

WIRELESS SETS No. 33

WORKING INSTRUCTIONS

PART I—OPERATION

ZA. 10732

NOT TO BE PUBLISHED

NOTE

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CHAPTER I - GENERAL DESCRIPTION.

1. Purpose and Facilities.

The Wireless Set No.33 is a general purpose medium power sender with a R.F. output of about 250 watts on C.W. Its main purpose is for use as a ground station, but it may also be used in a vehicle as a mobile station. It is normally used with a Reception Set R.107.

The circuit permits "local" operation of the sender on C.W., M.C.W. and R.T. (i.e. Class A1,A2 and A3 waves respectively). In conjunction with Wireless Remote Control Unit C, the sender may be switched on and off, keyed on C.W. and M.C.W., and modulated by any V.F. system (including teleprinter) from a remote point. Hand and high-speed keying may be used on C.W. or M.C.W. At present no facilities are provided for speech modulation of the sender from the remote end but these can easily be improvised (see 3(4)(c) page 33).

The sender may be connected directly to the following aeri-als:-

- (1) An aerial system fed by 100 ohm or 600 ohm twin feeders.
- (2) Half-wave horizontal aerial, fed by single-wire 600 ohm feeder (i.e. Wyndom Aerial).
- (3) Under certain conditions a simple single wire end-fed aerial; but in general use must be made of "Aerial Coupling Equipment - Aerial Unit G" for matching purposes in order to avoid loss of range and efficiency.

Connection to an aerial at some distance from the sender may be made by means of a feeder cable and "Aerial Coupling Equipment G".

Provision is made for "break-in" working on all systems. This facility means that when the key is up or the microphone pressel switch is released the receiver becomes automatically operative while the sender ceases to radiate. In this case the receiver aerial circuit is connected to the sender and uses the same aerial. When the sender is radiating the receiver is muted but sidetone is fed back to the receiver output stage.

2. Range.

The range of working depends upon so many factors, e.g. signal frequency, time of day and season, location of sites and types of aeri-als, etc., that no definite limits can be laid down. Even under the most unfavourable conditions, however, communication with a reasonably sensitive receiver should be assured up to 25 miles on M.C.W. and R.T., and up to 50 miles on C.W., while with normal conditions up to 500 miles on C.W. should be achieved. These distances may be increased greatly on C.W. with an efficient aerial system and favourable conditions.

3. Frequency Band.

The frequency band of 17.5 M.c/s to 1.2 M.c/s is covered in four overlapping main ranges as follows:-

Range 1	17.5 M.c/s	to	10 M.c/s.
Range 2	10.5	"	" 5.2 "
Range 3	5.3	"	" 2.5 "
Range 4	2.55	"	" 1.2 "

4. Power Supply.

The sender may be energised from any available single phase A.C. supply of between 100v. and 250v. at 45 to 60 cycles. capable of giving 1.5KW.

If an A.C. mains supply of suitable voltage and frequency is available this will normally be used but if not, the A.C. supply will be taken from one of the petrol-electric sets (Power Units A.C/D.C. 2 K.V.A. No.2 (ONAN) supplied with the complete station.

5. Brief Description of Sender.

The sender comprises two units, the R.F. Unit and the Power Supply Unit. The R.F. unit contains four R.F. stages - Master Oscillator, Buffer Amplifier and Frequency Multiplier, Driver, and Power Amplifier.

The sender frequency is governed by that of the master oscillator which may be either self-excited or crystal controlled. When self-excited the frequency of the master oscillator is continuously variable, being half the emitted frequency on each range. The buffer stage is normally tuned to twice the oscillator frequency but with crystal control this stage may be tuned to the same frequency or any multiple of the frequency of the oscillator within the range of the sender. The driver stage amplifies at the buffer frequency and drives the power amplifier stage (two valves in parallel) which is also tuned to this frequency.

Correct tuning is indicated by lamps, except in the output stage where meters are used. The frequency ranges are selected by switches, thus obviating coil changing. Tuning charts are provided for guidance to the operator.

The sender is keyed on C.W. and M.C.W. in the suppressor circuit of the driver valve and all modulation is done in the suppressor circuit of the power amplifier valves.

There is also a two stage modulator. On M.C.W. the first valve in this acts as an oscillator at 900 c/s, and on R.T. this valve acts as an amplifier.

The R.F. Unit contains in addition a power transformer which is used for supplying all circuits except the anodes of the P.A. valves.

The main function of the Power Supply Unit is to provide the H.T. for the anodes of the power amplifier valves in the R.F. Unit. Besides this H.T. supply circuit there are also various contactors and safety relays and switches.

6. Composition of the Station (See also Appendix I).

The actual components of a station will depend upon the type of service intended, i.e. whether it is a ground or vehicle station and further whether it is to be operated locally or from a remote receiver station. This pamphlet deals with a local send-receive ground station and a remote control send-receive ground station. The complete station is carried in seven wooden cases together with two petrol-electric power units, four Batteries, 48 mast sections 6 ft., and one mile of Cable Electric D8 twisted wound on a cable drum.

Five of the above cases, viz., Nos.1, 2, 3, 4 and 4A, contain the equipment required at the local station, with the exception of the Aerial Coupling Equipment, Aerial Unit G. The remaining two cases, Nos.5 and 6, contain the equipment required for the remote station, together with the Aerial Coupling Equipment, Aerial Unit G. Contents lists and instructional diagrams for each case are pasted on the inside of the case lid, and similar diagrams are shown in Figs.13-19.

TABLE I - MAIN COMPONENTS OF THE STATION.

No. per Station.	Description.
1	Wireless Set No.33, R.F.Unit and Instructional Pamphlet.
1	Wireless Set No.33, Power Supply Unit.
2	Reception Sets R.107, and Instructional Pamphlet.
1	Wireless Set No.33, Dummy Aerial.
1	Aerial Coupling Equipment - Aerial Unit G and Set Unit G.
6	Connectors, Twin No.58 (50-ft. lengths - Aerial Feeders).
8	Masts, 36-ft., steel.
4	Dipoles (Nos.6A, 6B, 6C and 5). Other Aerial Gear, Earth Pins, etc.
1	Wireless Remote Control Unit C.
1	Microphone, Hand No.4.
2	Power Units A.C/D.C., 2 K.V.A., No.2 (ONAN).
2	Switchboards A.C.No.1.
4	Batteries, Sec. Port., 12v. 75 Ah.
1	Morse Key and Plug Assembly. Spares, Valves, Vibrators, etc. Various Reels of Wire and Inter-Unit Connectors.

Cases Nos.3, 5 and 6 weigh approximately 200 lb., and Nos.1, 2, 4 and 4A approximately 250 lb. The dimensions of all cases are approximately 27" x 27" x 19", the lid dimensions being 27" x 27". The 48 mast sections, each 6-ft. in length, weigh 324 lb. and the D8 cable on drum weighs 177 lb. Each Battery (17" x 8" x 11") weighs 80 lbs. when full.

Details of the main sender units are as follows:-

TABLE II - WEIGHTS AND DIMENSIONS.

Unit	Weight lb.	Length ins.	Height ins.	Depth ins.
R.F.Unit	175	25	23	16
P.S.Unit	170	25	15	16
Aerial Unit G	52	15	18	11
Remote Control Unit C.	8 $\frac{1}{2}$	8	8	10
Dummy Aerial	6	16	5	9
Power Unit 2 K.V.A.	300	27	21	22

CHAPTER II - OPERATION.1. General.

The first step is to set up the local station.

The location of the sender and receiver is determined largely by the site chosen for the aeri-als. The sender R.F.Unit must not normally be more than 50 feet (one length of feeder cable) from the centre of the aerial used for frequencies above 10 M.c/s. Figure 10 shows the more usual types of aeri-als. Figure 11 shows an arrangement of the sender dipole aeri-als (provided with the station) so that the entire frequency band is covered. Figure 12 is similar but does not allow for efficient transmission between 2.4 M.c/s and the lowest sender frequency 1.2 M.c/s. Note the direction of maximum radiation which is at right angles to the line of aeri-als 6A and 6B. From these figures the best position for the sender relative to the aeri-als is decided. With "BREAK-IN" working the receiver uses the same aeri-als.

The sender R.F.Unit is normally set up with its Power Supply Unit to the right and the Reception Set R.107 to the left. The packing cases containing them (Cases Transit No.1, No.2 and No.3) are used to support these units and act as operators' tables. Cases Transit No.4 and No.4A contain, mostly, aeri-als and mast gear and when unpacked are used as operators' seats.

Besides the "local" station, provision is made for a "remote" station. One mile of cable (D8 twisted) is supplied for inter-connection of the two stations, but any reasonable length of cable may be used. The main items for this remote station are a Reception Set R.107 and a Wireless Remote Control Unit C together with an aerial and mast gear. The apparatus is contained in Cases Transit No.5 and No.6.

The sender and receivers may be energised from any available single phase A.C. supply of between 100v. and 250v. at 45 to 60 c/s capable of giving 1.5 K.V.A.

If suitable A.C. mains supplies are available they will generally be used; otherwise the petrol-electric sets (Power Units A.C/D.C. 2 K.V.A. No.2 (ONAN) will be used.

Two of these units are supplied and both are normally kept at the local station. Each is fully equipped with leads and switchboard A.C. No.1 so that, while one is in use, the second is a complete spare or may be transported to the remote station. The Units supply 230 volts at 50 c/s A.C. and have provision for battery charging. Full particulars are given in the "Service Manual" provided with each unit.

The receivers will also operate from 12 volt accumulators and two are supplied for each receiver, one for use with one spare or on charge. These accumulators must be prepared for work according to the instructions on the lids. More silent operation is generally obtained when working the receivers from accumulators. The remote receiver will normally work from an accumulator but one of the petrol-electric sets, together with

1. General (Cont'd).

a switchboard and connectors, may be transported to the remote point for charging purposes or, if necessary, to work the receiver. Adjust the receivers according to their own instructional pamphlets.

2. The Local Station.(1) Unpacking and Setting Up the Sender and Receiver.(a) Case Transit No.1 should have been opened first.

Place Case Transit No.2 or No.3 alongside unopened. By means of the rope handles inside Case No.1, lift out the sender R.F.Unit on its cradle and place it on the unopened case. See that the tuning chart also carried is attached to the side of the Unit. Case No.1 may now be converted into an operators' table to support the sender (see the diagram on the lid). One half of the case lid fits as an extension of one of the plain sides of the case and is then supported by slides which can be drawn out of the case at two corners. Place the case on its side so that these slides are uppermost and pull them out. Fit the half lid in position to form an extension to the top side of the case. Lift the R.F. Unit by its side handles and place it on the table with the back of the Unit in line with the back of the table (i.e. the original bottom of the case). Put the R.F.Unit cradle and the unused half lid inside the case.

(b) Open Case Transit No.2 and pull out the Cases Spare Valve and see that the Fire Extinguisher is in the bracket in the smaller compartment. Place an unopened case (e.g. No.3) alongside and by means of the rope handles inside Case No.2 lift out the Power Supply Unit on its cradle and place it on the unopened case. Now take Case No.2 and set it up as a second table in the same way as for Case No.1, immediately to the right of the R.F.Unit table. Lift the Power Supply Unit on this table so that it is alongside the R.F.Unit. Put the Power Supply Unit cradle and unused half lid inside the case, together with the spare valve case in its original position.(c) Open Case Transit No.3 and take out the Dummy Aerial, Satchel Signals, Lamps Operators No.3 and two Switchboards A.C.No.1 from the smaller compartment. Place the Dummy Aerial on the top right of the R.F. Unit. Fit the two switchboards in position inside the Case supporting the Power Supply Unit where fixing screws will be found for them. Next remove the cover and pamphlet of the receiver in Case No.3 and pull it out; stand it on an unopened case while Case No.3 is made into a table as before, standing on the left side of the R.F.Unit table. Then place the receiver on this table, so that it is alongside the R.F.Unit. Stand the Operators' Lamp in front of the receiver.

From the Satchel Signals take out:-

2.(1)(c) Cont'd.

- (i) two pairs of Receivers Headgear D.L.R. and plug them in the PHONE jacks of the receiver;
- (ii) the slide for the operators' lamp and fit it to the bottom of the lamp. This lamp may be fitted in any convenient position;
- (iii) the Key and Plug Assembly No.2B with slide, and plug this in the KEY jack of the R.F.Unit. The slide should be screwed to a table top where convenient for the operator;
- (iv) a Microphone Hand No.4, and plug this in the MIC jack of the R.F.Unit.
- (v) A Wireless Remote Control Unit C Adaptor, if remote control is to be used, and clip this in position at the left underside of the R.F.Unit table. Lift up the front leaf of the table and thread the adaptor lead between this and the table top then replace the leaf with the lead in the notch. Plug the lead into the LINE jack of the R.F.Unit.

Put the Satchel Signals and unused half lid in Case No.3.

- (d) Open Case Transit No.4 and take out the Case 2-Valve A.T.P.100 and Aerial Coupling Equipment, Set Unit G. Place the valve case in front of the R.F.Unit and fix the Aerial Coupling Unit with leads to the front on the left top of the R.F.Unit by means of the wing nuts. Take out all the connectors and leads from the long compartment and place them on the operators' tables ready for connection to the sender units and receiver. From the same compartment take out 20 Pickets and lay them near the aerial site. Take out the Stationery Box and place under the operators' table. Replace the case lid. The case may now be used as a seat.
- (e) Case Transit No.4A contains aerials and mast gear. For erection of the aerials see section (2) page 12.
- (f) Case Transit No.5 contains gear for a remote receiving station and remote control of the sender. It should not be opened at the sender site, unless a spare receiver is required there instead of at a remote point, but should be transported unopened to the remote point. See section (3) page 28.
- (g) Case Transit No.6 also contains apparatus for the remote control point, mainly aerials and mast gear. But it also contains the Aerial Coupling Equipment, Aerial Unit G which may be used with the sender. Open the case and remove this unit then replace the lid for transport to the remote point, unless a separate receiver aerial is required at the local station.

2.(1)(g) Cont'd.

Place the Aerial Unit G with the sender aerial gear.

(h) Connections.

Figure B shows the inter-connection of the R.F.Unit with the Power Supply Unit, the Reception Set R.107, and other apparatus. For extending connectors and leads, if required, Wire Electric P.11 and P.13 is carried in Case Transit No.4.

- (i) Interconnect PLUGS "A" on the R.F.U. and P.S.U. with Connector Single No.29 and PLUGS "B" with Connector 10 point No.4.
- (ii) Connect P.S.U. POWER SUPPLY plug to one of the three left-hand sockets on one of the Switchboards A.C. No.1 by Connector Twin No.81.
- (iii) Connect a similar socket on the Switchboard to the A.C.SUPPLY plug on the receiver by Connector Twin No.62, for working it from A.C.
- (iv) Connect a Battery Sec. Port. 12v. 75 Ah. to the D.C. SUPPLY plug on the receiver by Connector Twin No.61, for working it from D.C.
- (v) Interconnect the MUTING & S/T plugs on the R.F.Unit and receiver with Connector 3 point No.9.
- (vi) Connect the REC'R AE. terminal on the R.F.Unit to the OPEN AERIAL terminal on the receiver by Connector Single No.21A, unless a separate aerial is to be used. See receiver pamphlet. If the REC'R AE terminal is not to be used connect it to an earth terminal on R.F.Unit.
- (vii) Interconnect the EARTH terminals on the R.F. Unit and receiver with Wireless Set No.12 Lead No.1, having the double tag at the receiver end. See receiver pamphlet for use of other tag which is used for earthing the right-hand DIPOLE terminal.
- (viii) With POWER switches OFF on the R.F.Unit, P.S.U. and receiver, connect the Switchboard in use to one of the Power Units A.C/D.C. 2 K.V.A. No.2 (ONAN) (if a suitable mains supply is not available) by means of a Connector Twin No.82. This power unit should be placed as far away (to leeward in open air) from the receiver as the connector or other conditions will allow to minimise the possibility of interference, although the unit is efficiently suppressed. Do not run the engine with the lead connected at this stage.

2.(1)(h)(viii) (Cont'd).

Disconnect to test.

If a suitable mains supply is available connect this to the Switchboard but do not switch on the power.

- (ix) Connect the MAIN EARTH terminal at the left-hand side of the R.F. Unit panel to an earthing pin or earth mat or both by means of a short piece of wire (e.g. R.4). Insert the earthing pin in the ground as close to the sender as possible. If the ground is very dry, rocky or stony the earth mat must be used. (See also under section (2), page 16). An earth pin and mat (Nets, earth 14-ft.) will be found in Case Transit No.4A.

NOTES.

1. The remaining Connectors Twins No.62 and 82 should be kept with the spare switchboard and petrol-electric set.
2. The Connectors Twin No.60 are for connecting batteries to the petrol-electric sets when charging.
3. The Wireless Set No.12 Lead No.2 is for connecting the receiver chassis to any earthed metal apparatus which it may be placed near.

(j) Adjustments for Power Supply Voltage.

Adjust the primary tappings to the power transformer and the contactor transformer both of which are in the Power Supply Unit. The adjustments are made behind the metal cover which is fastened to the lower half of the P.S.U. front panel by knurled-head bolts.

Remove this cover to reveal two small panels side by side (see Fig.4) in each of which are two rows of tapped holes engraved with the voltages of the primary taps to which they are connected. The top row of holes in each panel is connected to the contactor transformer and the lower row to the power transformer. The left-hand panel contains the fine adjustment taps which are 50, 40, 30, 20, 10 and 0 volts while the right-hand panel contains the coarse adjustment taps which are 100, 150 and 200 volts. The correct position of the adjusting screws is that in which the voltage markings engraved over the two holes in use most nearly add up to the voltage of the A.C. supply from which it is desired to work the sender. This voltage may be measured by means of the voltmeter on the switchboard. It is essential that only the screws provided are used because of the importance of the length and further that each row of tappings in each panel has only one screw inserted in it.

After adjustment, replace the cover plate.

2.(1)(k) Fuses.

Insert suitable wire in the fuse holders fitted to lower right-hand side of the P.S.U. front panel and in those on the Switchboards A.C. No.1. Fuse wire is carried in the Stationery Box.

The top pair on the P.S.U. and those on the Switchboards A.C. No.1 should be fused for a current approximately equal to 2,000 divided by the supply voltage from which it is desired to work. Use the 36 S.W.G. wire provided for supply voltages over 200 volts and the 32 S.W.G. wire for lower voltages.

The lower pair of fuses on the P.S.U. should be fused for 2 amps. irrespective of the supply voltage. Use the 36 S.W.G. Copper Wire provided if a more suitable gauge is not available.

Details of wires suitable for fusing at various currents are moulded on the inside of each fuse holder and the information is reproduced in the following Table III.

TABLE III - FUSE WIRE RATING.

S.W.G. Copper.	Current (Amps).
42	2
38	5
36	8
35	10
32	15
30	18
27	26
26	30

(m) Valves and Lamps.

Insert (or confirm that they are correctly in position) the twelve valves and five lamps in their appropriate sockets, seeing that the cap connections and valve retaining devices are correctly arranged. The valve positions are reached by opening the three doors on the R.F.Unit front panel. The positions of the valves and lamps are given in Figs.1, 2, 3 and 4. Access to valveholders V2A, V6A and V2C is obtained by undoing the knurled nut to the left of V2B and moving the screen to the right. If the Aerial Coupling Equipment - Aerial Unit G - is to be used a sixth lamp is required for this (Fig.6). Valves V4A and V4B are contained in the Case 2-Valve A.T.P.100. Replace the empty case in Case No.4.

2.(1)(m) Cont'd.

WARNING: Some of the indicator lamps are connected to high potential circuits of the sender. It is dangerous to try and replace any of them while the sender is in operation. Should a bulb fail it is necessary to switch OFF completely by means of the POWER switch on the P.S.Unit panel.

TABLE IV - VALVES AND LAMPS.

Ref.	Function.	Type.
V1A	Neon Stabiliser	AW3
V1B	Neon Stabiliser	AW3
V2A	Master Oscillator	ATS25
V2B	Buffer	ATS25
V3A	Driver	ATP35
V4A	Power Amplifier	ATP100
V4B	Power Amplifier	ATP100
V5A	500 volt Rectifier	AU1
V5B	500 volt Rectifier	AU1
V2C	Mod. Amp. 2.	ATS25
V6A	Mod. Amp. 1.	ARP34
V6B	Sidetone Rectifier	ARP34
PLA	Crystal Tuning	6v. 06A J.
PLB	Buffer Tuning	6v. 06A J.
PLC	Power Supply "On" (R.F.Unit)	6v. 06A J.
PLD	Power Supply "On" (P.S.Unit)	6v. 06A J.
PLE	Driver Tuning	6v. 06A J.

See that the knurled nut, clamping the screen between the M.O. and Buffer valves (V2A and V2B) is tightly fastened when the valves are in position.

- (n) Close and fasten the three doors of the R.F.Unit.
- (o) Make sure the overload relay just inside the P.S.U. door (Fig.5) has not been tripped (if contact arm up - reset by moving lever) and check that the H.T.Contactor situated on top of the contactor transformer, which is just behind the overload relay, moves down freely when the spring loaded plunger, visible at top of it, is pressed by finger. Close and fasten door of P.S.U.

NOTE: There are 6 safety switches in the power input circuit, 4 at the doors and 2 at Plugs A. Therefore until all doors are shut and Plugs A inserted the POWER SUPPLY switch on P.S.Unit is open circuited. Plugs B must also be inserted before the power can be switched on.

2.(2) Erecting the Aerials.

(a) General.

For one dipole aerial, as supplied with the station, three masts (one to support the feeder) are required. (Fig.10); for two dipole aerials five masts are required with one common to the two aerials or six masts may be used if the aerials are separated. For the arrays shown in Figs. 11 and 12 carrying three aerials six masts are necessary. A simple single wire aerial or Wyndom aerial is supported by two masts (Fig.10). Note that when central masts are used to support feeders they are offset 5 feet from the line of masts supporting the aerials.

One or more of the three dipole aerials (No.6A, 6B and 6C) supplied will normally be used. Where a fixed frequency is used for long range work the Wyndom aerial provides an efficient high angle radiator. The simple end-fed horizontal aerial may be used for quick erection in limited spaces; it is a very useful aerial when the frequency of transmission has often to be changed.

The distance apart of the masts is determined by the length of the aerial. When an adjustable dipole aerial is to be used the masts should be spaced sufficiently to accommodate the maximum length of the aerial (see Table V, page 14). Suitable distances for the Aerials Dipole No.6A, 6B and 6C are given in Figs. 11 and 12. Fig.9 gives the actual lengths of aerials for all working frequencies, including Wyndom aerials. A simple end-fed aerial may be made with about 50 ft. horizontal length and 50 ft. down lead for almost all frequencies. A tape measure is carried in the stationery box packed in Case Transit No.4.

(b) Erection of Masts 36 ft. steel.

On the site of each mast, together with six sections 6 ft., place the following from Case Transit No.4A:-

- 1 Shoe with 1 Antennae Rods "A" peg.
 - 1 Stayplate No.1 complete with guy ropes.
 - 1 Stayplate No.2 " " " "
 - 1 or 2 Halyards (see below).
 - 1 Pulley block (at first erection only).
 - 5 or 6 Pickets (some from Case No.4) (see below).
- A mast which is common to two aerials needs two halyards and 6 pickets; in Figs.11 and 12 these masts are those at the ends and middle of the straight portion of the array.

Attach an extra pulley block to each stayplate No.2; although the extra pulley is not needed for every mast, once fitted, it saves sorting out the stayplates at future erections.

Take out the hammer from Case Transit No.4A.

Each mast may be erected by two men and the following drill is recommended:-

2.(2) (b) Cont'd.

No.1 will note in which direction the aerial is to be run and select the position of the masts. Then action will be taken by each man as shown in the columns below. Reference to the direction of the aerial as applied to the systems shown in Figs. 11 and 12, means the direction of the straight portion containing Aerials Dipole No.6A and 6B.

No.1.	No.2.
<p>(a) Fixes the mast shoe in the position selected, with the open end at 45° to the direction of the aerial, by means of the peg.</p> <p>(b) Drives in 4 Pickets, each 6 full paces from the shoe and 90° round from its neighbour. The first picket is in the direction of the open end of the shoe, i.e. alongside the mast.</p> <p>(c) Drives in 1 picket 2 ft. from the shoe in the direction of the aerial for each halyard.</p> <p>(d) Puts stayplate No.2 on top section of mast with halyard ring(s) in correct position.</p> <p>(e) Runs out the two side guys from stayplate No.2 to the pickets on either side of the mast and tightens these guys.</p> <p>(f) Puts the ring from the underneath guy over the picket near the mast and runs the fourth guy out along the mast to its full extent past the shoe.</p> <p>(g) Picks up both free guys and faces in the direction of the mast.</p>	<p>(a) Assembles 4 mast sections on the ground, laid out in the direction of the open end of the mast shoe with belled ends at bottom. Puts base of mast near shoe.</p> <p>(b) Slides the stayplate No.1 over the fourth section.</p> <p>(c) Completes assembly of mast sections.</p> <p>(d) Runs out two side guys from stayplate No.1 to the pickets on either side of the mast and tightens these guys.</p> <p>(e) Puts the ring from the underneath guy over the picket near the mast and runs the fourth guy out along the mast to its full extent past the shoe.</p> <p>(f) Attaches halyard(s) and runs it (them) out in continuation of the mast.</p> <p>(g) Sees that base of mast is in shoe and then takes up a position near the top of the mast.</p>

2.(2)(b) Cont'd.

No.1.	No.2.
(h) Puts his foot against the base of the mast to keep it in the shoe, and gives the order "Hoist". Pulls on the two free guys as No.2 raises the mast.	(h) When given the order "Hoist" lifts the mast and "walks up" it with his hands until it is vertical.
(j) Puts the two guy rings over the picket behind him and tightens the guys as No.2 holds the mast. Regulates all the guys until the mast is truly vertical.	(j) Steadies the mast while No.1 regulates the guys. (k) Gets each halyard in correct position, clear of guys and ties it to the picket at foot of mast.

NOTE: In wet weather the guy ropes may shrink and tighten irregularly. Constant attention should be given to the adjustment of the guys.

(c) Dipole Aerials.

From Case Transit No.4A select one or more as required of the Aerials Dipole No.6A, 6B and 6C according to the following table:-

TABLE V - DIPOLE AERIALS.

Type	Maximum Length.	Frequencies Covered.
Aerials Dipole No.6A.	26 + 26 ft.	18 - 9 M.c/s.
" " No.6B.	50 + 50 ft.	9.3 - 4.7 "
" " No.6C.	98 + 98 ft.	4.8 - 2.4 "

To cover the remainder of Range 4 for frequencies from 2.4 to 1.2 M.c/s extensions are made to Aerial Dipole No.6C (see Fig.11).

Lay out each aerial between its supporting masts with the central coupling sockets opposite the mast which will

2.(2)(c) Cont'd.

support the feeder. If Aerial Dipole 6C is erected with the arms at an angle as in Figs.11 and 12, this angle must not be less than 90°. From Fig.9, using the graph or the formula, determine the length L of aerial required. The adjustment for length is made by folding back the arms of the dipole, clamping pieces being provided for this purpose. Adjust the aeriels carefully so that the arms are of equal length. See Fig.10.

To make extensions to Aerial Dipole No.6C for frequencies between 2.4 and 1.2 M.c/s use the R.7 wire provided. Attach appropriate equal lengths to the 3-link insulators of the dipole and fix 3-link insulators (from Case Transit No.4A) to the free ends. When necessary connect the extensions to the dipole arms by means of the clamping pieces normally used for folding back the arms.

After the adjustment for length attach the 3-link insulators at the aerial ends to the halyards of the supporting masts, using Cordage, Waterproofed $\frac{1}{8}$ inch, from Case Transit No.4A where necessary. Do not hoist aerial.

Plug a Connector Twin No.58 (aerial feeder) into the socket at the centre of each aerial and screw up the locking ring. Fasten the spring clip on the halyard (from the mast for supporting the connector) to the D-ring of the clamp on the connector below the plug. Fix the outer split ring on the aerial coupling socket round the halyard above the spring clip (see Fig.10).

Hoist the centre of each aerial and feeder almost to the top of the mast by means of the halyard. If this is done correctly there should be no kinks in the feeder cable.

Pull up the ends of each aerial by means of the corresponding halyards. Adjust the three halyards associated with each aerial until the aerial is taut and horizontal and the feeder is supported satisfactorily. Secure the halyards to the pickets at the base of the masts. Readjust guys if necessary.

Bring the free end of each feeder to the sender. Feeders (Connectors Twin No.58) may be connected in series where necessary but it is not recommended that this be done at frequencies over 10 M.c/s. Extra feeders are packed in Case Transit No.4.

(d) The Wyndom Aerial.

This type of aerial, which should only be used for long distance radiation by sky-wave at frequencies over 8 M.c/s, may be made up of R.7 wire carried in Case Transit No.4A.

Cut a length of wire L according to the formula or graph

2.(2)(d) Cont'd.

in Fig.9 allowing for the fixing of a 3-link insulator at each end. Measure a length D (Fig.9) from one end and solder on a length of wire at this point to act as down lead.

Erect the aerial as for the dipoles in (c) above, but without a central mast for supporting the feeder. It is desirable to have the masts at least 20 feet further apart than is necessary just to accommodate the aerial.

The down lead (or single wire feeder) should hang vertically down from the aerial. The position of the tap on the aerial may be affected by surrounding objects and it may prove advantageous to experiment with this especially at lower frequencies. The impedance of the single wire feeder is such that it may be coupled directly to the sender (see (4) pp 21). Alternatively it may be connected to Aerial Unit G as in the next section (e).

It is essential that a good earth connection is made to the sender, or to the Aerial Unit G if used, to obtain high efficiency from this type of aerial.

(e) The end-fed Horizontal Aerial. (See also (4) page 21.).

Cut off 100 feet of R.7 wire and fix a 3-link insulator to one end and another at the middle. Suspend this aerial by means of the insulators between two masts, so that it has a horizontal length of 50 feet and a downlead of 50 feet (approx.).

Connect the downlead to terminal A on the Aerial Unit G, placed under the aerial. In case of necessity this downlead may be connected directly to the sender but generally only at a sacrifice of efficiency.

Connect the terminal E of the unit to earth by means of a short piece of R.4 and an earth pin, or by means of an earth mat, (Nets, earth 14 ft., in Case Transit No.4A), which should preferably be buried in the ground beneath the aerial.

Plug a Connector Twin No.58 into the FEEDER INPUT socket of the Aerial Unit G and run the connector to the sender. Two or more of these connectors in series may be used at lower frequencies to couple the unit to the sender.

(3) Tuning the Sender.(a) General.

In addition to the calibrated OSCILLATOR tuning control, three charts are supplied with the sender as follows:-

2 (3)(a) Cont'd.

- (i) Buffer and driver tuning chart for selected frequencies. This chart is fitted to the lower left-hand door of the R.F.Unit. (Fig.1.).
- (ii) Blank chart for operator's own figures for the oscillator, buffer and driver tuning controls. This chart is fitted to the lower right-hand door of the R.F. Unit. (Fig.1.).
- (iii) Power amplifier settings chart giving tuning control and output tap positions for selected frequencies. This chart should be hooked on the perforated side of the R.F.Unit when not in use.

In the following tuning procedure it is assumed that the exact dial settings are unknown and instructions are given in great detail to assist the initial logging of data by the operator. When the exact figures are known and logged the procedure is much simpler.

Special precautions have to be taken to ensure that the buffer stage is correctly tuned. The output from this stage is almost the same whether tuned to the oscillator frequency or to harmonics even as high as the fourth. This secures good operation with one crystal on several radiation frequencies. The tuning charts provided lessen the possibility of using the wrong oscillator frequency harmonic. When the master oscillator is self-excited the buffer stage is tuned to twice the oscillator frequency, the oscillator tuning control being calibrated to twice the oscillator frequency to give the emitted sender frequency.

For procedure when using crystal control of the master oscillator see Appendix II.

(3)(b) Preliminary.

On the R.F.Unit:-

- (i) Set R.T. MOD. CONTROL to "1".
- (ii) Set OSCILLATOR switch to "M.O."
- (iii) Set SYSTEM switch to "TUNE".
- (iv) Set CONTROL switch to "LOCAL".
- (v) Set BREAK-IN switch to "NORMAL".
- (vi) Set the upper OUTPUT TAPS switch to "0" and the lower OUTPUT TAPS switch to "0 to 8".
To move these knobs hold the central RELEASE knob in an anti-clockwise direction.

2 (3)(b) Cont'd.

- (vii) Confirm that the POWER SUPPLY and H.T. switches are "OFF" and that the three doors in the front panel are firmly closed.

On the Power Supply Unit see that the POWER switch is "OFF" and the door in the front panel is firmly closed.

Switch the mains supply through to the Switchboard A.C. No.1 or start up the engine of the petrol-electric set according to its manual. The meter on the switchboard should show the voltage for which the Power Supply Unit (and receiver if using the A.C. supply) is adjusted.

(c) Initial tuning procedure.

- (i) Unfasten the locking nuts and rotate the BUFFER, DRIVER and P.A.TUNING Controls to 180°.
- (ii) From Table VI below determine the range in which the desired frequency occurs and set the OSCILLATOR, BUFFER, DRIVER and P.A. RANGE Switches to the appropriate number, remembering in the case of the P.A. RANGE Switch to turn the central RELEASE knob in an anti-clockwise direction.

TABLE VI - RANGE SWITCH SETTINGS.

Frequency M.c/s.	Main Range.	P.A. Sub-Range.
17.5 - 13.0	1	1A
14.0 - 10.0	1	1B
10.5 - 7.5	2	2A
8 - 5.2	2	2B
5.3 - 2.5	3	3
2.55 - 1.2	4	4

- (iii) Set POWER Switch on P.S.Unit to "ON". This should cause the red POWER lamp on the P.S.Unit to light but not that on the R.F.Unit.
- (iv) Set POWER SUPPLY-switch on R.F.Unit to "ON", when the power contactor in the P.S.Unit should be heard to close and the red POWER SUPPLY lamp on the R.F.Unit should light. Allow one minute for the valve heaters, etc., to warm up.
- (v) Unfasten the locking nut of the OSCILLATOR TUNING Control and set it to the desired frequency using the calibration on the control itself or, if greater accuracy is required, by means of a wavemeter.

(vi) Tuning the Buffer Stage.

Rotate the BUFFER TUNING Control slowly in an anticlockwise direction until the BUFFER TUNING lamp has attained maximum brilliance. Note the reading on the scale. If this reading corresponds to that given in the table of Buffer and Driver Tuning points fixed to the lower left-hand door of the R.F.Unit, proceed next to tune the Driver and P.A.Stages as described below. If the dial reading corresponds to that given in the table against half the desired frequency, then continue to rotate the BUFFER TUNING Control in an anticlockwise direction until another point of maximum brilliance of the lamp is obtained at approximately the correct scale reading.

Table VII below together with the charts supplied will help to obtain the correct setting. Note that these figures are approximate and not exact.

TABLE VII - CONTROL SETTINGS.

Freq. Mc/s.	Main Range	P.A. Sub- Range	Buffer	Driver	P.A.	Output Taps For Connectors Twin No.58.		Output Taps for Directly Coupled Wyndom.	
						Upper	Lower	Upper	Lower
17.5 17 16 15 14	1	1A	22 29 40 54 67	43 59 74 88 100	45 54 70 88 110	1 " " " "	0 to 8 " " " "	1 1 1 1 2	0 to 8 " " " "
14 13 12 11 10	1	1B	67 80 95 110 124	100 108 123 135 142	45 60 86 110 142	1 " " " "	" " " " "	4 5 5 5 6	" " " " "
10.5 10 9 8	2	2A	3 20 42 63	42 60 77 95	66 80 110 152	2 " " "	" " " "	7 7 7 8	" " " "
8 7 6 5.5 5.2	2	2B	63 87 110 125 138	95 109 130 140 152	47 73 115 144 168	3 " " " "	" " " " "	0 0 0 0 0	9 9 9 9 9

TABLE VII - CONTROL SETTINGS (Cont'd).

Freq. Mc/s.	Main Range	P.A. Sub- Range	Buffer	Driver	P.A.	Output Taps For Connectors Twin No.58.		Output Taps For Directly Coupled Wyndom.	
						Upper	Lower	Upper	Lower
5.3	3	3	10	68	28	7	0-8	0	11
4.9			27	77	40	"	"	"	11
4.5			45	88	52	"	"	"	11
4.1			60	99	65	"	"	"	11
3.7			78	110	78	"	"	"	11
3.3			94	123	98	"	"	"	11
2.9			118	138	126	"	"	"	11
2.5			148	164	172	"	"	"	11
2.6	4	4	14	54	30	0	13	0	16
2.4			26	72	38	"	"	"	16
2.2			42	84	46	"	"	"	16
2.0			58	96	56	"	"	"	16
1.8			72	108	70	"	"	"	16
1.6			90	122	90	"	"	"	16
1.4			115	138	118	"	"	"	16
1.2			143	160	160	"	"	"	16

2 (3)(c) (vii) Confirm that the SYSTEM switch is still in the "TUNE" position and then put the H.T. switch to "ON", when the H.T. contactor in the P.S. Unit will be heard to operate. There is now 2000 volts D.C. on certain components on the upper deck of the R.F. Unit and adequate care must be taken.

(viii) Tuning the Driver Stage.

Rotate the DRIVER TUNING Control in an anticlockwise direction until maximum brilliance of the DRIVER TUNING indicator lamp is obtained at the correct part of the DRIVER TUNING Control scale, which can be found approximately from the table of Buffer and Driver Tuning fixed to the lower left-hand door of the R.F. Unit or from Table VII.

The P.A. ANODE CURRENT meter may now show a reading up to 250 mA or slightly more.

(ix) QUICKLY rotate the P.A. TUNING control in an anticlockwise direction until a dip in the reading of the P.A. ANODE CURRENT meter reading is obtained. This dip may be quite sharp.

The dial reading of the P.A. TUNING control should be approximately that given in the loose chart of P.A. Settings or that given in Table VII for the frequency in use. If this dial reading differs widely from the charts, quickly rotate the P.A. TUNING control in the direction which will give nearer agreement with the tabulation until a second dip in the P.A. anode current is observed.

2(3)(c)(ix) Cont'd.

If a second dip in the current cannot be found, return to the original setting of the control and check the tuning of the previous stages. Do not leave the P.A. stage untuned.

- (x) When a dip in P.A. anode current has been obtained with a dial reading corresponding to the figures given in the chart or Table VII, carefully adjust the P.A. TUNING control to give the exact minimum reading on the P.A. ANODE CURRENT meter.

Approximate figures for the anode current of the P.A. stage both tuned and untuned (which must only be checked untuned with the SYSTEM switch at "TUNE" and only for a period long enough to take a reading) are given in the following Table VIII.

TABLE VIII - P.A. ANODE CURRENT.

Range	Approx. P.A. Anode Current (mA).	
	SYSTEM switch at " <u>TUNE</u> ".	
	P.A. Anode Circuit <u>Unloaded</u> (no connection to OUTPUT)	
	Anode Circuit <u>Untuned</u> .	Anode Circuit <u>Tuned</u>
1A	250	85
1B	260	70
2A	260	55
2B	260	35
3	255	35
4	240	25

(4) Coupling the aerials and loading the sender.(a) General.

To obtain maximum efficiency the aerial feeder must be correctly coupled to the sender. This is made possible in most cases by provision of a number of taps on the coil of the power amplifier tuned anode circuit. In practice the simple horizontal end-fed aerial may give trouble at certain frequencies, but this type of aerial is normally coupled to the sender via Aerial Coupling Equipment - Aerial Unit G - which obviates this difficulty.

The dipole aerials and Aerial Unit G are coupled to the sender by means of feeders (Connectors Twin No.58) of about 100 ohms impedance. The Wyndom aerial feeder when correctly adjusted has an impedance of about 600 ohms. As the sender is primarily designed to feed 100 to 600 ohms non-reactive

loads these systems will correctly load the sender at all frequencies.

In the case of a single wire aerial of random length the impedance will vary from much less than 100 ohms to several thousand ohms according to frequency. If the Aerial Unit G cannot be used to overcome this difficulty, as in an emergency, such an aerial may have to be directly coupled to the sender, possibly with loss of efficiency. With an aerial of a total length of 100 ft. the low resistance difficulty will be more apparent at about 17.5 and 12.5 M.c/s and at these frequencies the aerial should be lengthened. If this is not possible then it should be shortened. Another difficulty may arise due to the reactance of the aerial at certain frequencies. This can generally be overcome by making a compensating change in the setting of the P.A.TUNING control.

The dummy aerial may be used to load the sender for test purposes when a non-radiating load is required, e.g. during wireless silence. Its main function is to load the sender correctly for 100 ohms approximately when using the Aerial Coupling Unit G. It can also be connected to act as a 600 ohm load approximately.

(b) Coupling the Aerial directly to the R.F. Unit.

(i) Put the H.T. switch on the R.F. Unit to "OFF" and see that the SYSTEM switch is at "TUNE".

(ii) Dipole Aerial.

Plug the end of the feeder cable from the appropriate aerial into the Set Unit G adaptor on top of the R.F. Unit and screw up the locking ring. Connect the Set Unit G leads to the OUTPUT terminals on the R.F. Unit.

(iii) Wyndom Aerial or simple end-fed aerial.

Connect the downlead to the left-hand OUTPUT terminal of the R.F. Unit, the right-hand terminal being left unconnected. Confirm that there is a good earth connection to the MAIN EARTH terminal of the R.F. Unit.

(iv) Dummy Aerial. (For test purposes or when using the Aerial Coupling Unit G).

Connect the two leads from the dummy aerial to the OUTPUT terminals of the R.F. Unit. Adjust the dummy aerial resistance by means of the links for 125 or 500 ohms as required (125 ohms for Aerial Coupling Unit G). The dummy aerial will fit in the position normally occupied by the Set Unit G, which must not be connected to the OUTPUT Terminals at the same time.

NOTE: Do not load the sender with the dummy aerial over the P.A. valves. If it is not required put it under the R.F. Unit table.

2 (4)(b) Cont'd.

- (v) Confirm that the OUTPUT TAPS switches are on "0" and "0 to 8", and that morse key is plugged in KEY jack.
- (vi) Check oscillator and buffer tuning.
- (vii) Put H.T.switch on R.F.Unit to "ON" and check driver and P.A. tuning. The P.A.TUNING control setting may have to be altered slightly owing to the connection of the aerial, more so on the high frequencies.

NOTE: If sufficient compensation cannot be obtained on the P.A.TUNING control alone, then move the P.A.RANGE switch to the adjacent range and quickly adjust the P.A.TUNING control to give a dip in the P.A.anode current. In such a case it may be necessary to make a similar change in the OUTPUT TAPS switch. On Ranges 1A and 4 there is no adjacent range giving a higher and lower frequency band respectively, so that if this trouble is found at the ends of the frequency band the aerial system must be checked with extreme care.

- (viii) Turn SYSTEM switch on R.F.Unit to "C.W." and arrange for morse key to be held down. Note the reading of the P.A.ANODE CURRENT meter.
- (ix) Turn the RELEASE knob anticlockwise and move the upper OUTPUT TAPS knob from "0 to 1" then allow the RELEASE knob to return to its normal position.
- (x) Readjust the P.A.TUNING control for minimum reading. This reading should be higher than before but less than 250 mA.
- (xi) Continue this process, moving the upper OUTPUT TAPS switch to the next position and readjusting the P.A.TUNING control for minimum reading on the P.A. ANODE CURRENT meter.

During this process observe the OUTPUT CURRENT meter and adjust the taps to obtain maximum reading on this meter for a reading of less than 250 mA on the P.A. ANODE CURRENT meter when the P.A.TUNING control is correctly adjusted.

- (xii) If sufficient loading is not obtained when the upper OUTPUT TAPS switch has reached "8", proceed to turn the lower OUTPUT TAPS switch from position "0 to 8" to position "9" and so on, as necessary. Refer to TABLE VII which shows the appropriate tap at given frequencies on each range. It may not be possible to load up to 250 mA with an end-fed aerial, especially on Ranges 1A and 4.

2(4)(b)(xii) Cont'd.

When the output stage is correctly tuned and loaded the P.A. valve anodes will be dull red in colour. A yellowish-red colour indicates too high an anode dissipation which should only occur at readings of over 250 mA on the P.A. ANODE CURRENT meter, as when the P.A. stage is incorrectly tuned or loaded. Such a condition must be rectified immediately.

In the case of the dipole, Wyndom or dummy aerial the change in setting of the P.A.TUNING control from that found in the unloaded condition should be small. With a simple end-fed aerial, however, the aerial circuit may be highly reactive necessitating quite considerable retuning as the tap positions are moved.

(xiii) When the sender is correctly tuned and loaded lock the tuning controls by tightening the knurled nuts on the dials.

(c) Coupling the Aerial through the Aerial Unit G.

- (i) After tuning and loading the sender with the dummy aerial (set to 125 ohms), put the H.T. switch on the R.F. Unit to "OFF" and disconnect the dummy aerial, putting this under the R.F. UNIT table.
- (ii) Put H.T. switch "ON" and readjust the P.A.TUNING control if necessary to give minimum reading on the P.A. ANODE CURRENT meter.
- (iii) Put H.T. switch "OFF" and SYSTEM switch to "TUNE".
- (iv) Fit the Set Unit G on top of R.F. Unit and connect its leads to the OUTPUT terminals.
- (v) Fit the socket at the end of the feeder cable from the Aerial Unit G into the adaptor of the Set Unit G and screw up the locking ring.
- (vi) Put H.T. Switch "ON", leaving SYSTEM switch at "TUNE" and OUTPUT TAPS on settings found with the dummy aerial.
- (vii) Make a note of the settings of the P.A. RANGE switch on the R.F. Unit. With this note one operator will proceed to the Aerial Unit G, leaving another operator at the sender.
- (viii) At the Aerial Unit G, set the FEEDER and RANGE switches to the same number as noted at the sender. Put the upper AERIAL COUPLING switch to "L.C" and the lower to "O". Set the TUNING CONTROL to 180°.

2(4)(c) Cont'd.

- (ix) Rotate the TUNING CONTROL on Aerial Unit G slowly from 180° in an anticlockwise direction until the lamp on the panel lights to indicate resonance. If the lamp does not light, repeat the procedure with the PRESS FOR LAMP button pushed down.
- (x) Starting on lower AERIAL COUPLING control and continuing on the upper control if necessary, increase the aerial coupling, adjusting the TUNING CONTROL for maximum deflection in the AE CURRENT meter reading, until the P.A.ANODE CURRENT meter on the Sender reads approximately 140 mA on Ranges 1 and 2 or 120 mA on Ranges 3 and 4.

NOTE: On Ranges 1 and 2 the lower coupling control only is used, on Ranges 3 and 4 both the upper and lower controls are available. Whenever the lower control is in use, the upper control must be set at "L.C." The following Table IX shows the useful taps on various ranges.

TABLE IX - AERIAL COUPLING ON AERIAL UNIT 'G'.

Range.	Lower AERIAL COUPLING.	Upper AERIAL COUPLING.
1A	0 to 3 Turns.	Unavailable.
1B	0 to 4 "	"
2A	0 to 6 "	"
2B	0 to 9 "	"
3	0 to 9 "	Taps 1 to 3.
4	0 to 9 "	Taps 1 to 8.

- (xi) Change SYSTEM switch on R.F.Unit to "C.W." and hold morse key down.

- (xii) Rotate the AERIAL COUPLING control, adjusting the TUNING CONTROL for maximum reading on the AE CURRENT meter, until the Sender P.A.ANODE CURRENT meter reads 240 - 250 mA.
- (xiii) Note the reading of the AE CURRENT meter, and repeat the above procedure with other settings of the Sender OUTPUT TAPS switches to see if an even higher reading on the AE CURRENT meter can be obtained with a P.A. anode current of not more than 250 mA. Small increases in the AE CURRENT and decreases in the P.A.ANODE CURRENT meter readings can sometimes be obtained by readjusting slightly the P.A.TUNING control on the R.F.Unit.
- (xiv) When the necessary adjustments have been made to the controls of the Aerial Unit G, the TUNING control should be locked by the clamping device. Close the lid of the Unit, clamping it by the catches provided in order to keep it as weather-proof as possible. Take care that the aerial lead does not rest on the ground.

(5) Local Operation of Sender.

(Work the receiver according to its own pamphlet. When working "break-in" use the limiter to get rid of muting clicks).

- (a) Carry out the operations given in detail in sections 1 to 4 above as applicable. Log dial readings on right-hand tablet of the R.F.Unit.
- (b) When the local station is completely set up for the required conditions proceed to work the sender on one of the systems as in (d) to (j) below. Put the NORMAL/BREAK-IN switch to "BREAK-IN" unless it is required to mute the receiver continuously as for high speed work.
- (c) When it is required to work on a new frequency with dipole or directly coupled Wyndom aeri-als the appropriate aerial must be lowered and readjusted for length, etc., or another aerial used, as laid down in (2)(c) or (d). The sender must then be retuned and loaded as given in (3)(b) and (c) and (4)(b) respectively.

For a Wyndom aerial coupled through Aerial Unit G the procedure of loading must then be completed as in (4)(c). A simple end-fed aerial does not normally have to be altered in length for a new frequency but the sender must be retuned and reloaded as given in (3)(b) and (c) and (4)(b) and (c).

(d) Switching on. (Sender correctly tuned and loaded).

- (1) Start the petrol-electric set engine or switch on the mains supply. Check reading of meter on the switchboard.
- (ii) Put POWER switch on P.S.Unit to "ON".

2(5)(d) Cont'd.

(iii) Put POWER SUPPLY switch on R.F.Unit to "ON".

(iv) Wait $\frac{1}{2}$ minute, then put H.T. switch on R.F.Unit to "ON".

(e) C.W. Working.

(i) Put SYSTEM switch to "C.W." and NORMAL/BREAK-IN switch to "NORMAL" or "BREAK-IN" as required.

(ii) Press Morse Key when P.A.ANODE CURRENT Meter should read 240 milliamperes (approx.) and the OUTPUT CURRENT meter should show a reading.

(iii) Release Morse Key when the currents should fall to zero.

(iv) Operate with Morse Key in normal manner.

(f) M.C.W. Working.

(i) Put SYSTEM switch to "M.C.W." and NORMAL/BREAK-IN switch to "NORMAL" or "BREAK-IN" as required.

(ii) Press Morse Key; the P.A. anode current should rise to between 120 and 150 milliamperes and the OUTPUT CURRENT meter should show a reading.

(iii) Release the Morse Key; the currents should fall to zero.

(iv) Operate with Morse Key in normal manner.

(g) R.T. Working.

(i) Put SYSTEM switch to "R.T." and NORMAL/BREAK-IN switch to "NORMAL" or "BREAK-IN" as required.

(ii) Set R.T.MOD.CONTROL to position "6" (approx.).

(iii) Press pressel switch on microphone; P.A. anode current should rise to between 120 and 150 milliamperes and the OUTPUT CURRENT meter should show a reading.

(iv) Release pressel switch on microphone; currents should fall to zero.

(v) To send speak in a normal voice close to microphone with the pressel switch depressed. Depth of modulation may be varied by turning R.T.MOD.CONTROL in the appropriate direction in co-operation with the distant receiving station.

2 (5)(h) High Speed Working.

- (i) In order to avoid any loss of message when using this type of operation, put the NORMAL/BREAK-IN switch in the "NORMAL" position. Return to "BREAK-IN" for Reception.
 - (ii) Put the SYSTEM switch to "C.W." or "M.C.W." as required.
 - (iii) Remove Morse Key plug. Connect the high speed key to a No.10 plug and insert in the KEY jack.
 - (iv) Operate the high speed key. The P.A.anode current and output current should rise from zero when keying.
- (j) Teleprinter Working with Apparatus Telegraph Two Tone.

For teleprinter working the Remote Control Unit C must always be used in conjunction with the Apparatus Telegraph Two Tone.

- (i) On the R.F.Unit, set the SYSTEM switch to "R.T." with the R.T.MOD.CONTROL at "6" and put the NORMAL/BREAK-IN switch to "BREAK-IN".
 - (ii) Connect the terminals S and T on the Adaptor C to terminals S and T respectively on the remote control unit.
 - (iii) Insert the Adaptor C plug in the LINE jack and put the CONTROL switch to "REMOTE".
 - (iv) Now proceed as in (4)(b) page 33.
- (k) Closing Down.

- (i) Put SYSTEM switch to "TUNE".
- (ii) Put H.T. switch to "OFF".
- (iii) Put POWER SUPPLY switch on R.F.Unit to "OFF".
- (iv) Put POWER switch on P.S.Unit to "OFF".
- (v) Stop the petrol-electric set engine or switch off the mains supply.

3. The Remote Station.

NOTE: Cases Transit Nos.5 and 6 contain most of the apparatus required at the remote point. For power supply take two Batteries Sec. Port. 12v. 75 Ah. and if necessary the spare petrol-electric set. If a suitable A.C. mains supply for the receiver is available, these items will serve as stand-by. To support the receiving aerial 12 Masts, 36 ft. steel, sections 6 ft., which are not packed in the cases, are also required. Other apparatus such as teleprinters, automatic keys, etc., will have to be provided for according to their own instructional pamphlets.

3. The Remote Station (Cont'd).

The sender may only be switched ON and OFF, keyed and modulated from the remote point. Previous to operating from the remote point, therefore, the sender must be tuned to the desired frequency and loaded and all switches and other controls preset.

Control of the sender is exercised over Cable D8 Twisted, one mile of which is provided on the cable drum.

(1) Adjustment of Sender.

- (a) Tune and load the sender as given in 2(3) and (4) above (page 16.).
- (b) Set SYSTEM switch in an appropriate position, i.e. "C.W.", "M.C.W." or "R.T." ("R.T." for teleprinter working). For "R.T.", set "R.T.'MOD.CONTROL at "6".
- (c) Set BREAK-IN switch to "NORMAL".
- (d) See that Adaptor C plug is inserted in LINE jack.
- (e) Set CONTROL switch to "REMOTE".
- (f) Put POWER switch on P.S.Unit and POWER SUPPLY switch on R.F.Unit to "ON".

NOTE: There may be no effect observed when these switches are put on since the power circuit is broken by the CONTROL switch at "REMOTE". Control is taken over by the polarised relay, whose contacts should be open. If they are closed the sender will be switched on.

- (g) Wait $\frac{1}{2}$ minute, then put H.T. switch "ON".
- (h) Note sender frequency setting.
- (j) Connect the end of the Cable D8 Twisted to the terminals S and T of the Adaptor C under the R.F.Unit table. Note which way round the cable leads are connected to the terminals. Proceed to run the cable to the remote point.

3. (2) Unpacking and Setting up the Receiver and Remote Control Unit.

- (a) Open Case Transit No.5. Remove the cover and pamphlet of the Reception Set R.107 and pull the receiver out of the case, standing it temporarily on the unopened case (No.6). Also from Case No.5 remove the spare valve case, the Wireless Remote Control Unit C, the Satchel Signals and the Lamp Operators No.3. Set up Case No.5 as an operators table in the same way as described under 2(1); see diagram in the lid of the case. Put the receiver on this table. Stand the operators lamp in front of the receiver and place the spare valve case and unused half

3. (2)(a) Cont'd.

lid inside the case No.5. Adjust the receiver according to its instructional pamphlet.

Take off the front cover of the remote control unit. Undo the locking bolts at each side of the front panel and withdraw the Unit from its case. See that 4 batteries are inside and connected in series with the end negative lead to the terminal behind the EXTRA CELLS terminal and the positive terminal to the lead from the switch. Recase Unit and short circuit EXTRA CELLS terminals. Put the Unit on top of the receiver.

From the Satchels Signals take out:-

- (i) Two pairs of Receivers Headgear D.L.R. and plug them in the PHONES jack of the Reception Set R.107.
- (ii) Key and Plug Assembly No.2B with slide. The slide should be screwed to the table top in a position convenient for the operator. On no account plug this key into the Unit until instructed as the sender will be switched on if the key is touched.

Put the Satchels Signal back in Case No.5.

- (b) Open Case Transit No.6. Take out the Stationery Box and stow this under the operator's table. Also take out three Connectors, the roll of Wire Electric R.4, and 4 Batteries dry refill 8-cell No.1 Mk.I.

Take the case to the aerial site, for erection of which see (2) below.

(c) Connections.

Fig.8 shows the connections to the Receiver and Wireless Remote Control Unit C.

- (i) Connect the MUTING AND S/T plug on the receiver to the REC'R MUTING plug on the Remote Control Unit by means of Connector 3-point No.9.
- (ii) Connect the cable D8 twisted from the sender to the Remote Control Unit at the SENDER LINES terminals so that S and T on the unit are respectively connected to S and T on the Adaptor C at the sender.
- (iii) Connect the EARTH terminal of the receiver to an earth pin inserted in the ground as near the receiver as possible.
- (iv) If battery drive is to be used for the receiver, connect the D.C. SUPPLY plug to a 12 volt accumulator by Connector Twin No.61.

3. (2)(c) Cont'd.

- (v) If A.C. supplies are likely to be used, connect the A.C.SUPPLY plug on the receiver to one of the sockets on the Switchboard A.C. No.1 by Connector Twin No.62.

Connect the Switchboard to the Power Unit by means of Connector Twin No.82, or to a suitable A.C.mains supply if available.

(d) To Test Polarity of Lines.

NOTE: This test should be done in conjunction with test (e) below.

- (i) Put NORMAL/BREAK-IN switch to "NORMAL".
- (ii) KEY/AUTO switch to "KEY".
- (iii) Press SENDER CONTROL switch to "ON" and release.
- (iv) Wait half minute for sender to warm up.
- (v) Disconnect muting lead and tune the receiver to the sender frequency. 20 ft. of R.4 will serve as an aerial.
- (vi) Whilst listening with the receiver press the SENDER CONTROL switch to "ON" and release several times. The sender should be heard each time the switch is at "ON".
- (vii) If the Sender is not heard repeat from (iii) above pressing the control switch to "OFF" instead of "ON".
- (viii) If the Sender is now heard interchange the leads to the SENDER LINES terminals S and T.

(e) To Test the Line Voltage.

- (i) Put the SENDER CONTROL switch to "ON" and the NORMAL/BREAK-IN switch to "BREAK-IN".
- (ii) Plug the morse key in the Unit and key the sender at the highest speed obtained in practice.
- (iii) Listen to the sender signal with the receiver. A low line voltage will give clipped dots and dashes. In this case connect additional cells to the EXTRA CELLS terminals after first removing the short circuit link.
- (iv) Switch sender off by putting SENDER CONTROL switch to "OFF" and releasing. Pull out Morse Key plug.
- (v) Reconnect receiver muting leads.

3. (3) Erecting the Aerial.(a) General.

For the remote receiver an Aerial Dipole No.5 is supplied. As will be seen from its instructional pamphlet several other types of aeri-als may be used with the Reception Sets R.107.

The Aerial Dipole No.5 has a total length of 50 ft. with a low impedance feeder of 100 ft. connected at its centre. It is not adjustable in the same way as the sender aeri-als.

The aerial is supported by two 36 ft. masts spaced about 55 ft. apart. Theoretically the directions from which signals are best received are at right angles to the line of the aerial but in practice this effect may not be very pronounced.

(b) Erection of Masts, 36 ft. Steel.

Erect the two masts as given in 2(2)(b) page 12. Only one halyard is required with each mast. The mast gear, except the 6 ft. sections, is carried in Case Transit No.6.

(c) Attaching the Aerial.

Fit a 3-link insulator to each end of the dipole and attach to the halyards. Pull up the halyards until the aerial is taut and horizontal. Secure the halyards to the pickets near the feet of the masts.

Connect the free end of the aerial feeder to the DIPOLE terminals of the receiver.

(4) Remote Operation of Sender.

CAUTION: After being switched on the sender must be allowed a half minute to warm up before it is keyed.

(a) Keying the Sender.

- (i) Switch sender on by pressing SENDER CONTROL switch to "ON" and releasing.
- (ii) Put KEY/AUTO switch to "KEY" for hand keying, to "AUTO" for Wheatstone transmitter.
- (iii) Set NORMAL/BREAK-IN switch. "NORMAL" is always preferable for high speed keying.
- (iv) Plug in morse key in KEY jack for handspeed or connect Wheatstone Transmitter (Z & U) to "AUTO" terminals.

3. (4)(a)(iv) Cont'd.

Never insert the morse key plug unless the key is actually in use.

(v) Operate key or transmitter in normal manner.

(b) Teleprinter Working with Apparatus Telegraph Two Tone.

(i) Put KEY/AUTO switch to "AUTO".

(ii) Connect TONE terminals on unit to SENDER terminals on Apparatus Telegraph Two Tone Mk.II.

(iii) Put NORMAL/BREAK-IN switch on unit to "NORMAL".

(iv) Switch on Sender (already adjusted for R.T.) by pressing SENDER CONTROL switch to "ON" then releasing.

(v) Wait $\frac{1}{2}$ minute, then put KEY/AUTO switch to "KEY". Keying relay in the Sender will now be controlled from the SEND/RECEIVE switch on the Apparatus Telegraph Two Tone.

(vi) See the Working Instructions for the Apparatus Telegraph Two Tone. To ensure a satisfactory depth of modulation adjust the MODULATION LEVEL control in collaboration with the receiving operator.

NOTE: There is a heavy drain on the batteries in the remote control unit when transmitting teleprinter messages. Always put the SEND/RECEIVE switch to "RECEIVE" when not transmitting.

(c) Emergency Use of Remote R.T. or M.C.W.

(i) It is possible to transmit R/T or M.C.W. from a remote point, by means of the Wireless Remote Control Unit "C" and the Telephone Set D Mk.V.

(ii) Connect the terminals marked "TONE" on the Control Unit to the terminals L1 and L2 of the Telephone D Mk.V. Do not use an earth connection at any part of the remote system.

(iii) Put NORMAL/BREAK-IN switch to "NORMAL", KEY/AUTO switch to "KEY".

(iv) Connected in this way the keying relay of the No.33 Set is automatically operated and speech from the telephone modulates the sender.

3. (4)(c) Cont'd.

- (v) Keying the telephone through its buzzer will transmit M.C.W.
- (vi) When finished speaking or keying put the KEY/AUTO switch to "AUTO". This will release the keying relay in sender which stops radiating. To transmit return the KEY/AUTO switch to "KEY".
- (vii) To switch off - put KEY/AUTO switch to "AUTO", and then put the switch on the Control Unit to "OFF".
- (viii) It is not recommended that any line equipment - e.g. telephone exchange-be interposed between the Telephone Set D Mk.V and the Remote Control Unit "C".

(d) To Switch the Sender Off.

- (i) Make sure that morse key plug is out of KEY jack and that the Apparatus Telegraph Two Tone, if connected to the TONE terminals, has its SEND/RECEIVE switch at "RECEIVE".
- (ii) Put the SENDER CONTROL switch to "OFF" for a few seconds then release.

APPENDIX I - LIST OF ITEMS ISSUED WITH COMPLETE STATION.

(For references see page 40).

ITEM.	VOCAB. OR CATALOGUE No.	DESIGNATION.	LOCAL STATION.			REMOTE STATION.		
			MIN. FOR WORK.	ESSENTIAL SPARES.	TOTAL.	MIN. FOR WORK.	ESSENTIAL SPARES.	TOTAL.
1	2	3	4	5	6	7	8	9
		<u>SECTION F.</u>						
1	FA 2185	Hammers, Smiths, Hand 3 lbs.	1	-	1	1	-	1
2	FA 2229	" Handles, No.5.	1	-	1	1	-	1
		<u>SECTION J.</u>						
3	JA 0233	Boxes, Stationery, Telegraph Equipment Unit B.	1	-	1	1	-	1
		<u>SECTION V.2.</u>						
4	VC 2512	Watches, G.S.Mk.II.	1	-	1	1	-	1
5	VC 2290	Tapes, Measuring, Metallic Woven, 50 ft.	1	-	1	-	-	-
		<u>SECTION W.1.</u>						
6*	WA 1890	Pickets, Angle, Short Mk.III.	33	-	33	10	-	10

APPENDIX I (Cont'd).

1	2	3	4	5	6	7	8	9
		<u>SECTION W.2.</u>						
7	WB 0027	Batteries, Dry, Refills, 8-Cell No.1 Mk.1.						
8	WB 0071	Bulbs, 6-volt J.	1(c)	10(a)	11	4(m)	4	8
9	WB 0114	Cable, Electric, D8, Mk.III, Twisted miles				1(c)	4(b)	5
10	WB 0283	Drums, Cable, No.7, Mk.III.				1		1
11	WB 1057	Wire, Electric, R4, Mk.I. 41 yds.		1	1	1	1	1
12	WB 1060	" " R7, Mk.I. 200 yds.		1	1			
13	WB 1042	" " P11, Mk.I. 36 ft.		1	1			
14	WB 1043	" " P13, Mk.I. 36 ft.		2	2			
		<u>SECTION X.2.</u>						
15	XA 0927	Fuse Wire Copper No.36 S.W.G. (1/4 lb. reel)		1	1		1	1
16	XA 0925	" " No.32 S.W.G. (1/4 lb. reel)		1	1		1	1
17	XA 1053	Lamps, Electric Radiator CF. BCCC. DE. (g). (230-250 volts, 250 watts).		2	2			
		<u>SECTION Y.</u>						
18	YA 1152	Pins, Earth, Small.	1		1	1		1
		<u>SECTION Z.1.</u>						
19	ZA 0909	Aerials, Dipole, No.5.				1		1
20	ZA 10703	" " No.6A.	1		1			
21	ZA 10704	" " No.6B.	1		1			
22	ZA 10705	" " No.6C.	1		1			
23	ZA 0843	Aerial Coupling Equipment: Aerial Unit G.	1		1			
24	ZA 10701	" " : Set Unit G.	1		1			

APPENDIX I (Cont'd).

1	2	3	4	5	6	7	8	9
		SECTION Z.1 (Cont'd).						
25*	ZA 0374	Antennae Rods "A" Pegs.	6	6	12	2	2	4
26	ZA 0670	Blocks, Pulley, Single $\frac{1}{2}$ inch.	6	-	6	-	-	-
27	ZA 0942	Cases, Spare Parts No.5A.	1	-	1	-	-	-
28	ZA 0943	" " " No.5B.	-	-	-	1	-	1
29	ZA 10950	Cases, 2-Valve A.T.F.100.	1	-	1	-	-	-
30	ZA 0975	Connectors Single No.21A.	1	-	1	-	-	-
31	ZA 10714	" " " No.29A.	1	-	1	-	-	-
32	ZA 0989	" Twin No.58.	6	-	6	-	-	-
33	ZA 0977	" " No.61.	1	-	1	-	-	-
34	ZA 0978	" " No.62.	1	-	1	-	-	-
35	ZA 10715	" " No.80.	2	-	2	-	-	-
36	ZA 10716	" " No.81.	1	-	1	-	-	-
37	ZA 10717	" " No.82.	1	-	1	-	-	-
38	ZA 0984	" 3-point No.9.	1	-	1	-	-	-
40	ZA 10710	" 10-point No.4.	1	-	1	-	-	-
41	ZA 10763	Cordage, Waterproofed, $\frac{1}{2}$ inch. 150 yds.	1	-	1	-	-	-
42	ZA 4444	Insulators, Chain, Small, 3-link.	1	-	1	-	-	-
43	ZA 4500	Key and Plug Assemblies No.2B. (d).	1	-	1	-	-	-
44	ZA 4381	" " " Slides No.1. (d).	1	-	1	-	-	-
45	ZA 4524	Lamps, Operator No.2.	1	-	1	-	-	-
46	ZA 4600	" " " No.3.	1	-	1	-	-	-
47	ZA 3291	" " " Slides (d).	1	-	1	-	-	-
48*	ZA 3224	Masts, 36-ft. Steel, Sections 6 ft. Shoes.	36	-	36	-	-	-
49*	ZA 3225	" " " Stayplates No.1 (complete with guy ropes).	6	-	6	-	-	-
50*	ZA 3226	" " " Stayplates No.2 (complete with guy ropes).	6	-	6	-	-	-
51*	ZA 3227	" " " Halyards. (d).	6	-	6	-	-	-
52*	ZA 3120	Microphones, Hand No.4.	15	-	15	-	-	-
53	ZA 5313	Nets, Earth, 14 feet.	1	-	1	-	-	-
54	ZA 5484	Reception Set R.107.	1	-	1	-	-	-
55	ZA 3050	" " " Cases, Spare Valves.	1	-	1	-	-	-
56	ZA 2965	" " " Working Instructions.	1	-	1	-	-	-
57	ZA 3220		1	-	1	-	-	-

APPENDIX I (Cont'd).

1	2	3	4	5	6	7	8	9
		<u>SECTION Z.1. Cont'd.</u>						
58	ZA 3238	Receivers, Headgear, D.L.R. double Mk.I. (d).	2	-	2	2	-	2
58A	ZA 5785	" " " " C.L.R. double Mk.III. (alternative to above).						
59	ZA 6292	Satchels Signals.	1	-	1	1	-	1
60	ZA 3497	Valves W.T. Type A.R.21.	4	4(h)	8	4	4(h)	8
61	ZA 3493	" " " " A.R.P.34.	6	4(h)2(g)	12	4	4(h)	8
62	ZA 7012	" " " " A.T.P.35.	1	1(g)	2	-	-	-
63	ZA 5189	" " " " A.T.P.100.	2(j)	2(g)	4	-	-	-
64	ZA 7001	" " " " A.U.1.	2	2(g)	4	-	-	-
65	ZA 3494	" " " " 6X5G.	1	1(h)	2	1	1(h)	2
66	ZA 7013	" " " " A.W.3.	2	2(g)	4	-	-	-
67	ZA 10813	" " " " A.T.S.25.A(ZA3496-A.T.S.25 may be used)	3	3(g)	6	-	-	-
68	ZA 3231	Vibrators No.5.	1	1(h)	2	1	1(h)	2
69	ZA 7372	Voltmeters, Pocket, 250 volt, No.2.	1(a)	-	1	1(b)	-	1
70	ZA 7369	" " " " " , Cases.	1(a)	-	1	1(b)	-	1
71	ZA 9987	Wireless Remote Control Unit C.	-	-	-	1	-	1
72	ZA 3219	" " " " Adaptors. (d).	1	-	1	-	-	1
73	ZA 10724	Wireless Set No.33, Cases Transit No.1.	1	-	1	-	-	1
74	ZA 10725	" " " " No.2.	1	-	1	-	-	1
75	ZA 10777	" " " " No.3.	1	-	1	-	-	1
76	ZA 10778	" " " " No.4.	1	-	1	-	-	1
78	ZA 10811	" " " " No.4A.	1	-	1	-	-	1
79	ZA 10779	" " " " No.5.	-	-	-	1	-	1
80	ZA 10780	" " " " No.6.	-	-	-	1	-	1
81	ZA 10727	" " " " Spare Valves.	1	-	1	-	-	1
82	ZA 10728	" " " " Dummy Aerial.	1	-	1	-	-	1
83	ZA 10729	" " " " Power Supply Unit.	1	-	1	-	-	1
84	ZA 10730	" " " " Sender (R.F.Unit).	1	-	1	-	-	1
85	ZA 10732	" " " " Working Instructions.	1	-	1	-	-	1
86	ZA 10731	" " " " Tablets Calibration.	1	-	1	-	-	1
87	ZA 3222	" " " " No.12, Leads No.1.	1	-	1	-	-	1
88	ZA 10079	" " " " " Leads No.2.	1	-	1	-	-	1

APPENDIX I (Cont'd).

1	2	3	4	5	6	7	8	9
		<u>SECTION Z.2.</u>						
89	ZB 0220	Batteries, Secondary, Portable, 12-volt, 75 Ah.	1	1	2	1	1	2
90	ZB 0140	Power Units A.C/D.C. 2 K.V.A. No.2 (ONAN).	1	1	2	-	-	-
91	ZB 0239	Switchboards A.C. No.1.	1	1	2	-	-	-
		<u>SECTION LV6 - MT.1.</u>						
92	2212 46655	Extinguishers, Fire. Tetrachloride filled. Extinguishers, Fire. BB bracket.	1 2	- -	1 2	1 2	- -	1 2
		<u>SECTION LV6 - MT.3.</u>						
94	12516	Bulbs, Electric Lamp, 12/14 Volts, 6 Watts, S.B.C.	1(e)	2(a)	3	1(e)	2(b)	3

REFERENCES.

- (a) Carried in Cases Spare Parts No.5A.
- (b) " " " " " No.5B.
- (c) For use in Lamps Operator No.2.
- (d) Carried in Satchels Signals.
- (e) For use with Lamps Operator No.3.
- (f) Carried in Boxes Stationery Tele.Equip.Unit B.
- (g) " " W/S No.33 Cases Spare Valve.
- (h) " " R/S No.107 " " "
- (j) " " Cases 2-Valve A.T.P.100.
- (k) " " Watch-holder on R/S R.107.
- (m) Fitted in Wireless Remote Control Unit C.

*ZA 3223 Masts, 36 ft., steel - comprises:-

ZA 3224	Sections, 6 ft.....	6
ZA 3225	Shoes.....	1
ZA 3226	Stayplates No.1.....	1
ZA 3227	Stayplates No.2.....	1
ZA 3120	Halyards.....	2
ZA 0374	Antennae Rods "A" Pegs.....	2
WA 1890	Pickets, Angle, Short Mk.III.....	5

Extra components are issued for reasons given in text.

A P P E N D I X II.

CRYSTAL CONTROL OF SENDER FREQUENCY

1. General.

With crystal control of the master oscillator the Buffer, Driver, and P.A. stages may be tuned to the fundamental or any harmonic frequency of the crystal within the frequency range of the sender. This allows a choice of several emission frequencies, up to four in some cases, with a given crystal.

When switching and tuning the Oscillator stage it must be remembered that its actual frequency of oscillation is half that inscribed on the OSCILLATOR tuning control dial.

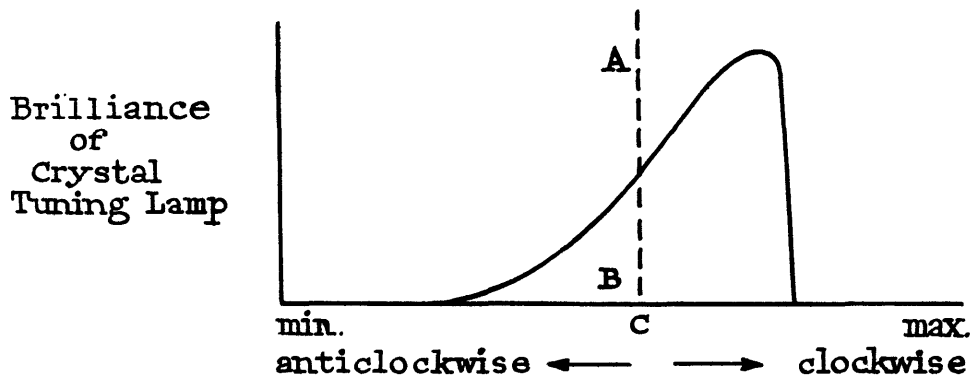
The instructions below should be followed in place of 2(3)(b) (page 17) when using crystals.

2. Tuning the Sender.

- (1) Open lower left-hand door of the R.F.Unit and insert the crystal in the holder just inside the door. The right socket of the holder is the earth connection.
- (2) Close and fasten the door.
- (3) Put the OSCILLATOR switch to "CRYSTAL".
- (4) Using Table VI (page 18), set the OSCILLATOR RANGE switch to the range in which twice the fundamental frequency of the crystal occurs.
- (5) Using the same table, set the BUFFER, DRIVER and P.A.RANGE switches to the range including the desired emission frequency, which may be the fundamental frequency of the crystal or any multiple of this frequency within the range of the sender. Remember to turn the RELEASE knob before altering the position of the P.A.RANGE switch.
- (6) Unfasten the locking nuts and rotate the BUFFER, DRIVER and P.A.TUNING controls to 180°.
- (7) Unlock the OSCILLATOR tuning control and set it to read approximately twice the fundamental frequency of the crystal.
- (8) Set POWER switch on P.S.Unit to "ON". This should cause the red power lamp on the P.S.Unit to light.
- (9) Set POWER SUPPLY switch on R.F.Unit to "ON". The main contactor in the P.S.Unit should be heard to operate and the red POWER SUPPLY lamp on the R.F.Unit should light. Allow $\frac{1}{2}$ to 1 minute for the valve heaters, etc., to warm up.

APPENDIX II (Cont'd).

2. (10) Readjust the OSCILLATOR tuning control about its setting until the CRYSTAL TUNING lamp glows with maximum brilliance.
- (11) Turn the OSCILLATOR tuning control gradually in an anticlockwise direction until a slight decrease in brightness of the CRYSTAL TUNING lamp is noticed. This gives the optimum point of oscillator stability as illustrated in the diagram below.



Oscillator Tuning with Crystal Control

- (12) From the data available in Table VII (page 19), on the left-hand tablet of the R.F. Unit or any logged readings, adjust the BUFFER TUNING control to the setting for the correct harmonic of the crystal frequency, i.e. for the desired emission frequency. Near this setting of the control the BUFFER TUNING lamp should light. Adjust the control carefully for maximum brilliance of this lamp.
- (13) Put the H.T. switch to "ON".
- (14) In the same way as for (12) above, adjust the DRIVER TUNING control for the correct frequency to give maximum brilliance of the DRIVER TUNING lamp.
- (15) Quickly turn the P.A. TUNING control in an anticlockwise direction until a dip is obtained in the P.A. ANODE CURRENT meter reading.

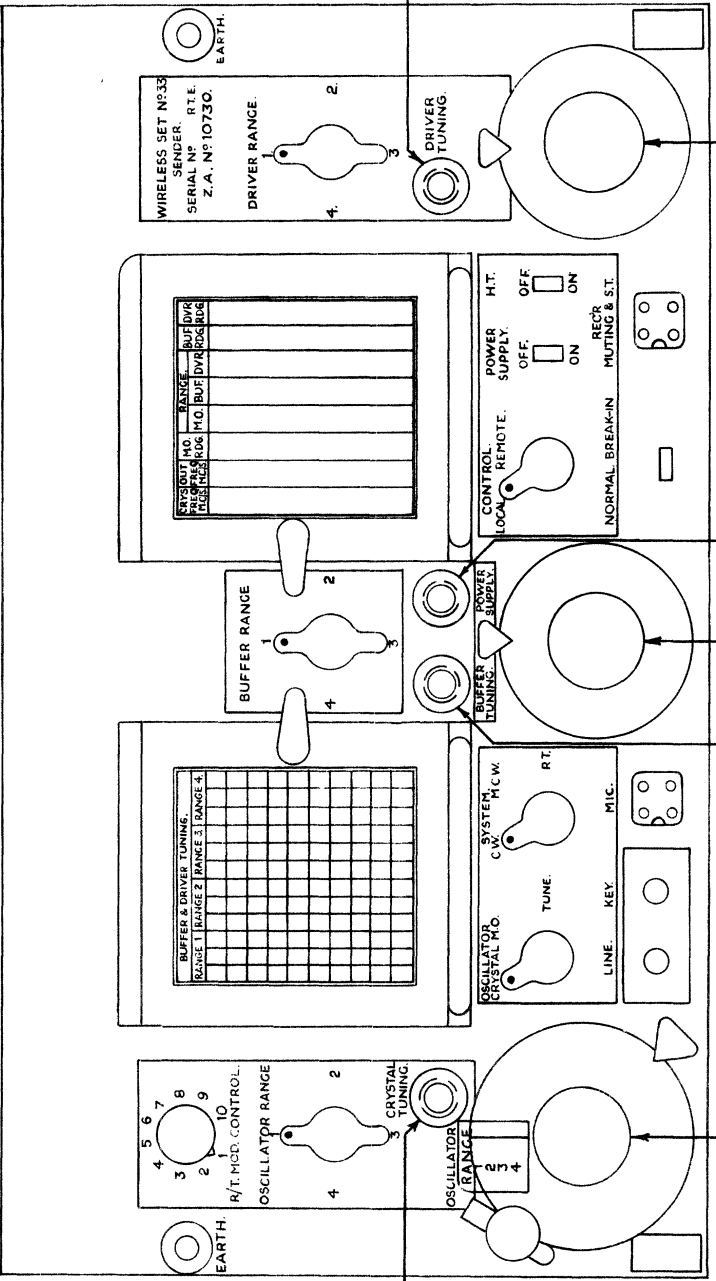
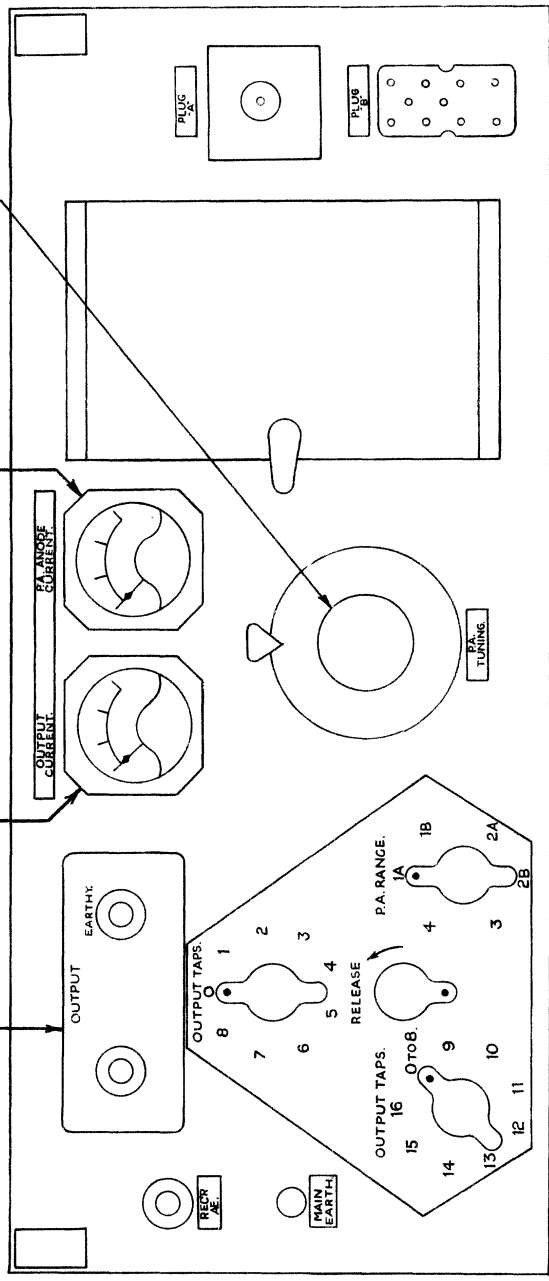
APPENDIX II (Cont'd).

- 2.(16) Look at the chart of P.A. control settings and also at Table VII (page 19) to see if the P.A.TUNING control is set at the correct part of the scale for the frequency in use.
- (a) If so, carefully make a fine adjustment with the control to obtain a minimum reading on the P.A. ANODE CURRENT meter.
 - (b) If not, quickly rotate the P.A.TUNING control to the part of the scale indicated in the tables until a second dip is obtained in the meter reading. Then proceed as in (a) above.

NOTE: If difficulty is found in obtaining a dip in P.A.anode current at the correct part of the scale the crystal may be a poor one or too great a frequency multiplication is being attempted. Do not leave the P.A.TUNING control with the meter reading over 240mA but adjust it until a dip is obtained, even if at the wrong place on the dial, while a check is being made on the frequency, tuning, etc.

- (17) Check all tuning control positions, etc., to ensure that the correct emission frequency has been obtained. Also check the reading of the P.A.ANODE CURRENT meter against those given in Table VIII (page 21). The reading may be slightly different especially if the frequency multiplication is more than double that of the crystal.
- (18) Proceed to load the sender as in (4) (page 21).

OUTPUT CURRENT METER P.A. ANODE CURRENT METER P.A. TUNING CONTROL

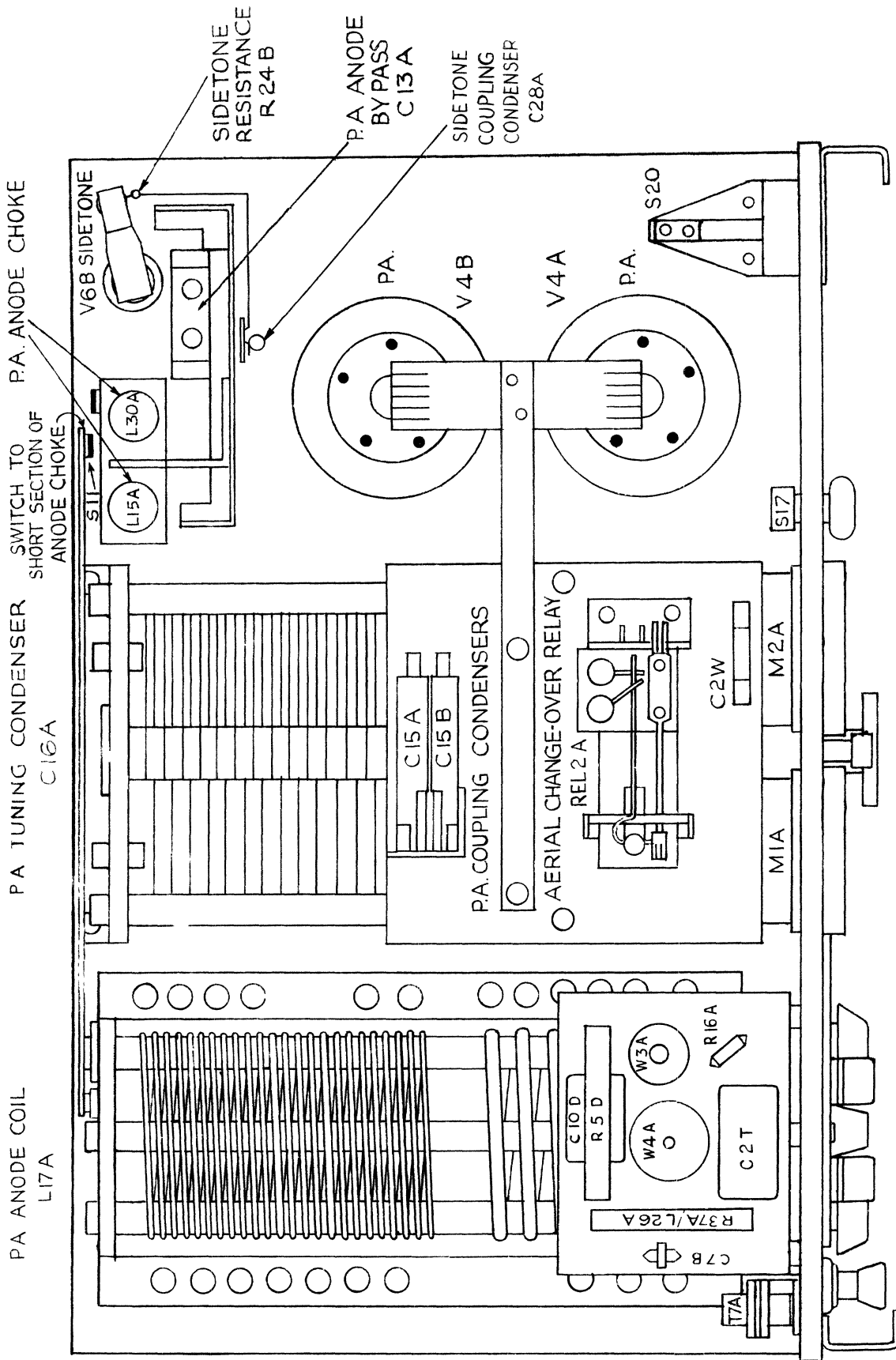


CRYSTAL TUNING LAMP

OSCILLATOR TUNING CONTROL BUFFER TUNING CONTROL DRIVER TUNING CONTROL POWER SUPPLY LAMP

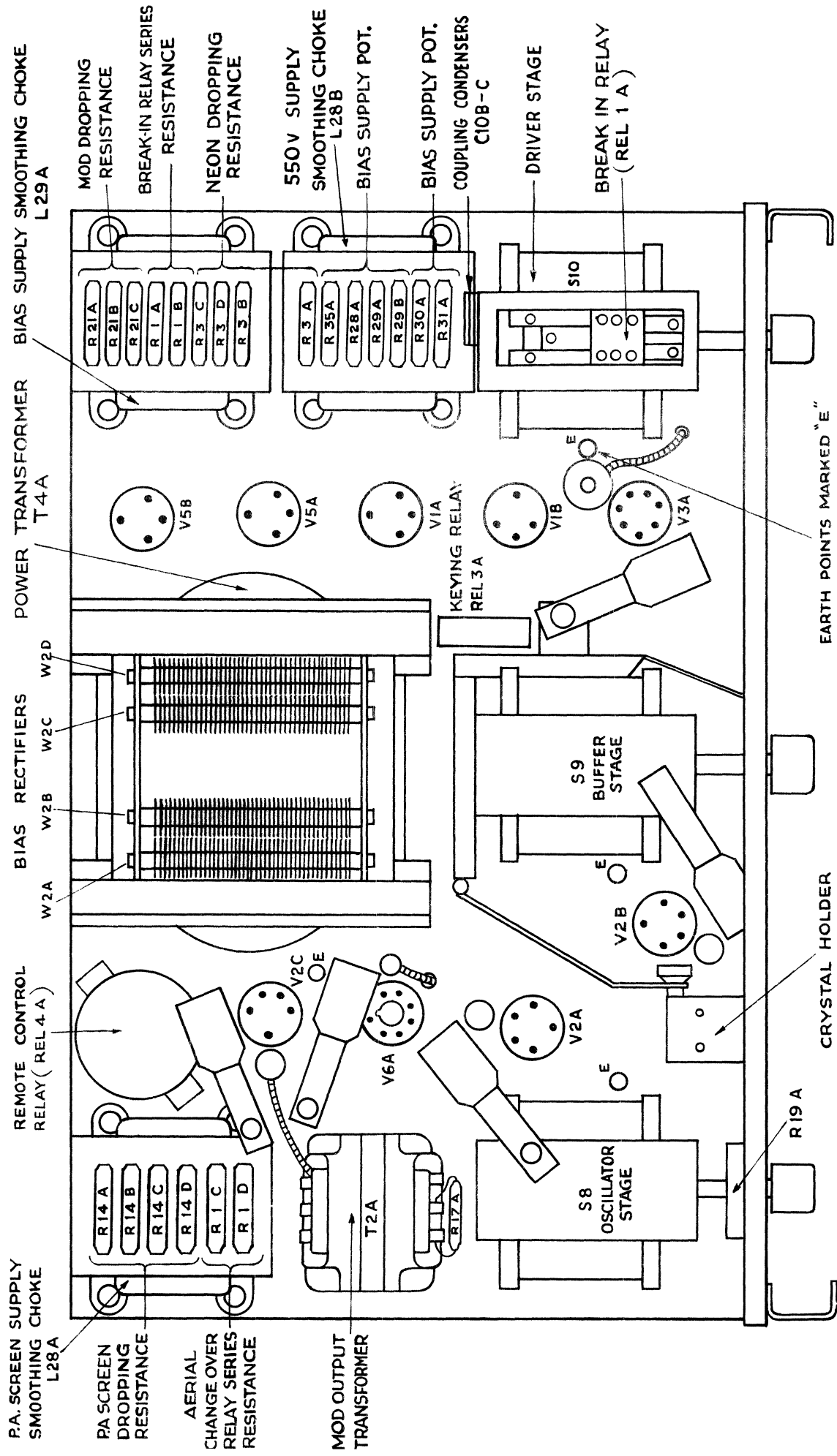
FRONT PANEL LAYOUT OF R.F. UNIT.

FIG. 1.



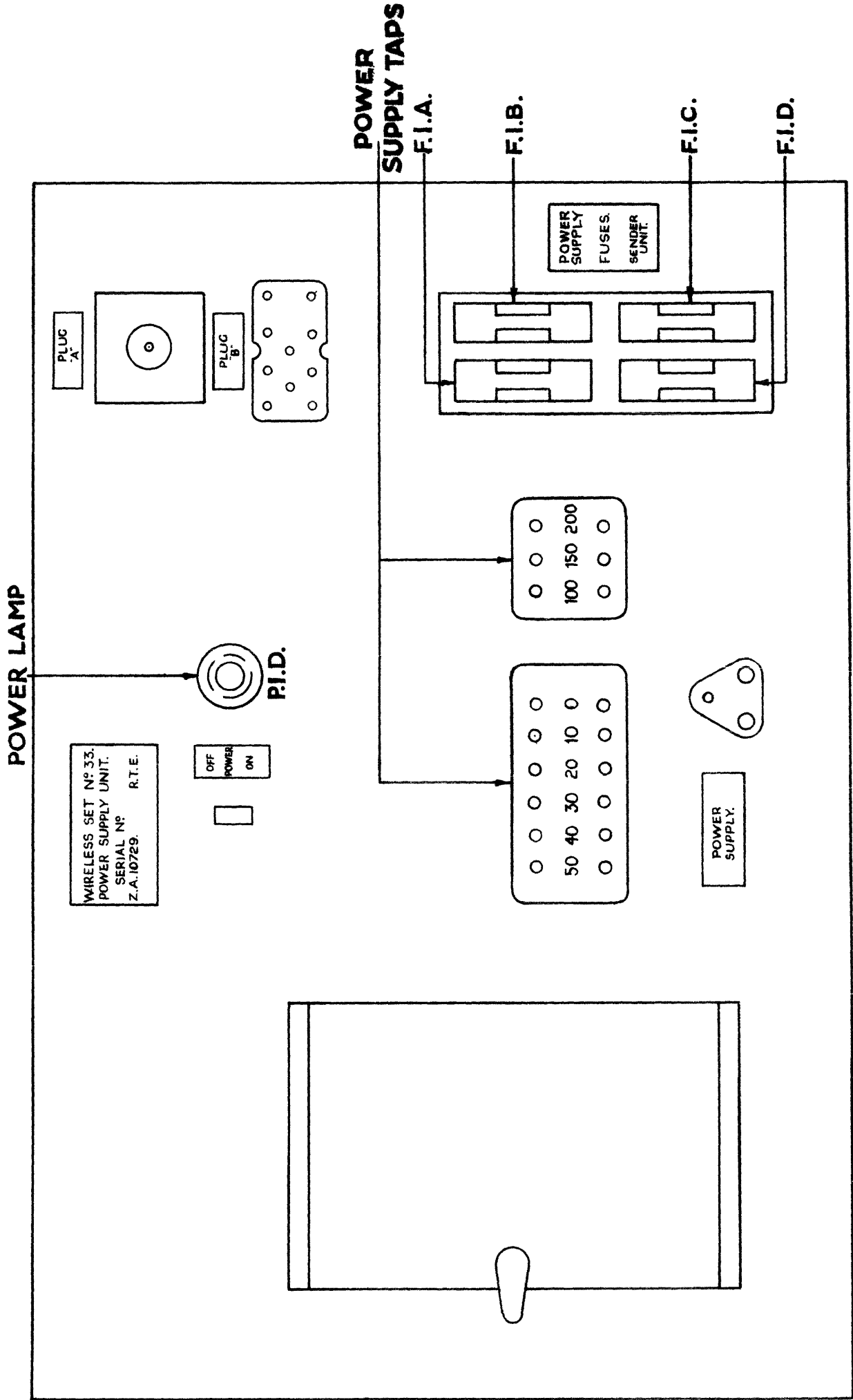
CHASSIS LAYOUT OF R.F. UNIT. TOP DECK

FIG 2



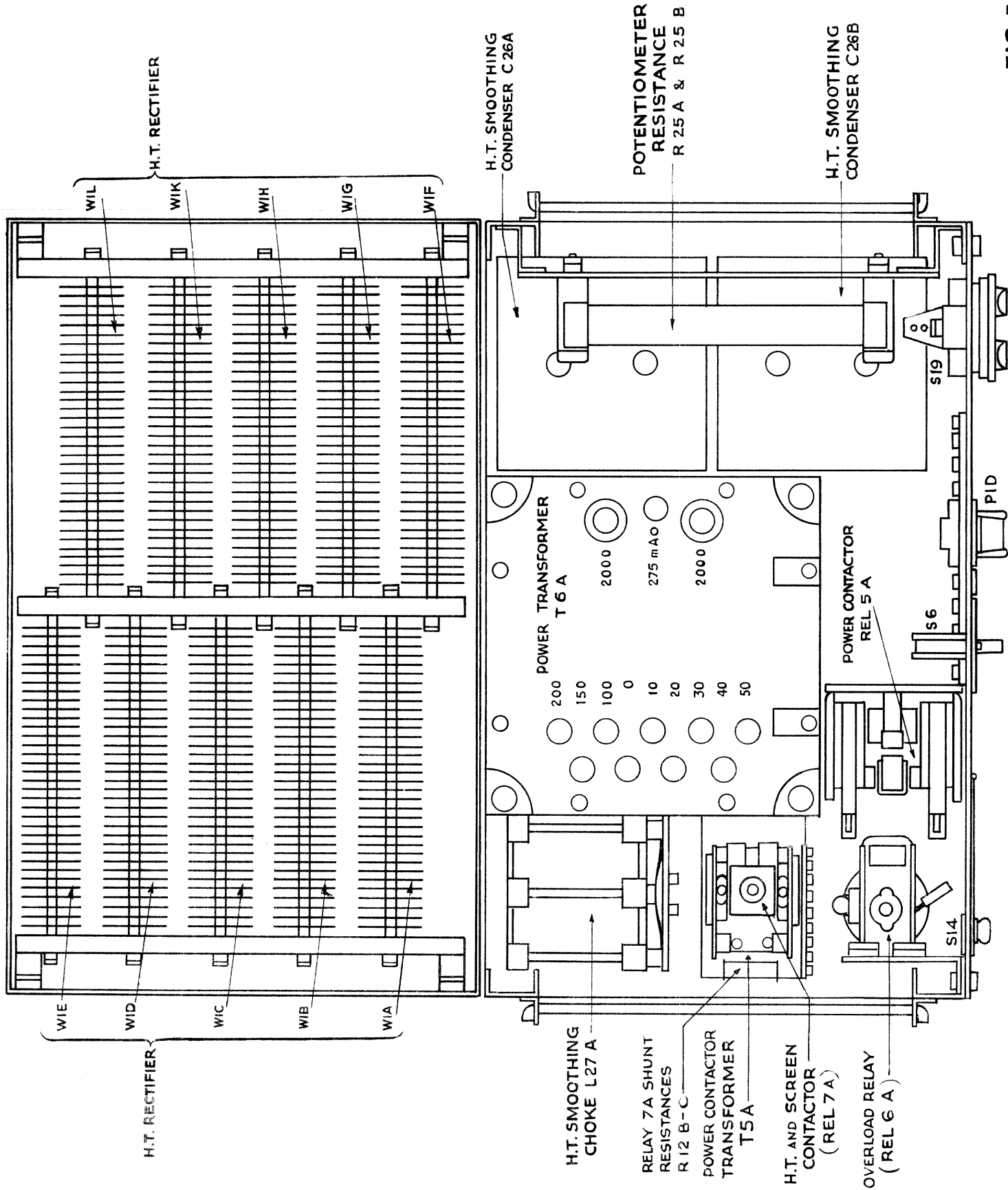
CHASSIS LAYOUT OF R.F. UNIT BOTTOM DECK

FIG. 3



FRONT PANEL LAYOUT OF P.S. UNIT.

FIG. 4



CHASSIS LAYOUT OF P.S. UNIT

FIG 5

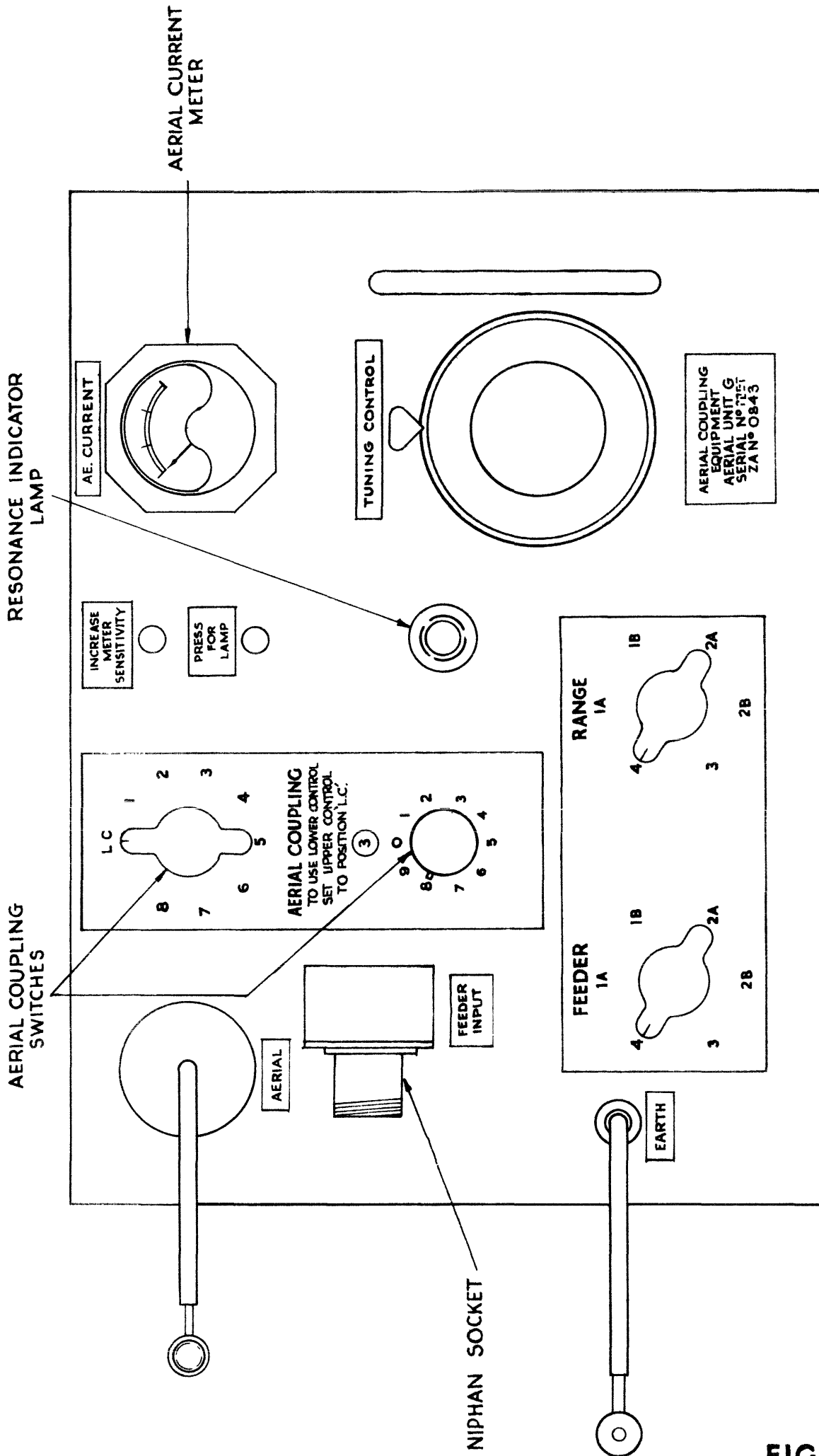


FIG. 6
FRONT PANEL LAYOUT OF AERIAL UNIT G

FIG. 6

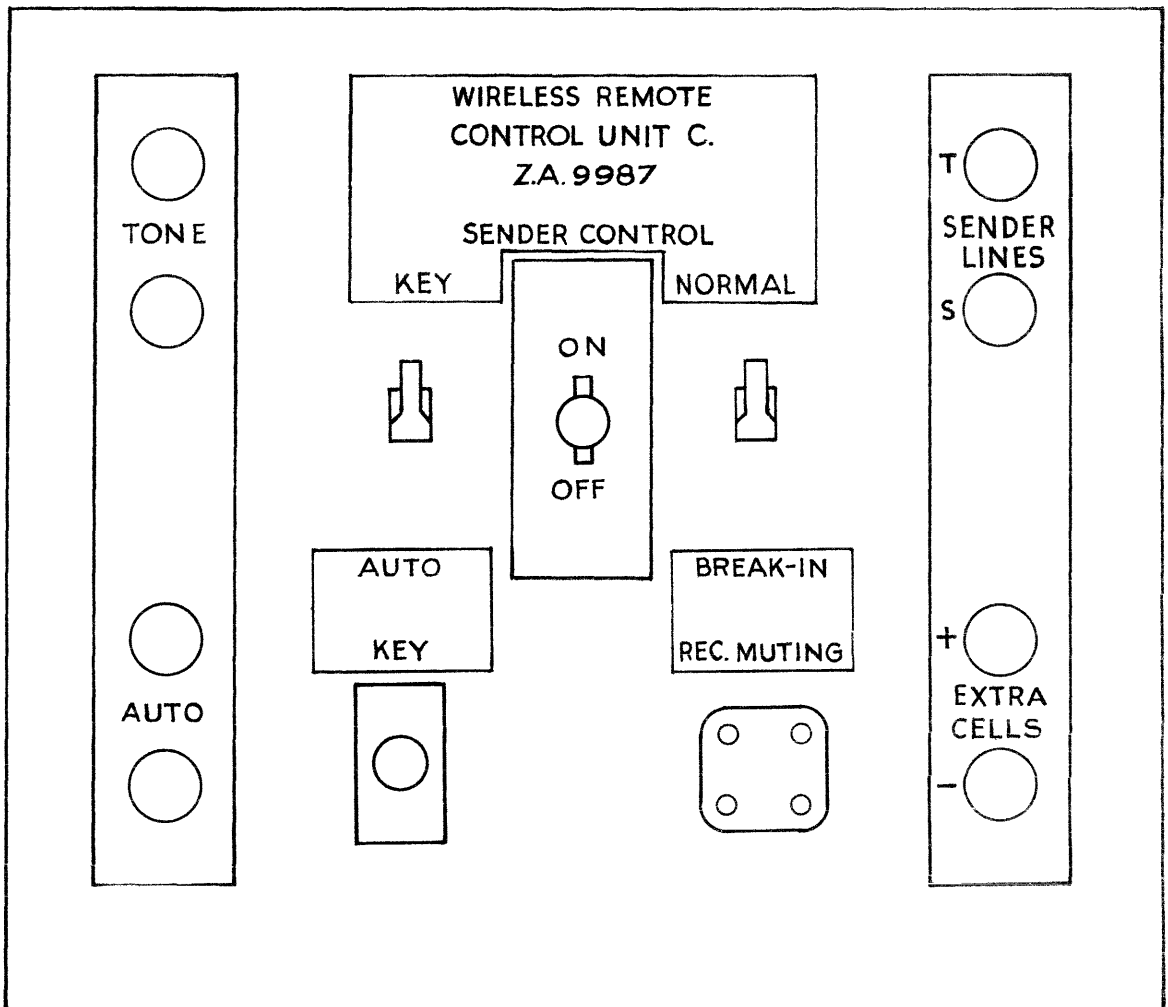
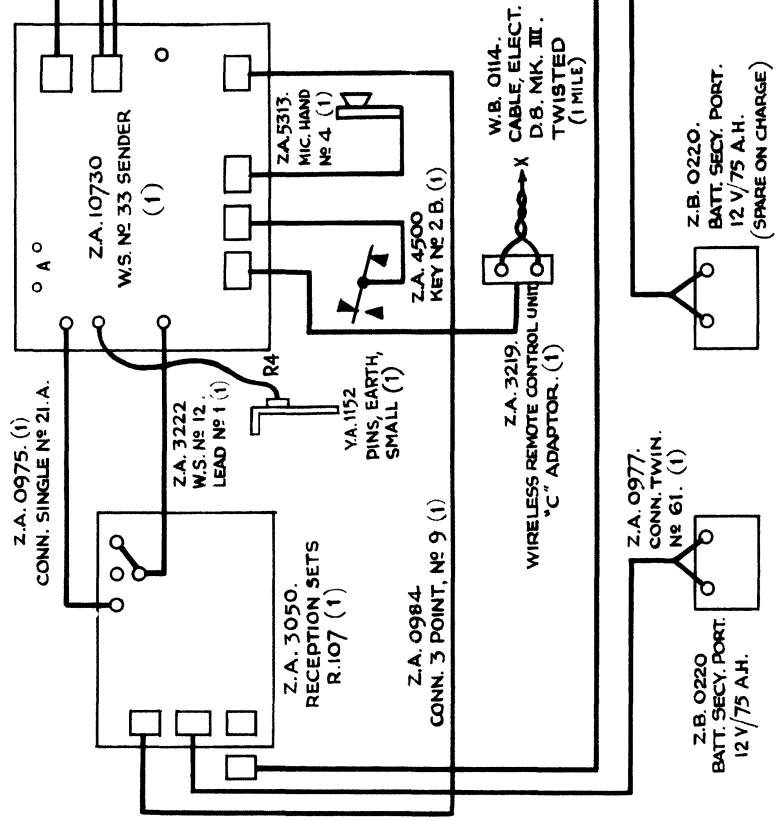
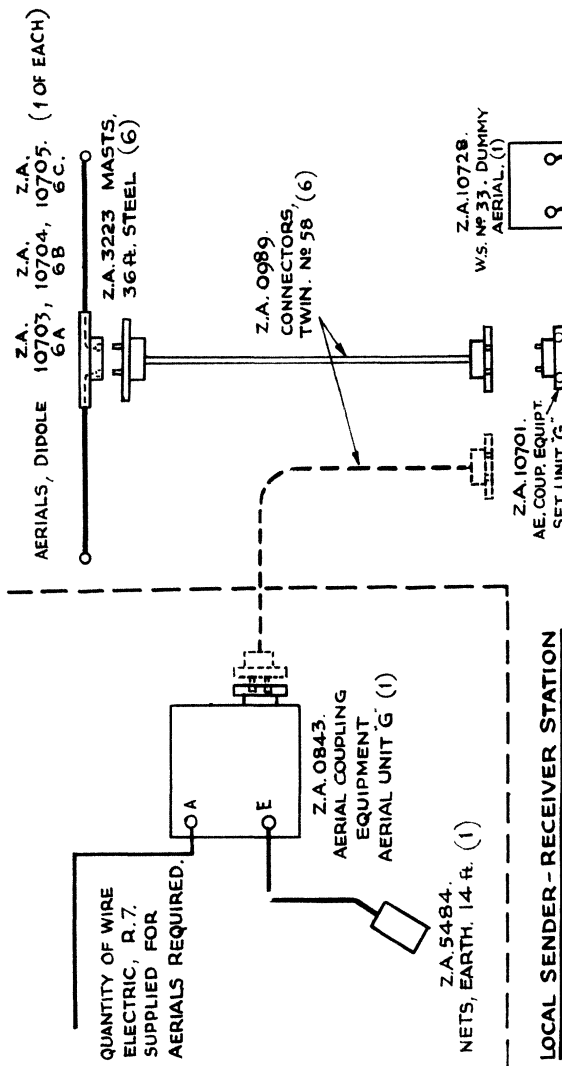
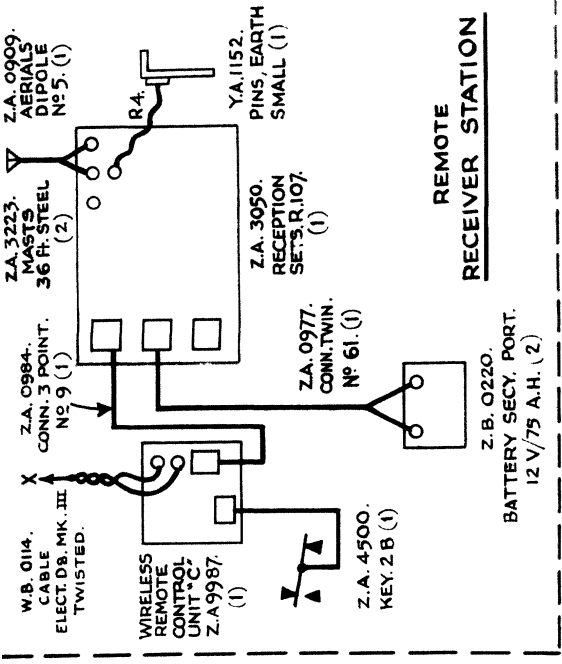
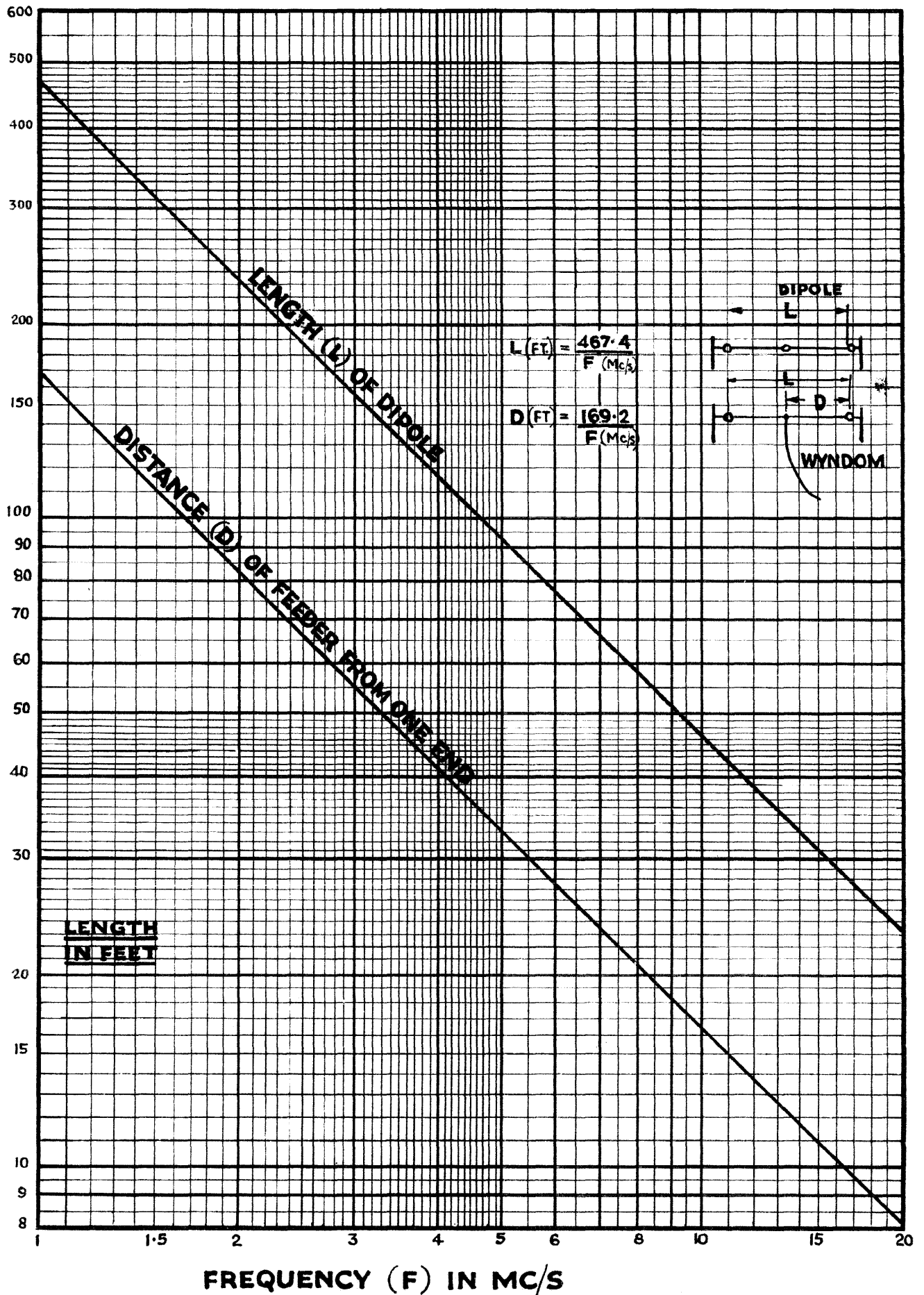


FIG 7
FRONT PANEL
OF WIRELESS REMOTE CONTROL UNIT C.

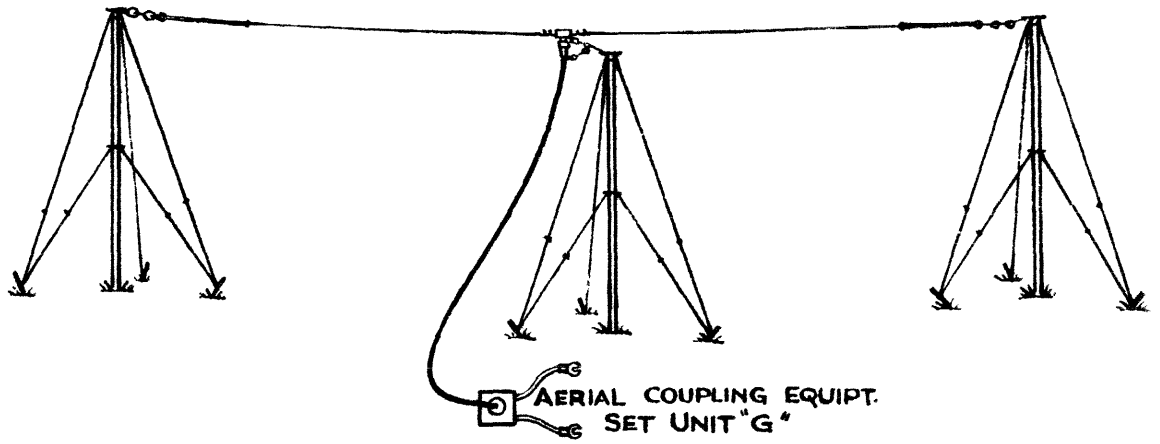


WIRELESS SETS NO 33. GROUND STATION LAYOUT

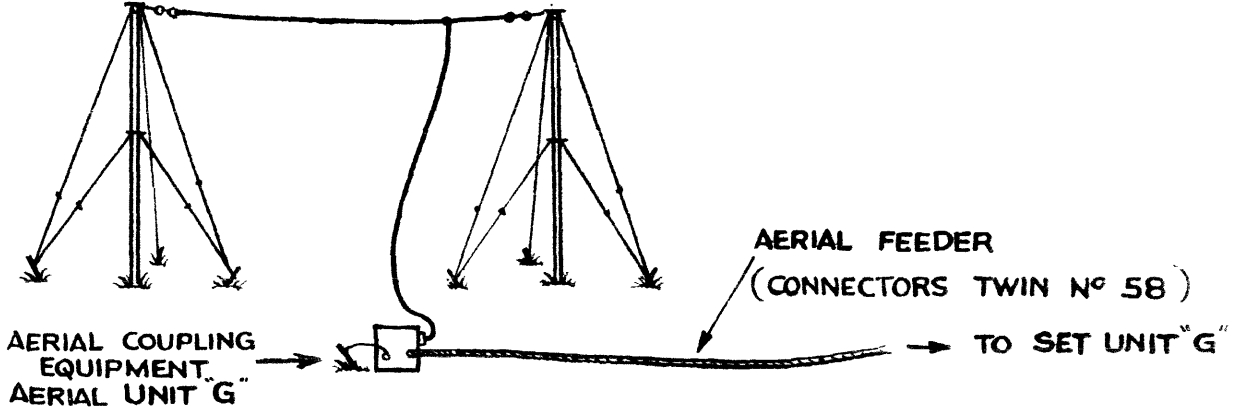
FIG. 8



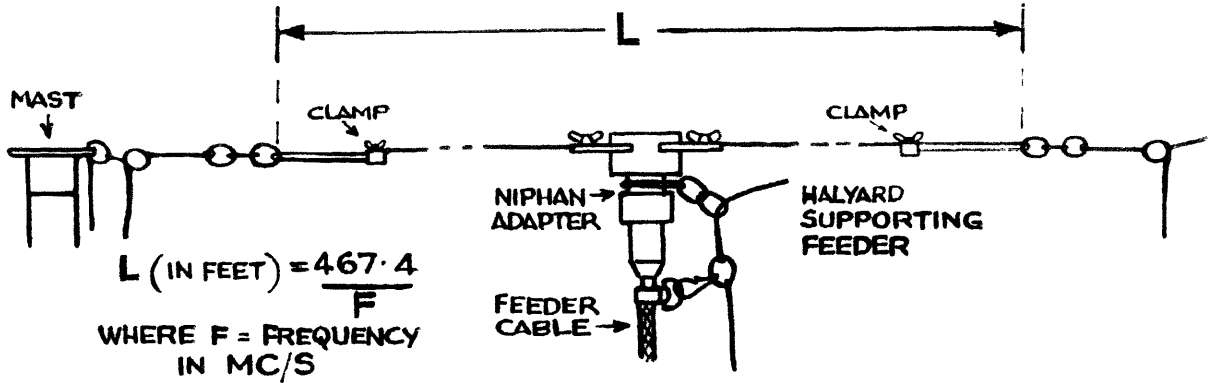
GRAPHS AND FORMULAE FOR AERIAL LENGTHS FIG. 9



DIPOLE AERIAL



WYNDOM AERIAL (OR END-FED) USING AERIAL COUPLING EQUIPMENT "G"



ADJUSTABLE DIPOLE AND FEEDER CABLE COUPLING

AERIALS

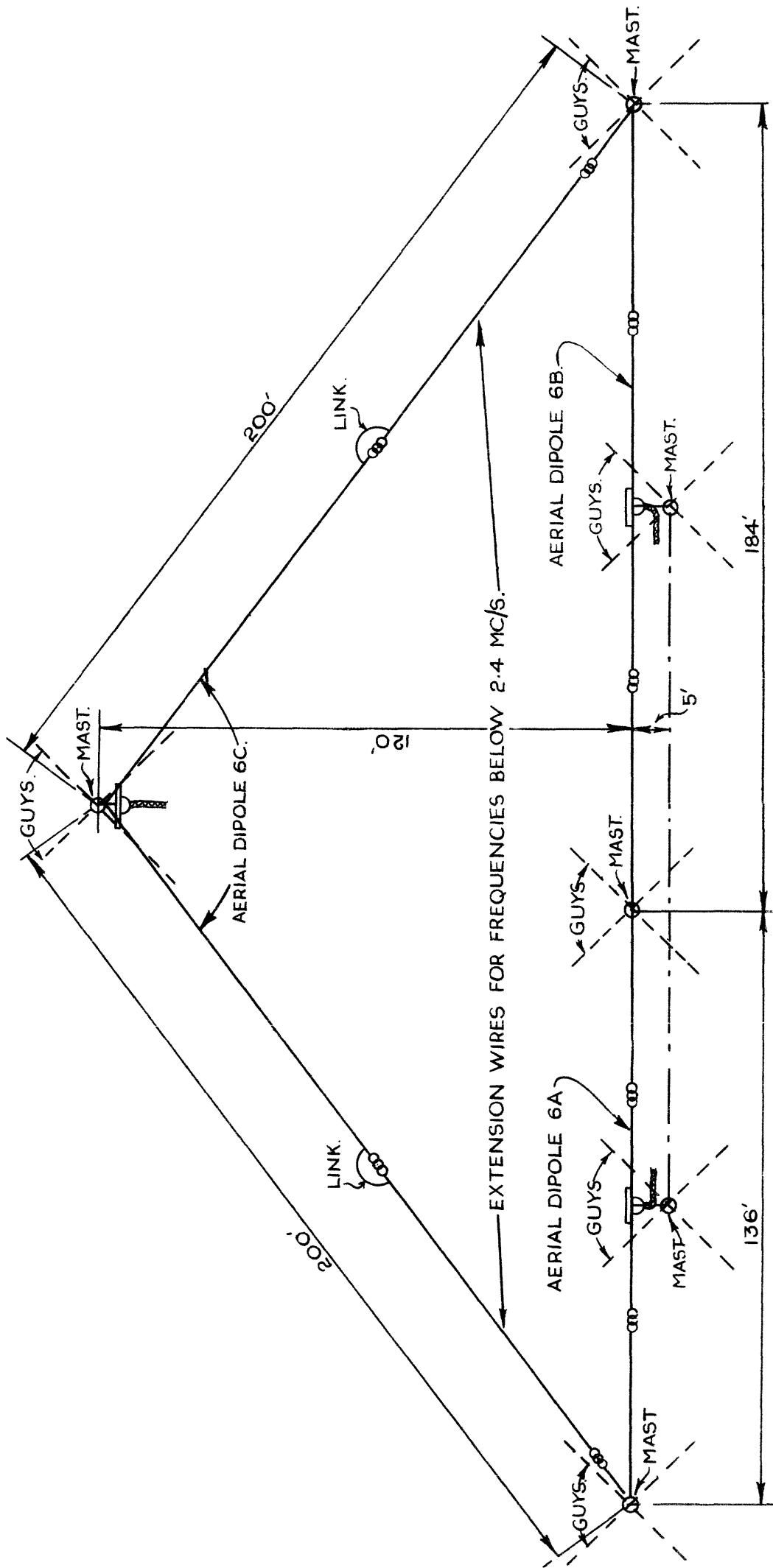


FIG II

AERIALS SHOWN AT MAXIMUM EXTENSION.

FIG. II

ARRANGEMENT OF MASTS TO SUPPORT DIPOLE AERIALS COVERING THE FREQUENCY BAND 1.2-17.5 MC/S.

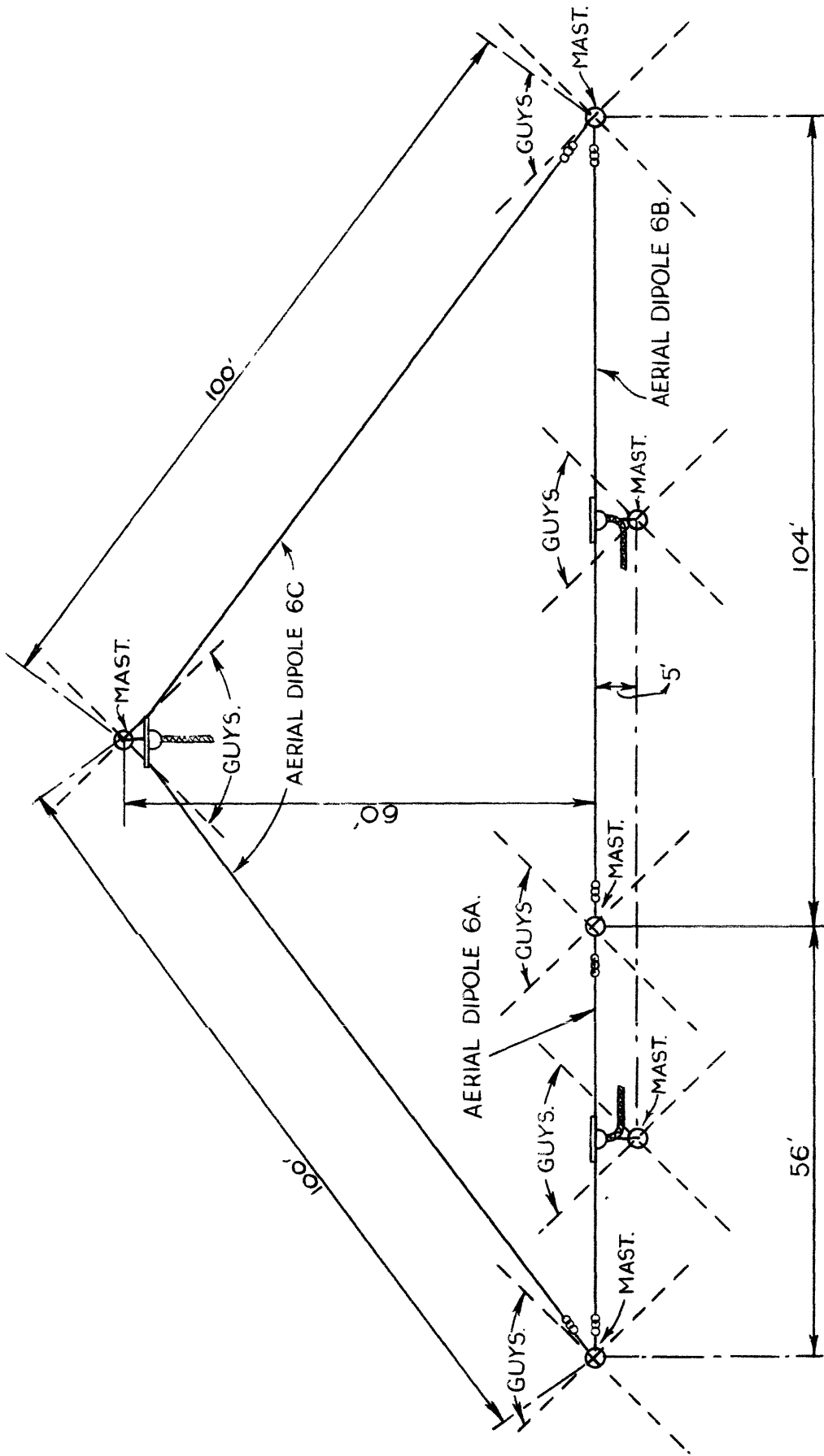


FIG 12

AERIALS SHOWN AT MAXIMUM EXTENSION.

FIG.12

**ARRANGEMENT OF MASTS TO SUPPORT DIPOLE AERIALS COVERING THE FREQUENCY BAND
24-175 MC/S.**

1 WIRELESS SETS N° 33 SENDER

1 WIRELESS SETS N°33
TABLETS CALIBRATION
(SLUNG AT SIDE OF SET)

1 WIRELESS SETS N°33
WORKING INSTRUCTIONS
(FLAT ON TOP OF SET)

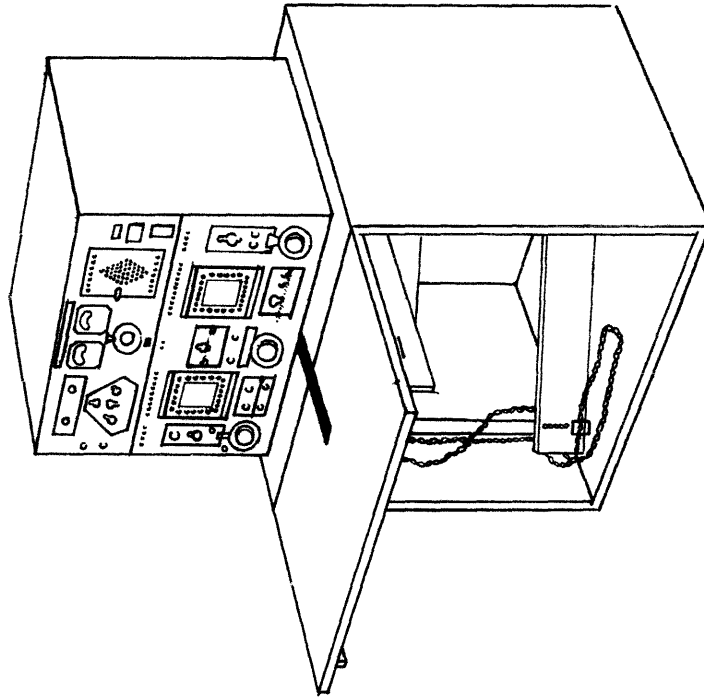
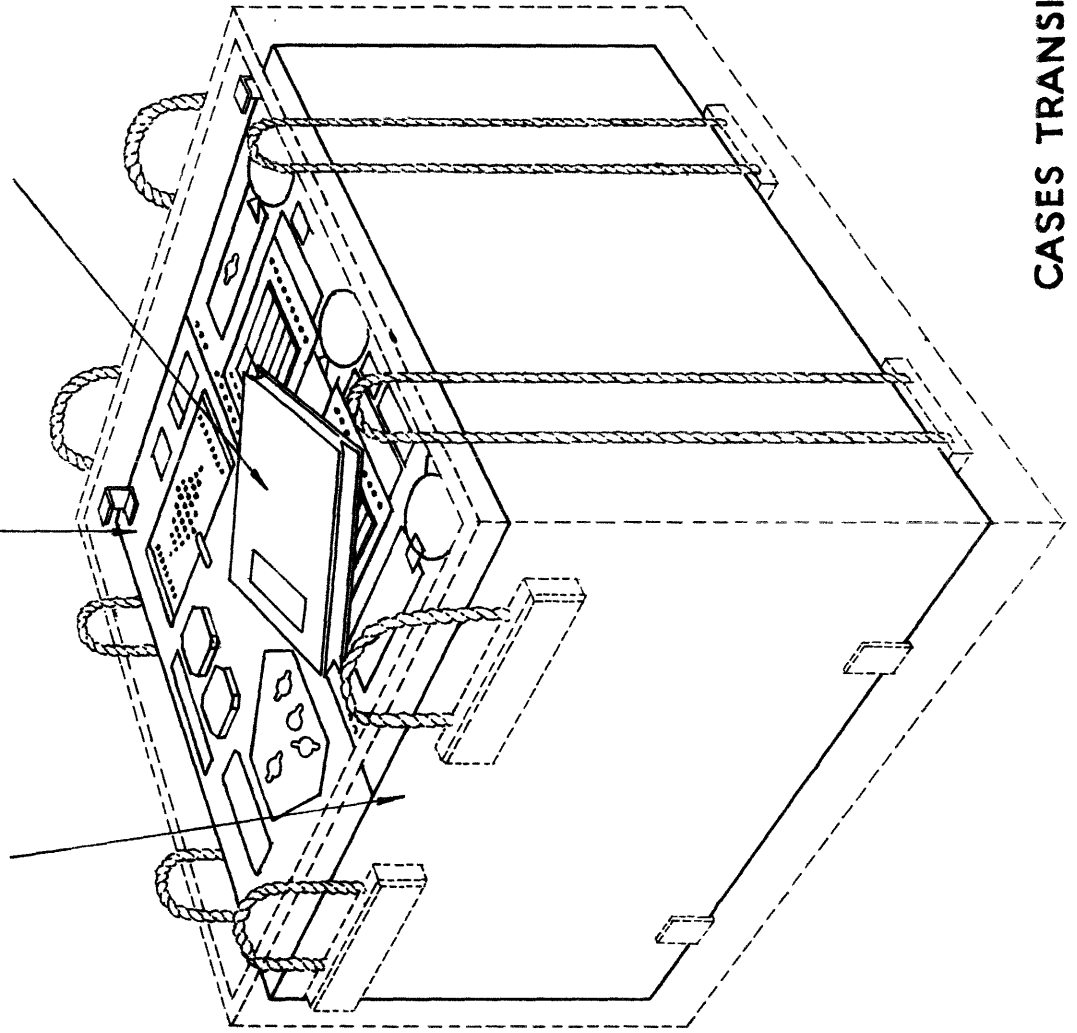


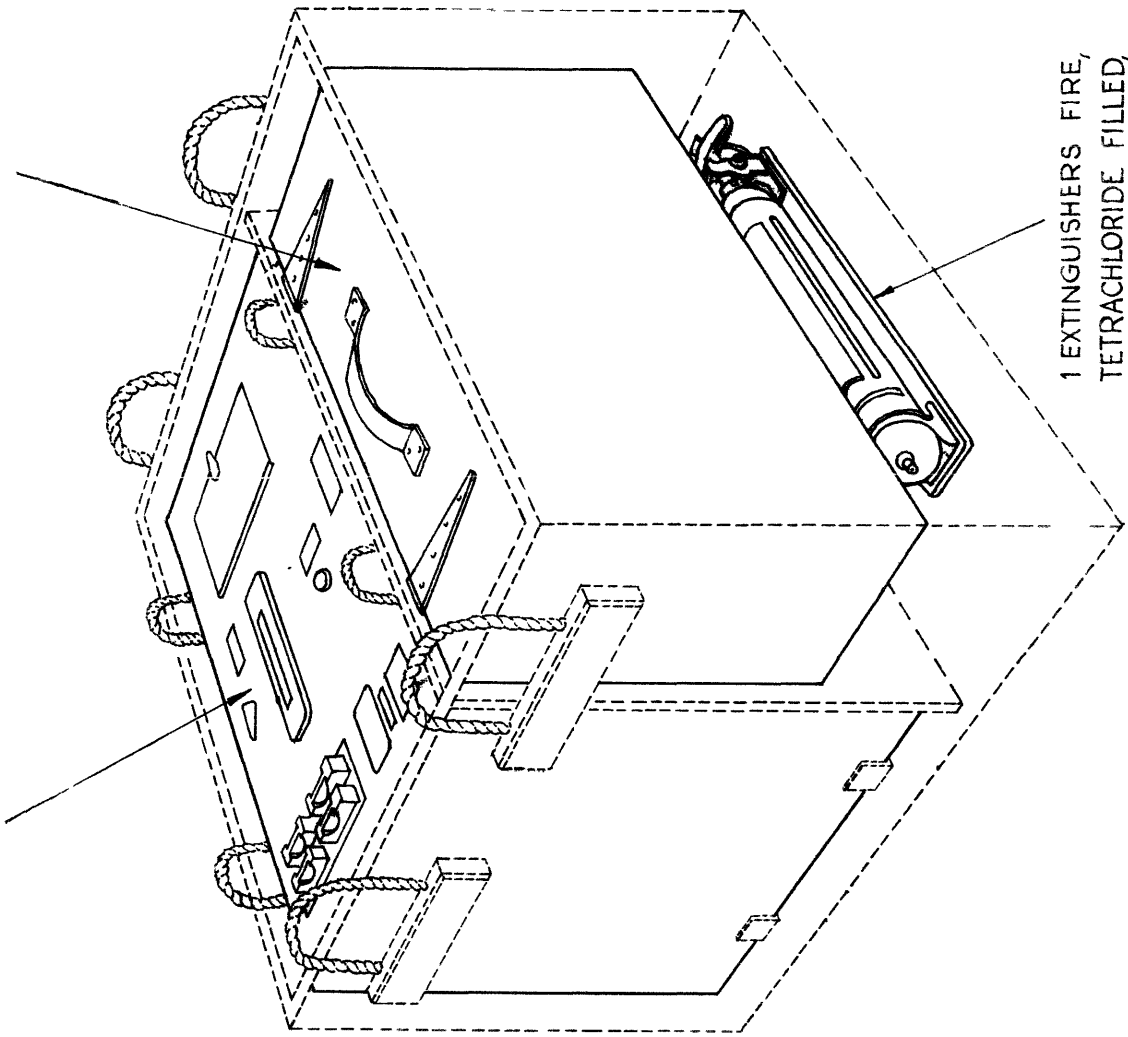
DIAGRAM SHOWING SUPPORTS DRAWN OUT
FROM CASE WITH LID IN POSITION FORMING
TABLE AND SET READY FOR CONNECTING

CASES TRANSIT N° I

FIG. 13

1 WIRELESS SETS N°33
POWER SUPPLY UNIT

1 WIRELESS SETS N°33
CASES SPARE VALVE



1 EXTINGUISHERS FIRE,
TETRACHLORIDE FILLED,
WITH B.B BRACKETS

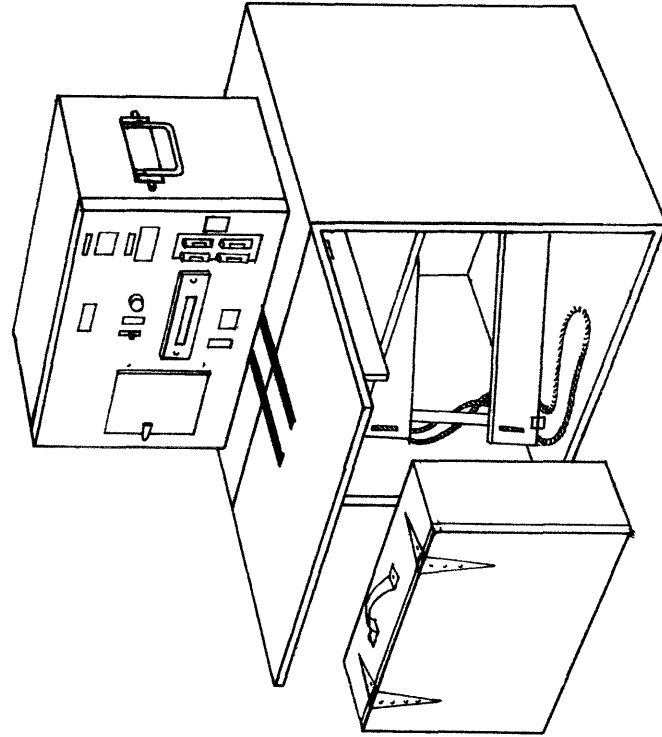


DIAGRAM SHOWING SUPPORTS DRAWN OUT
FROM CASE WITH LID IN POSITION FORMING
TABLE AND SET READY FOR CONNECTING.

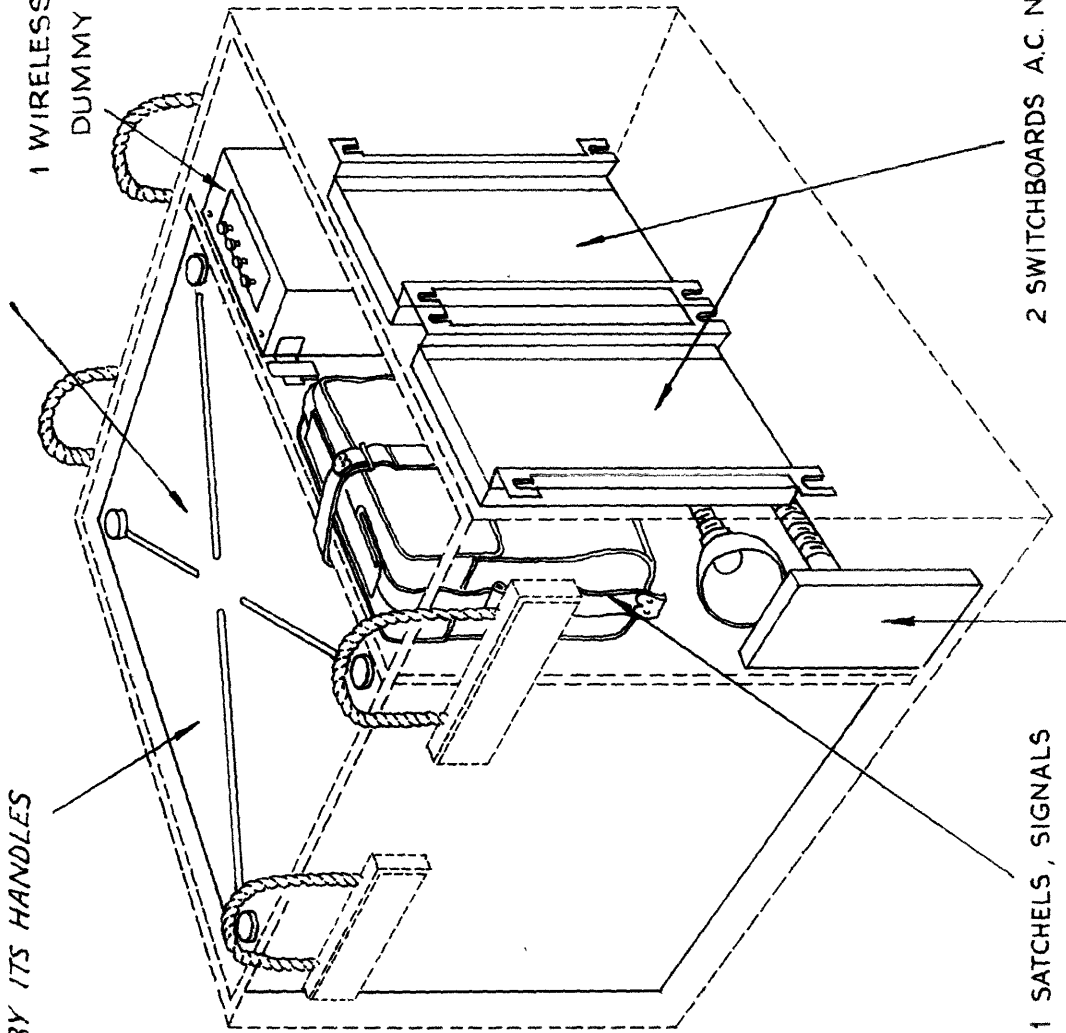
CASES TRANSIT N° 2

FIG. 14

1 RECEPTION SET R107
(COVER MUST BE TAKEN OFF
IN ORDER TO DRAW OUT SET
BY ITS HANDLES

1 RECEPTION SET R107
WORKING INSTRUCTIONS
(INSIDE COVER OF SET)

1 WIRELESS SET NO 33
DUMMY AERIAL



1 SATCHELS, SIGNALS

2 SWITCHBOARDS A.C. N°1

1 LAMPS, OPERATORS N° 3

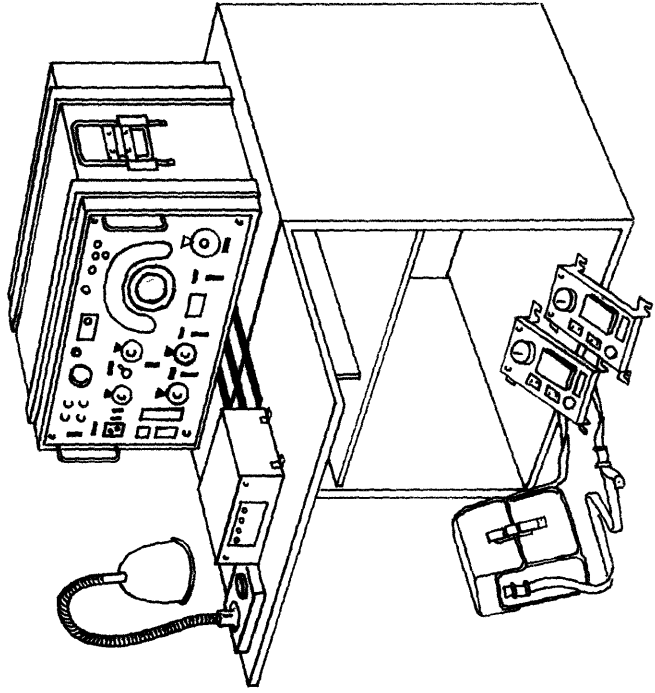


DIAGRAM SHOWING SUPPORTS DRAWN OUT
FROM CASE WITH LID IN POSITION FORMING
TABLE AND SET READY FOR CONNECTING.

CASES TRANSIT N° 3

FIG. 15

PICKETS, ANGLE, SHORT, MK. III .20
(FLAT ON BOTTOM OF COMPARTMENT)

CONNECTORS, SINGLE, N° 21 A. . . . 1

" " N° 29 1

CONNECTORS, TWIN, N° 61 1

" " N° 62 2

" " N° 80 2

" " N° 81 1

" " N° 82 2

CONNECTORS, 3 POINT N° 9 1

" 10 POINT N° 4 1

W/S N°12 LEADS N° 1 1

W/S N°12 LEADS N° 2 1

LISTED IN ORDER OF STOWAGE

CONNECTORS, TWIN N° 58 3

(COILED IN BOTTOM OF COMPARTMENT)

WIRE, ELECTRIC, P.11 MK I 36 FT.

WIRE, ELECTRIC, P.13. MK. I 72 FT.

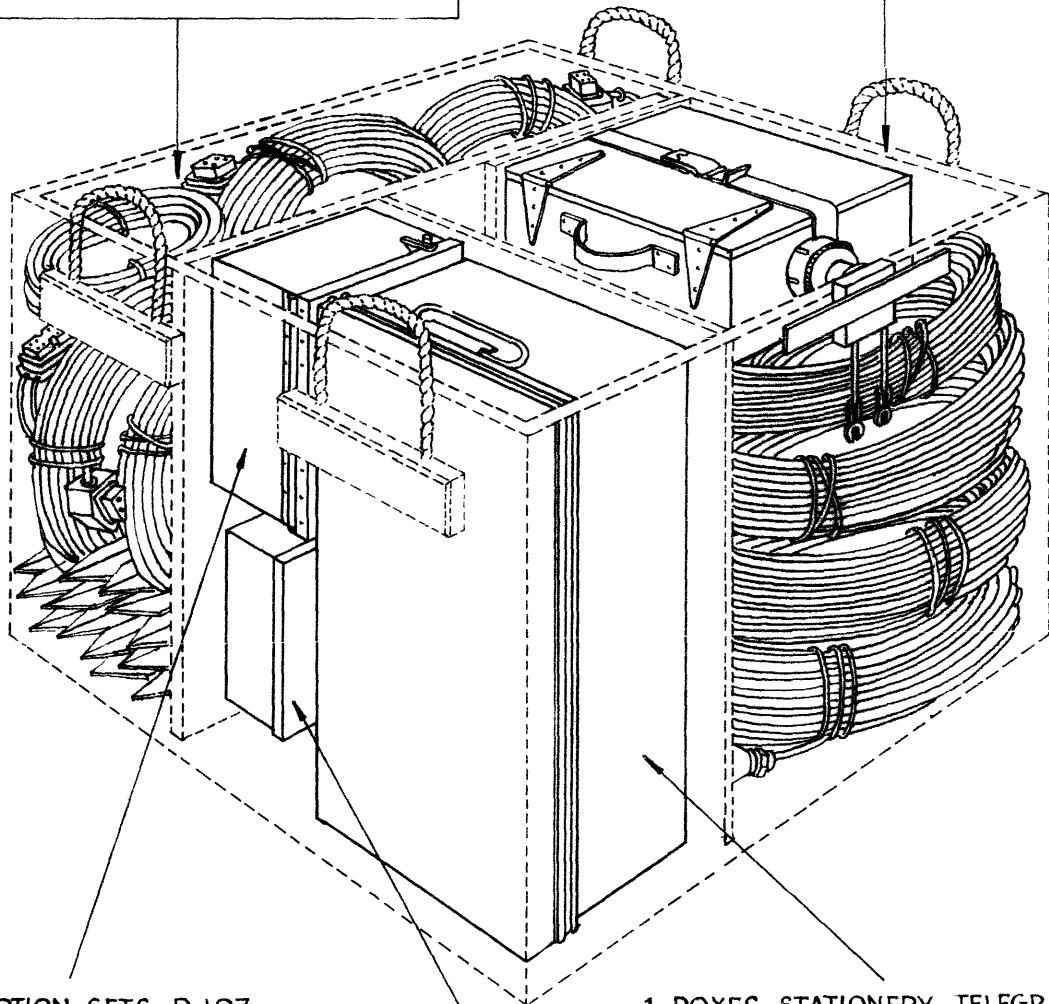
(STOWED INSIDE COILS OF CONN. TWIN N° 58)

CASES, 2 VALVE, ATP 100 1

AERIAL COUPLING EQUIPMENT

SET UNIT 'G' 1

LISTED IN ORDER OF STOWAGE



1 RECEPTION SETS R.107
CASES, SPARE VALVE

1 CASES, SPARE PARTS 5A

1 BOXES STATIONERY TELEGRAPH
EQUIPMENT, UNIT 'B'

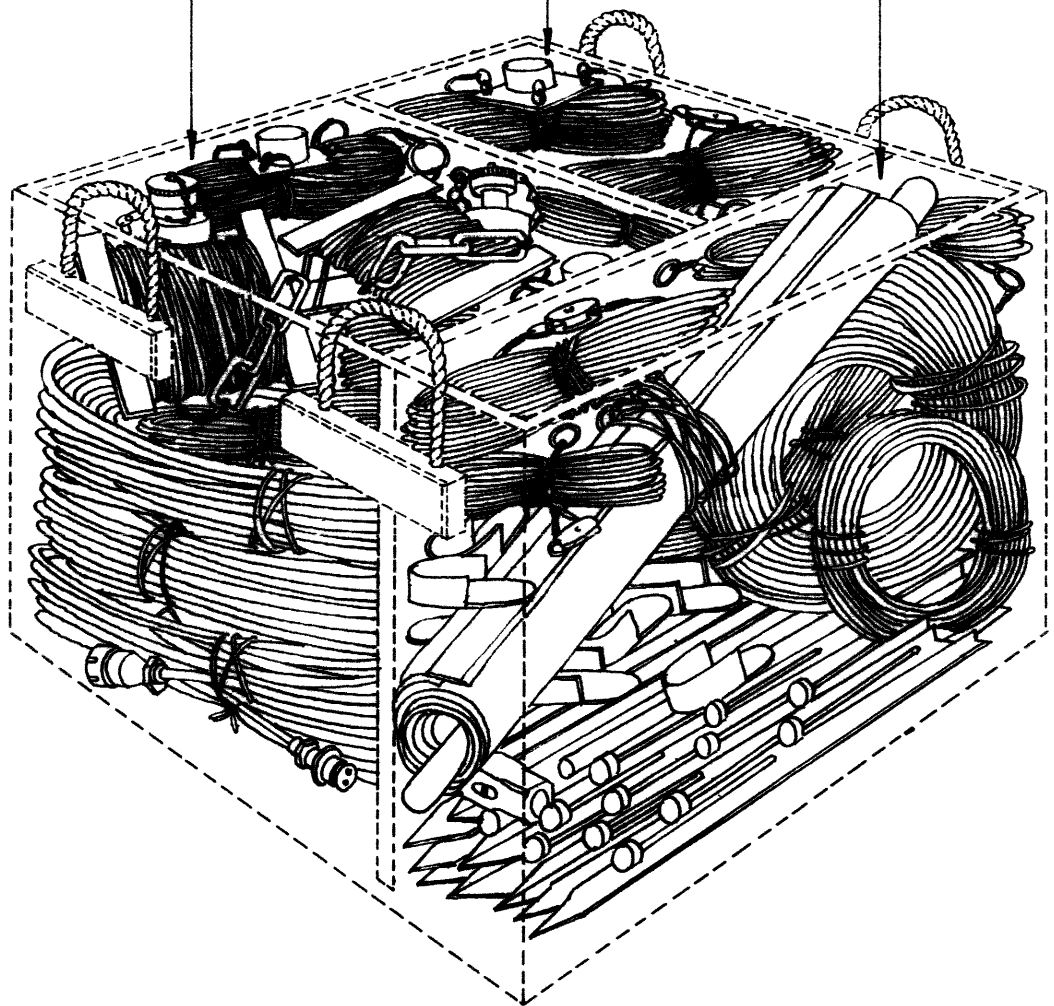
CASES TRANSIT N° 4

FIG. 16

MASTS, 36 FT. STEEL STAYPLATES N°2_6
 " " " HALYARDS_---9

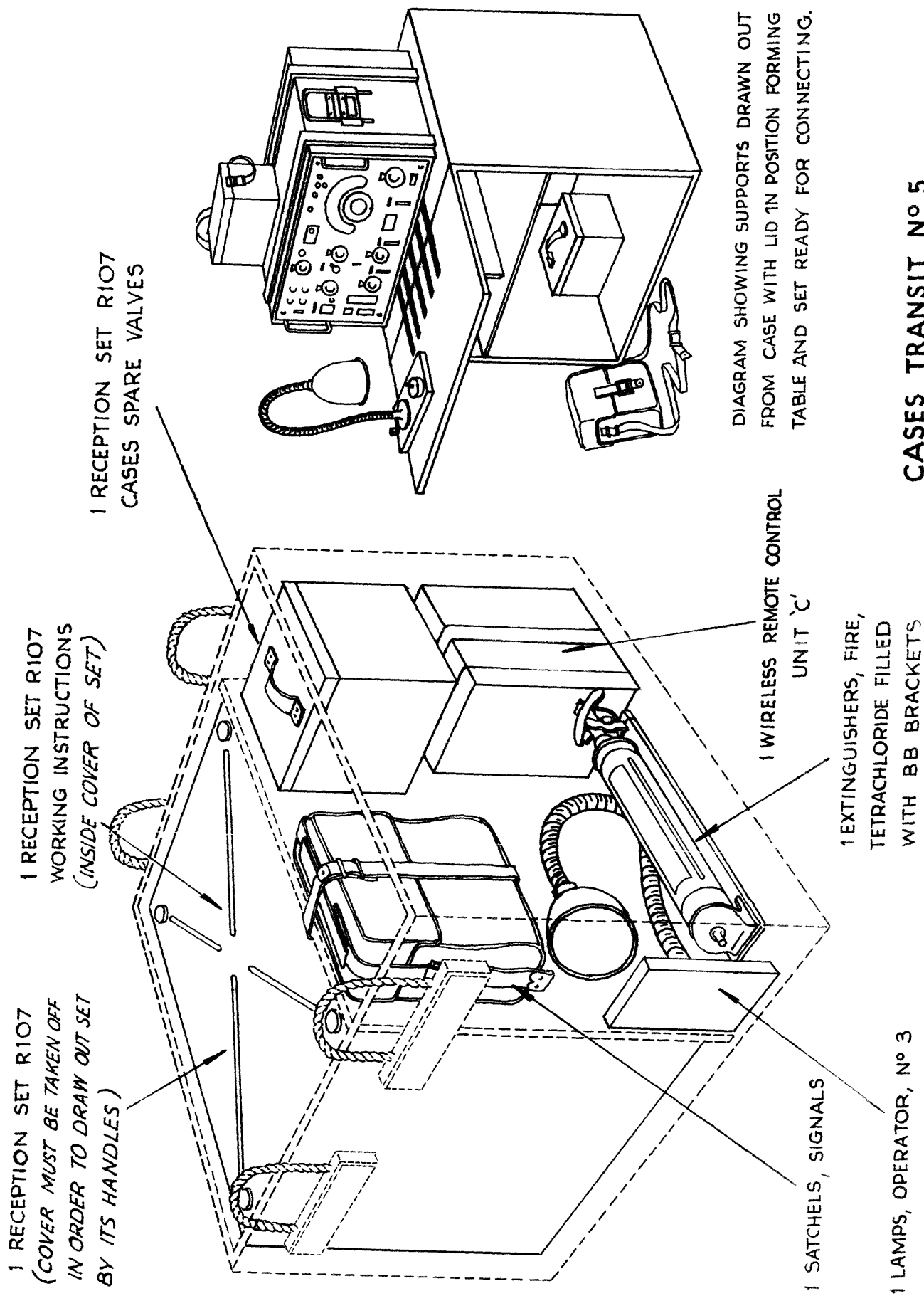
CONNECTORS, TWIN N° 58_-----3
 (COILED IN BOTTOM OF COMPARTMENT)
 CORDAGE, WATERPROOFED 1/2"_____150 YDS.
 (COILED ON TOP OF CONNECTOR TWIN N°58)
 BLOCKS, PULLEY, SINGLE 1/2"_____6
 INSULATORS, CHAIN, SMALL, 3LINK_---6
 (STOWED INSIDE CONN TWIN N°58 & CORDAGE)
 MASTS, 36 FT. STEEL, STAYPLATES N°1.6
 (STOWED ON TOP OF CORDAGE)
 AERIALS, DIPOLE N° 6A_-----1
 " " N° 6B_-----1
 " " N° 6C_-----1

PICKETS, ANGLE, SHORT MK III_ _13
 (FLAT ON BOTTOM OF COMPARTMENT)
 HAMMERS, SMITHS, HAND, 3LBS...1
 HAMMERS, HANDLE, N° 5_-----1
 PINS, EARTH, SMALL_-----1
 ANTENNAE, RODS, 'A' PEGS_---12
 WIRE, ELECTRIC, R4, MK I_---41 YDS
 " " R7, MK I_---200 YDS.
 (STOWED IN RIGHT HAND BOTTOM CORNER
 OF COMPARTMENT)
 NETS, EARTH, 14 FT,-----1
 (STOWED DIAGONALLY ACROSS COMPARTM'T
 FROM LEFT HAND BOTTOM CORNER)
 MASTS, 36FT, STEEL, SHOES_---6
 (STOWED IN LEFT HAND BOTTOM CORNER)
 MASTS, 36FT. STEEL, HALYARDS_--6



CASES TRANSIT N° 4A
 (LISTED IN ORDER OF STOWAGE)

FIG. 17



1 RECEPTION SET R107
CASES SPARE VALVES

1 RECEPTION SET R107
(COVER MUST BE TAKEN OFF
IN ORDER TO DRAW OUT SET
BY ITS HANDLES)

1 RECEPTION SET R107
WORKING INSTRUCTIONS
(INSIDE COVER OF SET)

1 WIRELESS REMOTE CONTROL
UNIT 'C'

1 EXTINGUISHERS, FIRE,
TETRACHLORIDE FILLED
WITH BB BRACKETS

1 SATCHELS, SIGNALS

1 LAMPS, OPERATOR, No 3

DIAGRAM SHOWING SUPPORTS DRAWN OUT
FROM CASE WITH LID IN POSITION FORMING
TABLE AND SET READY FOR CONNECTING.

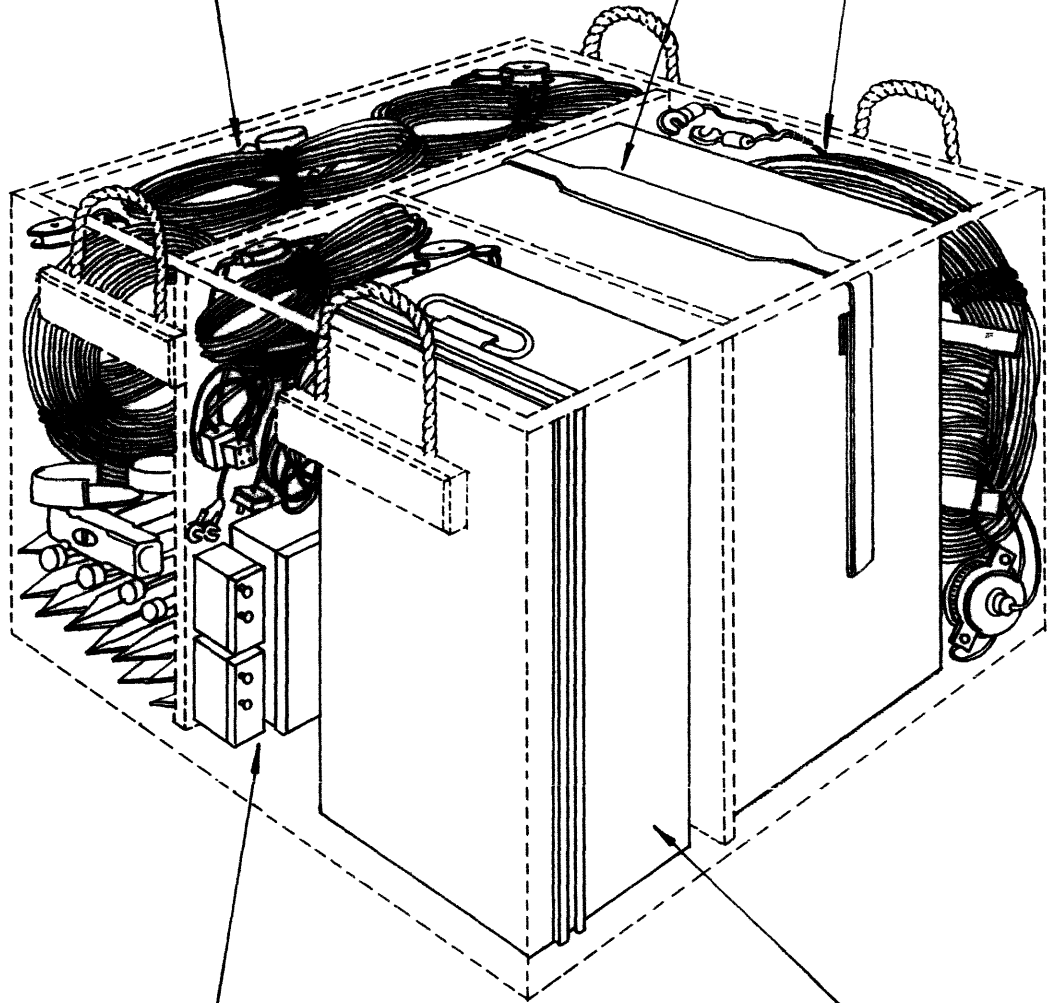
CASES TRANSIT No 5

FIG. 18

PICKETS, ANGLE, SHORT, MK III	10
<i>(FLAT ON BOTTOM OF COMPARTMENT)</i>	
HAMMERS, SMITHS, HAND, 3LBS.	1
HAMMERS, HANDLE, N° 5	1
PINS, EARTH, SMALL	1
INSULATORS, CHAIN, SMALL 3 LINK	4
MASTS, 36 FT. STEEL, SHOES	2
ANTENNAE RODS 'A' PEGS	4
WIRE, ELECTRIC, R4 MK. I	41 YDS
MASTS 36FT STEEL STAYPLATES N° 1	2
" " " " N° 2	2
" " " HALYARDS	2

1 AERIAL COUPLING EQUIPMENT
AERIAL UNIT 'G'

1 AERIALS DIPOLE N° 5



BATTERIES, DRY, REFILL, 8 CELL N°1 MKI	4
CASES, SPARE PARTS, N° 5B	1
W/S N° 12 LEADS N° 2	1
CONNECTORS TWIN N° 61	1
CONNECTORS 3 POINT N° 9	1
MASTS, 36FT, STEEL, HALYARDS	2

1 BOXES, STATIONERY TELEGRAPH
EQUIPMENT, UNIT 'B'

CASES TRANSIT N° 6
LISTED IN ORDER OF STOWAGE

FIG. 19