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**WIRELESS SETS No. 38  
MK. II or MK. II\*  
IN CHURCHILL I, II, III AND IV TANKS**

*Working and Fitting Instructions*

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# WIRELESS SET No. 38 Mk. II or Mk. II\* IN CHURCHILL I, II, III AND IV TANKS

## CHAPTER I.—GENERAL DESCRIPTION

### I. General.

The Wireless Set No. 38 Mk. II or Mk. II\* fitted in infantry tanks provides short range communication between the tanks and supporting infantry.

The complete 38 Set installation is mounted in the turret and provides facilities for transmission and reception by the commander and gunner separately, and for reception by the whole crew. Reception is carried out via the Wireless Set No. 19 Intercommunication Amplifier.

The 38 Set is connected in the existing intercommunication circuit by means of a Control Unit No. 12 (W.S. No. 19/No. 38 Control Unit), having a switch giving the above facilities.

The microphone and headphones used are the Microphone and Receiver Headgear Assembly No. 1 normally used with the Wireless Set No. 19.

The aerial is an external vertical rod, 8 ft. long.

The single tuning dial on the 38 Set may be locked on any desired frequency within the range.

The power in the aerial circuit when the set is transmitting is of the order of 0.02 watt.

A view of the complete apparatus is shown in Fig. 7.

### 2. Frequency Range.

The Wireless Sets No. 38 Mk. II and Mk. II\* have a frequency range of 7.3 Mc/s to 8.8 Mc/s when sending or receiving.

### 3. Valves.

Four A.R.P. 12 and one A.T.P. 4 are used.

### 4. Controls.

(1) Wireless Set No. 38.

The two controls, situated on the top panel of the set are as follows :

TUNING Mc/s control.

OFF-RECEIVE-SEND switch.

A button is fitted on the Mark II set which when pressed on SEND causes a pilot lamp to light when the set is radiating. This lamp flickers when modulation is applied to the set.

(2) The Control Unit.

The Control Unit has the following controls :—

VOLUME control.

This controls the gain of the 38 Set receiver.

A-I C-B switch (19 set control switch).

This has three positions and is used by the commander in the same way as the similar control switches on the 19 Set control units.

GL-GS-CS switch (38 Set control switch).

This is operated by the gunner and has three positions :—

GL (gunner listen). In this position the 38 Set is received by all the members of the crew on the intercommunication system.

GS (gunner send). In this position the gunner can send and receive on the 38 Set.

CS (commander send). In this position the commander can send and receive irrespective of the position of the A-IC-B switch.

**Note.**—In positions GS and CS any member of the crew on the intercommunication system can receive on the 38 Set. They can also hear the transmitted messages.

#### 5. Power Supply.

The Wireless Set No. 38 Mk. II works from a single dry battery, Battery, Dry H.T. and L.T. 150V/3V which supplies 3 volts L.T. and 150 volts H.T.

The current consumption when sending is approximately 14 mA H.T. and 400 mA L.T. with an average battery.

The current consumption when receiving is approximately 7 mA H.T. and 200 mA L.T. with an average battery.

#### 6. Aerial and Range of Working.

An 8 ft. "fishing rod" aerial (Antennae Rods F Sections 2 and 3) is used mounted in an Aerial Base No. 8 or 10 secured to a bracket on the tank turret. The aerial carries a lead terminating in a plug which is inserted in the larger aerial socket on the 38 Set.

The equipment has a range of up to 1,000 yds. on the move.

#### 7. Netting.

A number of Wireless Sets No. 38 may be netted from a control station. Mk. I, Mk. II and Mk. II\* sets may be included in one net.

#### 8. The Circuits.

- (1) The 38 Set Sender circuit (Fig. 1).

With the OFF-RECEIVE-SEND switch at SEND the set acts as a sender.

Oscillations are generated by a master oscillator circuit employing an A.R.P. 12 valve (V1B). The valve is used as an electron coupled (inverted Hartley) oscillator, the drive to the power amplifier being taken from the anode at double frequency.

The power amplifier A.T.P. 4 (V2A) is grid modulated from an A.R.P. 12 modulation amplifier (V1D) which is also used as an I.F. and A.F. amplifying valve on RECEIVE.

- (2) The 38 Set Receiver circuit (Fig. 1).

With the OFF-RECEIVE-SEND switch at RECEIVE the set acts as a receiver.

The receiver is a superheterodyne type having an intermediate frequency of 285 kc/s with the following stages:—

(a) V1A—R.F. Amplifier (A.R.P. 12.)

(b) V1B—Local Oscillator (A.R.P. 12).

The circuit of (b) acts as the master oscillator on SEND. When changing from RECEIVE to SEND a compensating network is removed from the oscillator which causes it to generate the same frequency as the set was receiving.

(c) V1C—Mixer Valve (A.R.P. 12).

(d) V1D—I.F. Amplifier (A.R.P. 12).

(e) W1—Second Detector—Westector (Metal Rectifier).

The Westector circuit also supplies an A.V.C. bias to the R.F. Mixer and I.F. valves.

(f) V1D—A.F. Output Valve (A.R.P. 12).

This is the I.F. Amplifier valve which has a reflex circuit. It is also the modulation amplifier when sending.

The Power Amplifier Valve L.T. and H.T. is switched off on RECEIVE and the R.F. and Mixer Valves L.T. is switched off on SEND.

- (3) The Control Unit No. 12 Circuit (Figs. 5 and 6).

The output of the 38 Set is fed into the 19 Set Intercommunication Amplifier via a potentiometer in the Control Unit marked VOLUME, which acts as input gain control to the amplifier. Thus signals received on the 38 Set are heard by all members of the crew on I.C.

Simplified circuit diagrams showing the various conditions of use are shown in Fig. 6.

The 38 Set is designed to work normally with sensitive low level microphone and headphones (Receivers Headgear D.L.R.). In order to give the correct level when working with the 19 Set microphones and headphones resistances are included in the Control Unit circuit.

The Control Unit is connected to the 38 Set by the 6-core lead which carries the set output, input and battery supply leads. A 4-core lead attached to the Control Unit connects with the combined L.T. and H.T. supply.

#### 9. Sidetone.

Sidetone is provided. The volume of sidetone depends on the setting of the VOLUME control on the Control Unit No. 12. A pilot lamp, which lights on SEND and flickers when the operator speaks, indicates that the radiated carrier is being modulated on Mark II sets only. The lamp will only light on pressing the button when the aerial plug is inserted in the socket. The lamp will not light on RECEIVE.

#### 10. General Construction.

The equipment is mounted on the side of the tank near the commander and gunner. The Control Unit No. 12 takes the place of the original Wireless Set No. 19 Control Unit No. 1 as used by gunner and commander. The 38 Set is clamped in a carrier. The 38 Set battery carrier is to the left of the Control Unit No. 12 in Churchill I tanks and Churchill II tanks (Fig. 10) and alongside the set carrier in Churchill III tanks and Churchill IV tanks (Fig. 12). A separate carrier is provided to hold a spare battery (See Figs. 8A and 13).

- (1) The Control Unit No. 12.

The Control Unit is contained in a metal box bolted to the nearside turret wall. In addition to the controls mentioned under Sec. 4 the unit has a 6-point plug on the left-hand side to take the 6-core plug and lead from the 38 Set. A battery lead terminating in a 4-point battery plug, is connected to the right-hand side of the Control Unit. Also on the right-hand side the Control Unit carries two drop-leads; one to take the commander's and the other to take the gunner's headphones and microphone. The commander's drop lead is the lower one. A 12-point plug to take the 19 Set intercommunication 12-core connector is mounted on top of the unit.

- (2) The 38 Set.

The 38 Set is housed in a metal case and is fixed with its battery to the forward nearside turret wall.

- (3) The Aerial.

The two aerial sections are stowed in a canvas container (Antennae Rods F Cases Carrying No. 3) when not in use.

(4) Leads.

A connector is provided to join the 6-point plug on the control box to the socket on the 6-core lead from the 38 Set. This is known as Connector 6-point No. 20 (Fig. 7).

The various leads are cleated to the wall of the turret as explained in the Fitting Instructions, Chapter IV.

## CHAPTER II.—WORKING INSTRUCTIONS.

### 11. Preliminary.

- (1) See that Antennae Rods F Sections 2 and 3 are inserted in the Aerial Base No. 8 or 10.
- (2) Insert the aerial plug in the larger of the two aerial sockets on the 38 Set.
- (3) Insert the 6-point socket on the lead from the 38 Set in the plug on the Connector 6-point No. 20 and insert the socket on the other end of this connector in the 6-point plug on the left side of the Control Unit No. 12.
- (4) Insert the 4-point battery plug on the lead from the Control Unit No. 12 into the socket on the 38 Set battery. In the case of the Churchill III tank and Churchill IV tank, the battery may have to be pulled out from its holder for some distance before the plug can be inserted.
- (5) Insert the 5-point plug of the commander's headphones and microphone set in the 5-point socket on the lower lead from the control unit.
- (6) Insert the 5-point plug of the gunner's headphones and microphone set in the 5-point socket on the upper lead from the control unit.

### 12. Operation of the Wireless Sets No. 38 Mk. II or Mk. II\*

- (1) To send, put the OFF-RECEIVE-SEND switch to SEND, tune to the desired frequency with the TUNING Mc/s dial and lock the dial.
- (2) To receive, put the OFF-RECEIVE-SEND switch to RECEIVE, tune in the signal with the TUNING Mc/s dial and lock the dial.
- (3) The sender frequency is the same as that of the received signal tuned as in (2) above.
- (4) Wait for 3 seconds before speaking after switching to SEND.
- (5) The sender may be tested by putting the OFF-SEND-RECEIVE switch to SEND speaking into the microphone, as described in Section 3 below, and pressing the button on the panel. The pilot lamp should glow steadily when no speech is being transmitted. It should flicker on speech and sidetone should be heard in the headphones. This lamp is present on Mark II sets only.

### 13. Operation of Control Unit No. 12.

- (1) For normal 19 Set and Intercommunication Working, with 38 Set inoperative, set the 38 Set Control Switch on the Control Unit No. 12 to GL position and switch off the 38 Set.
- (2) For Reception on 38 Set switch the 38 Set to RECEIVE and the 38 Set control switch on Control Unit No. 12 to GL position. When the calling station is heard adjust the VOLUME control to a convenient level. The 38 Set is heard on the I.C. circuit by Gunner and Driver, who are always on I.C., and by the Commander and Wireless Operator when switched to I.C.



- (3) For Commander to send on 38 Set, set the 38 Set Control switch on Control Unit No. 12 to CS position and the 38 Set to SEND. On CS position it is not necessary for the A-IC-B switch to be in the I.C. position for Reception of 38 Set signals. On CS position, Gunner will hear Commander's speech on sidetone and incoming signals on 38 Set, but will not be able to speak on 38 Set.
- (4) For Gunner to send as well as to receive on the 38 Set, the 38 Set control switch on Control Unit No. 12 is put to GS position and the 38 Set is switched to SEND.

**NOTE:** The volume of sidetone is dependent upon the setting of the VOLUME control. When the sidetone is very loud, the control should not be turned down as this will cause received signals to be very weak. The commander and gunner should speak as on the 19 Set Intercommunication System, i.e. right into the mouthpiece. It may often be necessary to speak loudly. They should not speak more softly if sidetone appears unduly loud. Also, at close range, the VOLUME control will normally be set so low that there will be no audible sidetone. This should not encourage the commander or gunner to speak more loudly.

- (5) The entire crew, when switch is at I.C., will hear incoming signals on the 38 Set whatever the position of the 38 Set control switch. They will also hear sidetone of Commander and Gunner.

#### GENERAL NOTE.

- (1) **Always switch "OFF" the 38 Set when not in use to conserve battery power.**
- (2) In C.S. position of 38 Set control switch on Control Unit No. 12, the commander's 19 Set A—I.C.—B control switch is inoperative. This enables the commander to resume his previous 19 Set working as soon as his communication over the 38 Set is completed by returning the 38 Set control switch to G.L. position.
- (3) With the A—IC—B switch at B the warning lamp on the 19 Set operator's control unit will light if the 19 Set operator is on I.C. or B. This indicates that the 19A Set is unattended. No warning lamp is fitted to the Control Unit No. 12. A fuse, fitted in the Control Unit No. 12 is connected in this warning lamp circuit. It should be renewed as soon as it blows.
- (4) Access to the Control Unit No. 12 for general inspection, repair, etc., may be obtained by releasing the four large captive screws on the front panel. The control knobs need not be removed.

### CHAPTER III. OPENING UP, NETTING AND MAINTENANCE DRILLS.

#### 14. Opening up Drill.

- (1) Erect 38 Set Aerial.
- (2) Check that Set, battery and Control Unit No. 12 are connected up.
- (3) Carry out Daily Maintenance (see separate table).
- (4) Switch off.

**15. Prepare to Net Drill.**

- (1) Unlock Mc/s dial and set to ordered frequency.
- (2) Turn volume control on Control Unit No. 12 to maximum.
- (3) Switch 38 Set control switch to C.S. position (or to G.S. if it is intended that gunner shall do netting).
- (4) Switch to RECEIVE a few minutes before netting time.

**16. Netting Drill.**

- (1) When signal is heard turn volume down to strength 2.
- (2) Adjust Mc/s dial to loudest signal and lock.
- (3) After communication has been established switch to G.L. position.

**17. Daily Maintenance Tests. No. 38 Set.**

Part Tested.	No.	Test	What should happen.	What should NOT happen.	What is likely to be wrong	What to do about it.
Battery & Receiver	1	Switch to RECEIVE and CS position on control unit No. 12.	Mush should be heard in Cdr's 'phones.	Set dead.	(a) Battery exhausted (b) Internal fault.	(a) Change battery and re-test. (b) Report.
Control Unit	2	Listen on all headsets.	Mush heard in all 'phones on I.C. irrespective of position of 38 Set control switches	Nothing heard.	Internal fault.	Report.
<p><b>Note:</b> Headsets will have been tested during maintenance on No. 19 Set.</p>						
Sender	3	Switch to send removing aerial of 38 set (as if under W. Silence). Volume control to max. 38 Set control switch to G.S. posn. Speak into Gunner's mic.	Sidetone heard.	No sidetone heard.	Internal fault.	Report.
Spare battery	4	Inspect spare battery.	Seal should be unbroken.	●		Replace with new battery if necessary.

## CHAPTER IV.

### FITTING INSTRUCTIONS FOR CHURCHILL I, II, III AND IV TANKS

#### 18. General.

This chapter describes briefly the procedure adopted for installing the Wireless Set No. 38 Mk. II in Churchill I, II, III and IV Tanks. The differences between the two installations are chiefly due to the difference in the design and stowage in the types of tank. Some of the fittings are common and some are special to each.

The Wireless Set No. 38 Mk. II is located so that it may be operated by the gunner while the control box may be operated by either commander or gunner.

#### 19. Fitting Wireless Set No. 38 Mk. II or Mk. II\* in Churchill I and II Tanks.

##### (1) Preliminary.

The seven fittings designed for this installation are listed below. Items (e)—(g) are common to all installations.

- (a) A mounting bracket for securing the Aerial Base No. 10 to the outside of the turret (Aerial Bases No. 10, Bracket Mounting No. 2).
- (b) An aerial lead for connection between the 38 Set and aerial base (Aerial Lead 3 ft. No. 6).
- (c) A carrier for the 38 Set battery in use with the set (Carrier Primary Battery No. 2).
- (d) A carrier which houses and secures the 38 Set to the inside of the turret (Wireless Sets No. 38 Mk. II Carrier No. 5).
- (e) The Control Unit No. 12.
- (f) A carrier to house the spare 38 Set Battery (Carriers Primary Battery No. 1).
- (g) A jumper connecting lead for insertion between the plug of the six-core connector attached to the 38 Set and the six-point socket on the Control Unit No. 12 (Connector 6-point No. 20).

##### (2) Fitting the Aerial Bases No. 10, Bracket Mounting No. 2 (Fig. 9).

This item is provided complete with one  $1\frac{1}{4}$  inch B.S.F. bolt for securing the bracket to the tank, and six  $\frac{1}{4}$  inch Whitworth hexagonal headed set screws,  $\frac{1}{2}$  inch long, with nuts and washers for securing the Aerial Base No. 10 to the bracket. The  $1\frac{1}{4}$  inch B.S.F. securing bolt has a hole drilled along its axis to accommodate the aerial lead. Proceed with the fitting as follows:—

- (a) Remove the  $1\frac{1}{4}$  inch B.S.F. blanking bolt immediately in front of the gunner's periscope on the near side of the turret roof. See if the tapped hole, into which this bolt is screwed, is drilled right through the turret roof. If it is drilled only partly through, drill a  $\frac{3}{4}$  inch diameter hole through the remainder of the roof plate.  
Take the aerial base mounting bracket and remove the conduit section by pulling it vertically out of the two spring clips and holes in securing bolt and platform of bracket.
- (b) Pass the end of the Aerial Lead 3 ft. No. 6, terminating in a plug, through the hole in the centre of the securing bolt head, and into the inside of the turret.

- (c) Pass the other end of the Aerial Lead 3 ft. No. 6 into the end of the conduit which lay over the securing bolt head. Pull the lead right through and pass it through the smallest hole in the platform of the aerial base mounting bracket.
  - (d) Replace the conduit in the spring clips with the correct ends passing into the securing bolt and platform holes respectively.
  - (e) Pass the aerial lead up through the large centre hole in the platform of the aerial base mounting bracket and secure the terminal end of the aerial lead to the inside of the aerial base No. 10 using at this end, the screw provided in the aerial base.
  - (f) From inside the turret pull the aerial lead until the aerial base is tight against the top face of the platform with the six holes round the circumference of the base located over the six holes in the platform. Secure the aerial base with the six set screws and nuts provided.
- (3) Fitting the Wireless Set No. 38 Mk. II or Mk. II\* (Fig. 10).
- (a) Remove the two bolts from the holes in the tops of the two metal straps on the Wireless Sets No. 38 Carrier No. 5.
  - (b) Place the 38 set in the carrier by passing the back of the set through the strap nearest the circular edge of the carrier base. Push the set until the back of it is just through the second strap (Fig. 10).
  - (c) Replace the bolts and nuts removed from the carrier straps and tighten them up to secure the 38 Set in the carrier. Insert the plug on the end of the Aerial Lead 3 ft. No. 6 in the larger aerial socket on the 38 Set.
  - (d) Secure this assembly to the turret ring. This is done by first removing two selected  $\frac{3}{8}$  inch set screws which pass horizontally through the turret ring. The screws are selected by first trying the position of the 38 Set so that its control panel is clear of the case, holding the two spare periscope prisms on the left of the gunner, without being too far away for the Aerial Lead 3 ft. No. 6 to be connected. The  $\frac{3}{8}$  inch set screws are later replaced through the holes in the fin of the carrier base which is thus secured to the turret. The fin is provided with two alternative sets of holes, the most convenient pair being selected.
  - (e) Place the carrier and set in its final position and rearrange any flexible conduits along the turret side, at this point, so that the set carrier does not pinch them against the wall.
  - (f) Replace the set screws, previously removed from the turret ring, through the holes in the carrier base fin and secure the carrier and 38 Set to the turret.
- (4) Fitting the Carrier Primary Battery No. 2 (Fig. 10).  
This carrier houses the dry battery used for supplying the 38 Set.
- (a) Remove from the near-side turret wall the metal strap holding the signal pistol case (see dotted outline in Fig. 8B). This is done by removing the two set screws which secure the strap to the turret wall.
  - (b) Refit the signal pistol case on the front of the signal cartridge container in the position shown in Fig. 8B. Drill two  $\frac{1}{8}$  inch diameter holes in the front face of the signal cartridge container 3 inches apart. The right-hand hole should be

3 $\frac{3}{4}$  inches from the left-hand edge of the container (see Fig. 8B). Secure the case by two  $\frac{1}{2}$  inch  $\times$   $\frac{1}{4}$  inch B.S.F. hexagon head set screws and flat nuts with spring washers. The screws, with flat washers, should be inserted with the heads inside the pistol case.

- (c) Secure the Carrier Primary Battery No. 2 in the place occupied by the pistol case using the set screws previously removed from the turret wall.
- (5) Fitting the Control Unit No. 12 (Fig. 10).
  - (a) Remove the Wireless Set No. 19 Control Unit No. 1 from the near-side turret wall and replace this unit by the Control Unit No. 12. Use the same fixing holes and set screws to hold the Control Unit No. 12 as were used for the Control Unit No. 1. Select the pair of holes in the flange of the Control Unit No. 12, which allows the socket of the 12-point connector previously connecting with the Control Unit No. 1, to engage the 12-point plug on the top of the new control unit.
- (6) Fitting the Carrier Primary Battery No. 1 (Fig. 8A).
  - (a) Fit the carrier on the right-hand side of the driver's compartment as shown in Fig. 8A.
  - (b) Use the two  $\frac{3}{8}$  in. B.S.F. bolts shown in this figure and drill the flanges of the carrier to correspond.
- (7) Stowage of Case Spare Valve No. 2.

The Case Spare Valve No. 2 is stowed with the Case Spare Parts No. 5C in a compartment below the Wireless Set No. 19.
- (8) Connecting Up (Fig. 7).

Connect the component parts of the Wireless Set No. 38 installation as shown in Fig. 7.

  - (a) Plug microphone and receiver head and breast sets in drop leads from Control Unit No. 12.
  - (b) Connect the 6-core lead from the Wireless Set No. 38 to the one end of the Connector 6-point No. 20 and plug the other end of this connector in the right-hand 6-point plug on the Control Unit No. 12.
  - (c) Connect the four-point lead from the Control Unit No. 12 to the 38 Set battery with the 4-point plug provided. If the connector is too long either shorten it or tie up the slack.
  - (d) Insert the plug of the Aerial Lead 3 ft. No. 6 into the larger aerial socket on the 38 Set.
  - (e) Insert Socket of 12-point connector in 12-point plug on top of Control Unit No. 12. This is the socket which was previously connected to the removed Control Unit No. 1. Arrange the leads along the walls of the turret using Clips. Cable fixing  $\frac{1}{8}$  in. which may be secured to convenient bolts or screws.

## 20. Fitting Wireless Set No. 38 Mk. II or Mk. II\* in Churchill III and IV Tanks

### (1) Preliminary.

These fitting instructions apply to the Churchill III and IV Tanks.

The Wireless Set No. 38 is located so that it may be operated by the gunner while the control box can be used by either commander or gunner.

The four fittings have been designed for this installation :—

CHAPTER IV—Section 20

- (a) A Control Unit (Control Unit No. 12) which replaces the existing W/S No. 19 Control Unit No. 1.
- (b) A Carrier (Wireless Set No. 38 Carrier No. 4) which secures the set with its battery to the near side turret wall. The carrier has a resilient mounting.
- (c) A stowage container to house the spare battery for the 38 Set (Carriers, Primary, Battery No. 1).
- (d) A bracket to accommodate the aerial base and to secure it to the top of the tank.

It is assumed that the complete Wireless Set No. 19 Station is already installed in the tank before the present fitting is made.

- (2) Fitting the Control Unit No. 12 (Wireless Sets No. 19/38 Control Unit Fig. 12).
  - (a) Remove from the near-side wall of the turret the Wireless Set No. 19 Control Unit No. 1, after first removing the 12-point plug-socket connector. The unit is released by unscrewing the two bolts securing it to the turret wall.
  - (b) Replace this unit by the Control Unit No. 12 (W/S No. 19/38 Control Unit) using the pair of fixing holes just below the centre line of the No. 12 Unit. Secure the unit to the turret wall using the bolts which secured the No. 1 Unit.
  - (c) Connect up the 12-point connector to the socket on the new Control Unit No. 12. If it is found that more length of connector is required, this may be obtained by releasing the clamping cleats and getting what surplus is available around the turret roof.
- (3) Fitting the Wireless Set No. 38 Mk. II or Mk. II\* and its battery (Wireless Set No. 38 Carrier No. 4 Fig. 12).
  - (a) Remove the two flat metal brackets housing the Box Spare Maps. These brackets are immediately below the fan on the near-side turret wall. The Map Box to be re-stowed at the discretion of the commander.
  - (b) Secure the Wireless Set No. 38 Carrier No. 4 with the bolts which previously held the brackets.
  - (c) Fit and secure the 38 Set in the two metal loops on the resilient mounting attached to the bracket section of the carrier.
  - (d) Insert the 4-point battery plug in the socket on the battery, **then** slide the battery into its container at the side of the 38 Set. Make sure that the plug is on the **recessed** side of the container.  
Secure the battery with the web straps from top to bottom of the container.
- (4) Fitting the spare battery carrier (Carrier Primary Battery No. 1 Fig. 13)

This carrier is fixed to the near-side turret wall immediately forward of the air cleaner (Fig. 13). The carrier flanges are drilled to pick up existing bolts.
- (5) Fitting the aerial mounting (Figs. 11 and 12).

Prior to fitting the aerial mounting, a hole  $\frac{3}{4}$  in. diameter must be made in the roof of the turret. The position of this hole is shown in Fig. 11.

  - (a) Secure the Aerial Lead 2 ft. No. 6 to the underside of the Aerial Base No. 10 using the screw in the aerial base and the terminal wire end of the lead.

- (b) Drop the aerial lead through the centre hole in the Aerial Base No. 8 Mounting No. 3, pass the plug through the centre hole in the aerial bracket and secure the aerial base to the bracket with the Mounting No. 3 between. Use the six nuts and spring washers provided to secure the complete assembly.
  - (c) Remove the large nut on the centre spigot of the aerial base bracket, pass the plug on the aerial lead and the spigot through the hole in the tank turret roof and nut up with the large nut.
  - (d) Connect the aerial plug to the 38 Set aerial socket.
- (6) Completing the installation.  
Complete the installation by using the Connectors 6-point No. 20 as a jumper lead to lengthen the normal 6-point connector from the 38 Set to the control box.  
This lead should be passed behind the container which houses the Tin Oil Mk. II.  
Use the cleats provided under the most convenient bolts.

- (7) Stowage of Cases Spare Valve No. 2 (Fig. 14).

This case should be carried in the bin which normally contains the case spare valve for the No. 19 Set and the Case Spare Parts No. 50 for the No. 19 Set. The case, spare parts should be removed, and the case spare valves No. 2 stowed in its place.

The Case spare parts No. 5c should then be stowed on top of the six spare prisms in the adjoining bin, the cotton waste being packed around it.

**IMPORTANT NOTE:** A REME modification circular (E.M.E.R. TELS F417) Wireless Set No. 38 Modification Instruction No. 5, has now been issued. This gives details of modifications to Carriers Primary Battery Nos. 1 and 2 and Wireless Set No. 38 Carriers Set No. 4 to enable Batteries Dry HT/LT 150/3 No. 2 to be used in place of the No. 1 battery.

## CHAPTER V.

### ADJUSTMENT OF AERIAL CIRCUIT OF WIRELESS SET No. 38 WHEN FITTED IN CHURCHILL TANKS.

#### 21. General.

For infantry use the Wireless Set No. 38 Mk. II is normally adjusted to give maximum output with a 4 ft. aerial using the smaller aerial socket and with a 12 ft. aerial using the larger aerial socket. In series with the larger aerial socket, is a trimmer (CIA Fig. 1) which can be used to adjust the aerial circuit, if the set is operated with aerials other than those mentioned above.

The set when installed in either Churchill I and II tanks uses an 8 ft. rod aerial in an aerial base mounted on the turret. The aerial carries a lead terminating in a plug which is inserted in the larger aerial socket. As the aerial capacity presented to the set when thus mounted is considerably different to that for which it was primarily intended, it is necessary to tune the aerial circuit to give maximum output. An aerial Lead 3 ft. No. 6 is used in Churchill I and II tanks and an Aerial Lead 2 ft. No. 6 is used in Churchill III and IV tanks.

When the set is switched to "send," pressing the press-button switch should light the pilot lamp on the set thus indicating the radiated carrier. If however, the aerial circuit is not tuned, the lamp will not light. It

should be noted that the maximum brightness of the lamp does not necessarily indicate the maximum tuning of the set because the auxiliary circuit introduced on pressing the button switch is likely to detune the set aerial circuit to a certain extent. Thus, the lighting up of the pilot lamp will indicate that the set is not far off its optimum tuning.

## 22. Instructions for adjusting the aerial circuit.

To adjust the set for maximum aerial current when mounted in the tank the following procedure may be adopted :—

Insert an 8 ft. rod in the aerial base. Set the GL—GS—CS switch to either position CS or position GS on the Control Unit No. 12.

- (1) For preliminary adjustment, the aerial circuit may be tuned by using the pilot lamp. Lock the TUNING Mc/s dial at 8 Mc/s. Unscrew the four screws in the front panel of the set, and withdraw the set from the case. The trimmer, C1A, is mounted under the aerial sockets and across the two terminals leading to the two aerial sockets. After adjusting the trimmer, replace the set back in the case, switch to “send” and push the button. Repeat this procedure until the lamp lights up on pressing the button.

*NOTE*: It is advisable to switch the set off before withdrawing it from the case in order to prevent damaging the set.

- (2) To tune the set for maximum output the following procedure must be adopted :—

Set the TUNING Mc/s dial to 8 Mc/s and lock it. Switch the 19 Set to receive and set the meter switch on the 19 Set to read A.V.C. Switch the 38 Set on to SEND and tune the 19 Set to the carrier radiated from the 38 Set. The correct tuning of the 19 Set will be indicated by the maximum dip on the meter. Adjust the trimmer, C1A, as indicated in (1) till the meter indicates the maximum dip. The 38 Set is then adjusted for maximum output. For maximum sensitivity on the A.V.C. meter, the 19 Set should be slightly detuned by means of the variometer, to prevent the A.V.C. “swamping” the incoming signal.

It should be noted that the method described under (1) will only provide a rough indication of the optimum adjustment of trimmer, and may be dispensed with altogether. With the set adjusted, as under (2), the pilot lamp should light on “send” although it may not be at its maximum brightness.

When using a 4ft. aerial it is not necessary to retune the 38 set.



## IMPORTANT NOTE

**Appendix I and Appendix II comprise a provisional list of components and equipment. This list does not constitute an authority to draw stores.**

### APPENDIX I

#### WIRELESS SET No. 38 Mk. II and Mk. II\* IN INFANTRY TANKS.

##### LIST OF COMPONENTS. (Refer to Fig. 1)

Components.	Value & Tolerance.	Circuit.
<b>Condensers.</b>		
C1A	5-40 pF (CVS11)	12 ft. Aerial trimmer.
C1B	" " "	Grid V1A trimmer.
C1C	" " "	Grid V1C trimmer.
C1D	" " "	Grid V1B trimmer.
C2A	4.5 pF (U.I.C.)	
	10%	Neutralising V2A.
C2B	3-12 pF in W/S. No. 38 Mk. II,	Compensating Network.
	3-30 pF in W/S No. 38 Mk. II*	
C3A	5-35	Grid, V1B trimmer.
C4A	5-50	Grid Tuning V1A.
C4B	5-50	Grid Tuning V1C.
	} 3 gang	Oscillator Tuning V1B.
C5A	100 pF. 15%	Aerial Circuit.
C5B	" "	Grid V1A.
C5C	" "	Grid V1B
C5D	" "	Grid V1C.
C5E	" "	Coupling V1B to V2A on SEND. (V2A off on RECEIVE).
C6A	0.01 $\mu$ F	Screen decoupling V1A.
C6B	" "	A.V.C. line decoupling.
C6C	" "	Screen decoupling V1B.
C6D	" "	V1C.
C6E	" "	Primary of A.F. transformer T2.
C6F	" "	Coupling V1D to V2A on SEND.
C7A	45 pF	I.F. band pass anode V1C.
C7B	" "	I.F. band pass grid V1D.
C7C	" "	I.F. band pass anode V1D.
C7D	45 pF	Grid, oscillator, V1B on SEND.
C8A	200 pF	I.F. by pass grid V1D on RECEIVE.
C8B	" "	I.F. decoupling grid V1D on RECEIVE.
C8C	" "	2nd Detector circuit W1.

APPENDIX I (contd.)

Components.	Value & Tolerance.	Circuit.
C8D	200 pF	Anode I.F. decoupling V1D.
C9A	35 pF in W/S No. 38 Mk. II	Compensating network grid V1B.
	18 pF in W/S No. 38 Mk. II*	
C10A	1 $\mu$ F	Screen decoupling V1D.
C11A	175 $\mu$ F	I.F. band pass 2nd detector W1
C13A	4 $\mu$ F	H.T. decoupling.
C14A	25 $\mu$ F	By pass R10A.
C15A	0.01 $\mu$ F	H.T. blocking condenser.
C16A	30 pF in W/S No. 38 Mk. II	Compensating Network on receive (V1B).
	680 pF in W/S No. 38 Mk. II*	
<b>Inductances.</b>		
L1	6.3 $\mu$ H	Grid tuning V1A.
L2	—	Lamp B1.
L3	4 $\mu$ H	Anode V1A.
L4	—	Cathode V1B oscillator.
L5	16 $\mu$ H in W/S No. 38 Mk. II	Grid tuning V1B osc.
	14 $\mu$ H in W/S No. 38 Mk. II*	
L6	215 $\mu$ H in W/S No. 38 Mk. II	Tracking coil. compensating network V1B
	9 $\mu$ H in W/S No. 38 Mk. II*	
L7A	5 mH	I.F. band pass V1C anode.
L7B	5 mH	I.F. band pass V1D grid.
L7C	—	I.F. band pass „ anode.
L8	—	
L9	1.7 mH	I.F. band pass 2nd Det. W1.
L10	1.25 mH	Grid V2A.
<b>Resistors.</b>		
R1A	0.22 megohm	Screen V1B.
R1B	0.18 „	„ V1D.
R1C	0.1 „	H.T.—lead.
R2A	600 ohms.	Screen V2A.
R3A	1.0 megohm	A.V.C. line V1A.
R4A	0.1 „	Screen V1A.
R4B	„ „	„ V1B.
R4C	„ „	Grid V1B on RECEIVE.
R5A	50,000 ohms.	Grid V1B.
R5B	„ „	2nd Det. W1.
R6A	470,000 ohms.	Screen V1C.
R6B	„ „	2nd Det. W1.
R6C	„ „	Sec. T2.
R7A	2 meg.	A.V.C. line V1C.
R7B	„ „	Grid V1D on RECEIVE.
R7C	„ „	2nd Det. W1.
R7D	„ „	A.V.C.
R10A	1,500 ohms.	Grid bias resistor.
R11A	5 „	Filaments V1A, V1C.
R11B	5 „	„ V1B, V1D.
R12A	1.7 „	„ V2A.

APPENDIX I (contd.)

Components.	Value & Tolerance.	Circuit.	
<b>Switches.</b>		OFF-SEND-RECEIVE.	
<b>S1</b>			
S1 comprises :		SEND	RECEIVE
S1A		H.T. to screen V1B.	H.T. to screen V1A.
S1B		H.T. to screen & anode V2A.	—
S1C		Connects C7D in grid circuit of V1B.	Connects compensating network L6, C16A, C9A, & C2B in grid circuit of V1B.
S1D		Connects sec. of mic. trans. T1 to grid, V1D.	Connects output of 2nd det. to grid of V1D (reflex circuit).
S1E		Output of mod. amp. V1D to grid V2A.	—
S1F		H.T. + to H.T. Line.	H.T. + to H.T. Line.
S1G		L.T. + to V2A filament.	L.T. + to filament of V1A and V2C.
S1H		L.T. + to filaments of V1B, V1D.	L.T. + to filaments of V1B, V1D.
S2		Lamp B1 switch.	
<b>Transformers</b>		Microphone transformer.	
T1		A.F. Output Transformer.	
T2			
<b>Valves.</b>			
V1A	A.R.P. 12	Master Oscillator.	R.F. Amplifier.
V1B	A.R.P. 12		Local Oscillator.
V1C	A.R.P.12	Modulation amp.	Mixer.
V1D	A.R.P.12	Power Amplifier.	1st I.F. & A.F. amp.
V2A	A.T.P.4		2nd Detector.
<b>Rectifier.</b>			
W1			

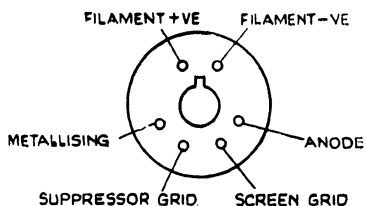
**APPENDIX II. WIRELESS SETS No. 38 Mk. II or Mk. II\* IN CHURCHILL I, II, III AND IV TANKS.**

(SEE NOTE ON PAGE 15).

Item No.	Vocab. Cat. No.	Designation.	Churchill I & II			Churchill III & IV		
			Min for Work (4)	Essen-tial Spares (5)	Total (6)	Min for Work (7)	Essen-tial Spares (8)	Total (9)
(1)	(2)							
1	WB 2730	<sup>(3)</sup> SECTION W.2. Batteries, dry H.T./L.T. 150/3 volts.	1	1	2	1	1	2
2	WB 2756	Bulbs, 2-Volt W.F.	1	1	2	1	1	2
3	ZA 1887	SECTION X.1. Aerial Bases, No. 10 Mk. 1	1	—	1	1	—	1
4	ZA 16865	" " Brackets Mounting No. 1	—	—	—	1	—	1
5	ZA 17201	Aerial Bases No. 10	1	—	1	—	—	1
6	ZA 16866	Brackets Mounting No. 2	—	—	—	1	—	1
7	ZA 17195	Aerial leads 2 ft. No. 6	1	—	1	—	—	1
8	ZA 11800	Aerial leads 3 ft No. 6	1	—	1	1	—	1
9	ZA 0895	Antennae Rods F Cases, Carrying No. 3	1	—	1	1	—	1
10	ZA 0896	Antennae Rods F Sections No. 2	1	—	1	1	—	1
11	ZA 12971	Antennae Rods F Sections No. 3	1	—	1	1	—	1
12	ZA 16867	Cases, spare valve No. 2.	1	—	1	1	—	1
13	ZA 17202	Carriers, primary battery No. 1	1	—	1	1	—	1
14	ZA 10600	Carriers, primary battery No. 2	4	2	6	4	2	6
15	ZA 16869	Clips, cable fixing, $\frac{1}{8}$ "	1	—	1	1	—	1
16	ZA 16868	Control Unit, No. 12	4	—	4	4	—	4
17	ZA 7023	Connectors, 6 point No. 20	1	—	1	1	—	1
18	ZA 5502	Valves W.T. type ARP12	1	—	1	1	—	1
19	ZA 13280	" " ARP4	4	4	8	4	4	8
20	ZA 16870	Wireless Sets No. 38 Mk. II or Mk. II* Wireless Sets No. 38 Mk. II or Mk. II* Carriers No. 4	1	1	2	1	1	2
21	ZA 17203	Wireless Sets No. 38 Mk. II Carriers No. 5	—	—	—	1	—	1
22	ZA 14284	Wireless Sets No. 38 Mk. II Working Instructions	1	—	1	1	—	1



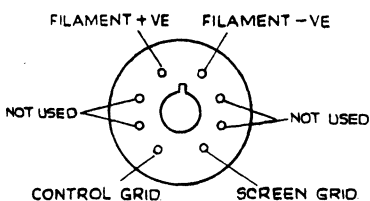
ARP. 12.



VIA, VIB, VIC, VID.

TOP CAP - CONTROL GRID  
BRITISH OCTAL BASE.

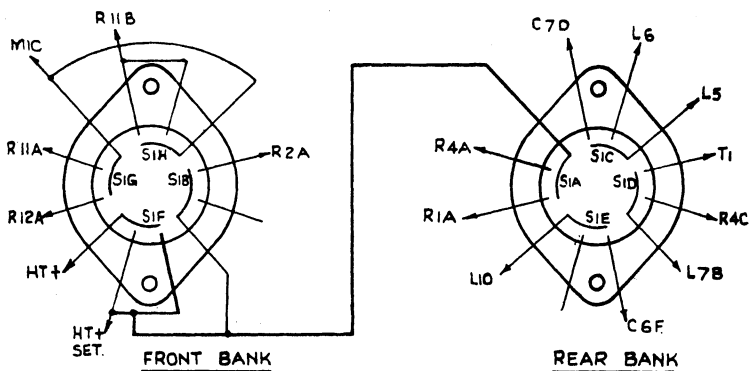
ATP. 4.



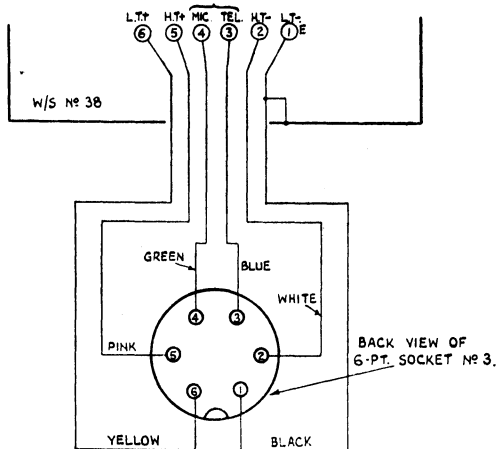
V2A

TOP CAP - ANODE  
BRITISH OCTAL BASE.

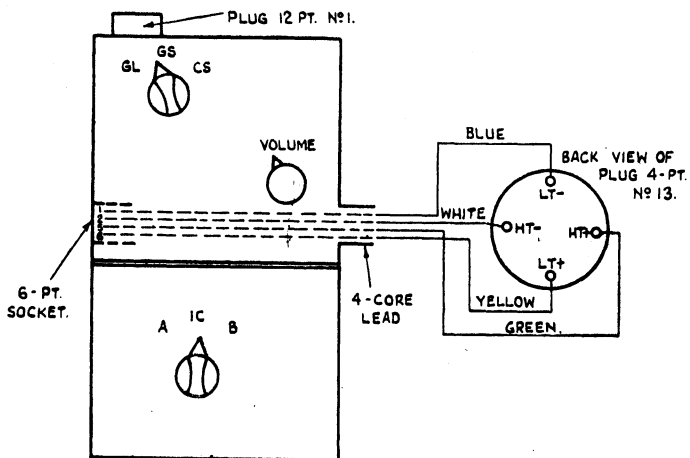
OFF-RECEIVE-SEND SWITCH, SIA-H - REAR VIEW.



**FIG. 2—WIRELESS SET No. 38 Mk. II AND Mk. II\*.  
VALVE BASE AND SWITCH CONNECTIONS.**



**FIG. 3—CONNECTIONS BETWEEN 38 SET AND 6-POINT SOCKET**



**FIG. 4—CONNECTIONS BETWEEN CONTROL UNIT AND 38 SET BATTERY PLUG.**

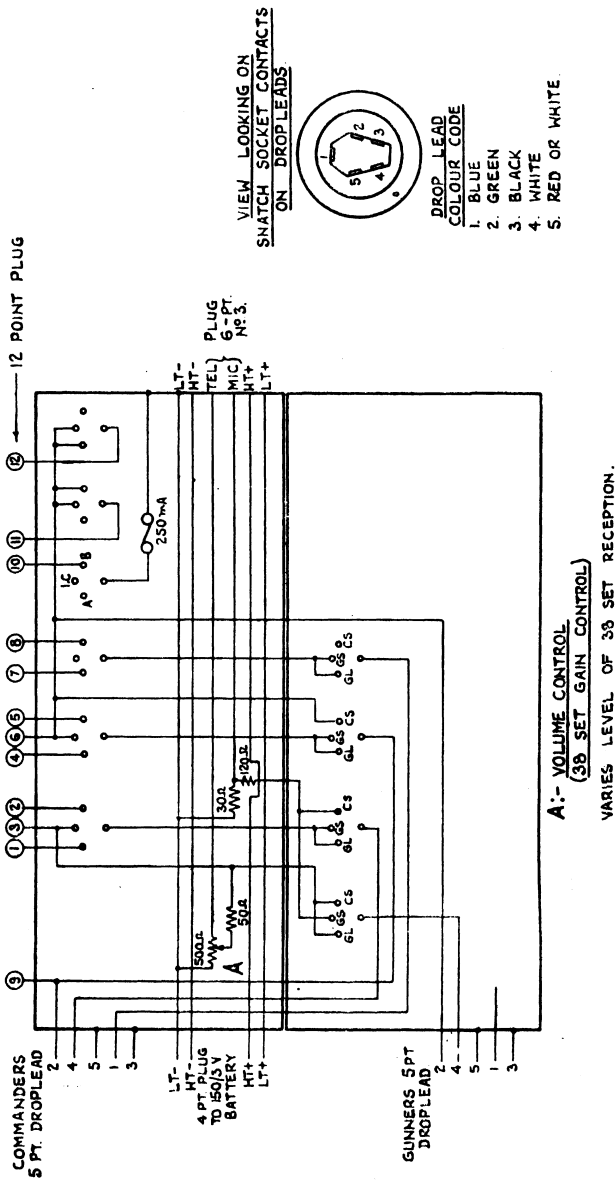
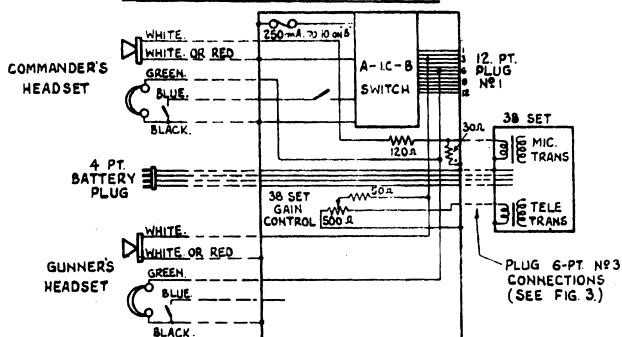


FIG. 5—CIRCUIT OF CONTROL UNIT No. 12.



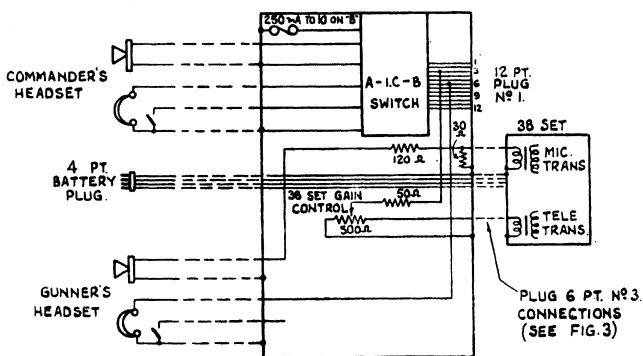
W/SET N° 38. CONTROL SWITCH IN 'CS' POSITION

COMMANDER SEND & REC. 38 SET.



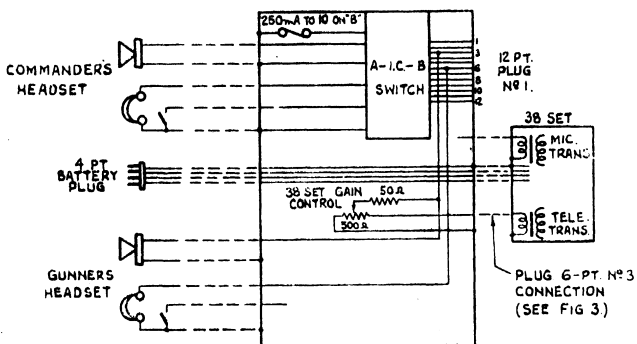
W/SET N° 38. CONTROL SWITCH IN 'GS' POSITION.

GUNNER SEND & REC. 38 SET.



W/SET N° 38. CONTROL SWITCH IN 'GL' POSITION.

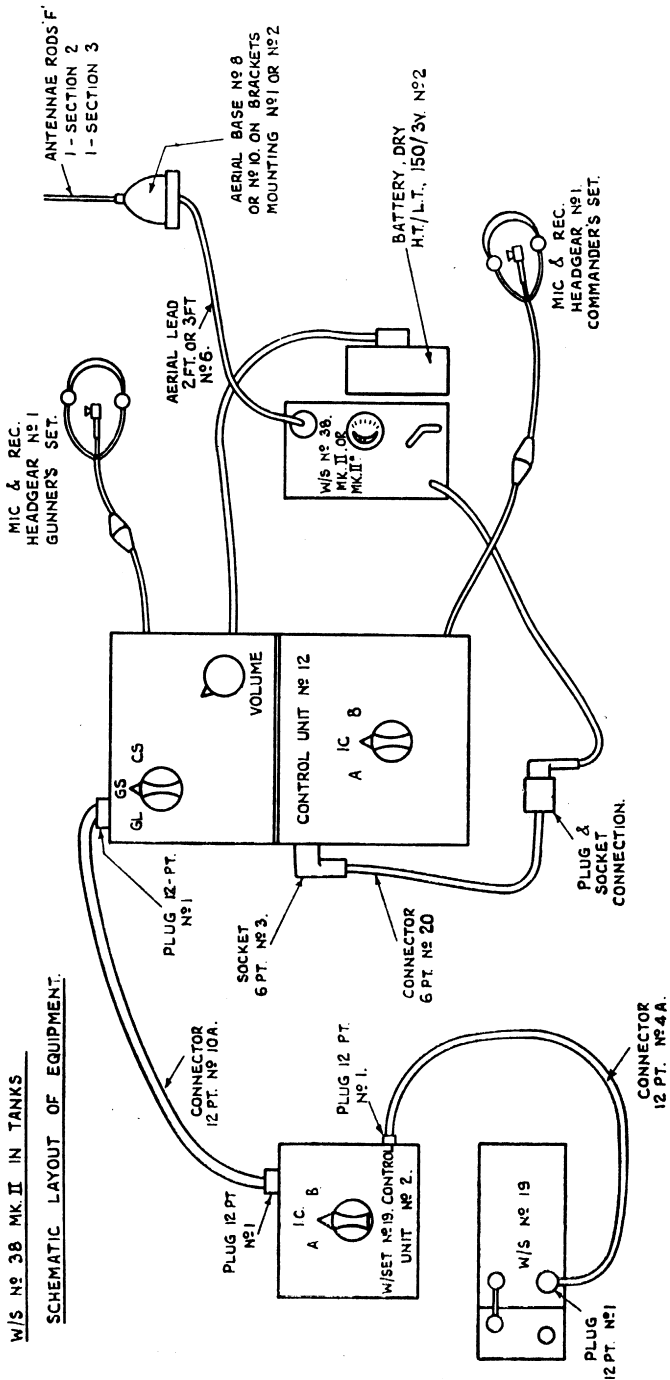
38 SET RECEIVE ON 19 SET I.C. 19 SET NORMAL.



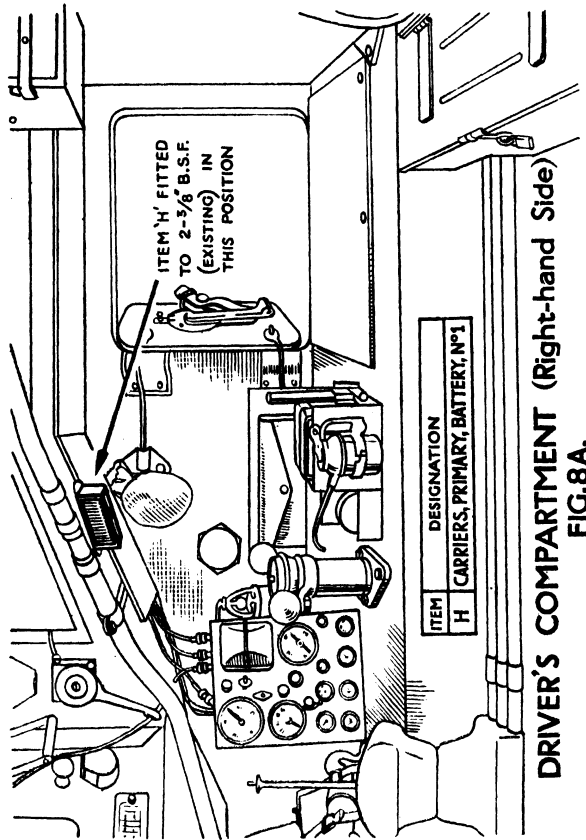
**FIG. 6—SIMPLIFIED CIRCUIT CONNECTIONS.  
CONTROL UNIT No. 12.**

W/S No 38 MK. II IN TANKS

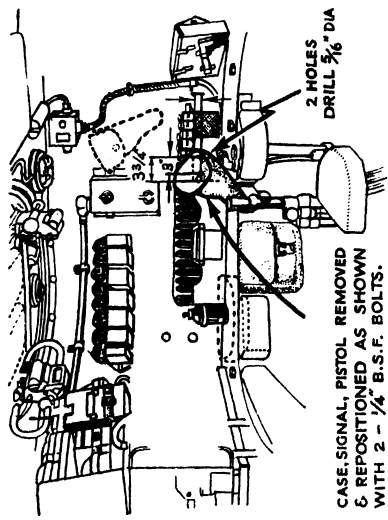
SCHEMATIC LAYOUT OF EQUIPMENT.



**FIG. 7—W/S No. 38 MK. II IN TANKS. SCHEMATIC LAYOUT OF EQUIPMENT.**



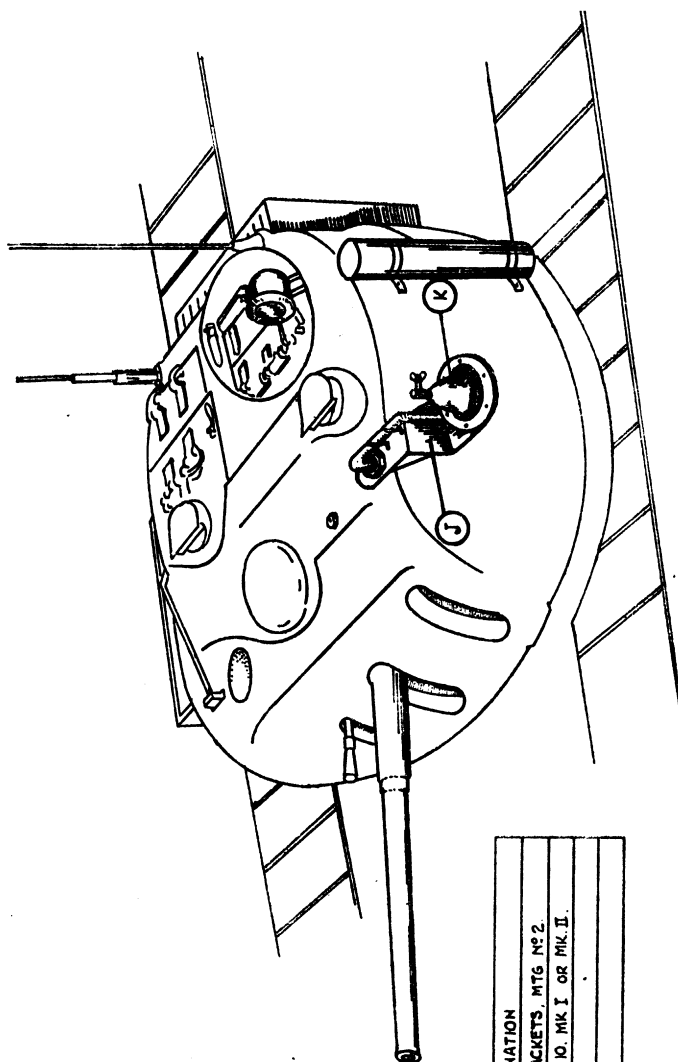
**DRIVER'S COMPARTMENT (Right-hand Side)**  
**FIG. 8A.**



**CASE, SIGNAL, PISTOL REMOVED & REPOSITIONED AS SHOWN WITH 2 - 1/4\"/>**

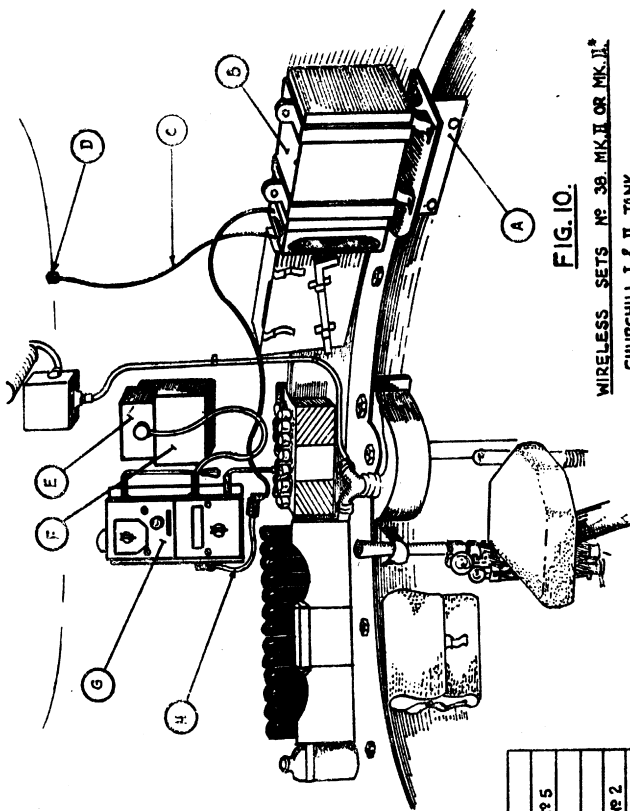
**TURRET & HULL (Left-hand)**  
**FIG. 8 B.**

**FIG. 8—WIRELESS SETS No. 38 Mk. II OR Mk. II\* IN CHURCHILL I AND II TANKS.**



ITEM	DESIGNATION
J	AERIAL BASES, BRACKETS, MT6 N°2.
K	AERIAL BASES N° 10. MK I OR MK II.

FIG. 9—WIRELESS SETS No. 38 Mk. II or Mk. II\* IN CHURCHILL I AND II TANKS.  
EXTERNAL VIEW OF TURRET NEARSIDE.

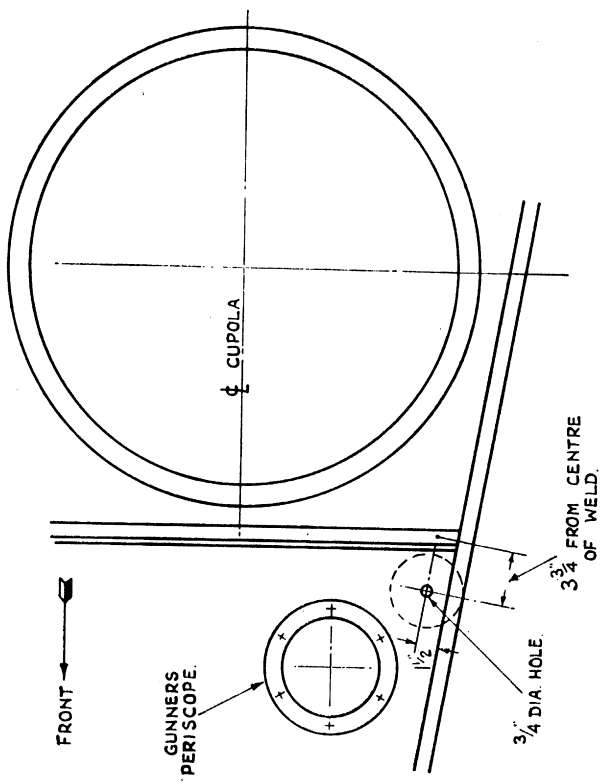


**FIG. 10.**

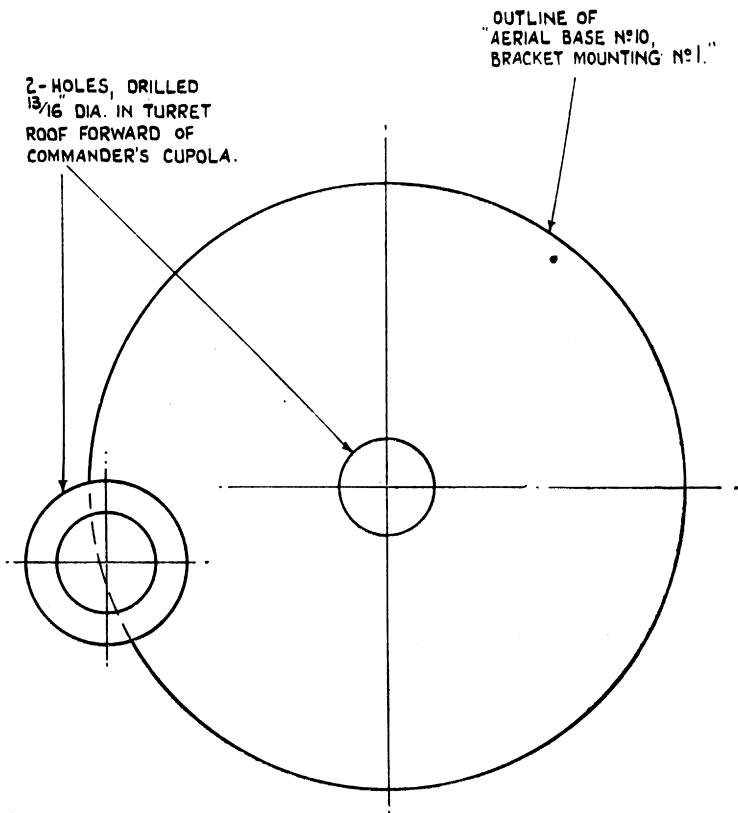
**WIRELESS SETS NO. 38, MK. II OR MK. II\*  
CHURCHILL I & II TANK.**

**INTERNAL VIEW OF FORWARD  
NEAR-SIDE TURRET WALL.**

ITEM	DESIGNATION
A	WIRELESS SETS NO. 38, CARRIER NO. 5
B	WIRELESS SETS NO. 38, MK. II.
C	AERIAL LEADS 3 FT. NO. 6.
D	AERIAL BASES NO. 10, BRACKET M.T.G. NO. 2
E	BATTERY DRY HT/LT. 190/3V NO. 2
F	CARRIERS PRIMARY. B.T.Y. NO. 2
G	CONTROL UNIT NO. 12.
H	CONNECTOR 6 PT. NO. 20

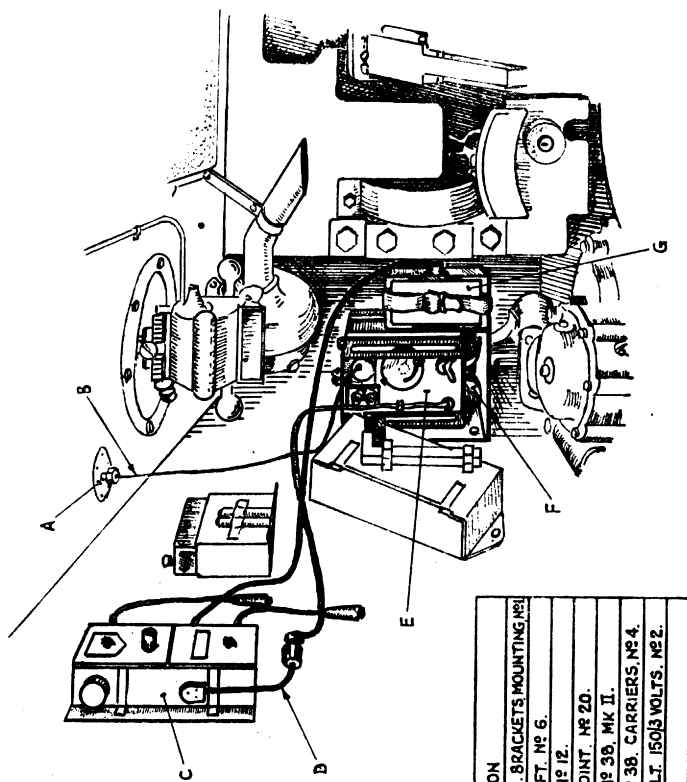


**FIG. 11—AERIAL BASE LOCATION. CHURCHILL III AND IV (6 POUNDER PLATE TURRET).**



ONE EXISTING HOLE USED FOR MOUNTING BRACKET.  
 OTHER HOLE TO BE C'SK.  $90^\circ$  CONE TO 1.352" DIA.  
 AND PLUGGED WITH  $\frac{3}{4}$ " DIA. C'SK. HD. BOLT  $\times$  2" LONG.

**FIG. 11a—CHURCHILL IV.  
 6 POUNDER CAST TURRET.**



ITEM	DESIGNATION
A	AERIAL BASES, NO. 10, BRACKETS MOUNTING NO. 12.
B	AERIAL LEADS, 2 - FT. NO. 6.
C	CONTROL UNITS, NO. 12.
D	CONNECTORS, 6 - POINT, NO. 20.
E	WIRELESS SETS, NO. 38, MK. II.
F	WIRELESS SETS, NO. 38, CARRIERS, NO. 4.
G	BATTERIES, DRY, HT./LT. 150/3 VOLTS, NO. 2.

FIG. 12—WIRELESS SETS No. 38 Mk. II. OR Mk. II\* IN CHURCHILL III AND IV TANKS.  
VIEW OF FORWARD NEARSIDE TURRET WALL.



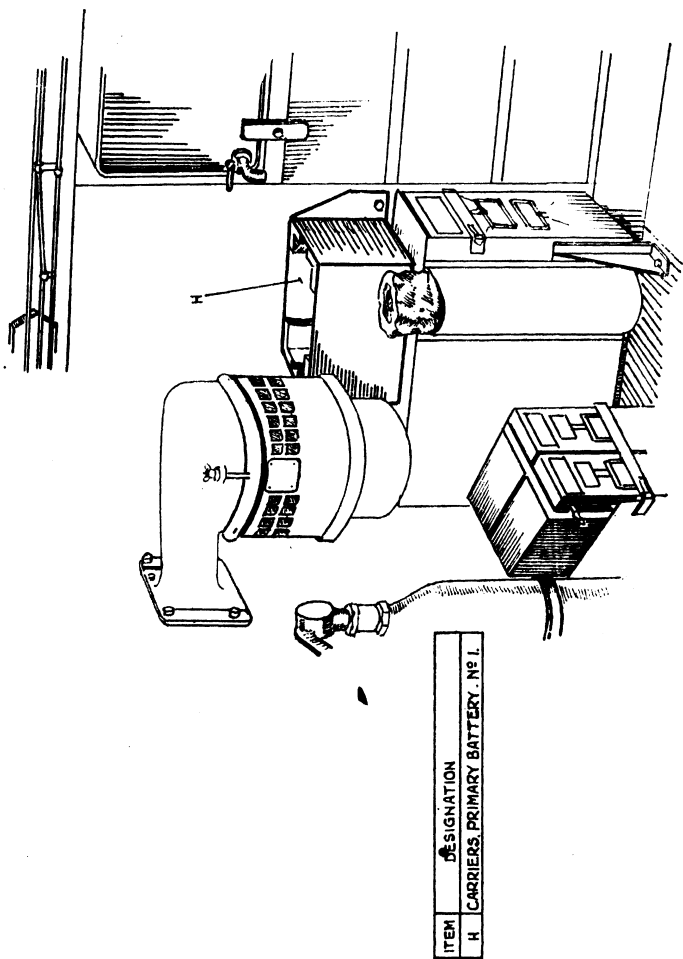


FIG. 13—WIRELESS SETS No. 38 Mk. II OR Mk. II\* IN CHURCHILL III AND IV TANKS.  
VIEW OF REAR NEAR SIDE OF HULL.

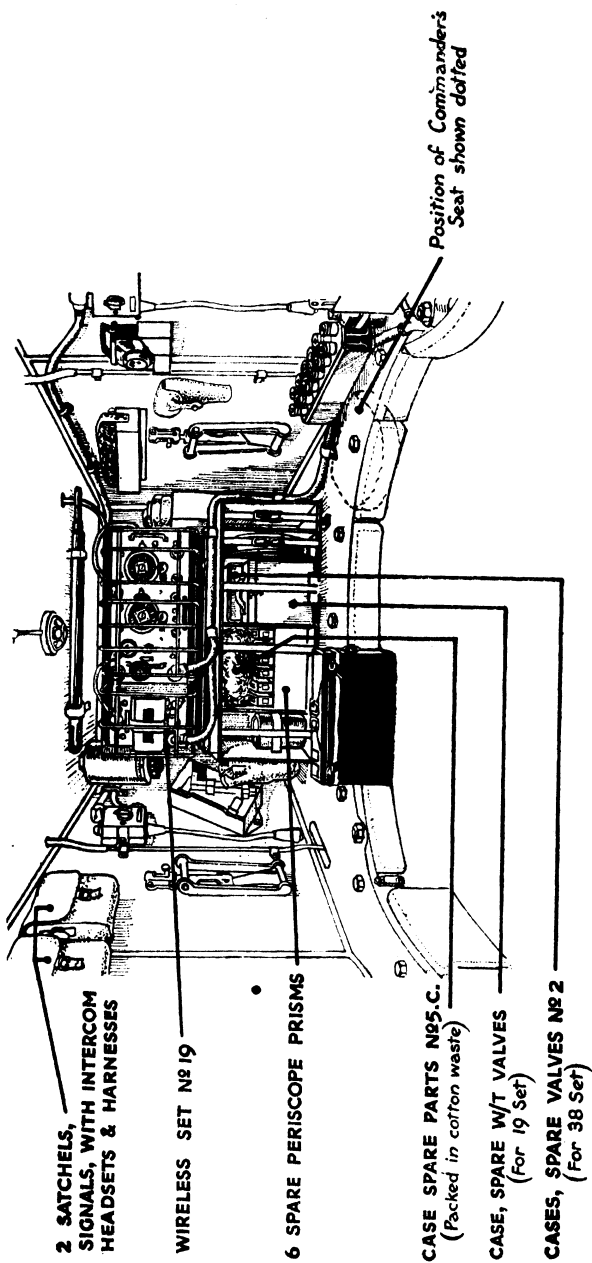


FIG. 14—WIRELESS SETS No. 38 Mk. II OR Mk. II\* IN CHURCHILL III AND IV TANKS.  
INTERNAL VIEW OF TURRET, REAR.