), the grid of which is fed from the anode of the detector valve through a 0·005 mfd. condenser (120) and a 10,000 ohm grid anti-parasitic resistance (123), the junction of condenser and resistance being connected to earth through a 500,000 ohm resistance (121).

The anode of the valve is connected to the H.T. supply line through the primary winding of the output transformer (125) and a 30 ohm meter shunt resistance (124). The junction of winding and resistance is

connected to the meter switch (144). The anode of the valve is also bypassed to earth by a 0·01 mfd. condenser (129) and is connected to the high resistance speaker terminal through a 0·25 mfd. condenser 130). To the high resistance speaker terminal is connected a potential divider consisting of a 0·005 mfd. condenser (131), a 10,000 ohm resistance (132) and a 5,000 ohm resistance (133), the junction of the two resistances being taken to the "High or Low Resistance Phones" terminal and to the telephone jack (136).

The secondary winding of the output transformer (125) is connected to the "Low Resistance Speaker" terminal and to the internal loudspeaker (135) via the loudspeaker switch (134).

The cathode of the valve is connected to earth through two 750 ohm resistances (126) (127) in parallel, which are shunted by a 25 mfd. electrolytic condenser (128).

9. SENSE VALVE.

The sense valve (1) is a 6J5G triode valve, which is provided to give a current in the sensefinder windings (18) (20) which is in phase with the aerial voltage. These windings are wound on the same former which carries the semi-circular corrector coils (17) (21) so as to be coupled with the latter.

The effect of the sensefinder valve is therefore to introduce into the search coil circuit a current which is in phase or anti-phase with that produced by the signal in the loops, thus giving the usual cardioid characteristic. When the aerial switch (24) is in the "Sense" position the Sense/Search aerial is connected to the grid of the sense valve through a differential condenser (12). The aerial is connected to the moving plates of the condenser, one set of fixed plates being connected to the grid of the valve and the other set of fixed plates being connected to earth. This condenser serves as an input volume control for the sense valve and is labelled "Sense Input".

The grid of the valve is also connected to earth through a 1 megohm grid leak resistance (13), while the cathode is connected to earth through a 1,000 ohm resistance (14) and a 0·1 mfd. condenser (15) in parallel. The anode is connected to the H.T. supply line through the coupling windings (20) (18) of the semi-circular corrector, the aerial switch (24) and a 500,000 ohm decoupling resistance (35). The junction of switch and decoupling resistance is bypassed to earth through a 0·1 mfd. condenser (36).

10. POWER SUPPLY CIRCUITS.

The H.T. and heater supplies for the receiver are derived from a power pack contained in the model and fed from a 230-volt A.C. supply.

The A.C. supply is fed through a double-pole switch (147) and fuses (146) to the primary winding of the mains transformer (142) in series with which is connected the safety switch (148). The switch is broken when the access door on the top of the model is opened.

The transformer (142) has three secondary windings, one of which supplies the heaters of the receiver valves and the dial lights at 6·3 volts; the second supplies the anodes of the 5Z4G rectifier valve (8) while the third supplies the heater of the rectifier valve at 5 volts.

The H.T. supply is smoothed by means of two 8 mfd. electrolytic condensors (139) (140) and a choke (138).

11. VOLUME CONTROL CIRCUITS.

D/F receivers FMA and FMB have a very great reserve of amplification and the output to the telephone jack is therefore deliberately curtailed at a certain power level to avoid aural shock. (If too much gain is used on a strong signal the noise components may reach the same cut-off level as the signal component, swamping the signal. The volume control should therefore be used with discrimination in order to obtain the most favourable signal/noise ratio.

Volume control is effected by means of a potentiometer (57) which varies the R/F gain. The potentiometer has a value of 3,000 ohms and is connected in series with a 100,000 ohm resistance (56) between the H.T. supply line and earth. The slide of the potentiometer is connected to the R/F volume control bias line, to which the cathodes of the second and third R/F valves (3) (4) are returned. The slider is also connected to earth through a 20 mfd. electrolytic condenser (58).

12. TEST METER CIRCUITS.

The test meter (145) mounted at the centre of the tuning scale may be connected by means of the meter switch (144) so as to measure the anode currents of valves (2), (3), (4), (5) and (7), or so as to function as an output meter having two degrees of sensitivity.

In the first five positions of the switch the meter (145) is connected across the meter shunt resistances (38), (67), (82), (97) and (124) of the 1st. R/F, 2nd. R/F, 3rd. R/F, Detector and A/F valves respectively, in series with a 3,000 ohm resistance (141).

In the next position, "Output 1", the meter (145) is connected across the output side of the metal rectifier (137), the A.C. side of which is fed from the anode of the output valve through a 0·25 mfd. condenser (130), a 10,000 ohm resistance (158) and a 5,000 ohm resistance (143) in series. In position "Output 2" of the switch the 5,000 ohm resistance (143) is removed from the circuit, giving a higher sensitivity.

13. INDUCTANCE CORRECTING AND AERIAL SWITCHING UNIT. (See Fig. 15).

The inductance corrector serves to eliminate quadrantal error caused by the ship's magnetic field. Usually the effect of this field is to pull bearings towards the fore and aft line and the inductance corrector is, therefore, normally connected across the fore and aft loop. In some cases, however, (notably Type 15 and modernised CA class frigates, where the loop aerial is not fitted on the centre line) bearings are pulled towards the beam. It is then necessary to transfer the inductance corrector to the port and starboard loop, either by transposing the two pairs of aerial leads at the input and output of the inductance corrector unit, or by transposing the input connections only, and turning the goniometer search coil through 90°. Where these adjustments are necessary, they will be done during initial calibration and a notation will be made in the calibration report. They should not subsequently be altered except as a result of re-calibration.

Note.—Installations in which the inductance corrector has been transferred to the port and starboard loop, should be modified in accordance with Modification No. 2 to D.F. Outfit FM11/12 in B.R. 1917.

(Amendment No. 4.)

position the port and starboard loop is connected and the fore and aft loop is earthed, in the fourth position both loops are earthed.

14. RADIOGONIOMETER S33. (See Fig. 16).

Owing to the small effective height of the loops used with D/F Receivers FMA and FMB the maximum possible amount of energy must be transferred from the loops to the first tuned circuit. For this reason Radiogoniometer S33 has been designed with a very high co-efficient of coupling between the field coils and the search coil.

This is effected by winding the field coils round a core of specially prepared iron dust. The coils are placed very accurately at right angles to each other and are each divided into two sections, the junction between the two sections of each coil being earthed. The field coils are fixed and the search coil, also consisting of two sections with the junction earthed, is revolved around them by adjustment of the knob (11) of the dial bearing indicator.

The dial bearing indicator comprises a cursor moving over two scales graduated in degrees. The inner scale is fixed and is graduated 0-180° RED and GREEN, giving relative bearings. The outer scale is moved by a motor driven from the ship's master gyro compass system and is graduated 0-360° to give true bearings.

15. SENSE AERIAL CIRCUITS.

The sense aerial is connected to a plug located at the right-hand side of the top of the receiver. From the plug a gas-gap lightning arrestor (34) is connected to earth. When the receiver is not in use, the sense aerial may be earthed by means of a switch (32). When the receiver is in use and a W/T transmitter in the ship commences operating, the sense aerial is earthed by means of a relay (33) operated from the transmitter keying circuit. This relay may be disconnected when necessary by means of a switch (31).

" A low pass filter, Filter Unit Design 12, can be inserted in the sense aerial lead to provide protection against transmissions on frequencies above 30 Mc/s, particularly Radar types 79, 279, 281, 960 and variants. (*See* Fig. 19).

A " through connector " adaptor allows the circuit to be completed when the filter unit is not required."

CHAPTER 3.

OPERATION AND TUNING.

1. TUNING.

The procedure for operating the D/F Outfit is as follows:-

(i) Make the A.C. Supply switch (147) located on top of the receiver in the left-hand corner.

(ii) Set the Aerial Switch (24) on the front panel of the receiver to the "SEARCH" position and the semi-circular corrector (19) to its zero position, i.e. upright.

(iii) Set the Inductance Correcting switch (9) to the correct setting for the frequency in use, as stated in the Report of Calibration.

(iv) Set the Range Switch (161) to the required frequency band, as given below:-

Range 0	15 - 30 kc/s. (FMA only)
1	42 - 98 kc/s.
2	90 - 180 kc/s.
3	160 - 320 kc/s.
4	290 - 580 kc/s.
5	530 - 1060 kc/s. (FMB only)

(v) Set the "Het" switch (115) to position "1".

(vi) Set the tuning control (162) to the required frequency as shown on the calibration scale.

(vii) Tune either side of the indicated position until the signal is heard. If the signal received is I.C.W., set the "Het" switch (115) to "OFF", otherwise leave it at position "1".

(viii) Set the volume control (57) to give reasonable signal strength in the telephones. The signal should not be too loud.

(ix) Set the Aerial Switch (24) to the "Loops" position and obtain bearing (or reciprocal) in the usual manner by adjusting the goniometer pointer to a position of minimum signal strength. Increase the setting of the volume control (57) if necessary. Note the gyro and relative bearings, reading from the white pointer if the cam corrector is in use, otherwise from the black pointer.

(x) Set the Aerial Switch (24) to "Sense" (this operation brings in the sense aerial and the strength of signals should increase). See that the Sense Input control (12) is in the working position. If the working position is not known it should be obtained as instructed in para. 2.

(xi) Turn the goniometer pointer clockwise but not more than 90°. If the signal strength decreases when the pointer is rotated clockwise the bearing on which the pointer was trained (i.e., the bearing noted in operation (ix)) is the true bearing. If, however, the signal strength increases the bearing noted is the reciprocal and the goniometer pointer should be turned through 180° from that position and trained on the true bearing before proceeding with the next operation. If the sense indication is poor, check the setting of the sense input control (12) as detailed in para. 2.

(xii) Set the Aerial Switch (24) to the "Corrector" position and adjust the Semi-Circular Corrector control (19) until a well-defined minimum is obtained, keeping the goniometer pointer trained on the true bearing. This procedure will give a well-defined minimum with a blurred reciprocal.

(xiii) Read off the gyro and relative bearings and, if time permits, check the sense.

(xiv) If the Cam Corrector is not being used, apply correction for quadrantal error from the curves provided. (See Note (ii) and Report of Calibration, Para. 17, sub-para. (8)).

Notes:-

(i) The minimum obtained in operation (ix) may be good enough to allow the omission of operation (xii).

(ii) To avoid confusion when applying correction to relative bearings, as opposed to gyro bearings, the following rule is recommended:-

Apply all POSITIVE corrections CLOCKWISE and all NEGATIVE corrections ANTI-CLOCKWISE along the scales concerned, irrespective of whether gyro or relative bearings are being corrected.

It should be noted that the sign of the correction given by the curves is arranged for application direct to the gyro reading. If the gyro is out of action and relative bearings are being reported, the sign of the "RED" correction must be reversed if the correction is to be applied numerically. The rule recommended above makes it unnecessary to reverse the sign.

2. PROCEDURE FOR OBTAINING WORKING POSITION OF SENSE INPUT CONTROL.

(i) Set the Aerial switch (24) to the "~~Loops~~" position and train the goniometer pointer on the true bearing.

(ii) Switch to "Sense" and turn the goniometer pointer 90° in a clockwise direction.

(iii) Adjust the sense input control until the signal strength is a minimum. If the goniometer pointer was trained on the reciprocal bearing in (i) above, no sense minimum will be found and the goniometer pointer should be turned through 180°. The sense minimum is very pronounced and it is not likely to be confused with normal variations in signal strength caused by adjusting the Sense Input Control. The adjustment is fairly critical, but once it is obtained no change is required unless a large change in frequency is made.

3. PROCEDURE FOR OBTAINING SNAP BEARINGS.

When taking bearings of a station which has already been tuned in and which is only working for short periods, the Aerial switch (24) may be left in the "Corrector" instead of the "Search" or "Loops" position, thereby reducing the number of switch movements. Care should be taken to see that the semi-circular corrector (19) is set to its zero position, i.e. upright, when not in use.

ANODE VOLTAGES (± 15%) TO EARTH.

Valve	Anode Resistance		Volume Control	
	Item No.	Value (ohms)	Maximum	Minimum
1st R/F.	39	10,000	214	219
2nd R/F.	68	10,000	215	262
3rd R/F.	84	10,000	216	261
Detector	98, 100, 101	314,000	55	56
Het.	117, 118	97,000	56	58 Sw. Pos'n "1"
A/F.	125	Transformer	255	262
Sense	35	470,000	-	-

SCREEN VOLTAGES (±15%) TO EARTH.

Valve	Screen Resistance		Volume Control	
	Item No.	Value (ohms)	Maximum	Minimum
1st R/F.	37	100,000	56	57
2nd R/F.	53	22,000	87	94
3rd R/F.	83	100,000	59	110
Detector	104	2·2 megohms	-	-
Het.	-	-	-	-
A/F.	122	220	266	273

The above voltages are measured from the appropriate valve pin to earth. Figure 4 shows the pin connections for the various valves used in the set.

3. GYRO MOTOR AND CONDENSER UNIT.

It is of great importance that the mechanical system of the gyro drive to the Dial Bearing Indicator be kept clear of dust and dirt. Gearing should be lubricated at intervals with light oil. The correct indication of gyro bearing depends on careful maintenance.

In certain classes of ships the gyro motor (157) will have to be changed and a universal 2BA box spanner will be found fitted in the tool box to facilitate the removal of the three motor securing bolts. Provision has been made for fitting either a three-wire or four-wire motor. If a three-wire system is used, the motor leads should be connected to terminals 1, 2 and 3, of the gyro motor switch (156) which is fitted at the left-hand side of the receiver. If a four-wire system is used, the one odd coloured wire should be secured under terminal 4, the three similarly coloured wires being connected to terminals 1, 2 and 3. A check must be made to ensure that the direction of rotation of the motor is correct. If the direction is incorrect, any two of the leads connected to terminals 1, 2 and 3 must be reversed in position.

When a four-wire motor is fitted, a resistance must be fitted

in the gyro filter unit in place of the link used when a three-wire motor is used. The resistance is fitted to the right-hand cover plate for use when required. When it is used, the link is fitted to the cover plate.

4. ADJUSTMENT OF SEMI-CIRCULAR CORRECTOR.

The 100 mmfd. preset condenser (16) in the semi-circular corrector circuit is accessible under a small circular cover plate at the bottom left-hand side of the front panel. This condenser is accurately adjusted at installation, but if it is found necessary to readjust this control at any time, the following procedure should be adopted:-

(a) Inject a signal at about 40 kc/s and tune the receiver to this frequency.

(b) With the semi-circular corrector knob (19) at its central position (pointer vertical), adjust the goniometer to the minimum position.

(c) Set the semi-circular corrector knob to maximum correction in either direction and increase the injected signal until the reading on the output meter can be accurately observed. Note this reading.

(d) Turn the corrector knob back to the central position and rotate the goniometer until the same output is indicated. The angle through which the goniometer must be rotated should not exceed 4° at 40 kc/s. If this is exceeded, the preset condenser (16) should be adjusted.

In certain classes of ship fitted with D/F Receiver FMA, it may not be possible to obtain the above condition. Provision has therefore been made for short-circuiting the condenser (16). This is done by rotating the condenser control fully in the anti-clockwise direction, when the vanes will make contact with a short-circuiting strip, and locking the control in this position.

The lock nut must always be loosened before adjustment of the condenser and re-tightened after the adjustment has been made.

5. RETRIMMING HETERODYNE (BEAT OSCILLATOR CIRCUIT).

If the heterodyne (beat oscillator) valve (6) is changed at any time and is replaced by a valve of different type (Osram L63) to that originally fitted (6J5G), the following procedure is to be carried out:-

(a) Set range switch (161) to Range 5 (Range 4 in case of FMA).

(b) With the beat oscillator "OFF", tune in a modulated carrier or broadcast station having a frequency as near the top of the band as possible. The input to the receiver should be kept small (by using loops and radiogoniometer) in order that the receiver may be tuned exactly to the centre of the carrier.

(c) Switch on the beat oscillator.

(d) Slacken off locking ring of trimming condenser (108) and adjust the condenser to give a beat note of approximately 600 c/s. The adjustment should be such that the beat oscillator frequency is higher than that of the signal. This may be checked as follows:-

Turn the tuning control (162) towards the lower frequencies, when the pitch of the beat note should become higher.

(e) Now find a modulated carrier as near the bottom end of the band as possible.

(f) Switch off beat oscillator.

(g) Tune exactly to centre of carrier wave.

(h) Switch on beat oscillator.

(j) Adjust beat oscillator inductance (107), first slacking off the locking nut, to obtain a beat note of approximately 600 c/s. As before, the beat oscillator should be higher in frequency than the signal.

(k) Return to the higher frequency end of the band and re-trim the condenser (108). See that the locking ring is made tight without disturbing the adjustment.

(l) Return to the low-frequency end of the band and, if necessary, readjust the inductance trimmer. See that the locking nut is made tight without disturbing the adjustment of the trimmer.

(m) Repeat the above procedure on the remaining ranges, remembering that:-

(i) Capacity trimmer must be set near the high frequency end of the band.

(ii) Inductance trimmer must be set near the low frequency end of the band.

(iii) Beat oscillator frequency must be approximately 600 c/s higher than the carrier frequency.

(iv) Trimmers must be locked without disturbing the correct adjustment.

6. SWITCH MAINTENANCE.

A bottle of switch cleaning fluid (carbon tetrachloride) is provided in the receiver. If a switch develops high resistance due to dirty contacts, a little of the fluid should be applied to the contacts by means of the brush, the switch being operated meantime.

ON NO ACCOUNT must emery paper or files be used for the purpose of cleaning switch contacts.

7. ROUTINE TESTS.

Periodical tests should be carried out to ensure the correct functioning of the apparatus. A list of tests is given below and, while no arbitrary rule can be laid down to state how often the tests are required, they should, in general, be applied in accordance with column (f).

All the tests must be carried out immediately prior to calibration.

When Test No. 1 is carried out on installation, while the fitting-out specification is available, the position of cables, rigging etc., should be carefully noted for further reference when this test is to be made and the specification is not available.

No.	(a)
1.	✓ ✓
2.	✓ ✓
3.	✓ ✓
4.	✓
5.	

No.	Test	Fault	Cause	Remedy	To be carried out
(a)	(b)	(c)	(d)	(e)	(f)
1.	Examine aerials and rigging in vicinity of the D/F coil and confirm that it is in accordance with Spec. Check D/F frames so that one coil is exactly fore and aft as seen from forecastle or quarter deck.	Items not in accordance with Spec.	Faulty installation.	Correct as far as possible and call attention to points that cannot be rectified.	Monthly.
2.	Test insulation resistance of each frame aerial circuit to earth with a megger. (This measurement should be taken at the input terminals of Receiver by unscrewing the plugs marked F.A., P.S. Take measurement across one side of each loop and earth with other side of loop isolated).	Insulation resistance less than 20 megohm.	Probably connecting box or bad soldered joint on plug connecting loop aerials to receiver.	Remake soldered joints in connecting box or replace short "Telcon" leads if necessary.	Weekly.
3.	Test insulation of sense aerial to earth with a megger. (This is carried out by unscrewing the plug marked "Sense" and connecting megger between plug and earth.)	Insulation resistance less than 20 megohm.	Probably junction box or aerial insulators.	Clean aerial insulators and inside of junction box.	Weekly.
4.	Measure the ohmic resistance of each frame aerial circuit with bridge megger to two decimals. (This measurement should be taken at input terminals of Receiver by unscrewing the plugs marked F.A., P.S. and measuring across the plugs themselves.	Difference in resistance exceeding .5 ohm.	Broken wire or insulation in loop, broken cable or faulty soldered joint in connecting box or the leads running from connecting box to plugs.	Localise fault by test and renew defective part.	Monthly.
5.	Measure the ohmic resistance of the field coil windings of the goniometer. (Unscrew plugs of input terminals from frame coil marked F.A.,P.S., turn the "loops" switch to No. 1 position (F.A., P.S. connected), turn the "corrector" switch to No. 1 position (this last operation disconnects the inductance correcting coil from the loops). Test by connecting bridge megger across the appropriate sockets from which F.A., P.S. plugs have been removed.) (Measure ohmic resistance of the search coil by removing lower half of front panel, unscrewing the plugs coloured yellow and uncoloured and measure resistance across the plugs.)	High resistance and greater than following figures Goniometer S33 Field Coil 0·3 ohms. Search Coil 2·0 ohms.	Broken or imperfect contacts in input terminal sockets. Broken or defective leads or plugs from sockets to inductance correcting box. Imperfect contacts or soldered joints in "loops" switch.	Disconnect at the various points to localise the fault and replace defective part. If bad contact in "loops" switch, clean with fluid provided as laid down in Handbook.	Monthly.

No.	Test.	Fault	Cause	Remedy	To be carried out
(a)	(b)	(c)	(d)	(e)	(f)
5. (cont'd).				Imperfect contact leads or soldered joints in "Telcon" cables from inductance correcting unit to field coil input terminals	
6.	Test Receiver by receiving signals on all ranges.	No signals or intermittent or weak reception.	Defective receiver or associated apparatus.	Make sure that all leads have been correctly connected. Test on meter switch that all valves are functioning, that switches are in correct positions as indicated in Handbook. Make sure that turret coil contacts are clean and making contact, that speaker if being used is switched "on". N.B. Coil Trimmers should on no account be interfered with. From the above it should be possible to localise the fault and defective part or valve replaced.	Weekly.
7.	Test Receiver. Rotate Goniometer pointer while receiving signals.	Poor or noisy reception.	Bad valve connections or imperfect contacts at the slip rings of search coil.	Make sure that the joints and leads from search coil of goniometer to sense box are correctly made, soldered and fitted. Test for faulty valve and if necessary, remove cover from Goniometer, clean rotating contacts and smear lightly with vaseline oil.	Weekly.
8.	Test Sensofindor on known station. (This should be checked on H/F end of range).	Impossible to obtain satisfactory sense or sense reversed at high frequencies.	Defective valve, unsuitable sense aerial or defective leads to Goniometer. Sense aerial switch in "off" position.	Replace sense valve with new valve, vary the length of the sense aerial. Test for defective leads to Goniometer (particularly look for dry soldered joints on plugs).	Monthly.

No.	Test.	Fault.	Cause.	Remedy.	To be carried out.
(a)	(b)	(c)	(d)	(e)	(f)
9. ✓	Test semi-circular corrector, (Break frame aerial circuit by turning the "loops" switch to No. 4 position. (F.A., P.S. earthed.) Turn the "aerial" switch to the "CORR" position (in this position the sense aerial is connected to the semi-circular corrector)).	No signals heard or minimum not observed when knob marked "Semi-Circ. Corr." is turned to the mid-point position.	Sense aerial switch in "off" position. Lead disconnected or broken between input terminal and sense box. "Loops" switch situated in sense box not making contact. Wire disconnected from or shorting to earth on ball rotor of semi-circular corrector.	Test appropriate leads for OC or SC. Test continuity of ball rotor. Repair if necessary. If faulty contact in switch, clean with fluid provided as laid down in Handbook.	Monthly.
10. ✓	Line up the Goniometer. (a) Break the P.S. aerial circuit by turning the "loops" switch to No. 2 position (F.A. connected, P.S. earthed). Break the sense aerial circuit by placing the switch marked "sense aerial" in the "off" position. Receive a strong signal on the F.A. frame aerial. Set goniometer pointer so that one zero is at 0° on the inner scale.	Reciprocal zero, not at 180°.	Defective Goniometer.	Replace Goniometer with new one.	Monthly.
	(b) Break the F.A. aerial circuit by turning the "loops" switch to No. 3 position (F.A. earthed, P.S. connected). Break the sense aerial circuit as in (a) and receive signals on P.S. frame aerial.	Zeros not at 90° Red and Green.	Defective Goniometer.	Replace Goniometer with new one.	
11. ✗	Test for sense. Take approximate bearing of suitable station. (Not B.B.C.). At least two bearings should be taken, one approximately 950 kc/s and the other approximately 160 kc/s.	Reversed or unreliable sense.	Possibly wrong value of ship's head. Loop aerials or leads wrongly connected between input terminals and goniometer giving bearing in wrong quadrant. Another aerial near to D/F coil tunes to same frequency.	Check ship's head. Trace and check leads from frame coils to Goniometer. Isolate aerial.	Weekly.

No.	Test.	Fault.	Cause.	Remedy.	To be carried out.
(a)	(b)	(c)	(d)	(e)	(f)
12.	Test Gyro Repeater, e.g. by causing the master gyro to be turned slowly through 360°, first clockwise then anti-clockwise. While this test is being carried out, listen in headphones for any interference from the gyro system at different frequencies. Make sure that the knob marked "gyro reset" disengages freely from the bevel gears.	Lost motion between master and repeater i.e. failure to keep in step. Intermittent clicks heard in headphones while gyro system is working.	Bevel or worm gears meshing too tightly. Dry spindle or undue friction in bearing supporting bevel gear spindle. Imperfect transmission from the master gyro or defect in repeater motor. "Gyro reset" control not disengaging. Screen of wiring to gyro repeater motor incorrectly earthed. Dry joint in smoothing condenser of gyro filter unit.	Set worm gear to give approximately ¼° backlash on the rotating scale. Ease bevel gears to rotate freely without unduebacklash. Oil spindle of "gyro reset" control. Report other defects to the department in charge of gyros.	Weekly.
13.	Test R.I.S. with Radar transmitter working.	Interference still continues. Pilot light on phase control unit does not show.	Fuses in phase control unit blown. A.C. not made in Radar office.	Check fuses and wiring, renewing where necessary.	As necessary.

D.F. RECEIVERS FMA AND FMB

TEST VOLTAGES

These readings are for an H.T. line voltage of 275 volts.

For convenience the voltages quoted are at the valve holder pins with the valve removed. This enables the test to be made without dismantling the set. The volume control should be set to its minimum position.

Other voltage readings are given on pages 15 and 16.

TEST POINT	Pattern 47A Avometer		Pattern 32144 Model 7X Avometer		Pattern 67921 CT 54 Valve Voltmeter	
	Range	Reading	Range	Reading	Range	Reading
Valve 1 Anode	1200	75	1000 ÷ 2	160	480	—
Valve 2 Anode	1200	260	1000 ÷ 2	270	480	275
Valve 2 Grid 2	1200	100	1000 ÷ 2	120	240	140
Valve 3 Anode	1200	260	1000 ÷ 2	270	480	275
Valve 3 Grid 2	1200	240	1000 ÷ 2	265	480	275
Valve 4 Anode	1200	260	1000 ÷ 2	270	480	275
Valve 4 Grid 2	1200	100	1000 ÷ 2	120	240	140
Valve 5 Anode	1200	105	1000 ÷ 2	165	480	265
Valve 5 Grid 2	1200	19	1000 ÷ 2	50	480	260
Valve 6 Anode (BFO Switch Pos. 1).	1200	170	1000 ÷ 2	225	480	275
Valve 6 Anode (BFO Switch Pos. 2).	1200	40	1000 ÷ 2	90	480	265
Valve 7 Anode	1200	275	1000 ÷ 2	275	480	270
Valve 7 Grid 2	1200	275	1000 ÷ 2	275	480	275

Note

(1) On low impedance test points, very little difference in voltage will be found between the three types of meter.

(2) On high impedance test points, very large differences in voltage will be found. In this case it is preferable to use the meter with the highest resistance (i.e. preferred order, CT 54, Model 7X, Pattern 47A).

(3) When available, Avometer Model 8 SX and Pattern 12945 Avometer can be used. On d.c. the voltages obtained will be similar to those for the CT 54. On a.c. the readings will be similar to those obtained on the Model 7X Avometer.

D.F. RECEIVERS FMA AND FMB

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Valve 2 Anode	1200	260	1000 ÷ 2	270	480	275
Valve 2 Grid 2	1200	100	1000 ÷ 2	120	240	140
Valve 3 Anode	1200	260	1000 ÷ 2	270	480	275
Valve 3 Grid 2	1200	240	1000 ÷ 2	265	480	275
Valve 4 Anode	1200	260	1000 ÷ 2	270	480	275
Valve 4 Grid 2	1200	100	1000 ÷ 2	120	240	140
Valve 5 Anode	1200	105	1000 ÷ 2	165	480	265
Valve 5 Grid 2	1200	19	1000 ÷ 2	50	480	260
Valve 6 Anode (BFO Switch Pos. 1).	1200	170	1000 ÷ 2	225	480	275
Valve 6 Anode (BFO Switch Pos. 2).	1200	40	1000 ÷ 2	90	480	265
Valve 7 Anode	1200	275	1000 ÷ 2	275	480	270
Valve 7 Grid 2	1200	275	1000 ÷ 2	275	480	275

Note

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(2) On high impedance test points, very large differences in voltage will be found. In this case it is preferable to use the meter with the highest resistance (i.e. preferred order, CT 54, Model 7X, Pattern 47A).

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LIST OF IDENTITY NUMBERS.

No.	Description.	Admiralty Patt. No.	
1	Octal Base Valveholder (Valve 6J5G Patt. CV1067)	W1645	
2	" " " (CV1100 NR64 Patt. CV1281)	"	
3	" " " (" 6K8G Patt. CV1944)	"	
4	" " " (" NR64 Patt. CV1281)	"	
5	" " " (" NR64 Patt. CV1281)	"	
6	" " " (" 6J5G Patt. CV1067)	"	
7	" " " (" 6V6G Patt. CV509)	"	
8	" " " (" 5Z4G Patt. CV1863)	"	
9	Inductance Corrector.		
10	"Oak" type switch (2 bank)	W6934	
11	Radiogoniometer, S.33		
12	Condenser 200 mmfd.	W5553	
13	Resistance 1 megohm.	W2764	
14	Resistance 1000 ohms.	W2754	
15	Condenser 0·1 mfd. 350v. D.C.	W1278	
16	Condenser 100 mmfd.	W4866	
17	Coil Semi-circular corrector.		
18	" " " "		
19	" " " "		
20	" " " "		
21	" " " "		
22	Condenser 75 mmfd.	W6139	
23	Condenser ·002 mfd.	W2986	
24	"Oak" type switch (4 bank)	W6935	
25a - 25f	Coils, turret		
26a - 26f	" "		
27a - 27f	Condenser, Preset	W1277	R.F.1.
28a - 28f	Condenser 10 mmfd.	W2822	
29d	Condenser 30 mmfd.	W2825	
29e	Condenser 25 mmfd.	W5568	
29f	Condenser 15 mmfd.	W2824	
30	Condenser, Variable. (Part of 3-gang)	W1276	
31	Switch S.P. One Way.	W2046	
32	Switch S.P. Two Way.	W5571	
33	Relay	1694	
34	Gas Gap	8431	
35	Resistance 0·47 megohms.	W2726A	
36	Condenser 0·1 mfd.	W1278	
37	Resistance 100,000 ohms.	W1549	
38	Resistance 200 ohms.	W6874	
39	Resistance 10,000 ohms.	W1544	
40	Condenser 0·1 mfd.	W1278	
41	Resistance 300 ohms.	W6875	
42	Condenser 0·1 mfd.	W1278	
43	" " "	"	
44	" " "	"	
45	Resistance 100,000 ohms.	W1549	
46	Condenser 0·1 mfd.	W1278	
47a - 47f	Coils, Turret.		R.F.2.
48a - 48f	" "		
49a - 49f	Condenser, preset.	W1277	
50a - 50d			
51	Condenser, Variable. (Part of 3-gang)	W1276	
52	Condenser 50 mmfd.	W3316	
53	Resistance 22,000 ohms, 1 watt.	W3056	
54	Condenser 0·1 mfd.	W1278	
55	Resistance 750,000 ohms.	W6881	

No.	Description.		Admiralty Patt. No.	
56	Resistance 100,000 ohms.		W2746	
57	Potentiometer 3000 ohms.		W5556	
58	Condenser 20 mfd.		760	
59	Potentiometer 100,000 ohms.		W3978	
60	Condenser 0·025 mfd.		W5554	
61	Resistance 47,000 ohms.		W2758A	
62	Resistance 200 ohms.		W6874	
63	Condenser 0·1 mfd.		W1278	
64	" " "		"	
65	" " "		"	
66	Resistance 470,000 ohms.		W2762A	
67	Resistance 300 ohms.		W6875	
68	Resistance 10,000 ohms.		W1544	
69	Condenser, 0·1 mfd.		W1278	
70a - 70f	Coils, Turret			R.F.3.
71a - 71f	" "			
72a - 72f	Condenser, preset		W1277	
73a - 73c				
74	Condenser, variable.	(Part of 3-gang)	W1276	
75	Condenser 50 mmfd.		W3316	
76	Resistance 300 ohms.		W6875	
77	Condenser 0·1 mfd.		W1278	
78	" " "		"	
79	" " "		"	
80	Resistance 100,000 ohms.		W1549	
81	Condenser 0·1 mfd.		W1278	
82	Resistance 200 ohms.		W6874	
83	Resistance 100,000 ohms.		W1549	
84	Resistance 10,000 ohms.		W1544	
85	Condenser 0·1 mfd.		W1278	
86	Resistance, 100,000 ohms.		W1549	
87a - 87f	Coils, Turret.			DET.
88a - 88f	" "			
89a - 89f	Condenser, preset		W1277	
90a - 90b				
91	Condenser, variable.	(Part of 2-gang)	W5577	
92	Condenser 50 mmfd.		W3316	
93	Condenser 0·002 mfd.		W2986	
94	Condenser 0.0005 mfd.		W2574	
95	Condenser 30 mmfd.		W2825	
96	Resistance 2·2 meg.		W2765A	
97	Resistance 3,000 ohms.		W6879	
98	Resistance 47,000 ohms.		W2758A	
99	Condenser 8 mfd.		W5567	
100	Resistance 220,000 ohms.		W6877	
101	Resistance 47,000 ohms.		W2758A	
102	Condenser 0·001 mfd.		W4959	
103	Condenser 0·001 mfd.		W4959	
104	Resistance 2·2 meg.		W2765A	
105	Condenser 0·1 mfd. 350v. D.C.		W1278	
106a - 106f	Coils, turret			RET.
107a - 107f				
108a - 108f	Condenser, preset.		W1277	
109a	Condenser 0·01 mfd.		W3491	
110	Condenser, variable.	(Part of 2-gang)	W5577	

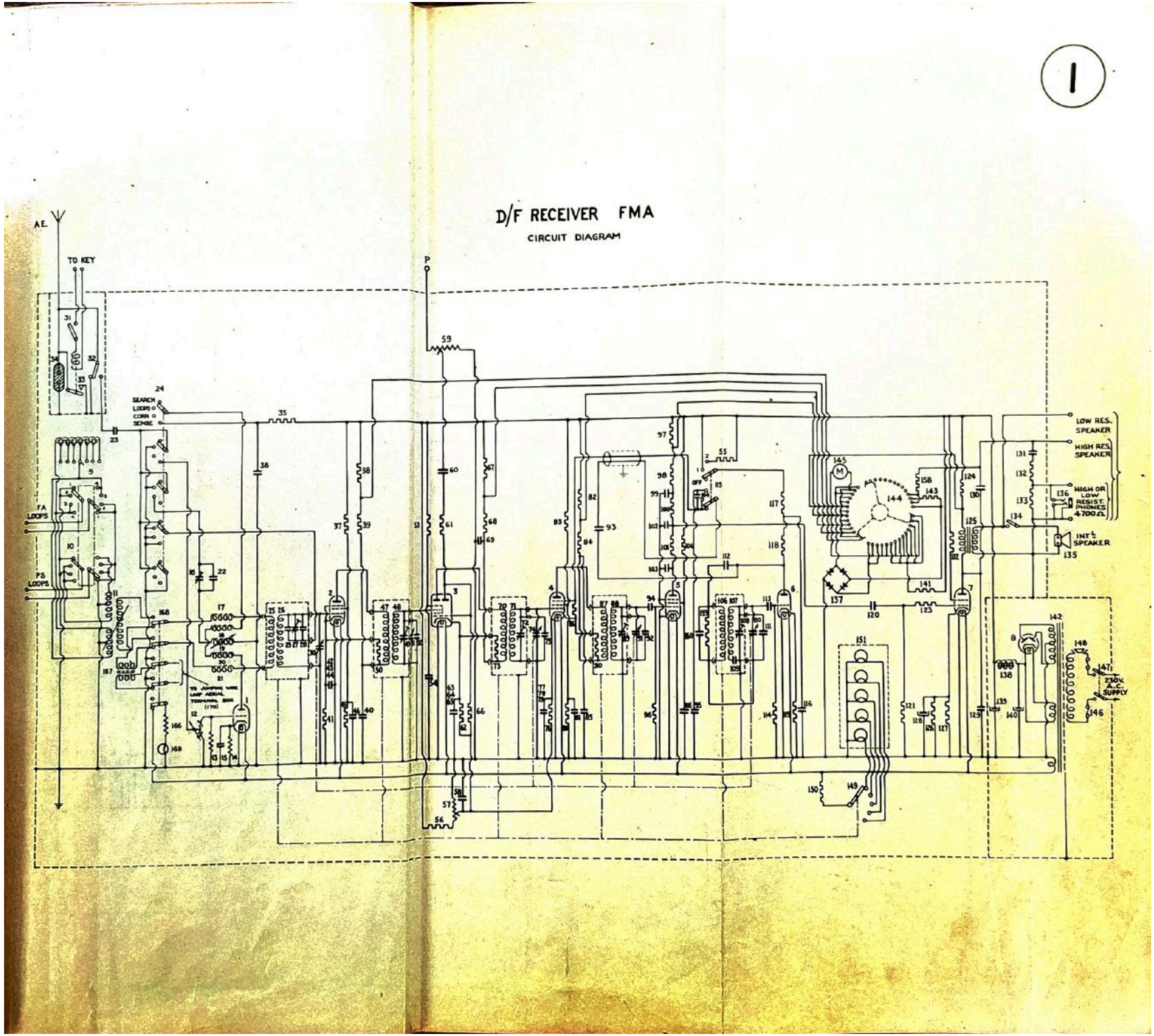
No.	Description.	Admiralty Patt. No.	
111	Condenser 50 mmfd.	W3316	
112	Condenser 0·002 mfd.	W2986	
113	Condenser 0·0005 mfd.	W2574	
114	Resistance 100,000 ohms.	W1549	
115	Switch "Oak" Type (one bank).	W6685	
116	Condenser 0·1 mfd.	W1278	
117	Resistance 22,000 ohms.	W3676A	
118	Resistance 75,000	W6880	
119	Resistance 1,000 ohms.	W6878	
120	Condenser 0·005 mfd.	W973	
121	Resistance 470,000 ohms.	W2762A	
122	Resistance 220 ohms.	W1542A	
123	Resistance 10,000 ohms.	W1544	
124	Resistance 30 ohms.	W6882	
125	Transformer (speaker).	W5064	
126	Resistance 750 ohms.	W4064	
127	Resistance 750 ohms.	W4064	
128	Condenser 25 mfd.	W6461	
129	Condenser 0·01 mfd.	W2813	
130	Condenser 0·25 mfd.	W3447	
131	Condenser 0·005 mfd.	W973	
132	Resistance 10,000 ohms.	W1544	
133	Resistance 4,700 ohms.	W4149A	
134	Switch S.P. one-way.	W2046	
135	Speaker (internal)		
136	Jack.	676	
137	Rectifier.	W3557	
*138	Choke.	6077 or W5803	
139	Condenser 8 mfd. or 16 mfd.	W5567 or W5205	
140	Condenser 8 mfd.	W5567	
141	Resistance 3,000 ohms.	W6879	
142	Transformer (Mains)	W5558	
143	Resistance 4,700 ohms.	W4149A	
144	Meter Switch	6110	
145	Meter	W5775	
146	Fuses	W4529	
147	Switch D.P. one-way	W1367	
148	Door Switch	W5980	
149	Switch S.P. 5-way		
150	Resistance 7 ohms ½ watt (overwound)		
151	Lamp Box.		
152	Condenser 4 mfd.	W4427	
153	" " "	"	
154	" " "	"	
155	Link or resistances 7058 and W314		
156	Barrel Type Switch		
157	Gyro Motor	7487	
158	Resistance 10,000 ohms.	W1544	
159	Resistance 10,000 ohms.	W1544	
160	Condenser 100 mmfd.	W2985	
161	Range Switch		
162	Tuning Control		
163	Gyro Reset		
164	Condenser 30 mmfd.	W2825	These items are used on FMA only.
165	Matching Transformer Unit.		
166	Resistance	117	
167	Transformer		
168	Matching Transformer Switch		
169	Warning Lamp		
170	Terminal Box		

*NOTE

When choke (Patt. 6077) is used, item 139 is an 8 mfd. condenser (Patt. W5567). When choke (Patt. W5803) is used, item 139 is then a 16 mfd. condenser (Patt. W5205).

D/F RECEIVER FMA

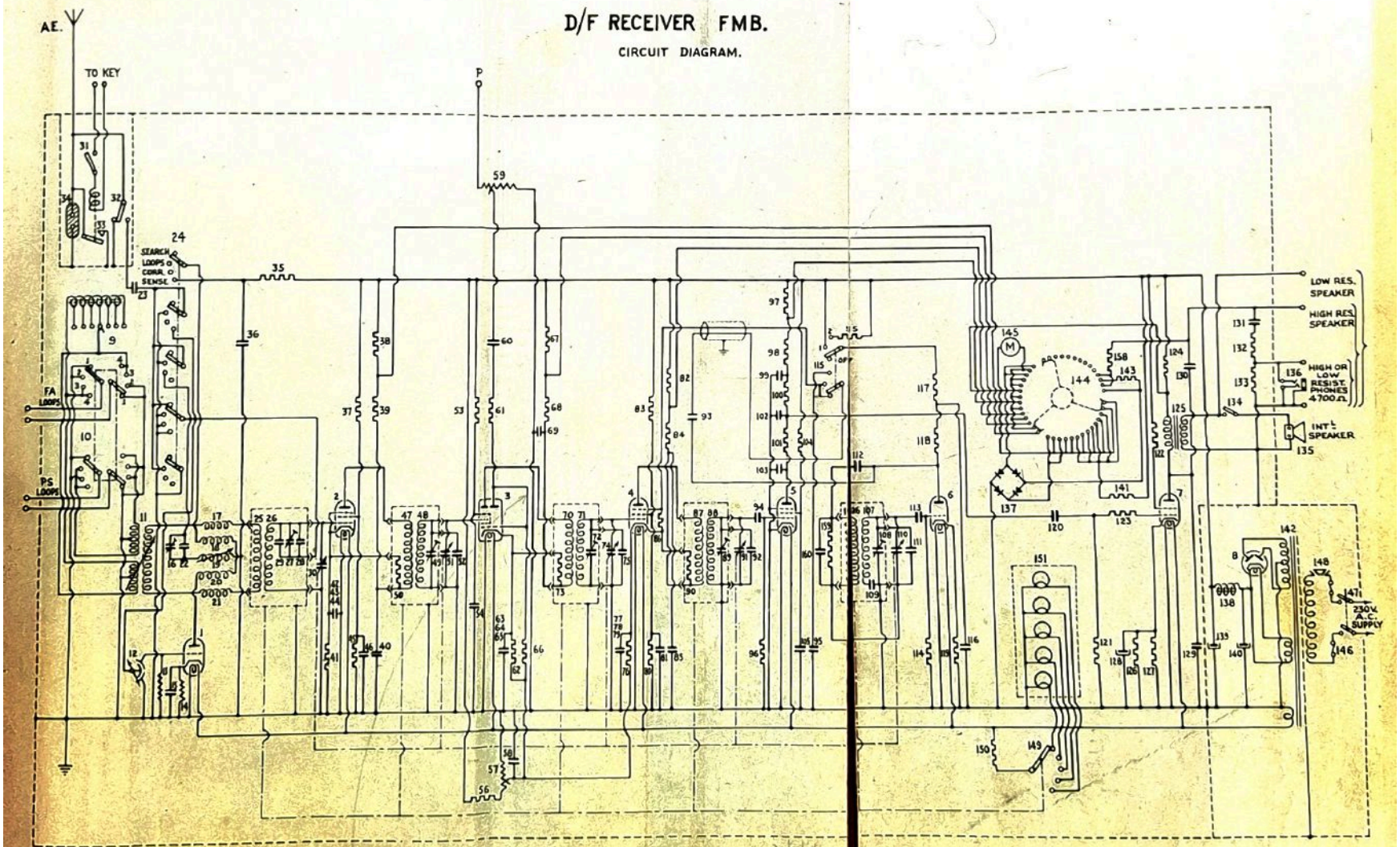
CIRCUIT DIAGRAM



1 A

D/F RECEIVER FMB.

CIRCUIT DIAGRAM.

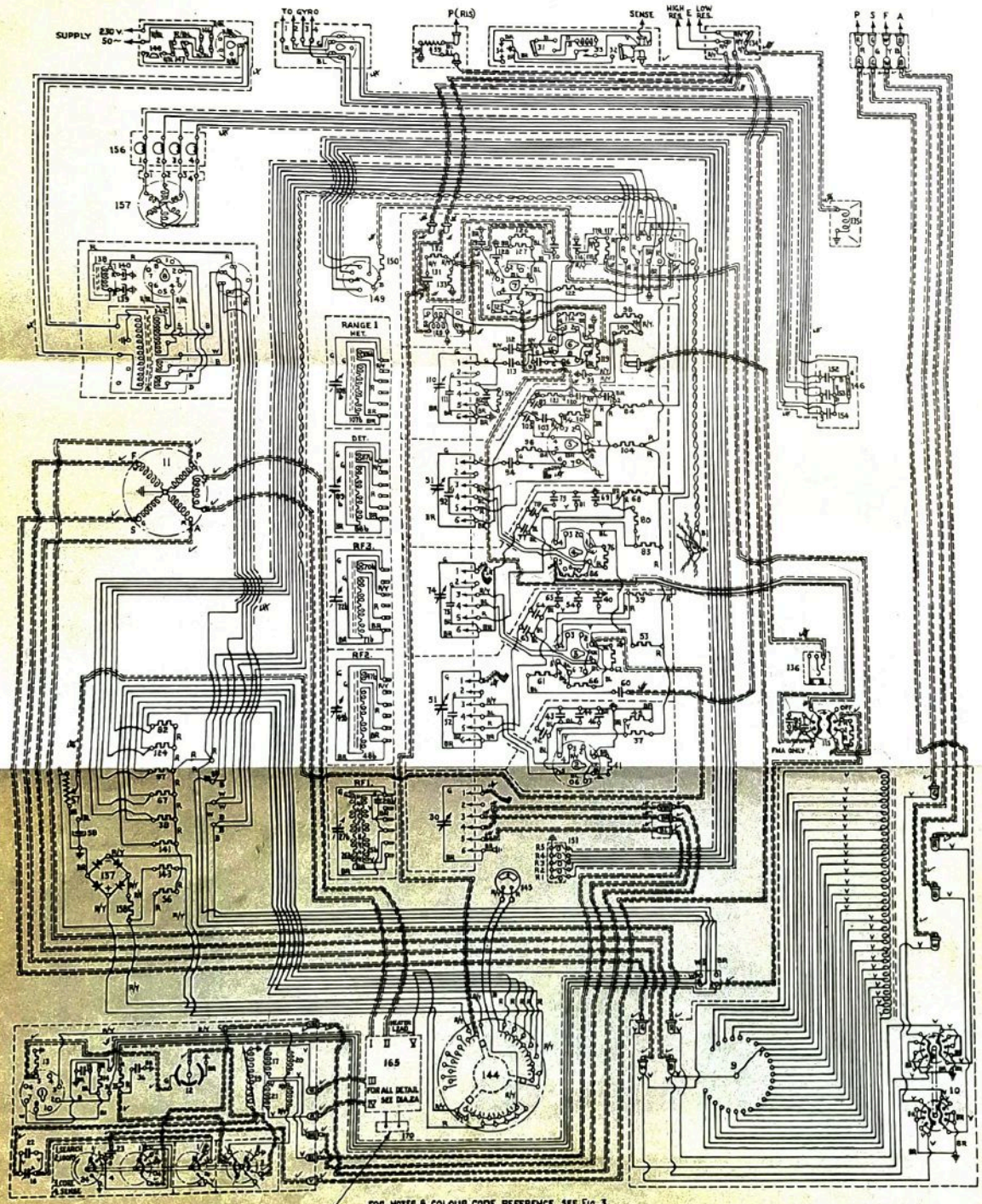


D/F RECEIVERS FMA & FMB.

WIRING DIAGRAM

VIEW LOOKING AT TOP & FRONT OF INSTRUMENT

(RANGE 1 ONLY)



FOR NOTES & COLOUR CODE REFERENCE SEE Fig. 3.

FOR VALVE BASE CONNECTIONS SEE Fig. 4.

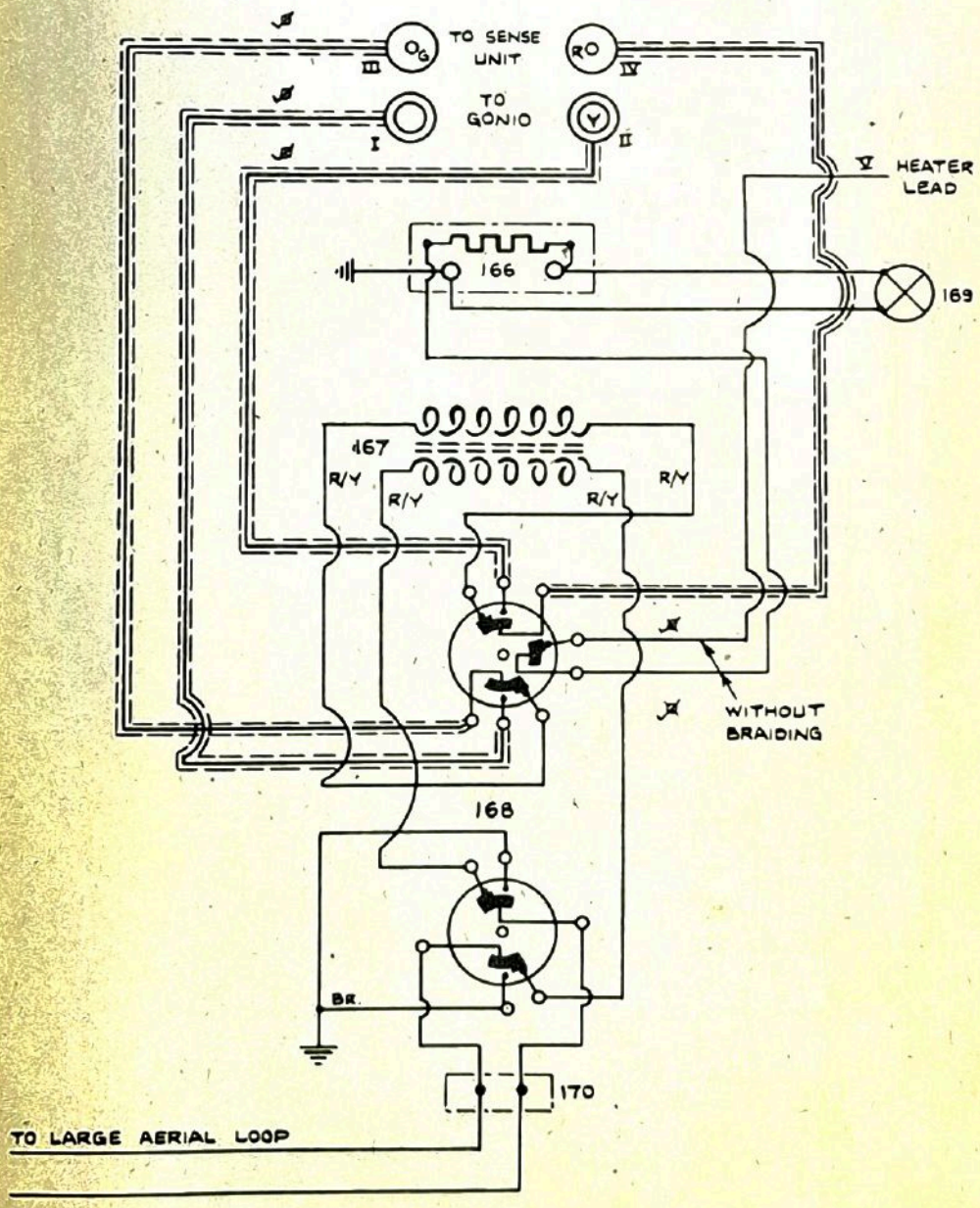
NOTE:- ITEMS 165 TO 170 ARE USED ONLY ON FMA. ON FMB THE CONNECTIONS ARE MADE DIRECT FROM SENSE UNIT TO RADIOGONIOMETER.

2A

D/F RECEIVER FMA.

WIRING DIAGRAM

DETAIL OF MATCHING TRANSFORMER UNIT (ITEM 165)



FOR NOTES & COLOUR CODE REFERENCE SEE FIG. 3

D/F RECEIVERS F.M.A., F.M.B

NOTES

1. ✓ CONNECTIONS DENOTED THUS ARE MADE WITH PATT. 13819 CABLE
   - ✓ " " " " " " PATT. 9084 "
   - ✓ " " " " " " PATT 9085 "
   - ✓ " " " " " " PATT 7699 "
   - ✓ " " " " " " 20 S.W.G. (0·036" DIA.)

   H.C TINNED COPPER WIRE COVERED WITH "LOW LOSS" SLEEVING AND SCREENED WITH TINNED COPPER BRAIDING.

   ✓ CONNECTIONS DENOTED THUS ARE MADE WITH A FLEXIBLE CABLE, 14/·0076" DIA., H.C TINNED COPPER WIRE COVERED WITH "LOW LOSS" SLEEVING AND SCREENED WITH TINNED COPPER BRAIDING

   ALL OTHER CONNECTIONS ARE MADE WITH 18 S.W.G. (0·048" DIA.) H.C. TINNED COPPER WIRE COVERED WITH CAMBRIC INSULATING TUBING, SUITABLE FOR USE IN TROPICAL CLIMATES, COLOURED AS INDICATED. SEE COLOUR REFERENCE.

   ⟋⟋⟋⟋⟋⟋⟋ INDICATES LEADS LIGHTLY TWISTED TOGETHER.

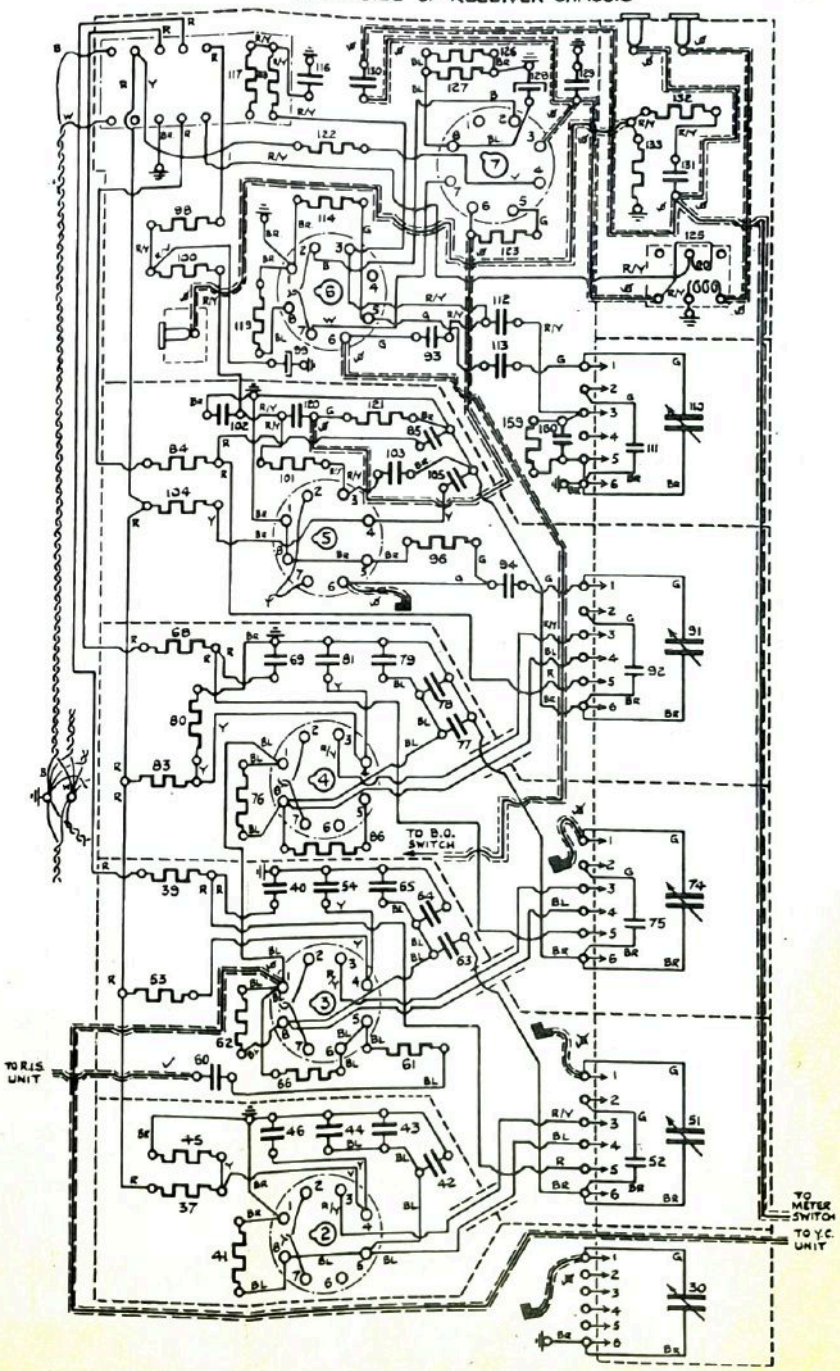
2. DOTTED LINES ------ INDICATE SCREENING

3. LETTERS SHOWN INSIDE CONNECTIONS THUS (BR) INDICATE ENAMELLED COLOURS ON SOCKETS, ETC., CODED AS FOLLOWS :-
   R-RED, G-GREEN, W-WHITE, B-BLACK, V-VIOLET, Y-YELLOW, BR-BROWN, BL-BLUE.

COLOUR REFERENCE.

R/BL	INDICATES	RED AND BLUE
R/Y	"	RED AND YELLOW
R	"	RED
BL	"	BLUE
Y	"	YELLOW
G	"	GREEN
V	"	VIOLET
BR	"	BROWN
B	"	BLACK
W	"	WHITE

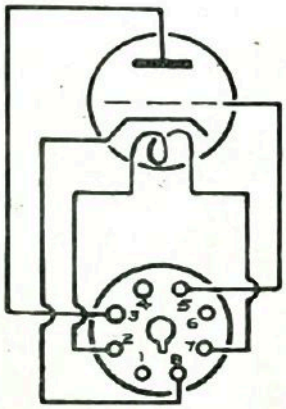
WIRING DIAGRAM
VIEW OF UNDERSIDE OF RECEIVER CHASSIS



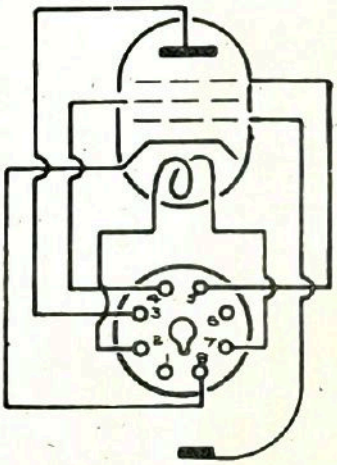
D/F RECEIVERS FMA & FMB

VALVE BASE CONNECTIONS

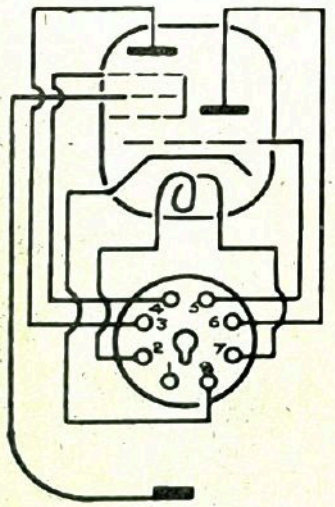
VALVES Nos. 1&6
6J 5G PATT. CV1067



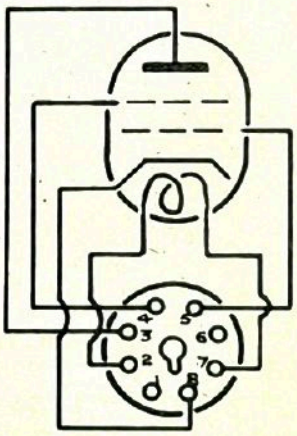
VALVES Nos. 2,4&5
NR64 PATT. CV1281



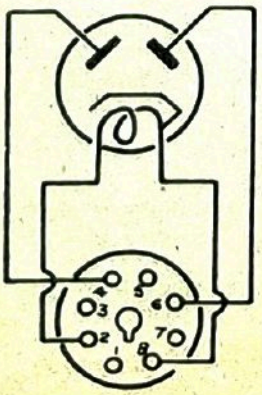
VALVE No. 3
6K 8G PATT. CV1944



VALVE No. 7
6V 6G PATT. CV509



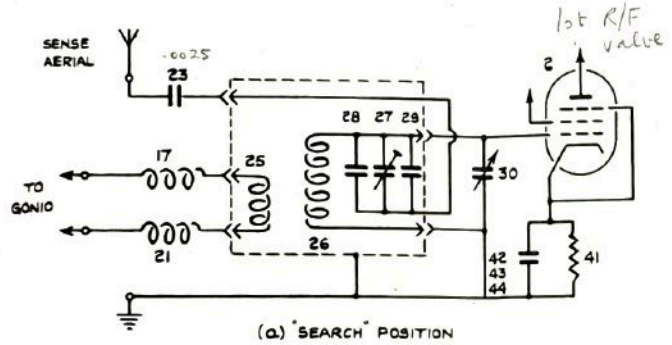
VALVE No. 8
5Z4G PATT. CV1863



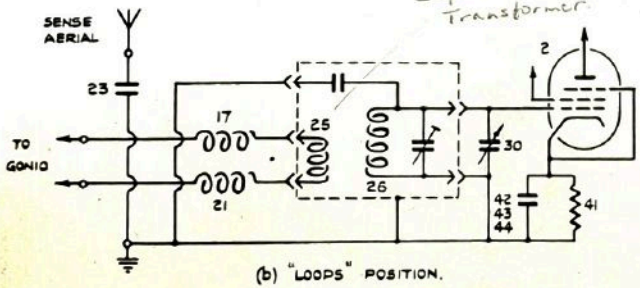
NOTE:- VALVE BASE CONNECTIONS
LOOKING FROM UNDERNEATH OF CHASSIS

D/F RECEIVERS FMA & FMB.

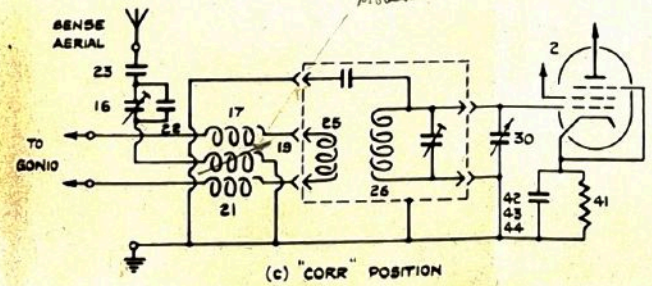
EQUIVALENT INPUT CIRCUITS.



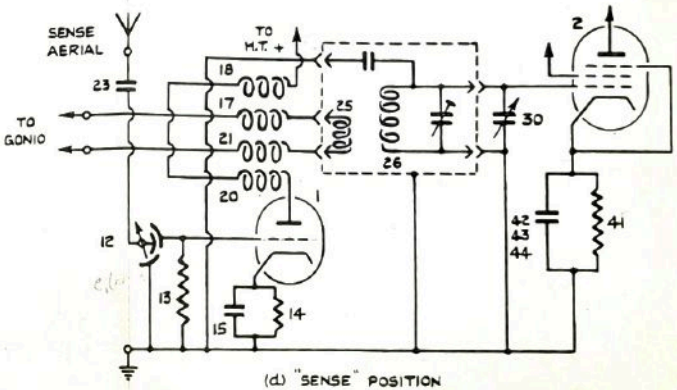
(a) "SEARCH" POSITION



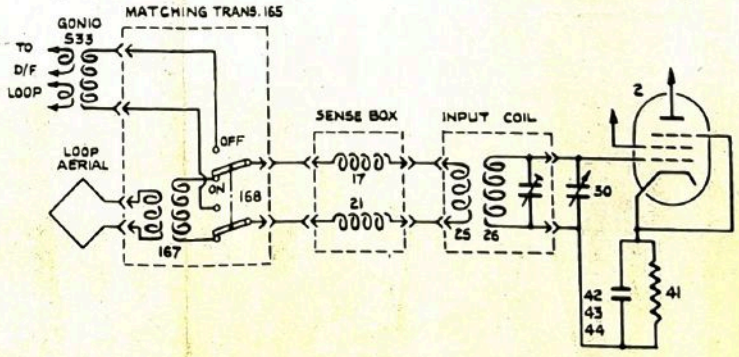
(b) "LOOPS" POSITION.



(c) "CORR" POSITION



(d) "SENSE" POSITION



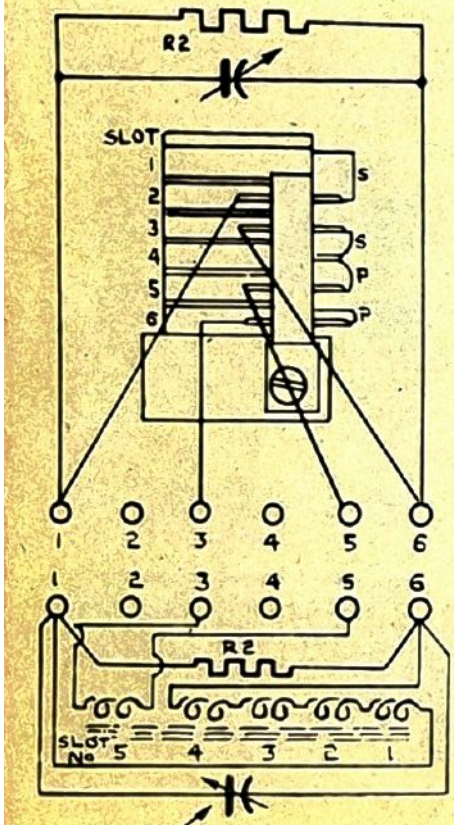
(e) LOOP AERIAL IN USE (FMA ONLY).

NOTE:- DIAGRAMS (a) TO (d) APPLY TO RECEIVER FMB, AND ALSO TO FMA WHEN THE MATCHING TRANSFORMER SWITCH (168) IS IN THE "OFF" POSITION, I.E. WHEN THE JUMPING WIRE LOOP AERIAL IS NOT IN USE.
DIAGRAM (e) APPLIES TO RECEIVER FMA ONLY, AND SHOWS THE LOOP AERIAL IN USE.

D/F RECEIVER F.M.A.

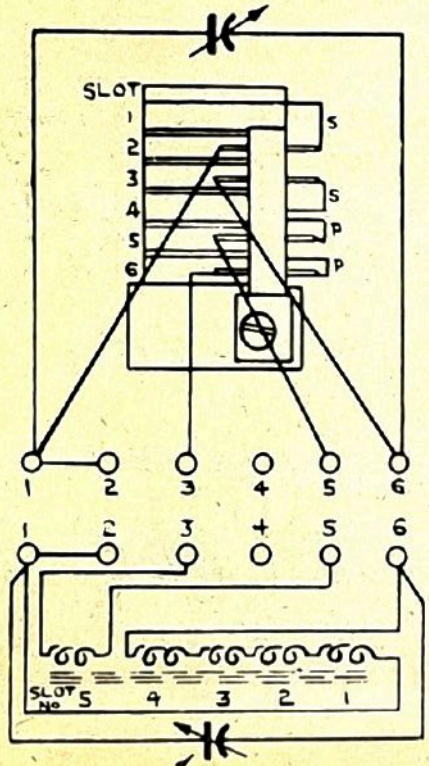
TYPICAL WIRING DIAGRAM
VIEW LOOKING FROM INSIDE OF CAN.

ASSEMBLY "B"



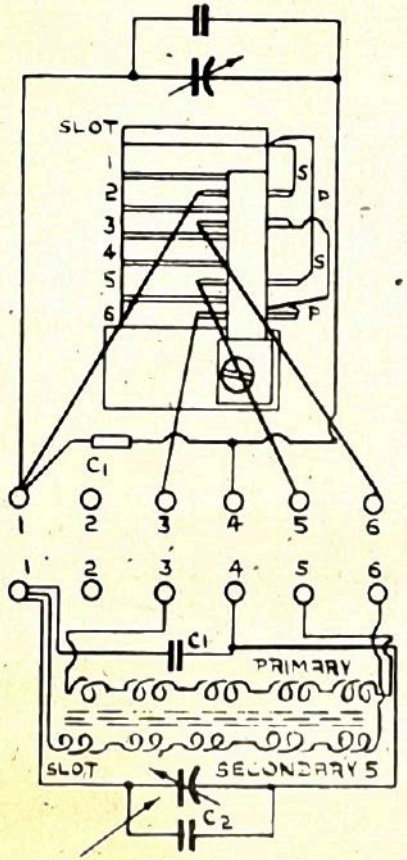
TRIMMER 50 μμF.

ASSEMBLY "C"



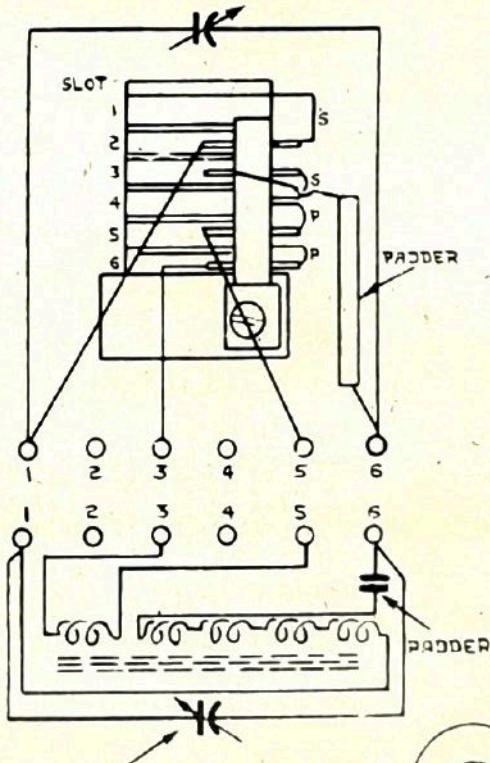
TRIMMER 50 μμF

ASSEMBLY "D"



TRIMMER 50 μμF

ASSEMBLY "E"



TRIMMER 50 μμF.

6

D/F RECEIVER ASSEMBLY FMA

WIRING DIAGRAM OF TURRET

VALUES OF RESISTANCES

1 MEG ½ WATT 73a
0·5 MEG ½ WATT 90a
} SEE NOTE BELOW

THE RESISTANCES R2 ARE TO BE FITTED ONLY IF THE RECEIVER PROVES TO BE UNSTABLE. 73a SHOULD BE FITTED FIRST AND IF STILL UNSTABLE, THEN 90a SHOULD BE ADDED.

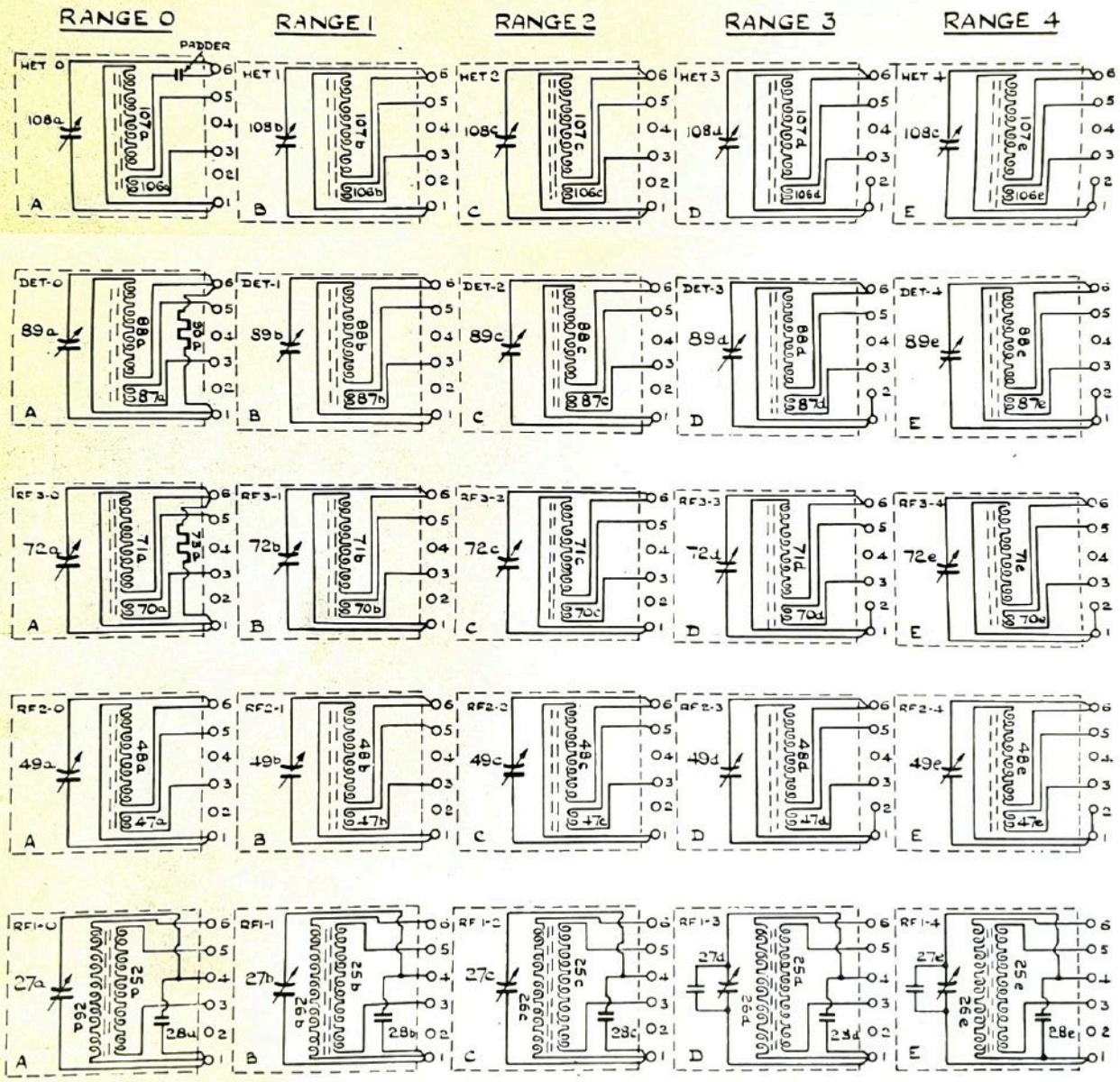
VALUES OF CONDENSERS

10μμF } - 28a-28e
30μμF - 29d
25μμF 29e

50μμF ADJUSTABLE { 27a-27e, 49a-49e, 72a-72e, 89a-89e, 108a-108e

0·01μF - DUBILIER TYPE 691 W. PADDER 109a

IN THE SYMBOL ⫲ FOR THE CONDENSER TRIMMERS, THE CURVED LINE INDICATES MOVING VANE



D/F RECEIVER ASSEMBLY FMA

NOTE:- THE RESISTANCES R2 ARE TO BE FITTED ONLY IF THE RECEIVER PROVES TO BE UNSTABLE. 73a SHOULD BE FITTED FIRST, AND IF STILL UNSTABLE, THEN 90a SHOULD BE ADDED

SCHEDULE I

			RF2-0	RF3-0	DET-0	HET-0	RF2-1	RF3-1	DET-1	HET-1	RF2-2	RF3-2	DET-2	HET-2	RF2-3	RF3-3	DET-3	HET-3	RF2-4	RF3-4	DET-4	HET-4
ELECTRICAL DATA	COUPLING FACTOR K ± 2%		-			-	0.52				0.50				0.48				0.49			
	MAGNIF	MAGNIF FACTOR Q	-			-	70 ± 10%				80 ± 10%				85 ± 10%				85 ± 10%			
		FREQ KC/S	-			-	50				90				170				310			
	SECONDARY INDUCTANCE		223.0 mH			234	31.8 mH				7.0 mH				1.75 mH				0.540 mH			
RESISTANCE R2		RATING WATTS		0.5	0.5	-				-			-	-		-	-	-	-	-	-	-
		VALUE OHMS		1MEG	½MEG	-				-			-	-		-	-	-	-	-	-	-
		RESIST. MARKING		73a	90a	-				-			-	-		-	-	-	-	-	-	-
CONNECT AS ASSEMBLY			B			E	B								C							
SECONDARY WINDING WOUND IN SLOTS 4,3,2&1	Nº OF TURNS	TOTAL	2810				1028				448				224				124			
		IN SLOTS 4,3&2	2175				771				336				168				93			
		IN SLOTS 4&3	1450				514				224				112				62			
		IN SLOT 4	725				257				112				56				31			
	GAUGE		42 SWG				38 SWG				36 SWG											
	TYPE OF WIRE		S.S.C. ENAMELLED H.C. COPPER																			
PRIMARY WINDING WOUND IN SLOT 5	NUMBER OF TURNS		85			450	50	40	40	200	35	35	35	112	25	30	30	56	26	26	26	36
	GAUGE		38 SWG								36 SWG											
	TYPE OF WIRE		S.S.C. ENAMELLED H.C. COPPER																			
CORE TYPE			H								GECALLOY TYPE 'G'											
FORMER			PATT W.1687								PATT 5462											
COIL MARKING			47/46a	70/71a	87/88a	106/107a	47/46b	70/71b	87/88b	106/107b	47/46c	70/71c	87/88c	106/107c	47/46d	70/71d	87/88d	106/107d	47/46e	70/71e	87/88e	106/107e
COIL DESIGNATION			RF2-0	RF3-0	DET-0	HET-0	RF2-1	RF3-1	DET-1	HET-1	RF2-2	RF3-2	DET-2	HET-2	RF2-3	RF3-3	DET-3	HET-3	RF2-4	RF3-4	DET-4	HET-4
KC/S RANGE			15 - 30				42 - 90				90 - 180				180 - 310				310 - 570			
RANGE			0				1				2				3				4			

PRIMARY WOUND IN SLOT 5

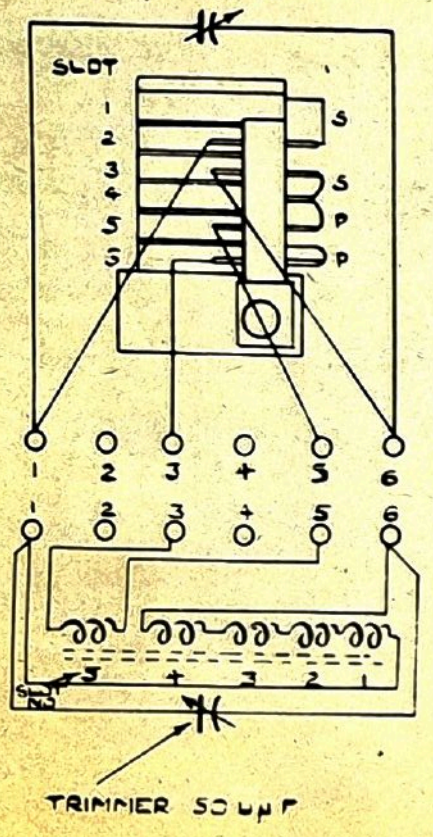
SCHEDULE II

			0	1	2	3	4
ELECTRICAL DATA	K-COUPLING FACTOR ± 2%		0.83	0.82	0.80	0.82	0.80
	EFFECTIVE MAGNIF (PRIMARY ON 325 µH)	Q-FACTOR ± 10%		40	65	85	95
		FREQ. KC/S		50	90	180	360
	SECOND. INDUCTANCE APPROX. VALUE (PRIMARY OPEN)		275 mH	39 mH	8.4 mH	2.1 mH	0.64 mH
	EFF. SECOND. IND. (PRIMARY CLOSE ON 325 µH)		223 mH	31.8 mH	7.00 mH	1.75 mH	0.540 mH
CONDENSER C2	VALUE µµF		-	-	-	30	25
	CONDENSER MARKING		-	-	-	29d	29e
CONDENSER C1	VALUE µµF		10				
	CONDENSER MARKING		28a	28b	28c	28d	28e
CONNECT AS ASSEMBLY			D				
SECONDARY WINDING EXTERNAL WOUND IN SLOTS 5 TO 1	NUMBER OF TURNS	TOTAL	3150	1165	545	268	156
		IN SLOTS 5,4,3&2	2600	928	430	212	122
		IN SLOTS 5,4&3	1950	693	320	156	90
		IN SLOTS 5&4	1300	457	210	100	58
		IN SLOT 5	650	221	100	44	26
	GAUGE		42 S.W.G.	38 S.W.G.	9/44 S.W.G.		27/44 S.W.G.
	TYPE OF WIRE		S.S.C. & ENAM.		LITZ, WIRE EACH STRAND ENAMELLED WHOLE S.S.C.		
INSULATION			EIGHT TURNS OF EMPIRE TAPE 0.006" THICK 3/32" WIDE				
PRIMARY WINDING INTERNAL WOUND IN SLOTS 5 TO 1	NUMBER OF TURNS	TOTAL	65				
		IN SLOTS 5,4,3&2	52				
		IN SLOTS 5,4&3	39				
		IN SLOTS 5&4	26				
		IN SLOT 5	13				
	GAUGE		36 SWG			27/44 SWG	
	TYPE OF WIRE		S.S.C. AND ENAMELLED			LITZ-WIRE EACH STRAND ENAM. WHOLE S.S.C.	
CORE TYPE			GECALLOY TYPE H				
FORMER			PATT: W 1687				
COIL MARKING			25/26a	25/26b	25/26c	25/26d	25/26e
COIL DESIGNATION			RF1-0	RF1-1	RF1-2	RF1-3	RF1-4
KC/S RANGE			15 - 30	42 - 90	90 - 180	180 - 310	310 - 570
RANGE			0	1	2	3	4

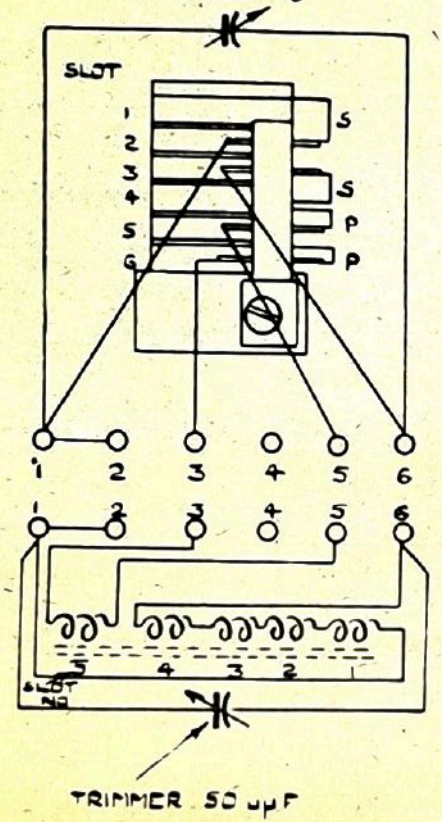
D/F RECEIVER F.M.B.

TYPICAL WIRING DIAGRAM. VIEW LOOKING FROM INSIDE CAN.

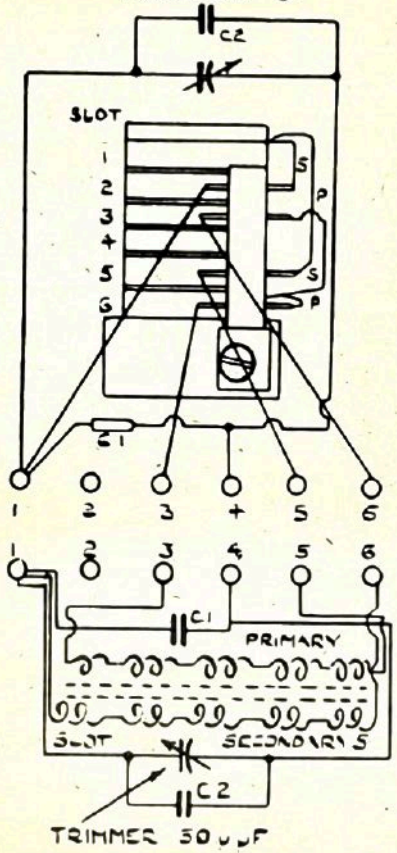
ASSEMBLY "B"



ASSEMBLY "C"



ASSEMBLY "D"



D/F RECEIVER ASSEMBLY FMB

WIRING DIAGRAM OF TURRET

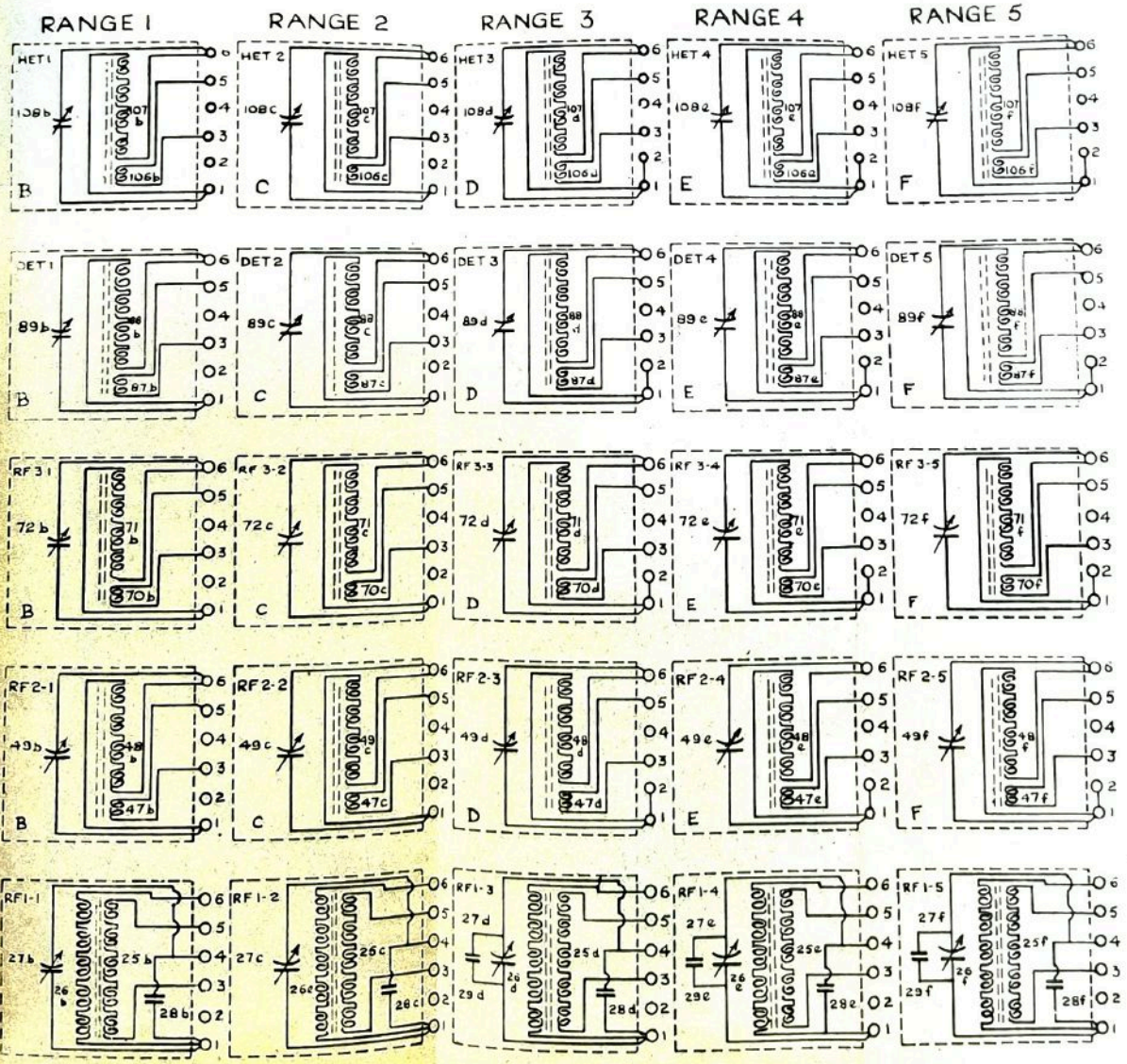
VALUES OF CONDENSERS

10μμF { 28b - 28f

30μμF - 29d.
25μμF - 29e.
15μμF - 29f.

50μμF ADJUSTABLE { 27b - 27f; 49b - 49f; 72b - 72f; 89b - 89f; 108b - 108f

IN THE SYMBOL FOR THE CONDENSER TRIMMERS, THE CURVED LINE INDICATES MOVING VANE



9

D/F RECEIVER ASSEMBLY FMB

SCHEDULE I

		Range 1	Range 2	Range 3	Range 4	Range 5
ELECTRICAL DATA	COUPLING FACTOR K ± 2%	0·82	0·80	0·40	0·49	0·47
	MAGNIF: MAGNIF FACTOR Q	70 ± 10%	80 ± 10%	85 ± 10%	85 ± 10%	125 ± 10%
	MAGNIF: FREQ KC/S	80	90	170	310	600
	SECONDARY INDUCTANCE	31·0 mH	7·0 mH	1·75 mH	0·540 mH	0·160 mH
CONNECT AS ASSEMBLY		A	A	C	C	C
SECONDARY WINDING WOUND IN SLOTS 4, 3, 2 & 1	Nº OF TURNS: TOTAL	1028	448	224	124	68
	Nº OF TURNS: IN SLOTS 4, 3, & 2	771	336	168	93	52
	Nº OF TURNS: IN SLOTS 4 & 3	514	224	112	62	34
	Nº OF TURNS: IN SLOT 4	257	112	56	31	17
	GAUGE	38 SWG	36 SWG	36 SWG	36 SWG	27/44 SWG
	TYPE OF WIRE	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER	LITZ-WIRE STRANDED ENAM, WHOLE S.S.C.
PRIMARY WINDING WOUND IN SLOTS	GAUGE	38 SWG	36 SWG	36 SWG	36 SWG	36 SWG
	TYPE OF WIRE	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER	S.S.C. ENAMELLED H.C. COPPER
CORE TYPE		H	GECALLOY TYPE 'G'	GECALLOY TYPE 'G'	GECALLOY TYPE 'G'	GECALLOY TYPE 'G'
FORMER		PATT. W1687	PATT. 5462	PATT. 5462	PATT. 5462	PATT. 5462
KC/S RANGE		42 – 90	90 – 180	180 – 310	310 – 570	570 – 1000

RANGE	COIL DESIGNATION	COIL MARKING	PRIMARY WINDING NUMBER OF TURNS
1	RF2-1	47/40a	50
1	RF3-1	90/71b	40
1			
1	DET-1	87/66b	40
1	HET-1	106/107b	200
2	RF2-2	47/40c	35
2	RF3-2	90/71c	35
2			
2	DET-2	87/66c	35
2	HET-2	106/107c	112
3	RF2-3	47/40d	25
3	RF3-3	70/71d	30
3			
3	DET-3	87/66d	30
3	HET-3	109/107d	56
4	RF2-4	47/46e	26
4	RF3-4	70/71e	26
4			
4	DET-4	87/66e	26
4	HET-4	106/107e	36
5	RF2-5	47/46f	15
5	RF3-5	70/71f	15
5			
5	DET-5	87/88f	17
5	HET-5	106/107f	17

SCHEDULE II

		Range 1	Range 2	Range 3	Range 4	Range 5
ELECTRICAL DATA	K-COUPLING FACTOR ± 2%	0·82	0·80	0·82	0·80	0·83
	EFFECTIVE MAGNIF (PRIMARY ON 325 µH): Q FACTOR ± 10%	40	65	85	95	96
	EFFECTIVE MAGNIF (PRIMARY ON 325 µH): FREQ Kc/s	50	90	180	360	550
	SECOND. INDUCTANCE APPROX VALUE (PRIMARY OPEN)	39 mH	8·4 mH	2·1 mH	0·64 mH	0·190 mH
	EFF. SECOND. IND. (PRIMARY CLOSE) ON 325 µH	31·8 mH	7·00 mH	1·75 mH	0·540 mH	0·160 mH
CONDENSER C_2	VALUE µµF	–	–	30	25	15
	CONDENSER MARKING	–	–	29d	29e	29f
CONDENSER C_1	VALUE µµF	10	10	10	10	10
	CONDENSER MARKING	28b	28c	28d	28e	28f
CONNECT AS ASSEMBLY		D	D	D	D	D
SECONDARY WINDING EXTERNAL WOUND IN SLOTS 5 TO 1	NUMBER OF TURNS: TOTAL	1165	545	268	156	78
	IN SLOTS 5, 4, 3 & 2	828	430	212	122	61
	IN SLOTS 5, 4, & 3	693	320	156	90	44
	IN SLOTS 5 & 4	457	210	100	58	27
	IN SLOTS	221	100	44	26	10
	GAUGE	38 S.W.G.	8/44 S.W.G.	8/44 S.W.G.	27/44 S.W.G.	27/44 S.W.G.
	TYPE OF WIRE	S.S.C. ENAM	LITZ-WIRE EACH STRAND ENAMELLED, WHOLE S.S.C	LITZ-WIRE EACH STRAND ENAMELLED, WHOLE S.S.C	LITZ-WIRE EACH STRAND ENAMELLED, WHOLE S.S.C	LITZ-WIRE EACH STRAND ENAMELLED, WHOLE S.S.C
INSULATION		EIGHT TURNS OF EMPIRE TAPE 0·005" THICK 3/32" WIDE	EIGHT TURNS OF EMPIRE TAPE 0·005" THICK 3/32" WIDE	EIGHT TURNS OF EMPIRE TAPE 0·005" THICK 3/32" WIDE	EIGHT TURNS OF EMPIRE TAPE 0·005" THICK 3/32" WIDE	EIGHT TURNS OF EMPIRE TAPE 0·005" THICK 3/32" WIDE
PRIMARY WINDING INTERNAL WOUND IN SLOTS 5 TO 1	NUMBER OF TURNS: TOTAL	65	65	65	65	55
	IN SLOTS 5, 4, 3 & 2	52	52	52	52	44
	IN SLOTS 5, 4 & 3	39	39	39	39	33
	IN SLOTS 5 & 4	26	26	26	26	22
	IN SLOT 5	13	13	13	13	11
	GAUGE	36 SWG	36 SWG	27/44 SWG	27/44 SWG	27/44 SWG
	TYPE OF WIRE	S.S.C. & ENAMELLED	S.S.C. & ENAMELLED	LITZ-WIRE EACH STRAND ENAM WHOLE S.S.C	LITZ-WIRE EACH STRAND ENAM WHOLE S.S.C	LITZ-WIRE EACH STRAND ENAM WHOLE S.S.C
CORE TYPE		GECALLOY TYPE H	GECALLOY TYPE H	GECALLOY TYPE H	GECALLOY TYPE H	GECALLOY TYPE H
FORMER		PATT: W 1687	PATT: W 1687	PATT: W 1687	PATT: W 1687	PATT: W 1687
COIL MARKING		25/26b	25/26c	25/26d	25/26e	25/26f
COIL DESIGNATION		RF1-1	RF1-2	RF1-3	RF1-4	RF1-5
KC/S RANGE		42 – 90	90 – 180	180 – 310	310 – 570	570 – 1000

D/F RECEIVER FMA
FRONT VIEW

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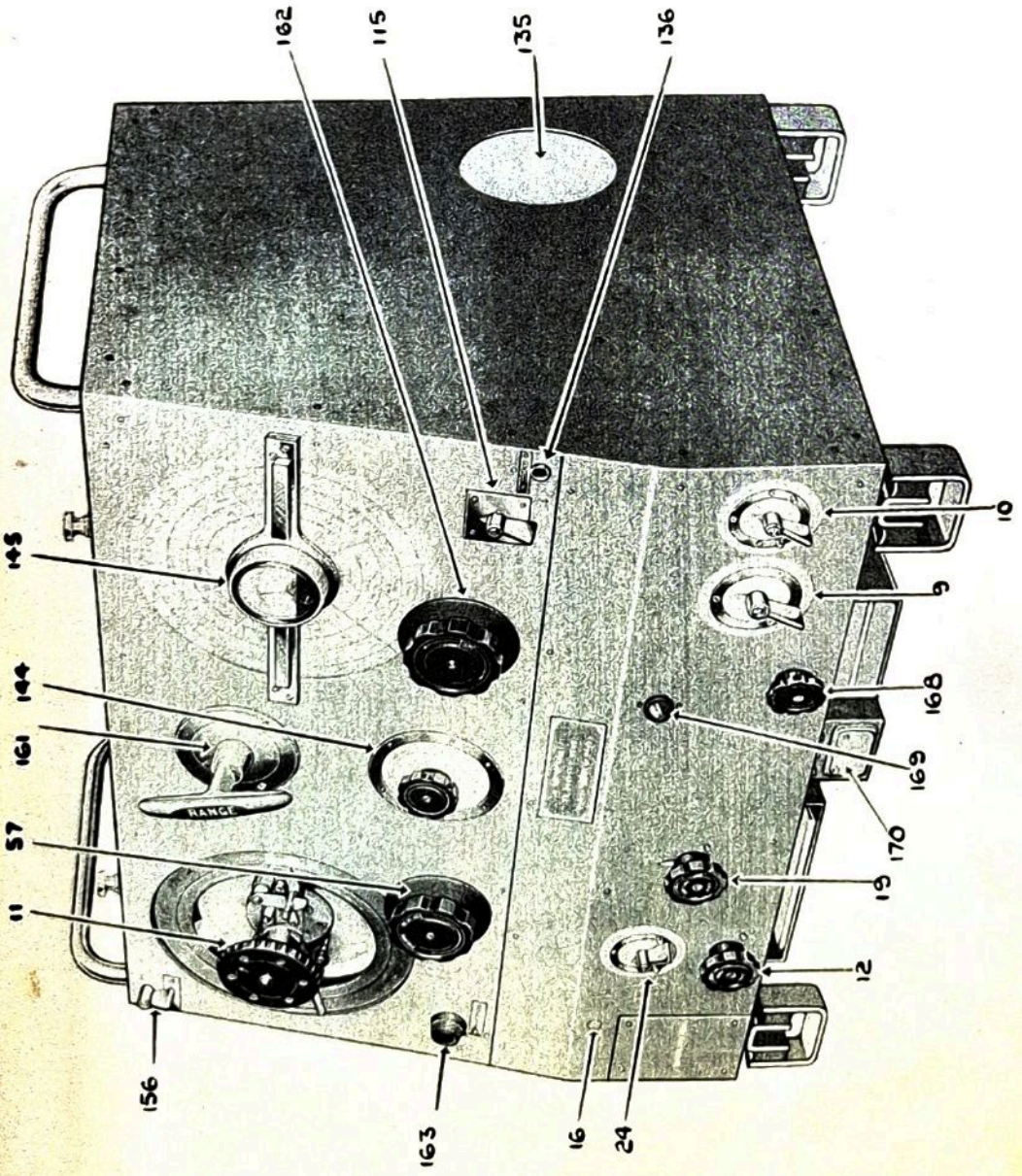
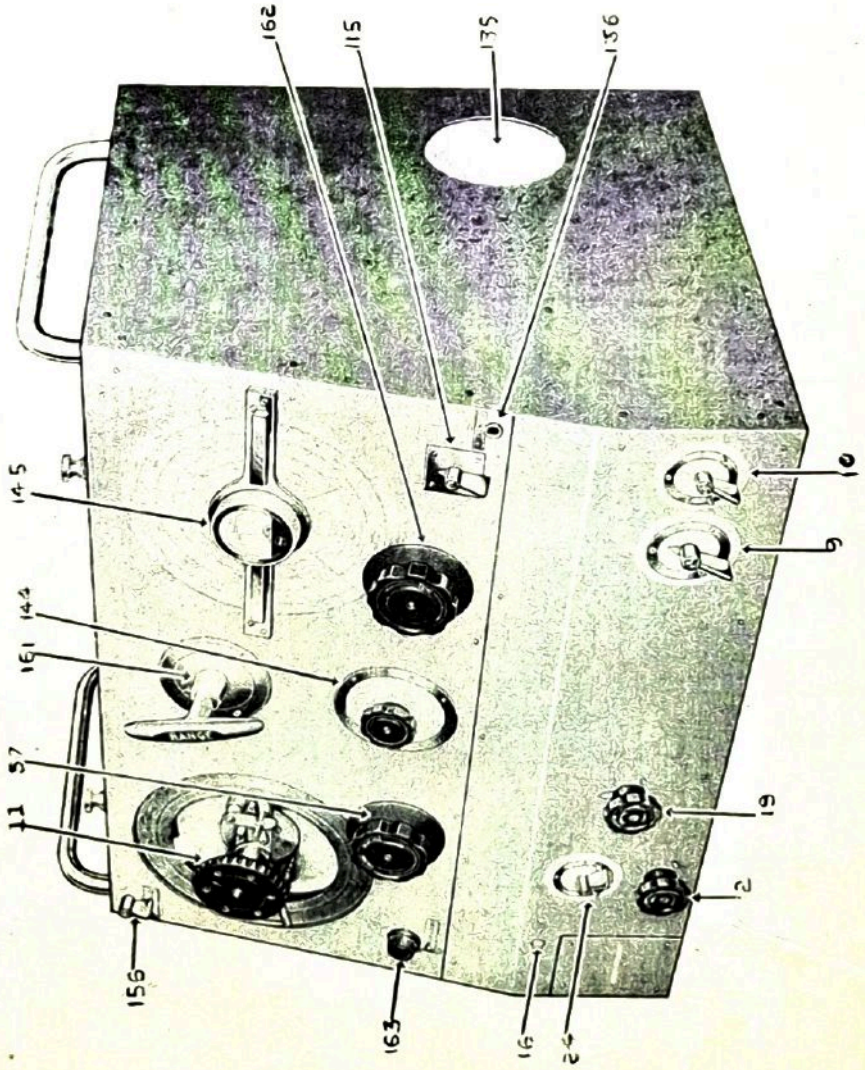


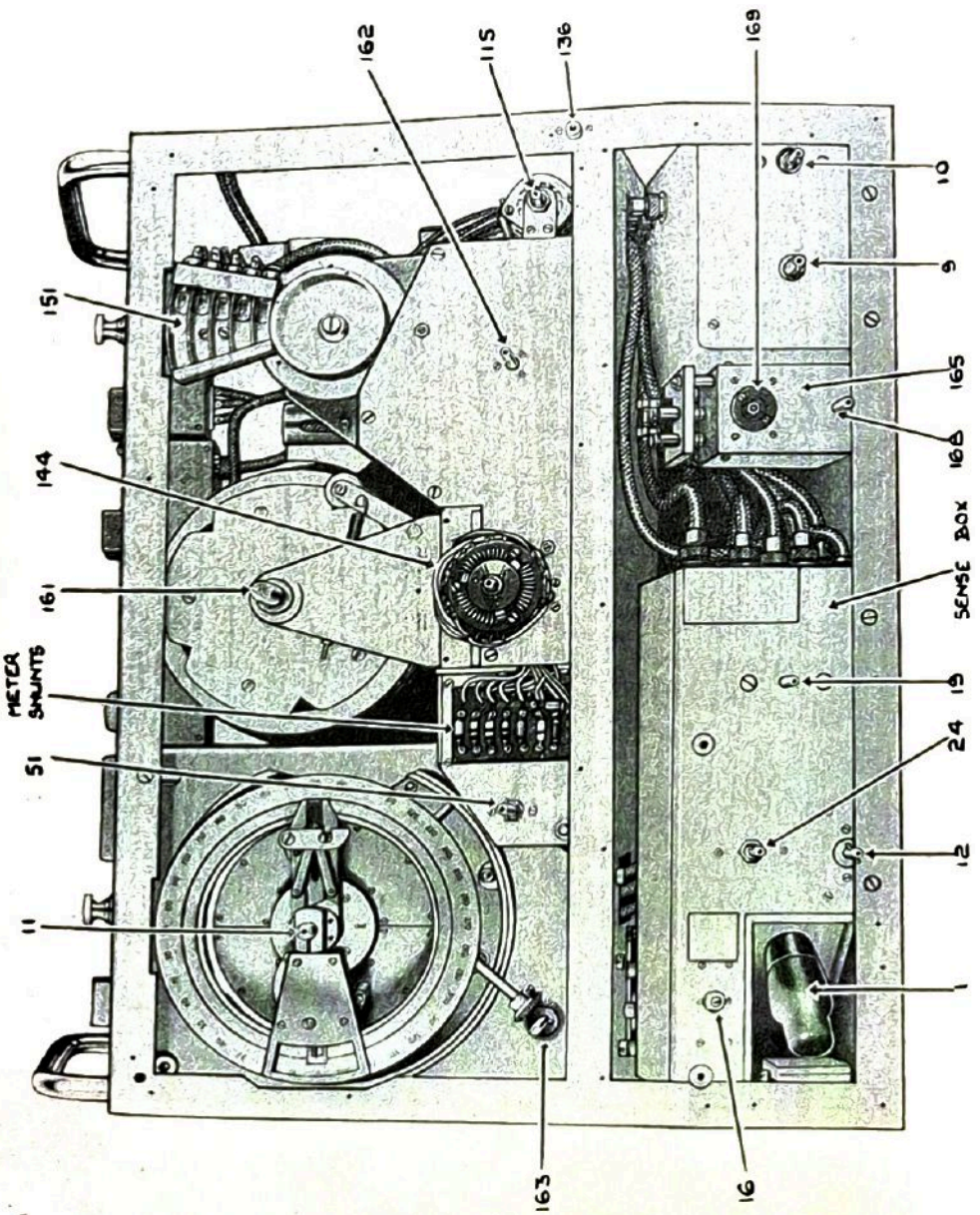
D/F RECEIVER FMB
FRONT VIEW

10A



D/F RECEIVER FMA

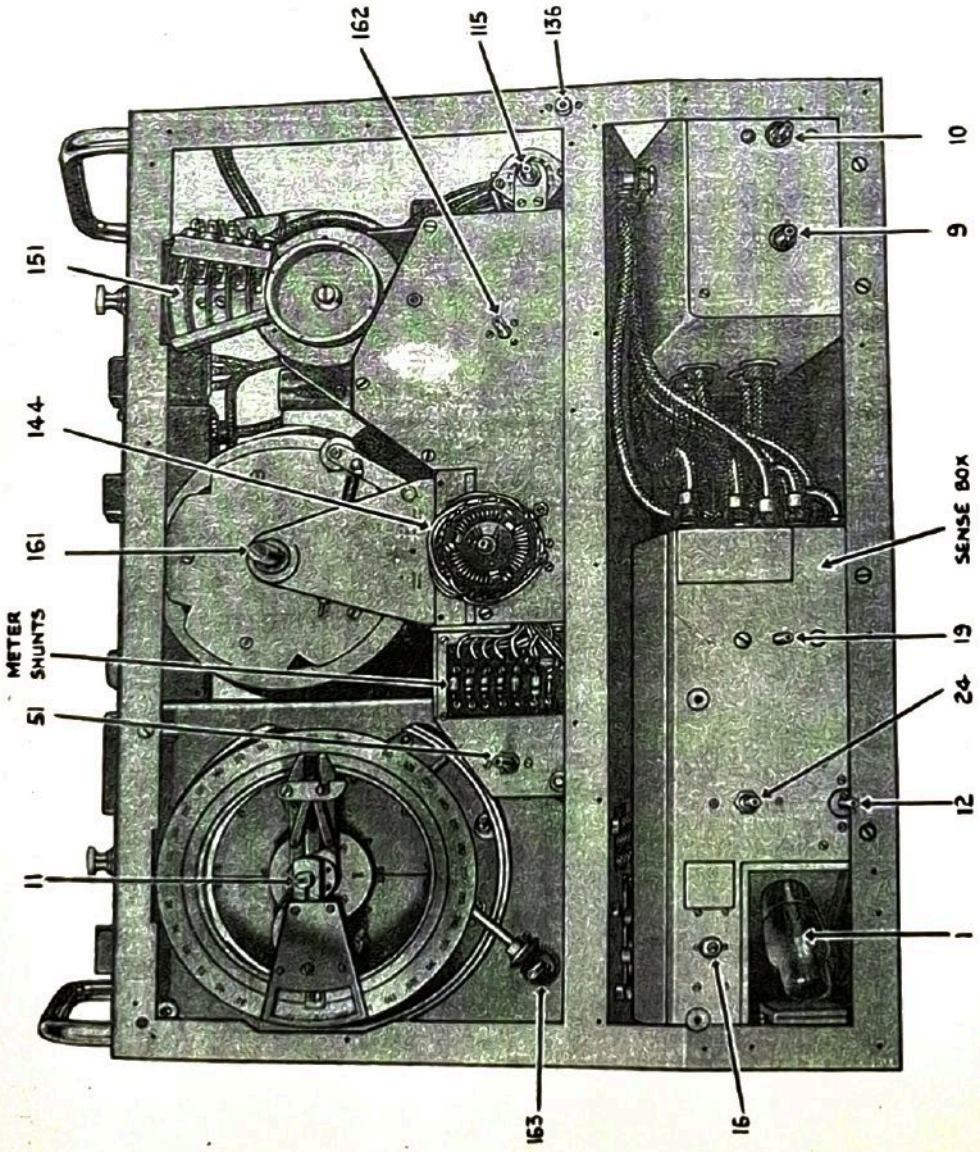
FRONT VIEW, COVER REMOVED



D/F RECEIVER FMB

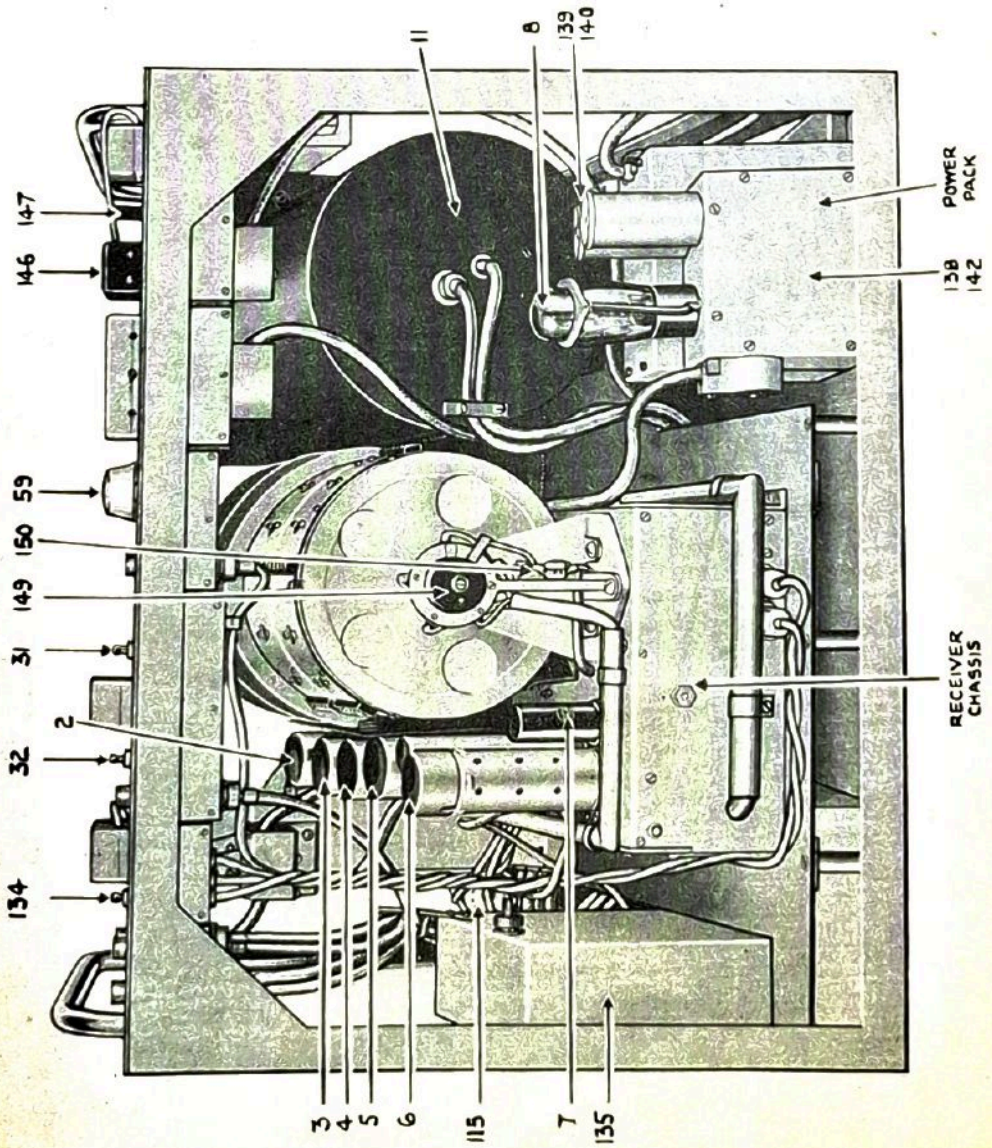
FRONT VIEW, COVER REMOVED

11A



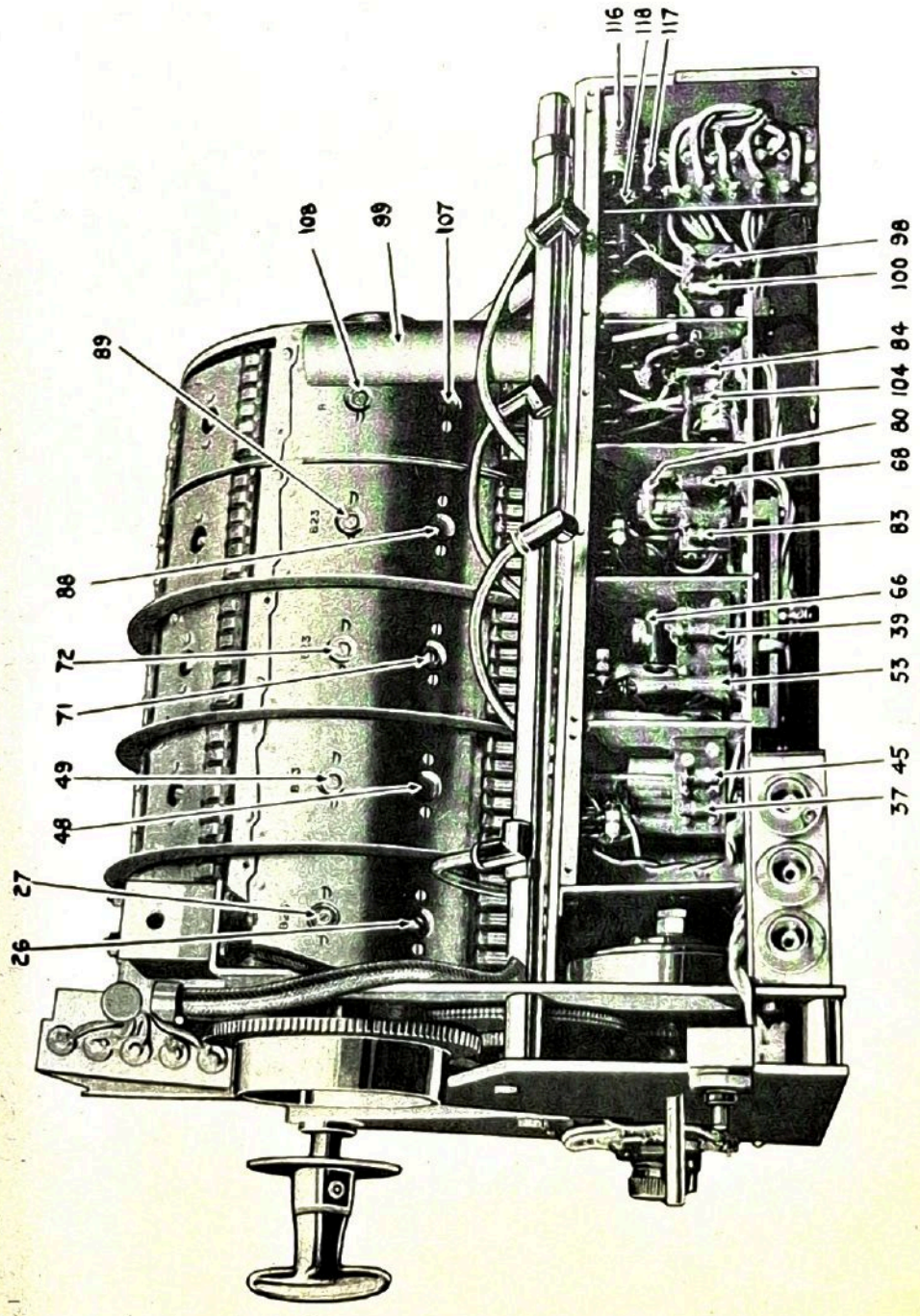
D/F RECEIVERS FMA & FMB

REAR VIEW, COVER REMOVED



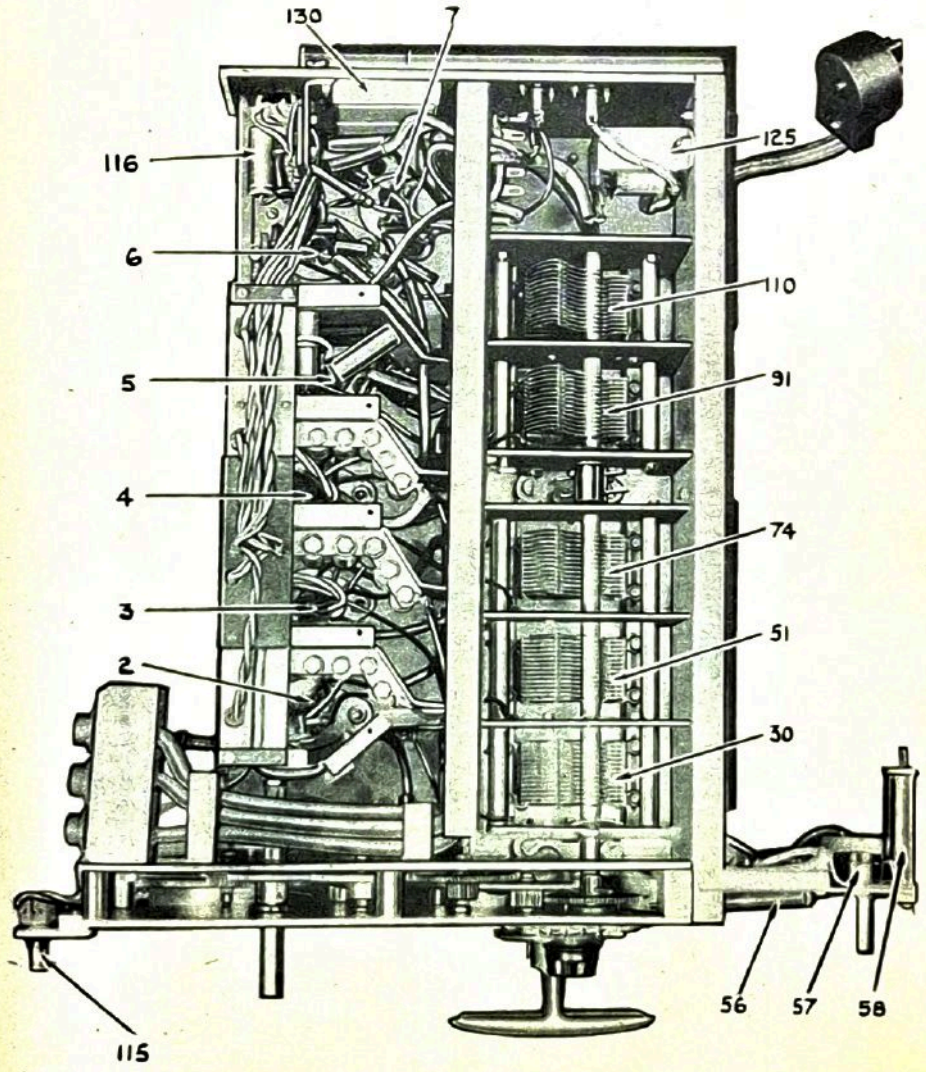
D/F RECEIVERS FMA & FMB

RECEIVER CHASSIS, SIDE VIEW.



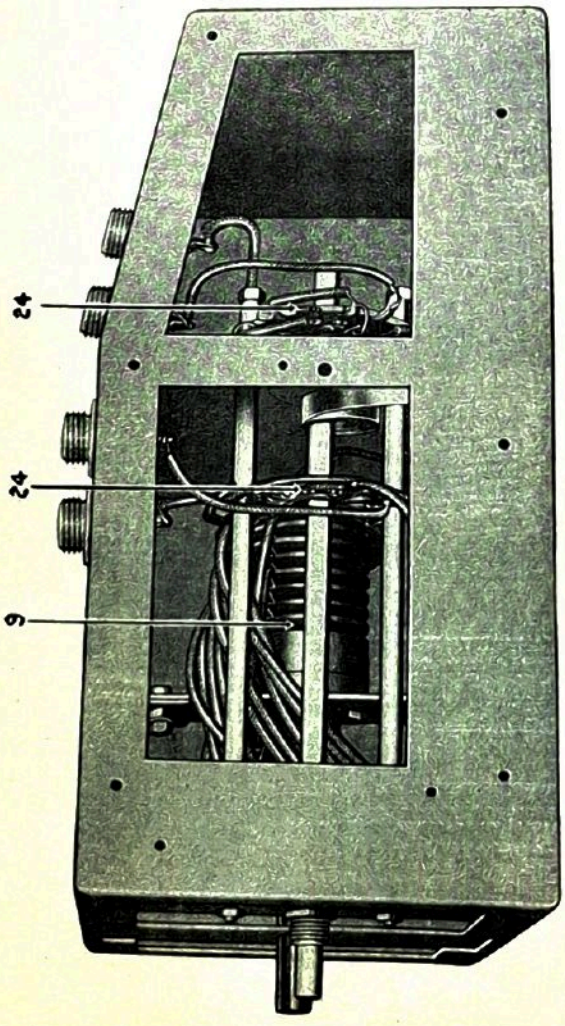
D/F RECEIVERS FMA & FMB

RECEIVER CHASSIS, UNDERSIDE VIEW.



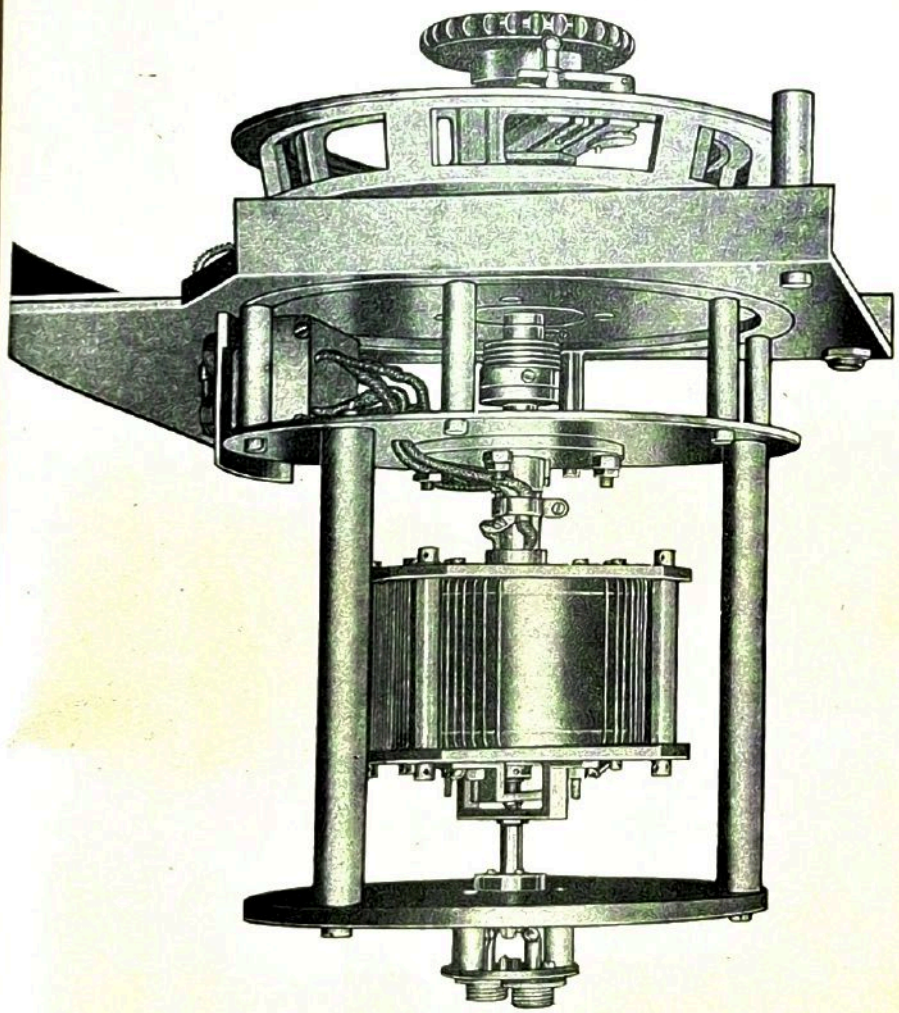
D/F RECEIVERS FMA & FMB

INDUCTANCE CORRECTING UNIT.



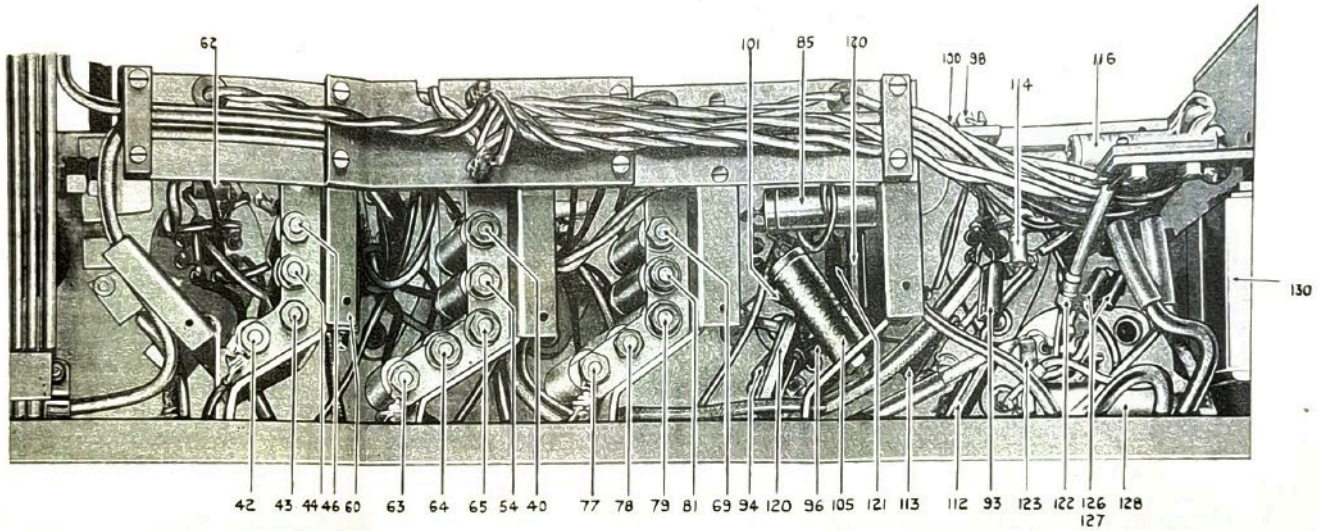
D/F RECEIVERS FMA & FMB

RADIOGONIOMETER S33.

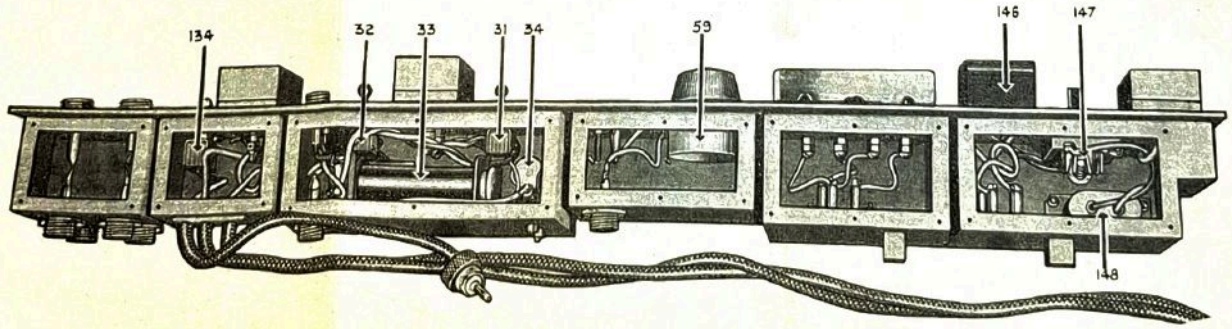


D/F RECEIVERS FMA & FMB.

UNDERSIDE DETAIL OF RECEIVER CHASSIS



TERMINAL UNIT, COVERS REMOVED.



A.P. 56152

FILTER UNIT DES. 12

CIRCUIT DIAGRAM

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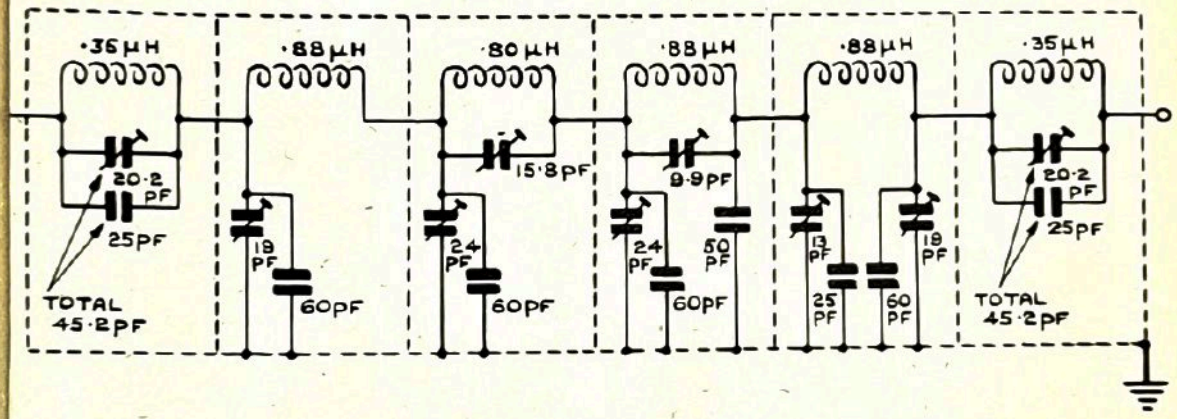

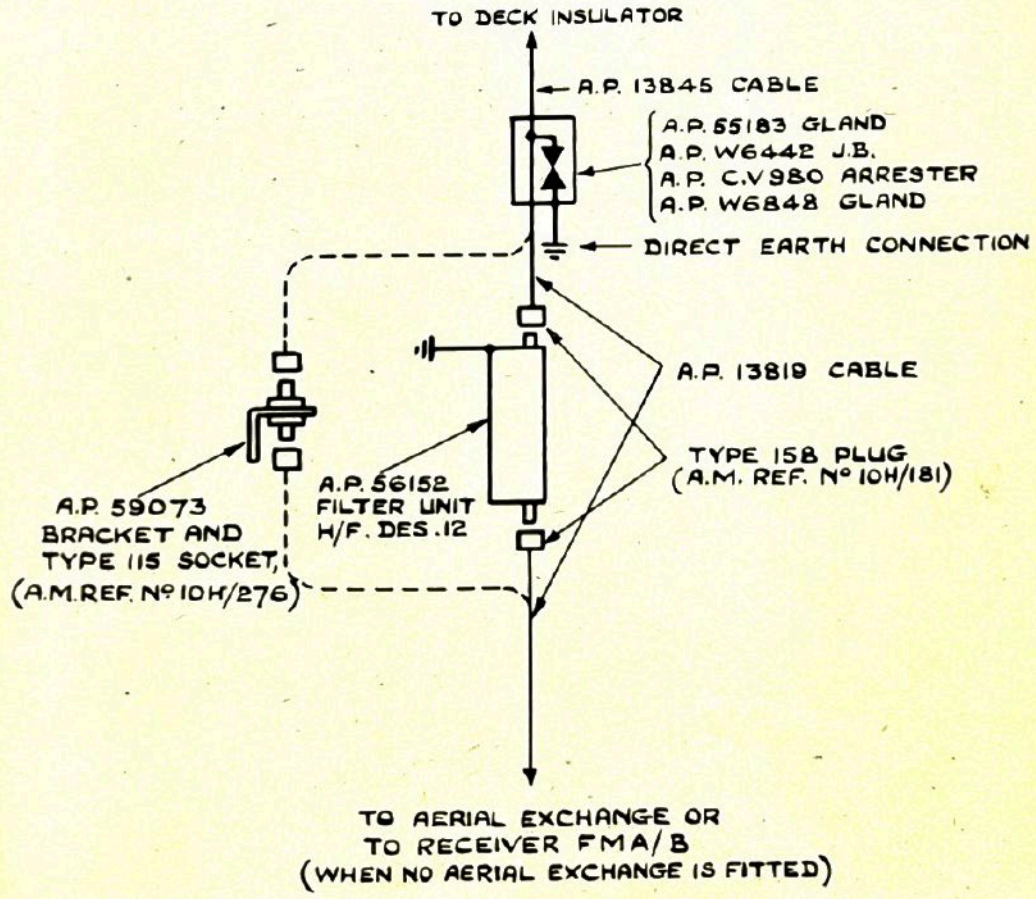

218/48 N.C.

A.S.R.E. DRWG. Nº H445/19