

WIRELESS SETS No. 19
Mark I

WORKING
INSTRUCTIONS

NOT TO BE PUBLISHED

The information given in this document is not to be communicated, either directly or indirectly, to the Press or to any person not holding an official position in His Majesty's Service.

For installation instructions refer to Installation Prints and other details in envelope packed with Installation Kit.

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CHAPTER I

GENERAL DESCRIPTION

1.1. Purpose.

Wireless Sets No. 19 are intended primarily as complete signals stations for armoured fighting vehicles providing the facilities set out in Table 1.

1.2. Installation.

The set is packed in a series of "kits" which enable a complete station to be installed in each of a selected range of A.F.V. For this purpose the sender-receiver, variometer, supply unit and carrier No. 1 are packed in one carton; all other parts which occur in all installations are collected in a second carton. All parts which occur in one or more installations but not in all are collected in a series of Installation Kits, each of which is special to one type of vehicle. Refer to Table 7 for details of kits required for various vehicles.

Detailed instructions for installation are contained in the large envelope supplied in each Installation Kit.

1.3. Sender-Receiver No. 19 (Set A).

1.3.1. Frequency Range.

The set covers the frequency band from 2.5 Mc/s to 6.25 Mc/s. (120 metres to 48 metres) in a single range.

1.3.2. Aerials.

The set is designed primarily for use with 8' or 12' rod aerials of the type supplied with the equipment. Where short range communication only is required under conditions in which the 8' aerial would be regarded as too conspicuous, a single 4' mast section may be used.

Any of the usual types of elevated aerial can be used with sender-receiver No. 19 and the conditions governing the connection and tuning of these aerials are set out in Table 2.

1.3.3. Circuit. Ref. to Figs. 1-5.

1.3.3.1. Receiver No. 19. (Figs. 1 and 3.)

The receiver is of the superheterodyne type employing an intermediate frequency of 465 Kc/s. It comprises:

				<i>Valve No.</i>
1. Signal frequency stage	6K7G			V.1.A.
2. Oscillator frequency changer ..	6K8G			V.2.A.
3-4. } I.F. Stages	6K7G			V.1.B. & V.1.C
5. Detector A.C. & A.F.	6B8G			V.3.A.
6. Het. Osc. (C.W.)	6K8G			V.2.B.

~~SECRET~~

FACILITIES PROVIDED BY COMPLETE STATION No. 19

Item	Panel designation	Frequency range	Purpose	Type of service	Range
Sender-Receiver No. 19. A-SET	A	230-250 Mc/s. 2-8	Communication troop to base or troop to troop.	R/T. C.W. M.C.W.	10 miles R/T between vehicles in motion with 8' rod aerial each end.
Sender-Receiver No. 19. B-SET	B	230-250 Mc/s (approx.)	Communication between vehicles in a troop.	R/T only.	1,000 yards between vehicles in motion with half-wave aerial supplied.
Inter-Communication Amplifier.	I-C	Speech only.	Communication among the crew of the vehicle.	Speech only.	

add Whip aerial



~~TABLE 2~~

USE OF ELEVATED AERIALS

	Description of Aerial	Method of Coupling	Method of Tuning
<i>1.</i>	Quarter-wave end-fed. Three-quarter wave end-fed. Half-wave end-fed. Half-wave centre-fed.	Using aerial coupling unit No.	Tuned for maximum reading of meter on set panel making successive adjustments of P.A. Tuning and Tapping Switch on \AA Coupling Unit.
<i>2.</i>	Quarter-wave end-fed. Three-quarter wave end-fed. Half-wave centre-fed.	Connected direct to \AA socket 'A' on panel.	Tune for maximum signal at out-station.
<i>3.</i>	Wyndom.	Using aerial coupling unit No.	First tune for maximum reading on meter as described above and tune finally for maximum signal strength on out-station.
<i>4.</i>			

1.3.3.2. Sender No. 19 (Figs. 2 and 3.)

In order to obviate separate adjustment of the sender master frequency, the outputs of the receiver oscillator and the heterodyne oscillator for C.W. reception are mixed in Valve V.2.B. to reconstitute a sender frequency equal to the frequency to which the receiver is tuned. This frequency is selected by the tuned buffer stage V.5.A.—ARP.35, and the output of this stage is applied to the grid of the P.A. stage V.4.A—807. Bias for the P.A. stage is obtained by rectification from the output of V.5.A. in the diode V.6.A.—ARDD5, and the input voltage and bias are held constant by bias applied to the grid of V.5.A. and obtained from the delayed diode rectifier V.6.A.—ARDD5. The output of the P.A. is coupled to the aerial by means of a low impedance line, feeder No. 1, connected to a suitable tapping on the tank coil, L.3.A. The aerial is inductively loaded to resonance by means of the aerial tuning variometer L.I.A, which is located in all cases as near as possible to the base of the aerial.

1.3.3.3. Other Circuit Details.

For details of the circuit of the V.H.F. sender-receiver (Fig. 4) and the I-C amplifier (Fig. 5) and for further details regarding the 19 sender-receiver, refer to Table 3.

6

** The sender comprises the following stages:*

1.3.4. The Aerial Circuit.

A common tuned circuit L.3.A., C.3.A. (labelled P.A. Tuning) is used to tune the grid of V.1.A. when receiving and the anode of V.4.A. when sending. The aerial is tuned to resonance by the variometer L.1.A., and this series resonant circuit is connected to a low impedance tapping on the tank coil L.3.A. via a low capacity feeder. The entire aerial circuit within the vehicle is fully screened to reduce interference from other electrical equipment in the vehicle.

The aerial tuning variometer assembly includes a current transformer T.1.A. and rectifier unit W.1.A., enabling the R.F. current to be measured in the aerial lead at the point where it leaves the variometer, the D.C. from the rectifier being fed back to the set over the low capacity feeder and measured by the meter on the panel when the meter switch is set to "Æ".

1.3.5. The Supply Unit.

Wireless Sets No. 19, Supply Unit No. 1 comprises a three-commutator rotary transformer developing H.T. voltages of 500 volts and 275 volts from the 12 volt input, together with the necessary r.f. and l.f. filters. For details of the circuit, see Fig. 6.

1.4. The Controls

The details of functions and operation of controls are set out in Table 4 below. Ref. to Figs. 8 and 11 for location of controls.

TABLE 3
VALVE DESIGNATIONS, TYPES, FUNCTIONS AND CIRCUIT DETAILS

Valve	Designation	Type	Function	Circuit and intervalve coupling details
V.1.A	6K7G	R.F. Pentode	R.F. Amplifier.	Tuned R.F. transformer L.7.A and L.7.B to grid of V.2.A.
V.2.A.	6K8G	Triode-hexode	Oscillator-mixer.	Two-circuit tuned I.F. (465 kc.) transformer L.8.A to grid of V.1.B.
V.1.B.	6K7G	R.F. pentode.	I.F. amplifier.	Two-circuit tuned I.F. (465 kc.) transformer L.8.B. to grid of V.1.C.
V.1.C.	6K7G	R.F. pentode.	I.F. amplifier.	Two-circuit tuned I.F. (465 kc.) transformer L.9.A. to diode elements in V.3.A.
V.3.A.	6B8G	Double diode-R.F. pentode	Demodulator, bias rectifier and A.F. output.	Audio-frequency output transformer T.2.A. to No. 19 telephone line in vehicle wiring.
V.2.B.	6K8G	Triode-hexode.	Triode as oscillator only.	I.F. oscillator for C.W. reception tuned near 465 kc. and adjustable over a small frequency range to enable the beat tone to be varied.
V.2.A.	6K8G	Triode-hexode.	Triode as oscillator only.	Oscillates as in receiver and output applied to hexode control grid of V.2.B. for mixing with output of triode oscillator V.2.B. now tuned to 465 kc.
V.2.B.	6K8G	Triode-hexode.	Oscillator-mixer.	Produces master frequency from output of receiver oscillator and 465 kc. oscillator. Tuned anode coupled to grid of V.5.A.—(L.4.B., C.9.D.).
V.5.A.	ARP35 EF50	R.F. pentode.	R.F. amplifier.	Coupled by tuned transformer L.4.A. to V.4.A. and V.6.A.
V.4.A.	807	Beam tetrode.	R.F. power amplifier.	Coupled by tuned anode L.3.A. and C.3.A. and low-impedance line, feeder No. 1 to series tuned aerial. Grid-modulated by V.3.A.

84-sec. Receiver
Receiver No. 19

A-sec Generator
Generator No. 19

TABLE 3 (continued)

Valve	Designation	Type	Function	Circuit and intervalve coupling details
V.3.A.	6B8G	Double diode. R.F. pentode.	Pentode only as modulator.	Anode coupled to grid of V.4.A. through C.17.B. and R.7.G.
V.6.A.	ARDD5 EB34 6H6	Double diode.	Twin rectifier.	One element supplies standing bias for V.4.A. The other element supplies A.G.C. bias to V.5.A. enabling the drive and standing bias to V.4.A. to be maintained constant over the frequency range.
V.7.A.	E1148 VR135	Low capacity triode.	Super-regenerative detector.	Resistance coupled to L.F. amplifier V.1.E.
V.1.D.	6K7G	R.F. pentode.	Quench oscillator.	Oscillates at a frequency between 158 and 228 kc. determined by the permeability tuned coil L.14.A. Frequency is adjusted by "Quench" control on set panel.
V.1.E.	6K7G	R.F. pentode.	A.F. amplifier.	Resistance coupled to output valve V.8.A.
V.8.A.	6V6G	Output pentode.	A.F. output.	Coupled by transformer T.5.A. to B. set telephone wiring.
V.7.A.	E1148 VR135	Low capacity triode.	Oscillator.	Coupled to aerial by tapped coil L.11.A. and resonant feeder No. 2 or No. 3.
V.1.E.	6K7G	R.F. pentode.	Modulator pre-amplifier.	Resistance coupled to modulator V.8.A.
V.8.A.	6V6G	Output pentode.	Modulator.	Coupled by transformer T.5.A. to anode circuit of V.7.A.
V.1.F.	6K7G	R.F. pentode.	Pre-amplifier.	Resistance coupled to output valve V.8.B.
V.8.B.	6V6G	Output pentode.	A.F. output.	Coupled by transformer to I-C telephone line.

I-C amplifier. Sender V.H.F. Receiver V.H.F.

B-Set Receiver 6

80-077 Smith 56A Power supply panel
 have change 5NA Panel of set

~~Transmitter~~

CONTROLS AND ADJUSTMENT

Designation of control.	Coding on circuit.	Location.	Function and operation.
Frequency Mc/s.	C.9.A., C.9.B., C.9.C., C.9.D.	Set panel.	The master frequency control of the set—tunes sender and receiver simultaneously. Operates a 4-gang variable condenser which tunes all the R.F. tuned circuits in the set except the aerial and P.A. anode circuits. Fitted with "Flick" dial. See below.
P.A. tuning.	C.3.A.	Set panel.	Operates the single variable condenser which tunes the anode circuit of V.4.A. and the grid circuit of V.1.A. simultaneously. Fitted with "Flick" dial. See below.
Gain A.	R.13.A.	Set panel.	Operates a 1Mn potentiometer controlling the L.F. gain only of No. 19 receiver.
M.C.W., C.W., R/T. Transmission selector switch	S.7.A.	Set panel.	Operates a 9-pole 3-position switch and enables the set to be used for transmission and reception of radio-telephony (R/T) continuous wave (C.W.) and modulated continuous wave (M.C.W.). In the M.C.W. position modulation only is keyed.
Het tone.	R.14.A.	Set panel.	Adjusts the heterodyne tone in C.W. reception between a few hundred cycles/second and about 2000 cycles/second.
Trimmer.	C.12.A.	Set panel.	Fine adjustment of oscillator frequency by variable air trimming condenser, enabling slight drift from "net" frequency to be corrected without resetting "flick" controls. Clamp fitted for locking this control.

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Transmission selector switch

[Handwritten signature]

[Handwritten signature]

TABLE 4 (continued)

Designation of control.	Coding on circuit.	Location.	Function and operation.
Net.	S.3.B.	Set panel.	Push button switch operating 465 kc. heterodyne oscillator to beat against signal produced in I.F. circuit by incoming carrier. When the received signal is tuned to zero beat this gives correct netting and ensures that the "A" set will transmit on the same frequency as that of the incoming signal.
"A" only.	S.10.A.	Set panel.	Two position switch giving the "A" set only as an alternative to the normal position in which all services are available.
Meter switch (marked \mathcal{E} , A.V.C., L.T., H.T.1., H.T.2, and Drive).	S.8.A.	Set panel.	Six position switch enabling the panel meter to be used for the following purposes:— \mathcal{E} —Measurement of aerial current in conjunction with transformer and rectifier on variometer assembly. A.V.C.—Indicates correct tuning of receiver. L.T. Checks L.T. voltage applied to valve heaters. H.T.1.—Measures 275V. H.T. supply voltage. H.T.2.—Measures 500V. H.T. supply voltage. Drive.— Checks correct operation of signal frequency circuits in sender prior to V.4.A.
Tuning B.	C.25.A.	Set panel.	Adjusts split stator variable condenser and varies the frequency of B set between 230 and 250 Mc/s. approx. Not calibrated in frequency but divided into ten divisions enabling resetting to be readily carried out.

TABLE 4 (continued)

Designation of control.	Coding on circuit.	Location.	Functions and operation.
Gain B.	R.35.A.	Set panel.	Operates a 0.1MΩ potentiometer controlling the A.F. gain only of B set.
Quench.	L.14.A.	Set panel.	Permeance tuning adjustment of quench frequency of set B receiver enabling this frequency to be adjusted to avoid interference between sets in a net due to beating of quench frequencies or their harmonics.
B Off/On.	S.9.A.	Set panel.	Two-position toggle switch enabling the V.H.F. transmitter-receiver to be switched off while leaving the remainder of the equipment operating.
Selector (marked A, I-C, B).	S.1.A.	Control unit No. 1.	Three-position switch enabling the tank commander to speak or listen on sender-receiver A, sender-receiver B, or on the I-C amplifier.
Selector (marked A, I-C, B).	S.1.B.	Control unit No. 2 (when fitted, i.e. in 3-man fighting compartments).	Three-position switch enabling the loader-operator to speak or listen on sender-receiver A, sender-receiver B or the I-C amplifier. Red light on Control Unit No. 2 lights up when both commander and loader-operator are engaged on set B, i.e. when set A is unattended.
Call Commander.	S.3.A.	Junction distribution No. 1.	Push-button switch which enables the driver to call the commander when the latter is operating either sender-receiver. Depressing the switch produces a loud buzz in the commander's telephone.

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CHAPTER II

OPERATING INSTRUCTIONS

2.1. Preliminary.

- (a) Roll up waterproof covers and secure on top of set.
- (b) See that your headgear is connected to Control Unit No. 1 or No. 2 via the snatch plug and socket.
- (c) Switch on power supply and check H.T. and L.T. voltages by means of the test meter. The valve heaters take about thirty seconds to warm up and this interval must elapse before sender and receiver will operate.
- (d) When valves have warmed up check that intercommunication between all members of the crew is satisfactory with the Control Unit set to "I-C," and if your vehicle has a three-man fighting compartment check communication between commander and leader-operator via the side-tone of each sender-receiver, i.e. with the switches on both controls set, (1) to "A" and (2) to "B." Note that when both switches are set to "B" the warning lamp Control Unit No. 2 will light up, denoting that sender-receiver No. 19 is unattended.
- (e) Turn switch on Control Unit to "A," noting that the "Frequency Mc/s" and "P.A. Tuning" dials are set to the same frequency; rotate the variometer dial and noise or signal received at one point will indicate that the aerial circuit is in tune.
- (f) Depress pressel switch and check drive volts on test meter. Turn meter switch to AE and note that a reading is obtained showing that the sender is operating.
- (g) Turn switch on Control Unit to "B." A rushing noise ("quench noise") in the telephones indicates that the V.F. receiver is operating.
- (h) Depress pressel switch. Disappearance of noise indicates that the V.H.F. sender is operating.

2.2. Tuning Sender-Receiver No. 19.

2.2.1. Netting.

- (a) Turn "flick" controls to "Tune."
- (b) Turn both dials to the nominal frequency of the control station.
- (c) Rotate the aerial variometer until the receiver noise indicates that it is approximately in tune.

- (d) Rotate the "Frequency in Mc/s" dial until the control station is heard.
- (e) Press the "Net" button and adjust until the beat note frequency drops to zero. Sender and receiver frequencies are now the same as those of the control station.
- (f) Depress pressel switch and make successive fine adjustments of the "P.A. Tuning" and "Æ Variometer" dials until the aerial current as indicated on the test meter is maximum. This completes the tuning of the sender-receiver.

2.2.2. Use on C.W. and M.C.W.

Turn the selector switch "M.C.W.; C.W.; R-T" to the required position. Plug the morse key and plug assembly No. 9 (stowed in the Case Spare Parts No. 5C) into the C.W. jack on the set panel. If no suitable platform is found on which to rest the key it may be strapped to the thigh.

To send the plug must be pushed home in its socket. To receive it should be partially withdrawn. No other send-receive switching is required.

When receiving C.W. the pitch of the heterodyne tone may be raised or lowered by rotating the control marked "Het Tone" on the panel.

2.2.3. The "Flick" Dials.

2.2.3.1. Description.

The "flick" dials fitted to the two main tuning controls enable the adjustments of these controls for two frequencies to be preset and repeated thereafter at will. Adjacent to the main tuning dials are two auxiliary controls marked "Flick," "Set" and "Tune." In the "Flick" position two pre-determined tuning settings are indicated by spring loaded followers which drop into notches in two discs mounted on the condenser shaft; the coloured flag indicators above the dials indicate which of the two discs is engaged. In this position the slow motion drive is disengaged. With the auxiliary control turned to "Tune" the "Flick" mechanism is disengaged and the slow motion drive functions in the normal manner.

2.2.3.2. Setting up the "Flick" Dials.

1. Engage either the blue or the red disc of each dial.
2. Turn the auxiliary controls to "Set."
3. Slacken off the appropriate (blue or red) locking screws on the front of the dial knobs.
4. Tune the "Frequency in Mc/s" control to the desired frequency and tighten the locking screws.
5. Set the Æ tuning condenser to the same frequency.

6. Depress the pressel switch and rotate the variometer dial for maximum aerial current.
7. Re-adjust the \AA tuning dial for maximum aerial current and tighten locking screws.
8. Engage the other disc of each dial and repeat the entire process for the other desired frequency.

The "Trimmer" provides a fine adjustment of oscillator frequency and should be used as follows:—

When the set has been operating for some time it is advisable to check netting and, if necessary, correct the tuning. If the "Flick" dial system is being used, the beat note can readily be brought to zero and the netting corrected by use of the trimmer without re-setting the "Flick" dial.

Note.—The trimmer must always be clamped at its zero position when setting up a "net."

After correcting the net with the trimmer check that the drive has not dropped, and if it has return the trimmer to zero and re-net with the main tuning dial.

2.3. Tuning the V.H.F. Sender-Receiver.

- (a) Turn the switch on the Control Unit to "B."
- (b) Turn "Gain B" to maximum and rotate "Tuning B" until Control Station is heard.
- (c) Carefully adjust "Tuning B" in the centre of the received signal.
- (d) Depress pressel switch and speak to Control Station.
- (e) Listen for Control Station who will advise you if you are correctly tuned. If not he will order you to tune to a higher or lower reading on the dial and speak again.
- (f) In setting up a "net" of V.H.F. sender-receivers it may be found that interference is produced in one or more of the receivers by the quench of the others. This interference is tunable by the quench control on the panel and can generally be removed by systematically adding one set to the net at a time and adjusting its quench frequency so that it does not interfere with the sets already in the net. If the net consists of more than four sets it may not be possible to eliminate the interference completely, and a high pitched whistle may persist in one or more of the receivers but will not interfere seriously with communication.

2.4. The Intercommunication and Control System.

The operation of the intercommunication and control system in two-man and three-man fighting compartments is set out in Tables 5 and 6.

~~Security~~

DETAILS OF CONTROL SYSTEM (9-~~MAN-OPERATED-CONTROL~~) *(CRUISE 2, 7, 2, 4)*

A-anel B-set

Switch Position Control Unit No. 1 (Commander)	Switch Position Control Unit No. 2 (Loader-operator)	Speaking and listening on sender-receiver. <i>A-SET</i>	Speaking and listening on sender-receiver. <i>B-SET</i>	Connected to inter-communication system	Remarks
I-C	I-C	—	—	All	Sender-receiver fed into I-C to provide calling signal <i>A-SET</i> and B-SET B-SET
A	I-C	*Commander	—	Loader-operator Gunner Driver <i>FHD-GUNNER</i>	Receiver. <i>B-SET</i>
B	I-C	—	*Commander	Loader-operator Gunner Driver <i>FHD-GUNNER</i>	No. 19
I-C	A	Loader-operator	—	Commander Gunner Driver <i>FHD-GUNNER</i>	Receiver. <i>B-SET</i>
A	A	Commander and Loader-operator	—	Gunner Driver <i>FHD-GUNNER</i>	Commander and Loader-operator may communicate over side-tone of sender-receiver. <i>A-SET</i> Receiver. This speech is radiated.

* Driver can call Commander in case of emergency by means of ~~sender-receiver~~ signal operated by dual-button on Junction Distribution ~~Unit~~ *I.*

TABLE 5 (continued)

Switch Position Control Unit No. 1 (Commander)	Switch Position Control Unit No. 2 (Loader-operator)	Speaking and listening on sender-receiver <i>A-S-E-V</i>	Speaking and listening on sender-receiver <i>B-S-E-V</i>	Connected to inter-communication system	Remarks
B	A Loader-operator	*Commander	*Commander	Gunner Driver Commander	Sender-receiver <i>A- and B-set</i> fed into I-C to provide calling signal
I-C	B	Loader-operator	Loader-operator	Commander Gunner Driver Co-driver	No. 19
A	B *Commander	Loader-operator	Loader-operator	Gunner Driver Commander	
B	B	*Commander and Loader-operator	*Commander and Loader-operator	Gunner Driver Co-driver <i>FWD-GUNNER</i>	Warning lamp on Control Unit No. 2 indicates " Sender-A-set <i>Sender-A-set</i> un-attended." Commander and Loader-operator may communicate over side-tone of sender-receiver <i>B-set</i> . This speech is radiated.

* Driver can call Commander in case of emergency by means of buzzer signal operated by push-button on Junction Distribution No. 1.

~~five-man vehicle only.~~

TABLE 6
DETAILS OF CONTROL SYSTEM (2-MAN FIGHTING COMPARTMENT)

Switch Position Control Unit No. 1 (Commander)	Speaking and listening on sender-rec'r. No. 19	Speaking and listening on sender-rec'r. V.H.F.	Connected to inter-communication system	Sender-rec'r. fed into I-C to provide calling signal	Remarks
I-C	—	—	All	No. 19 and V.H.F.	
A	*Commander	—	Gunner and Driver	V.H.F.	
B	—	*Commander	Gunner and Driver	No. 19	

* Driver can call Commander in case of emergency by means of buzzer signal operated by push-button on Junction Distribution No. 1.

CHAPTER III

MAINTENANCE

3.1. General Maintenance.

3.1.1. Canvas Cover.

When the set is not in use the canvas cover should be unrolled to provide waterproof protection for the front of the set.

3.1.2. The Rod Aerial.

See that the aerial sections fit firmly together and that the socketed ends are free from corrosion. Grease the socketed ends occasionally. Missing, bent or battered aerial sections must be replaced.

3.1.3. Plugs, Sockets and Leads.

The "snatch" plugs and sockets in the leads to the receivers headgear should be examined periodically and the contacts cleaned if required. They should be kept free from oil and any oil which reaches them should be removed at the earliest opportunity. The drop leads from the control boxes and junctions distribution and the leads for the receivers headgear should be examined for wear, particularly where they join connecting elements such as plugs, etc., and replaced if faulty.

The 6-way and 12-way connectors, plugs and sockets comprising the main control and communication wiring should require no attention, but should faulty contact be suspected the plugs may be withdrawn and replaced a few times to clean the contact surfaces.

3.1.4. The Carrier.

Check occasionally that the set and supply unit are securely fixed to the carrier and tighten the retaining nuts if necessary.

3.1.5. The Aerial Bases.

Check occasionally that the pigtail leads in the flexible aerial bases are in good condition. If frayed replace.

3.2. Sender and Receiver Test Figures

3.2.1. Voltage and Resistance Tests.

The correctness of the chassis and other circuits may be checked if required by voltage and current measurements on the valve-holders, etc., and by resistance checks from point to point in the wiring. Table 8 gives values of voltage current and resistance to enable these tests to be made. All voltages should be measured with a 1000 ohm/volt meter. Resistance checks should be made with an Avometer using the ohmmeter section of the instrument.

3.2.2. Receiver and Amplifier Sensitivity Tests.

(To be performed by skilled personnel only.) If suitable apparatus is available the gain of successive stages may be measured. Typical figures for sensitivity are set out in Table 9.

3.2.3. Tests on No. 19 Sender.

The operation of the No. 19 Sender may be checked by observing the aerial current and drive readings.

The aerial current at various frequencies is set out in Table 10.

TABLE 10.
AERIAL CURRENT (19 SENDER)

Frequency M c/s	Aerial Current Reading (R/T) (on 12V. scale of meter)
2.5	5.5
3.0	7.30
4.0	7.5
5.0	8.0
6.0	8.0

If the aerial current is low at any frequency the drive should be checked. Normally the drive will remain nearly constant over the entire frequency range at a reading of about 6 on the 12V. range of the meter, and low drive at any one frequency indicates mis-ganging of the R.F. drive circuits. This may be corrected, by skilled personnel only, by slight adjustments to the end vanes of the front gang condenser sections.

SENSITIVITY MEASUREMENTS

Description of test.	Connect input to:	Input voltage.	Frequency.	Output.*	Remarks.
A.F. Gain Receiver-19 A-SET	Grid.	2.4V.	400 c/s.	50 M.W.	Switch S.I.A. set to "A." Gain "A" set to Max.
A.F. Gain Receiver-V.H.F. B-SET	Grid V.I.E.	.2V.	400 c/s.	"	Switch S.I.A. set to "B." Gain "B" set to Max.
A.F. Gain I-C. A.	Grid V.I.F.	.2V.	400 c/s.	"	Switch S.I.A. set to I-C.
I.F. Gain Receiver-19 A-SET	Grid V.I.C.	2×10^5	465 kc.	"	Switch S.I.A. set to "A." Gain "A" set to Max.
	Grid V.I.B.		465 kc.	"	" " "
R.F. Gain Receiver-19 A-SET	Grid V.2.A.	40	3 Mc/s.	"	Switch S.I.A. set to "A." Gain "A" set to Max.
			4.5 Mc/s. 6 M/cs.	"	" " "
				"	" " "
	Grid V.1.A.	8 6 4	3 Mc/s. 4.5 Mc/s. 6 Mc/s.	"	" " "
			"	" " "	

* Output meter connected in all cases to Telephone contacts in Commander's snatch socket.

INDEX TO PLATE I
INFANTRY TANK MARK III

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3102	Carriers No. 1
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3100	Junction Distribution No. 1
7	ZA.1763	Aerial Bases No. 8
8	ZA.0894	Antennae Rods F, Sections No. 1
9	ZA.1764	Aerial Bases No. 9
10	ZA.1765	Aerial Bases No. 9, Mountings No. 1
11	ZA.1771	Antennae Rods G
12	ZA.3141	Leads, Aerial No. 1
13	ZA.3142	Leads, Aerial No. 2
14	ZA.2991	Aerial Feeder Assembly No. 2
15	ZA.1786	Connectors 12 point No. 1
16	ZA.1780	Connectors 6 point No. 4
17	ZA.1784	Connectors 6 point No. 6B
18		Drop Lead to Commander's Microphone and Receiver's Headgear Assembly No. 1
19		Drop Lead to Gunner's Headgear Assembly No. 1
20		Drop Lead to Driver's Headgear Assembly No. 2
21 } 22 }	ZA.10226	Clips, Cable Fixing, Sets No. 6

On later installations Control Units No. III ZA.10201 will replace Control Units No. I ZA.3098.

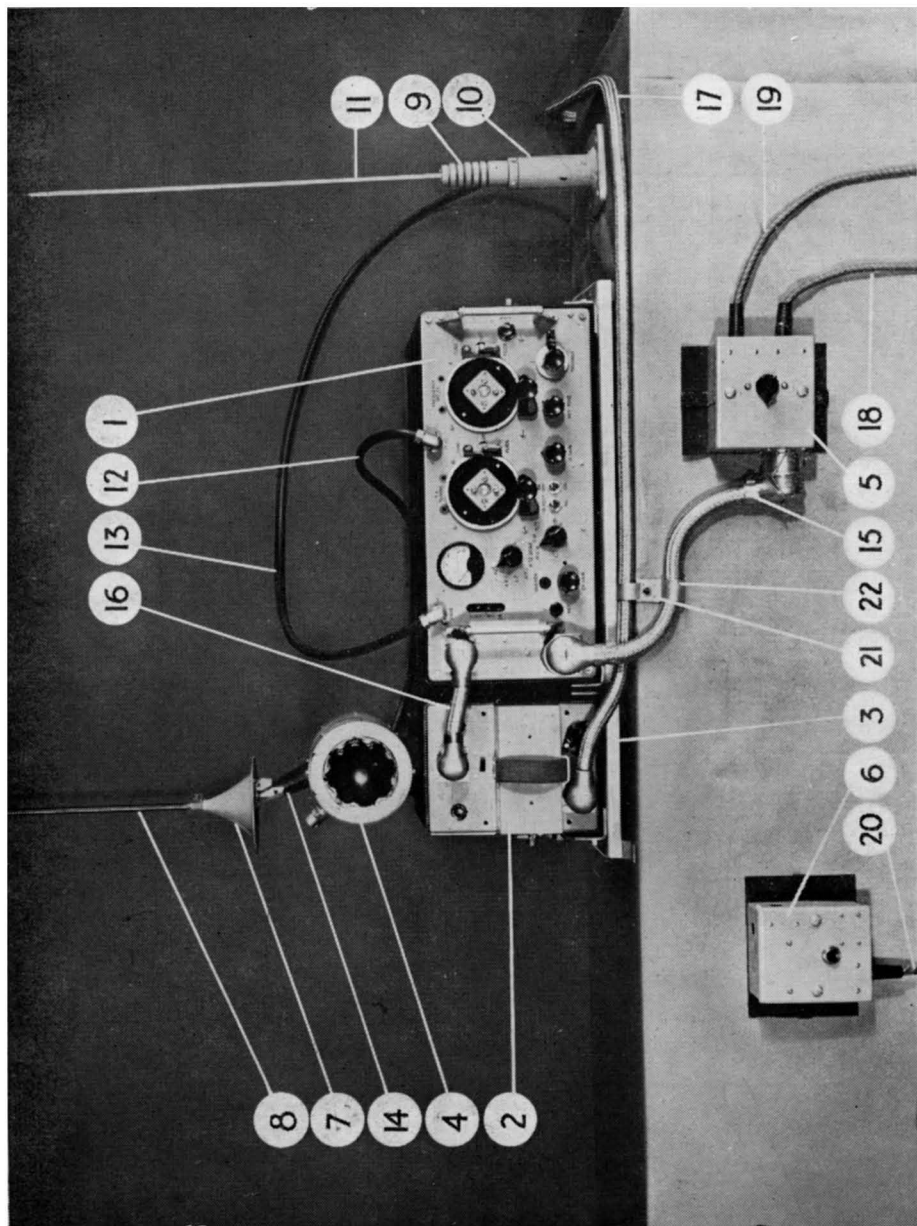


PLATE I. Wireless Sets No 19. Complete Station Installation for I.T. Mark III.

INDEX TO PLATE II
LIGHT TANK MARK VII

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3102	Carriers No. 1
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3100	Junction Distribution No. 1
7	ZA.1763	Aerial Bases No. 8
8	ZA.0894	Antennae Rods F, Sections No. 1
9	ZA.1764	Aerial Bases No. 9
10	ZA.1765	Aerial Bases No. 9, Mountings No. 1
11	ZA.1771	Antennae Rods G
12	ZA.3141	Leads, Aerial No. 1
13	ZA.3142	Leads, Aerial No. 2
14	ZA.2990	Aerial Feeder Assembly No. 1
15	ZA.1794	Connectors 12 point No. 1C
16	ZA.1780	Connectors 6 point No. 4
17	ZA.1782	Connectors 6 point No. 6
18		Drop Lead to Commander's Microphone and Receiver's Headgear Assembly No. 1
19		Drop Lead to Gunner's Headgear Assembly No. 1
20		Drop Lead to Driver's Headgear Assembly No. 2
21	ZA.10224	Clips, Cable Fixing, Sets No. 4
<hr/>		
ADDED.	ZA.1788	Connectors 12 point No. 1B
	ZA.3101	Control Units No. 2

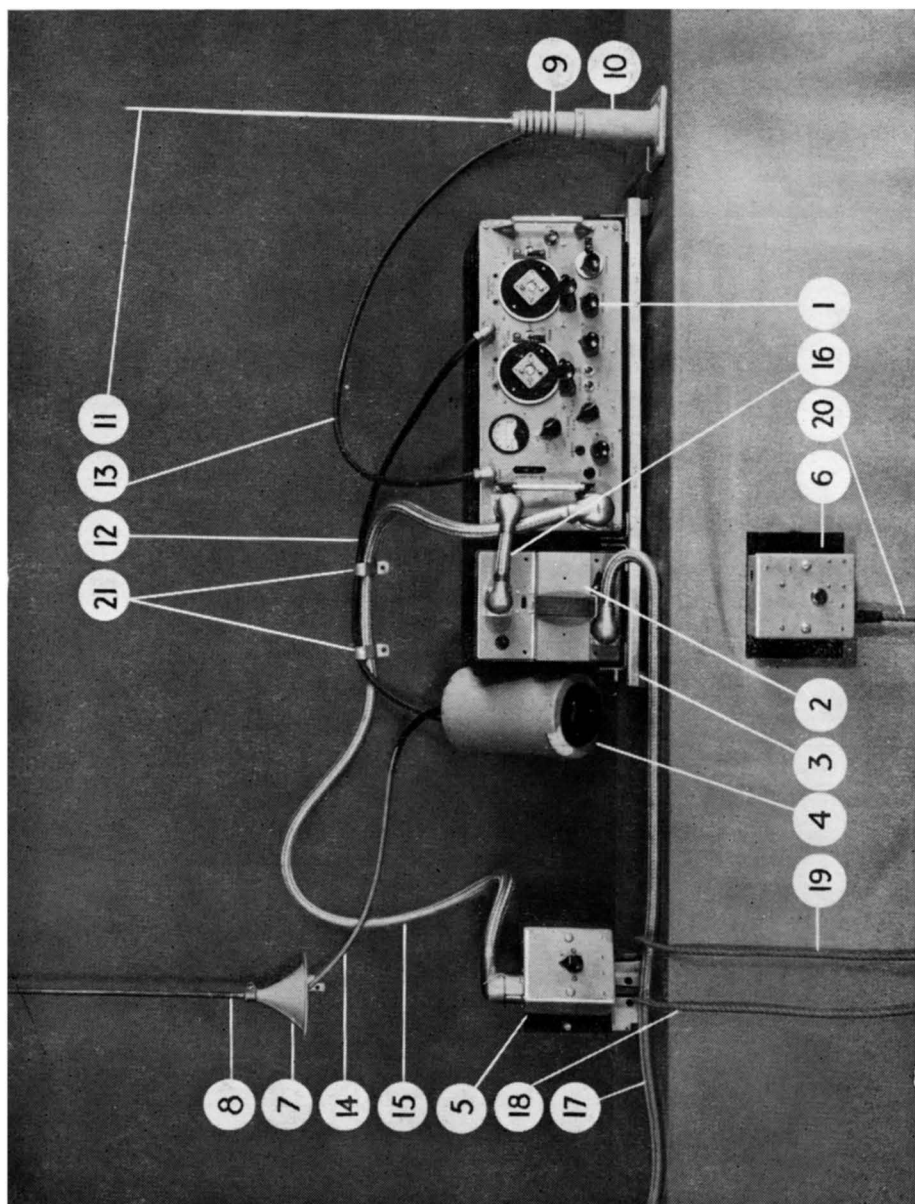


PLATE II. Wireless Sets No. 19. Complete Station. Installation for Light Mark VII.

INDEX TO PLATE III
A.C. DAIMLER

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3102	Carriers No. 1
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3100	Junction Distribution No. 1
7	ZA.1763	Aerial Bases No. 8
8	ZA.0894	Antennae Rods F, Sections No. 1
9	ZA.1764	Aerial Bases No. 9
10	ZA.1765	Aerial Bases No. 9, Mountings No. 1
11	ZA.1771	Antennae Rods G
12	ZA.3141	Leads, Aerial No. 1
13	ZA.3142	Leads, Aerial No. 2
14	ZA.2990	Aerial Feeder Assembly No. 1
15	ZA.1786	Connectors 12 point No. 1
16	ZA.1780	Connectors 6 point No. 4
17	ZA.1783	Connectors 6 point No. 6A
18		Drop Lead to Commander's Microphone and Receiver's Headgear Assembly No. 1
19		Drop Lead to Gunner's Headgear Assembly No. 1
20		Drop Lead to Driver's Headgear Assembly No. 2
21	ZA.10222	Clips, Cable Fixing, Sets No. 2

On later installations Control Units No. III ZA.10201 will replace Control Units No. 1 ZA.3098.

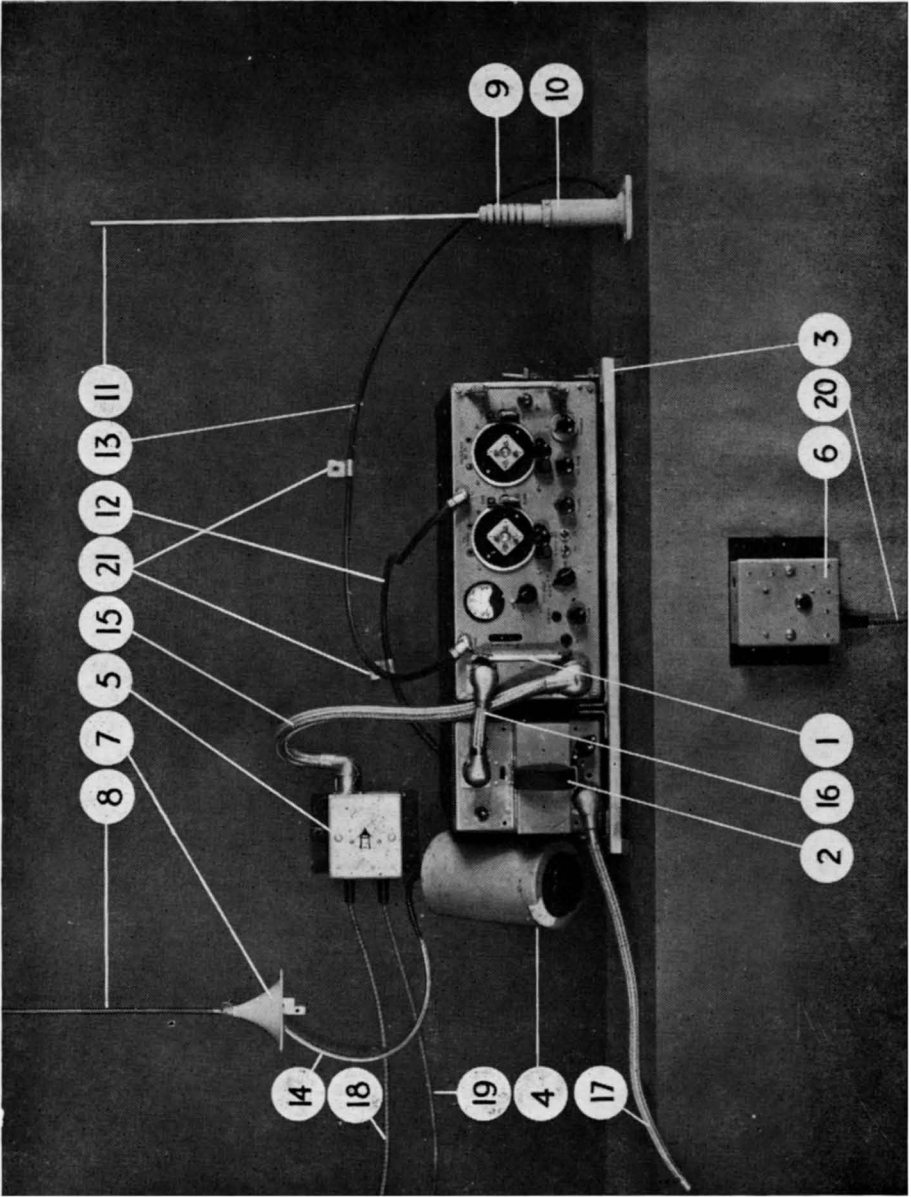


PLATE III. Wireless Sets No. 19. Complete Station. Installation for A.C. Daimler Mark I.

INDEX TO PLATE IV
A.C. HUMBER

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3102	Carriers No. 1
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3100	Junction Distribution No. 1
7	ZA.1763	Aerial Bases No. 8
8	ZA.0894	Antennae Rods F, Sections No. 1
9	ZA.1764	Aerial Bases No. 9
10	ZA.1765	Aerial Bases No. 9, Mountings No. 1
11	ZA.1771	Antennae Rods G
12	ZA.3141	Leads, Aerial No. 1
13	ZA.3142	Leads, Aerial No. 2
14	ZA.2957	Aerial Feeder Assembly No. 4
15	ZA.1787	Connectors 12 point No. 1A
16	ZA.1780	Connectors 6 point No. 4
17	ZA.1784	Connectors 6 point No. 6B
18		Drop Lead to Commander's Microphone and Receiver's Headgear Assembly No. 1
19		Drop Lead to Gunner's Headgear Assembly No. 1
20		Drop Lead to Driver's Headgear Assembly No. 2
21 } 22 }	ZA.10223	Clips, Cable Fixing, Sets No. 3

On later installations Control Units No. III ZA.10201 will replace Control Units No. 1 ZA.3098.

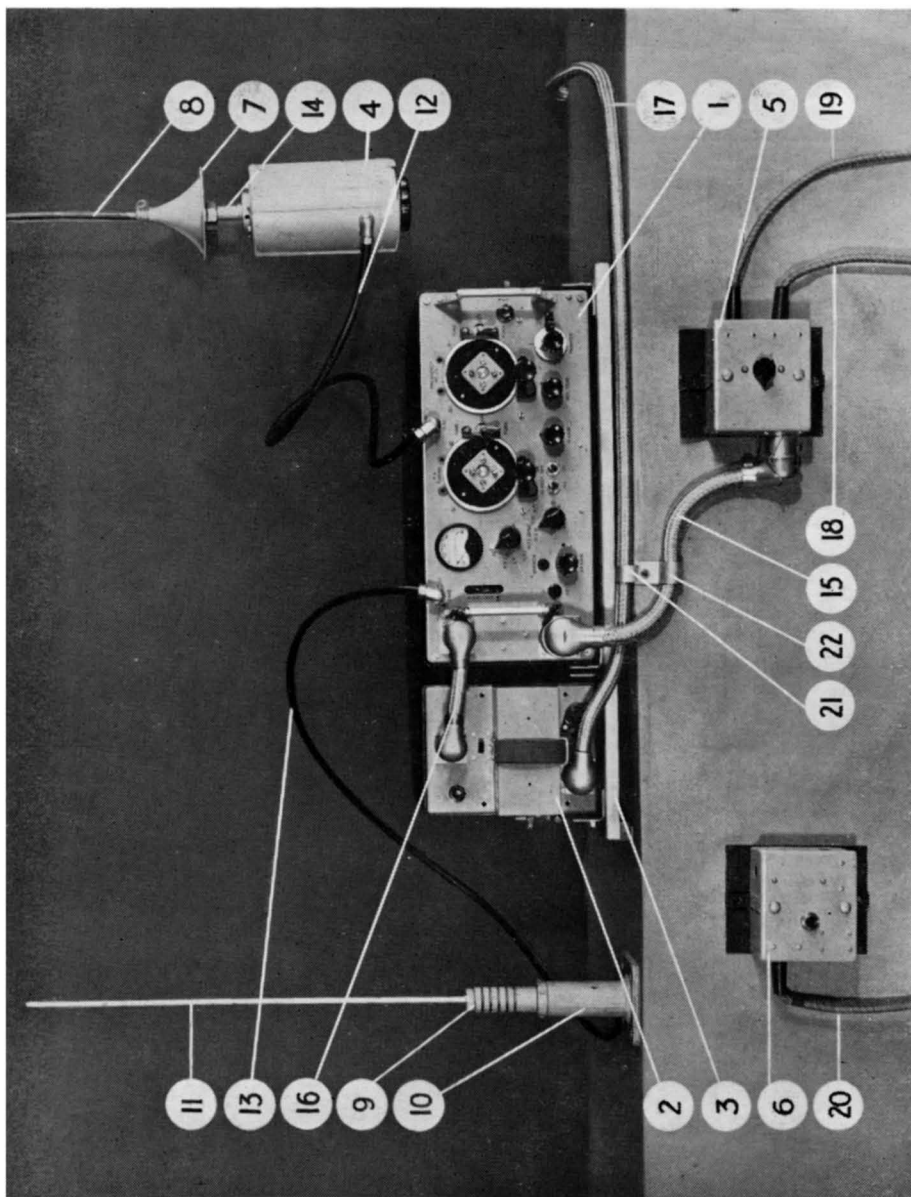


PLATE IV. Wireless Sets No. 19. Complete Station. Installation for A.C. Humber Mark I.

INDEX TO PLATE V
INFANTRY TANK MARK II

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3103	Carriers No. 2
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3101	Control Units No. 2
7	ZA.3100	Junction Distribution No. 1
8	ZA.1763	Aerial Base No. 8
9	ZA.0894	Antennae Rods F, Section No. 1
10	ZA.1764	Aerial Bases No. 9
11	ZA.1766	Aerial Bases No. 9, Mountings No. 2
12	ZA.1771	Antennae Rods, G Sections
13	ZA.2957	Aerial Feeder Assembly No. 4
14	ZA.3141	Leads, Aerial No. 1
15	ZA.3143	Leads, Aerial No. 3
16	ZA.1788	Connectors 12 point No. 1B
17	ZA.1794	Connectors 12 point No. 1C
18	ZA.1780	Connectors 6 point No. 4
19	ZA.1785	Connectors 6 point No. 6C
20		Drop Lead to Commander's microphone and Receiver's Headgear Assembly No. 1
21		Drop Lead to Gunner's Headgear Assembly No. 1
22		Drop Lead to Operator's Headgear Assembly No. 1
23		Drop Lead to Driver's Headgear Assembly No. 2
24	ZA.10225	Clips, Cable Fixing, Sets No. 5
25	ZA.1825	Aerial Bases No. 8, Mounting No. 1

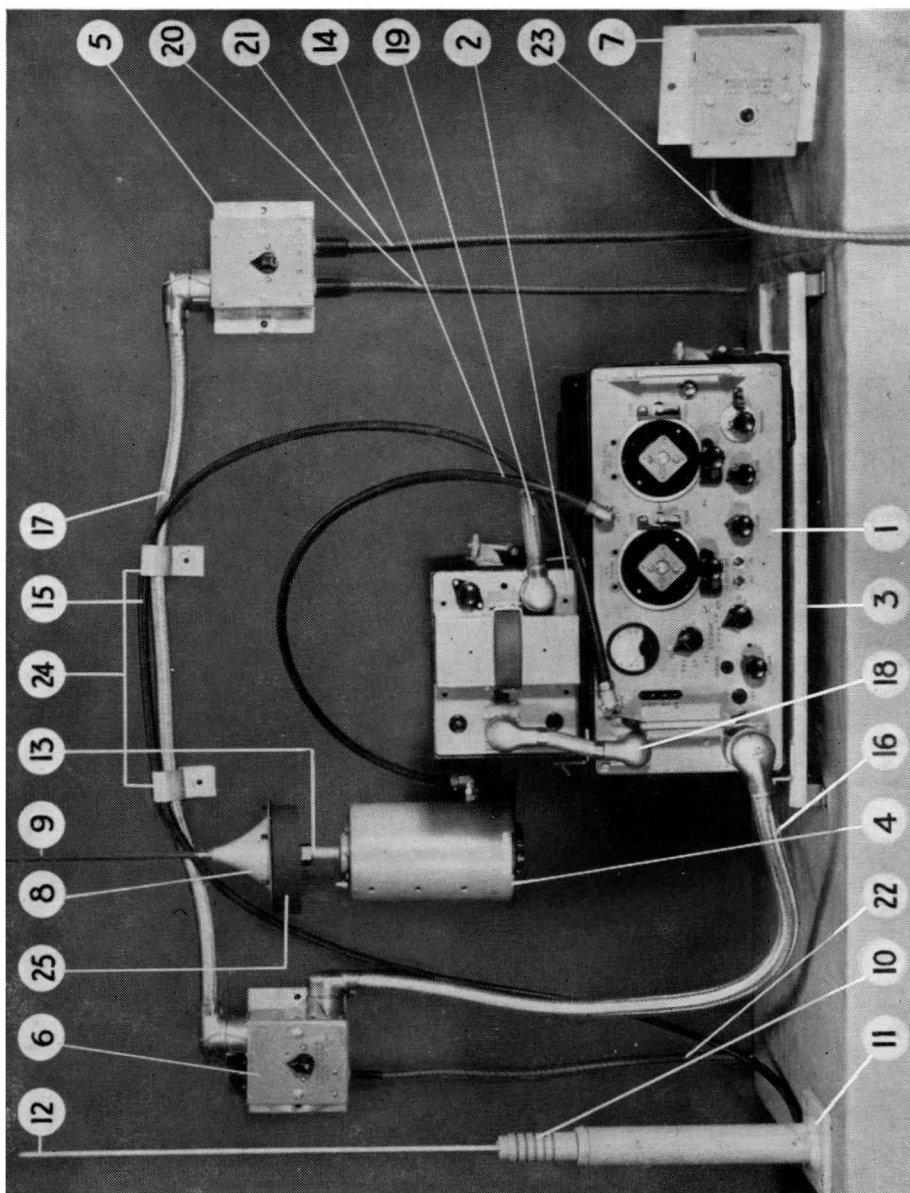


PLATE V. Wireless Sets No. 19. Complete Station. Installation for I.T. Mark II

INDEX TO PLATE VI
CRUISER TANK MARK V

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3102	Carriers No. 1
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3102	Control Units No. 2
7	ZA.3100	Junction Distribution No. 1
8	ZA.1763	Aerial Bases No. 8
9	ZA.0894	Antennae Rods F, Sections No. 1
10	ZA.2958	Aerial Feeder Assembly No. 5
11	ZA.1764	Aerial Bases No. 9
12	ZA.1765	Aerial Bases No. 9, Mountings No. 1
13	ZA.1771	Antennae Rods G
14	ZA.3141	Leads Aerial No. 1
15	ZA.3143	Leads Aerial No. 3
16	ZA.1787	Connectors 12 point No. 1A
17	ZA.1788	Connectors 12 point No. 1B
18	ZA.1780	Connectors 6 point No. 4
19	ZA.1772	Connectors 6 point No. 6D
20		Drop Lead to Commander's Microphone and Receiver's Headgear Assembly No. 1
21		Drop Lead to Gunner's Headgear Assembly No. 1
22		Drop Lead to Operator's Headgear Assembly No. 1
23		Drop Lead to Driver's Headgear Assembly No. 2
24	ZA.10227	Clips, Cable Fixing, Sets No. 7

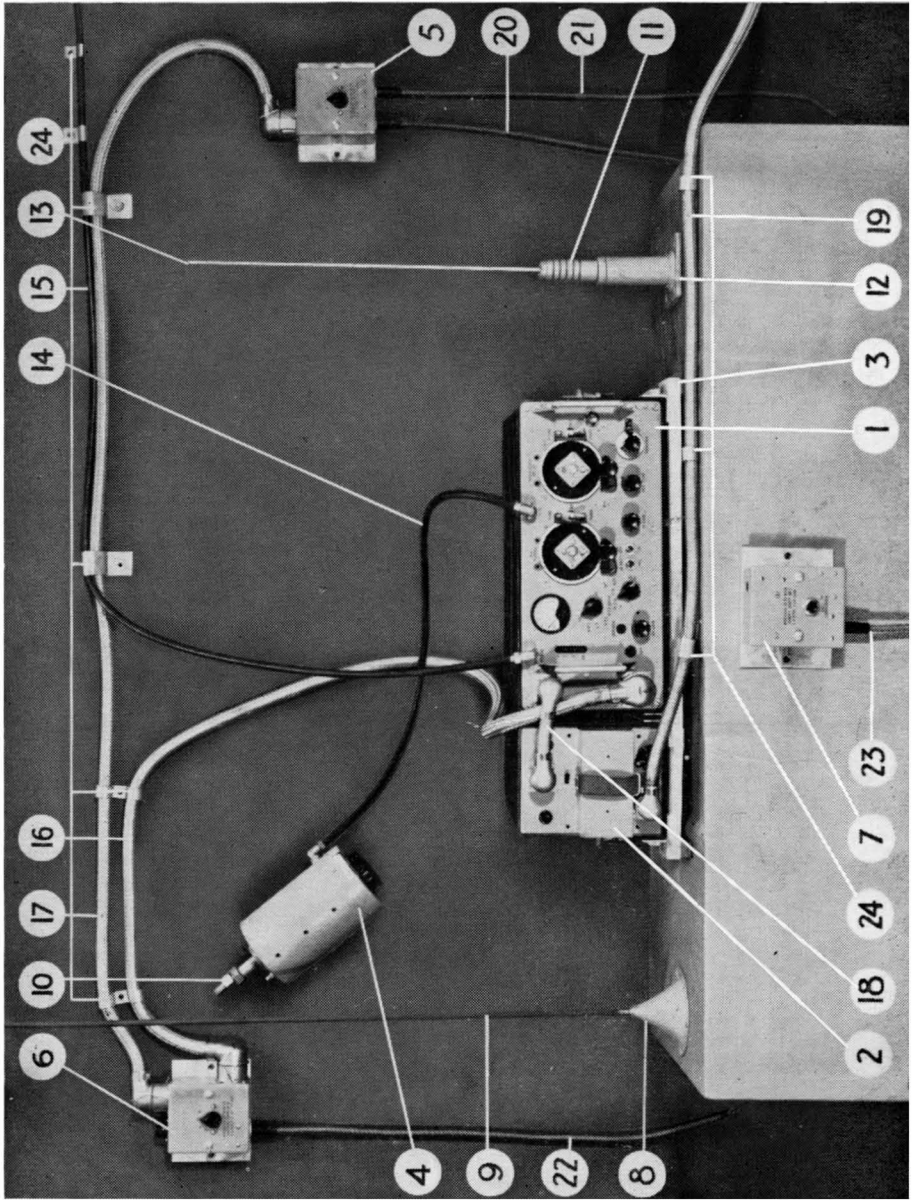


PLATE VI. Wireless Sets No. 19. Complete Station. Installation for Cruiser Tank Mark V.

INDEX TO PLATE VII
CRUISER TANK MARK VI

Index No.	Cat. No.	Item
1	ZA.3155	Wireless Sets No. 19
2	ZA.3108	Supply Units No. 1
3	ZA.3102	Carriers No. 1
4	ZA.3096	Aerial Variometer
5	ZA.3098	Control Units No. 1
6	ZA.3101	Control Units No. 2
7	ZA.3100	Junction Distribution No. 1
8	ZA.3097	Junction Distribution No. 2
9	ZA.1763	Aerial Bases No. 8
10	ZA.0894	Antennae Rods F, Section No. 1
11	ZA.1764	Aerial Bases No. 9
12	ZA.1765	Aerial Bases No. 9, Mountings No. 1
13	ZA.1771	Antennae Rods G
14	ZA.2958	Aerial Feeder Assembly No. 5
15	ZA.3141	Leads Aerial No. 1
16	ZA.3143	Leads Aerial No. 3
17	ZA.1787	Connectors 12 point No. 1A
18	ZA.1788	Connectors 12 point No. 1B
19	ZA.1780	Connectors 6 point No. 4
20	ZA.1772	Connectors 6 point No. 6D
21		Drop Lead to Commander's Microphone and Receiver's Headgear Assembly No. 1
22		Drop Lead to Gunner's Headgear Assembly No. 1
23		Drop Lead to Operator's Headgear Assembly No. 1
24		Drop Lead to Driver's Headgear Assembly No. 2
25		Drop Lead to Co-driver's Headgear Assembly No. 2
26	ZA.10227	Clips, Cable Fixing, Sets No. 7
27	ZA.1767	Connector's Twin No. 68

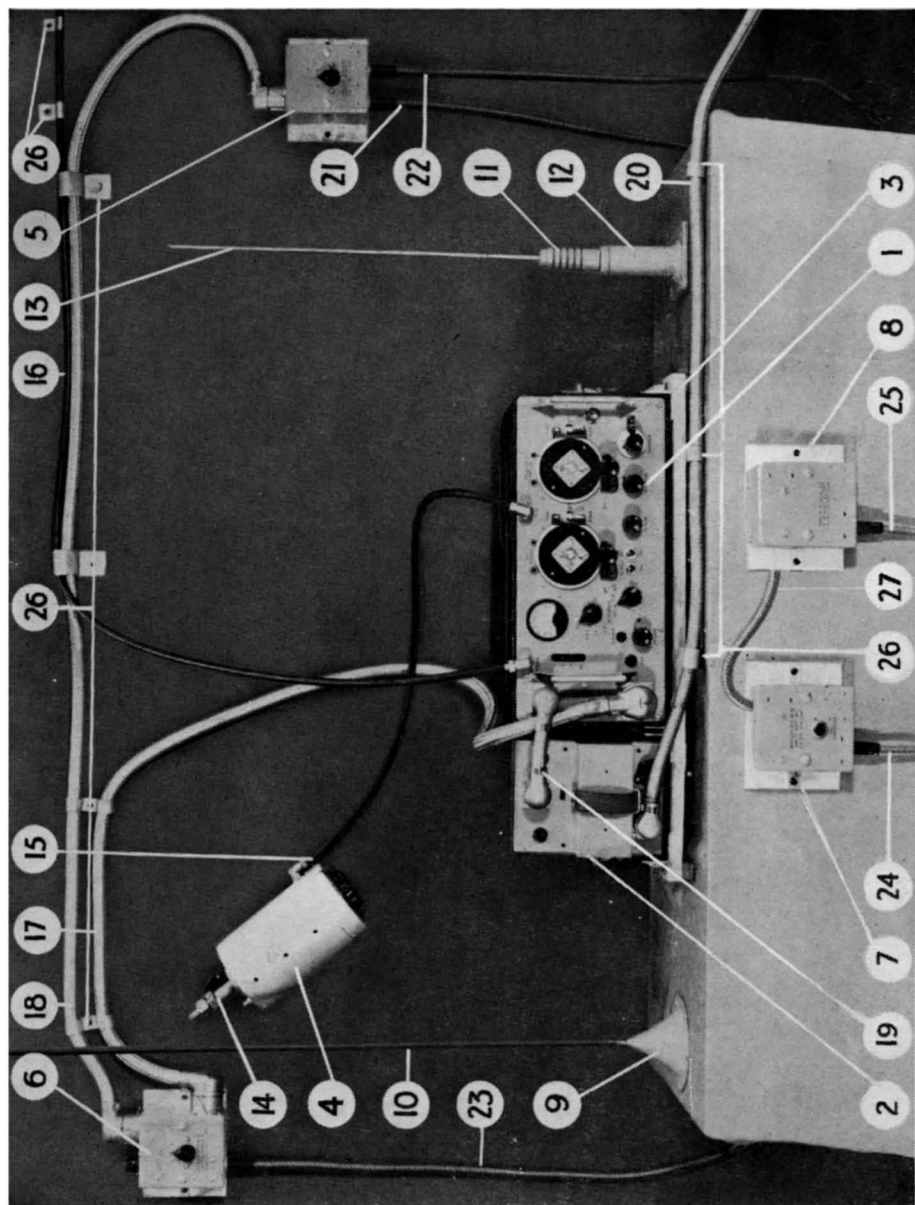


PLATE VII. Wireless Sets No. 19. Complete Station. Installation for Cruiser Tank Mark VI