

WIRELESS SETS No. 19
Mark I and Mark II

WORKING
INSTRUCTIONS

PART I
OPERATING

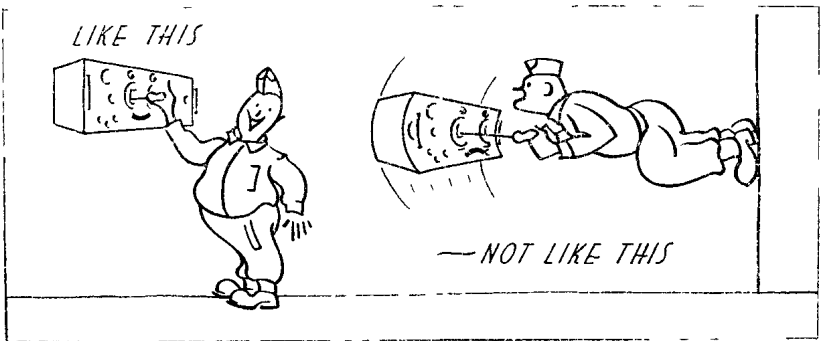
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For installation instructions refer to Installation Prints and other details in envelope packed with Installation Kit.

Z.A. 3109
(P.C. Ref. No. 90772)

KINDNESS PAYS



PART I (OPERATING)

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THINGS WE HAVE SEEN

1. (a) The driver, (b) the gunner, using (a) the gunner's and (b) the driver's headset. DON'T DO IT; they work much better the other way.
2. The Commander using the tuning knobs as a convenient step when climbing out turret. DON'T DO IT; you might slip and graze your knee.
3. The operator removing all the locking screws from the "flick" dials before setting up a net. DON'T DO IT; half a turn is quite enough and there are no medals given for getting them back in the holes if anything slips.
4. The operator tapping the meter with a 5/8" spanner because it didn't show any H.T. volts. DON'T DO IT; it's apt to damage the spanner and anyhow perhaps a fuse is blown.

CHAPTER I

GENERAL INSTRUCTIONS

I. Purpose of the Wireless Set No. 19.

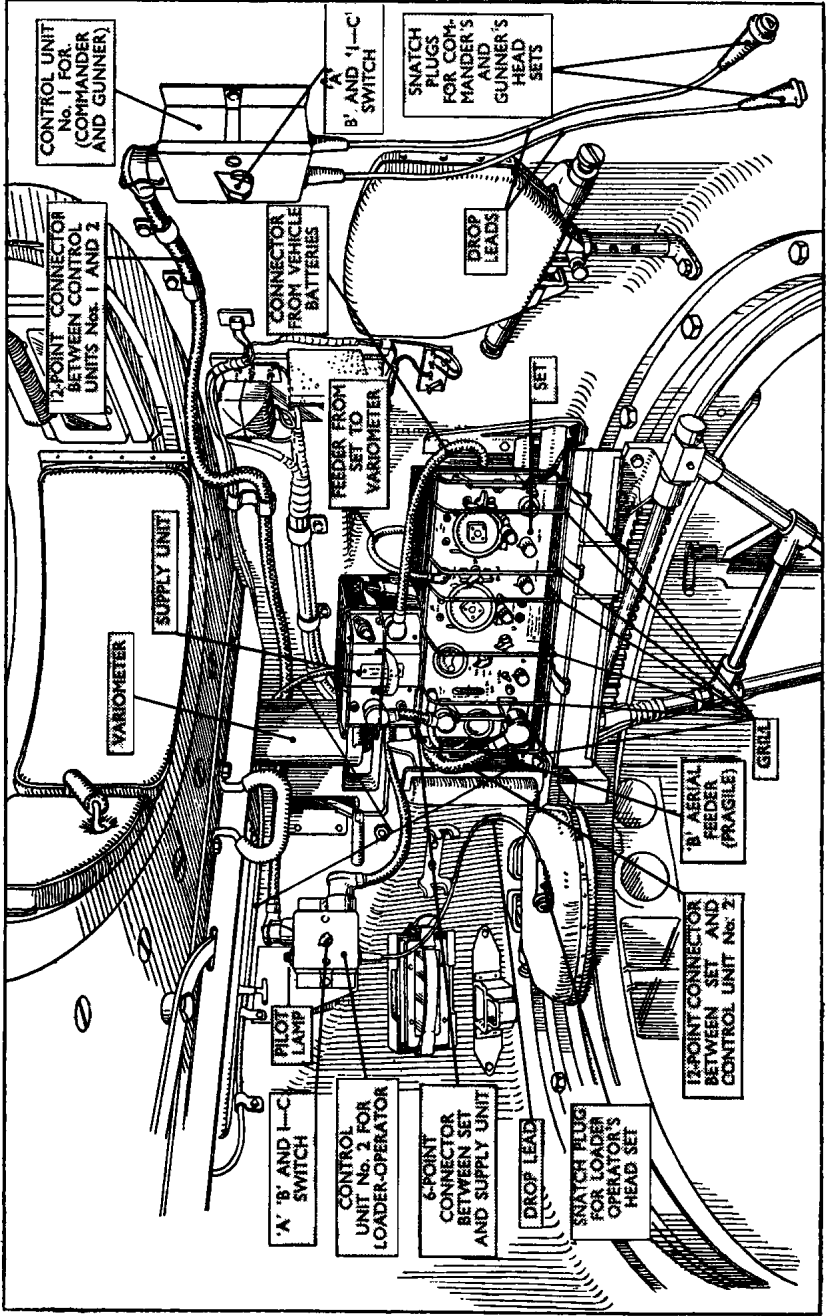
The 19 set is new and has been designed, since the needs of armoured troops in this war became clear, to give them the best possible communication system. Actions to-day are fought at high speed and formations move over long distances in a very short time, and it is important that during these operations communications should be complete, speedy and, above all, reliable. The 19 set is made specially for use in armoured formations and has three main uses. It has been designed to give clear speech in all these uses so that conversations can be kept up even when the vehicle is travelling at full speed. Of course, it is not easy to hear under these conditions, but it can still be done, even at long ranges.

In the first place, there is the "A" sender-receiver; this is used mainly for communication between the regimental commander and his squadron headquarters or between the squadron commander and his troops. Either speech or morse can be used; speech is possible over distances of about 10 miles and morse over about 20. The Mark I set works on frequencies between 2.5 and 6.25 Mc/s, and the Mark II between 2 and 8 Mc/s.

Secondly, there is the "B" sender-receiver for ranges up to about half-a-mile. This is used for speech conversation between vehicles in the same troop or headquarters; morse cannot be used. It works on a frequency of about 240 Mc/s (actually 235 Mc/s).

LAYOUT OF A SET IN A "MATILDA"

Fig. 1



The "A" and "B" sets have separate aerials; both mounted on the outside of the turret.

Lastly, there is the "I-C" system used for communication between members of the crew of the vehicle.

This system of communication is more complicated than those used in the past on account of the additional services given, and to help you to understand the equipment we will now tell you about the complete station in I.T. Mark II.

2. Communication in a Matilda.

Infantry Tank Mark II ("Matilda") has been chosen as a good example of how the set is installed and used. Other A.F.V.s installations differ in detail, but the idea is the same. Figure 1 is a drawing of the inside of the turret of this tank showing the layout.

The set, with the power supply unit on top, is housed in the bulge at the back of the turret. It has a grill over the front of it, which protects it, but still allows you to reach the controls. A waterproof cover (not shown in Fig. 1) keeps the control panel dry when the set is not in use. Power for the set is taken from the vehicle battery through the supply unit. The "A" aerial is of the fishing-rod type, maximum height 12', and is mounted in the flexible rubber base on the offside rear of the turret top plate. It is connected to the set through the variometer mounted inside the turret immediately below the aerial base. This is a special feature of the 19 set, and it gives extra efficiency and lessens noises from the engine, fans and other electrical devices in the tank.

The "B" aerial is a 20" rod mounted forward on the offside of the turret and is connected by a feeder direct to the set.

In the turret of this tank are the commander, his loader-operator and gunner, and, in the forward seat in the hull, the driver. All four are wearing headsets. The commander's and gunner's headset connections come from the box on the near side of the tank called "Control Unit No. 1," and by turning the switch on the front of the box the commander can speak and listen on the "A" set, the "B" set or the "I-C." This switching does not affect the gunner, who is all the time connected to the "I-C." The loader-operator is connected to a similar box on the offside of the tank called "Control Unit No. 2" (on some vehicles, all the switching is done from a single box called "Control Unit No. 3"). He, like the commander, can select which set he will speak or listen on by turning his switch. The driver's headset is connected to another box in the hull called "Junction Distribution No. 1"; like the gunner, he is connected to the "I-C" all the time. His microphone is different from the others and his headset won't work unless it is connected to this particular box. The driver's box has a push button in

front to attract the commander's attention, even if the commander is working one of the wireless sets. Pushing the button causes a buzz in the phones. This is very convenient in case of emergency because the driver is always looking out forward and may at any moment have something important to report.

While the commander and loader-operator have their switches set to "I-C," and while they are talking to the gunner and driver, there is a slight hiss to be heard in the telephones as well as their conversation. Suddenly the hiss disappears and a voice is heard speaking as if in the distance; this means that someone is calling on one of the wireless sets. The loader-operator turns his switch to "A" or "B" according to the call heard. As soon as he has switched to the right set (in this case, say "B") the interrupting voice disappears from the "I-C" because the call has now been answered.

While the commander is still in conversation with the gunner and driver another interruption is heard in the distance on the "I-C," showing that a signal is being received on the "A" set, and the commander switches to "A" knowing that the signal is probably his instructions from headquarters. While the commander and loader-operator are both busy with the two wireless sets, the gunner and driver are still able to talk to each other but they cannot hear what either the commander or the loader-operator is saying.

3. What are all the knobs for?

This is really the loader-operator's business, but just in case he has a sore finger or anything the commander and gunner, and even the driver, should know something about it as well.

Before ANYTHING will work, you must switch the power on, the switch for this is on the supply unit.

Whenever you are speaking into the microphone on either "A," "B" or "I-C" press the pressel switch on the microphone handle and let it go when you have finished. When you are speaking on "A" or "B," pressing this switch changes the set from "Receive" to "Send."

The diagram on page 7 gives you all the information you need about the knobs in a nutshell, and it is worth while having a good look at it with the set in front of you; here are a few hints to help you to use the controls correctly.

First of all the "I-C"; this will always be working so long as the set is switched on and the "A ONLY—ALL" switch is at "ALL." There's no volume control on the "I-C" so if you can't hear the driver you must just tell him to "speak up" as you would on an ordinary

telephone. You must remember that the commander and loader-operator can't talk on the "I-C" unless their control switches are turned to "I-C" and don't forget to press the pressel switch when you are talking and to let it go when you are listening.

Second, the "A" set. Once you have netted up (all about "netting" a little later) you need only the "A GAIN" control, to make this set louder.

Lastly, the "B" set; once the "net" is set up you should only have to use the "B GAIN" control, to make the signal louder or softer.

Just a last general word about the knobs. The knobs will turn so far and no further. Do not try to strain them beyond this point or you will damage them. (See *Frontispiece*)

CHAPTER II

HOW TO WORK THE SET

It is assumed that the set is connected up for working. If this is not the case, connect up as described in Chapter III, page 18.

1. Getting the set ready.

- (a) Roll up the waterproof cover and stow at top of set. See sketch, Fig. 3.
- (b) See that all the headsets are plugged into the correct drop leads from the Control Units. See sketch, Fig. 4.
- (c) Put "A ONLY—ALL" switch to "ALL" and "OFF—ON B" switch to "OFF." (If it is at "ON" you risk blowing the valve V7A.)
- (d) Put switch on supply unit to "ON," and wait for at least half-a-minute.
- (e) Put "OFF—ON B" switch to "ON."
- (f) Do the tests described under "*Daily Maintenance*," Chapter III, to see that everything is in working order.

2. Switching to "A," "B" and "I-C."

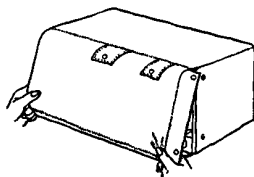
Chapter I tells you how these three sets are used. Here is a point to watch out for:—

If both commander and operator are switched to the same set (either "A" or "B"), each can hear what the other says. But they **MUST NOT TALK TO ONE ANOTHER**, as their conversation will be sent out on the air and the enemy may hear them.

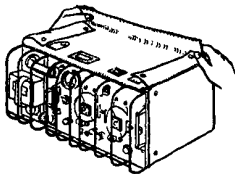
ROLLING UP THE WATERPROOF COVER

Fig. 3

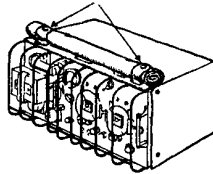
1. Lift Cover up



2. Roll up Tightly



3. Fasten Press-Studs



3. Tuning the "A" set.

Before you can net your set in a group you must learn to tune it to the required frequency and to use the "flick" controls.

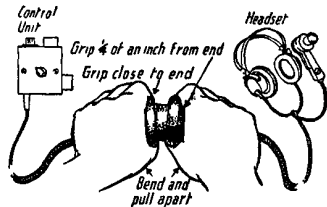
Normally your group will be given two frequencies to work on, the "blue" or normal and the "red" or spare frequency. The flick tuning allows you to tune the set for working on either and to change quickly from one to the other. You will notice beside each of the main tuning controls a small lever with three positions, "TUNE," "SET" and "FLICK." Fig. 5 shows how to set up a tuning dial for two flick frequencies. When this flick lever is turned to "TUNE" the fine tuning knob will turn the tuning dial to any frequency as in a broadcast receiver, and if flick frequencies are not in use the set may be tuned in this way. Fig. 6 shows exactly how to tune the "A" set.

4. Netting the "A" set. VERY IMPORTANT.

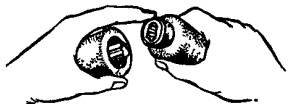
CONNECTING HEADSET-LEADS TO DROP LEADS FROM CONTROL UNIT

Fig. 4

1. Undoing



2. Moisten brass ring before plugging in again



3. Plugging In



It doesn't matter how good the wireless set you are using may be, you will not have good signals on a group of stations unless they are all accurately tuned to the same frequency. Bringing a group of stations on to the same frequency is called "NETTING" and to do it successfully all the operators in the group must:

1. Know exactly how to tune the wireless set quickly and with confidence. This has been described in the last section.
2. Understand and carry out the netting drill accurately, remembering that the control station is always right and his instructions must always be obeyed immediately.

Netting is always done before a force goes into action. The enemy must not hear you netting if it can be helped since if he does—

1. He will know your frequency and listen to your instructions, or “jam” them.
2. He may find out, roughly, where you are by “direction finding”

Netting in armoured formations is done in three ways:—

1. *Netting by wavemeter.*

Used when it is vital that the enemy should not hear the netting and it is not possible to bring all the sets together. Also used by control station whenever a wavemeter is available.

2. *Netting in harbour with senders detuned.*

Used whenever possible since the enemy is not likely to hear you.

3. *Netting at a distance.*

Used when 1 and 2 are impossible.

Before opening up you will have been told the frequency or frequencies, call signs and code names for the group, the time at which the netting is to begin and the details of the netting signals.

Switch your set on fifteen minutes before netting is due to start (because the set takes $\frac{1}{4}$ of an hour to settle down) and spend the time making the tests for “Daily Maintenance” (see page 26).

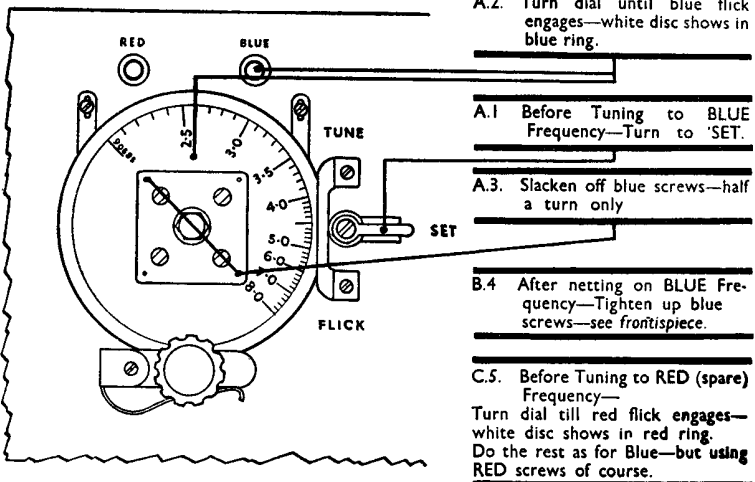
Netting by wavemeter.

All sets are netted alike as below:—

- (a) “Prepare set for Netting” (see Fig. 6) on Blue frequency before wavemeter arrives.

SETTING UP A TUNING DIAL FOR “FLICK” WORKING

Fig. 5



A.2. Turn dial until blue flick engages—white disc shows in blue ring.

A.1 Before Tuning to BLUE Frequency—Turn to 'SET'.

A.3. Slacken off blue screws—half a turn only

B.4 After netting on BLUE Frequency—Tighten up blue screws—see frontispiece.

C.5. Before Tuning to RED (spare) Frequency—

Turn dial till red flick engages—white disc shows in red ring. Do the rest as for Blue—but using RED screws of course.

- (b) The wavemeter will be brought near to your aerial, and will be sending a very weak C.W. signal.
- (c) Do "Netting Drill" as in Fig. 6.
- (d) If the group has been given a spare frequency the wavemeter will now be set to this frequency and you will net on it with the Red flicks engaged (see Fig. 5C).

Netting in Harbour with detuned senders.

Detuning the sender means adjusting it so that the signals sent out are too weak to be heard far from the harbour. Use the same length of aerial as you will use out of harbour.

A. Tuning the Control Station's set.

- (1) *Using a wavemeter.* (You will always use one whenever possible as it gives better results.)
 - (a) Net the set by wavemeter as above.
 - (b) Switch to M.C.W. and half insert key plug.
- (2) *Without a wavemeter.*
 - (a) PREPARE SET FOR NETTING (see Fig. 6) on BLUE frequency, setting "A" frequency as accurately as possible. (The electrician will give you details of the errors in your FREQUENCY MCS. dial calibration.)
 - (b) Do 4, 5, 6 of NETTING DRILL (see Fig. 6).
 - (c) Repeat (a) and (b) for RED frequency if used.
 - (d) Turn APA TUNING dial 1 megacycle away from BLUE frequency and A FREQUENCY MCS dial to BLUE frequency.
 - (e) Switch to M.C.W. and half insert key plug.
- (3) *Detuning.* Make certain you are detuned before sending, APA TUNING dial should be 1 megacycle off frequency (lower if possible).

B. Netting the group.

- (a) Before Netting Time, Control Station will tune as above and outstations will PREPARE SET FOR NETTING (see Fig. 6).
- (b) At the time ordered for Netting, Control will push home key plug and send tuning call for a short period. If netting by numbers continue keying until order 3 (see Fig. 6).
- (c) Stop keying, but leave key plug home until outstations have had time to net, or if netting by numbers till order 13.
- (d) Switch to R/T and give Group Call.

PREPARE SET FOR NETTING

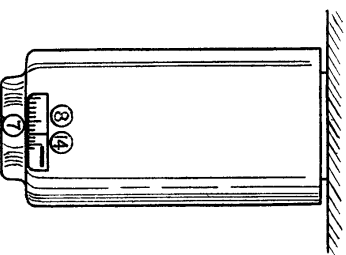
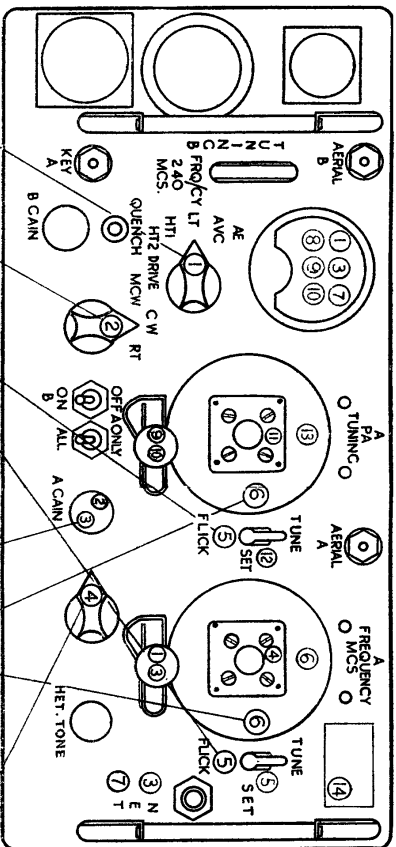


Fig. 6

- ① Set to AVC
- ② Set to R/T
- ③ Prepare Flicks for SETTING—see Fig. 5
- ④ Fully clockwise
- ⑤ Set to Ordered Frequency
- ⑥ MK. II Set to RANGE in which Ordered Frequency lies
- ⑦ Turn till rustling noise in phones is loudest

NETTING IN HARBOUR



NETTING DRILL

Use the numbers here for NETTING by NUMBERS when training

- ④ Lock A FREQUENCY MCS screws of correct colour
- ⑤ Turn to FLICK
- ⑥ Turn dial away and re-engage FLICK carefully
- ⑦ Check Netting is still good If noc. do 1-6 again
- ⑧ Adjust VARIOMETER for max. dip on AVC—see Chap. II 5 (d) WARNING
- ⑨ Adjust A PA TUNING for max. dip on AVC
- ⑩ Repeat 8 and 9 to give greatest dip
- ⑪ Lock A PA TUNING screws of correct colour
- ⑫ Turn to FLICK
- ⑬ Turn A PA TUNING away 1 Megacycle
- ⑭ Note VARIOMETER reading on Tablet and in Log

- ① Search holdly for Control. Choose Signal giving max. dip on AVC
- ② Reduce A GAIN to give strength 5 Signal
- ③ Press NET Tune A FREQUENCY MCS to zero beat and max. dip

- (e) While outstations answer in turn, Control listens carefully with button pressed to NET. Control should hear clear answers with no whistle or only a very low pitched hum. If any reply is badly distorted or gives a high-pitched whistle, the outstation is off NET, and should be ordered to NET again, (b) and (c) being done again.
- (f) If control has not used a wavemeter, he has still to set his APA TUNING dial and variometer. This he must do by telling an outstation to send a carrier (press pressel switch) and then setting his APA TUNING and doing numbers 8 to 14 of the NETTING DRILL (see Fig. 6).
- (g) If the group has an alternative frequency, the netting is repeated for this frequency with the tuning dials set for RED.

Netting at a distance.

A. Tuning Control Station's set.

- (1) *Using a wavemeter.*
 - (a) Net set by wavemeter as in 1 to 7 in Netting Drill (see Fig. 6).
 - (b) Switch meter to AE and do 9 to 12 in the NETTING DRILL (See Fig. 6) for maximum radiation.
 - (c) Note variometer reading on tablet and in log.
 - (d) Repeat (a) to (c) for RED frequency if required
 - (e) Switch to M.C.W. and half insert key plug.
- (2) *Without a wavemeter.*
 - (a) PREPARE SET FOR NETTING (see Fig. 6) on BLUE frequency setting "A" frequency as accurately as possible. (The electrician will give you details of the errors in your FREQUENCY MCS. dial calibration.)
 - (b) Do 4, 5, 6 of NETTING DRILL (see Fig. 6).
 - (c) Repeat (a) and (b) for RED frequency if used.
 - (d) Switch to M.C.W. and half insert key plug.

B. Netting the group.

As in harbour, but ignore 13 of NETTING DRILL (see Fig. 6), i.e. leave APA TUNING in correct position.

Outstations will switch meter to AE and see that they have good radiation whilst answering the Group Call. If any outstation has very low radiation he should adjust his variometer whilst speaking.

5. Other points about using the "A" set.

- (a) *The "TRIMMER"* (Mark I only). The line on the "TRIMMER" dial must ALWAYS be set to the line on the panel and the dial clamped.

- (b) *Checking your netting and re-netting.* For various reasons—such as the heat of the day or the state of your battery—the frequency of your set will vary slightly and this will put you “off net.” A good operator knows immediately he is tending to go off net by a rise in the pitch of Control’s voice, which also becomes slightly distorted, and rise in pitch of the background hiss. Bad quality usually means Bad Netting. You must correct this; so wait till you hear Control sending to another station and press your “NET” button. You should hear nothing, or perhaps a grunt; if you hear a whistle it means that you are going off net and you must re-net. This is done exactly as in “*Netting at a distance*” (page 13), but Control **MUST** be sending all the time you are doing it.
- (c) *Use of the “TUNE” position of Flick Lever.* If your set goes off net very frequently, when “checking net” set the flick levers to “TUNE.” You can now adjust both dials with the fine adjuster without loosening the flick screws each time. But remember that if you turn back to “FLICK” or “SET,” the mechanism will pull your tuning dial back to its old setting, thus undoing all your correction. The first opportunity should be taken to re-set the flick device, but this should **NOT** be attempted unless you are stationary and Control is making a long transmission to another station on the group of no interest to you. Having re-set the flick, the levers should be left at FLICK until the set is next noticed going off frequency.
- (d) *The variometer.* This needs re-adjusting whenever the frequency of the set or the length of the aerial is altered. When you set up for flick working, note the variometer settings for the two frequencies on the writing tablet at the right-hand end of the set and in your log so that you can re-set the variometer quickly when changing frequency. There are two scales on the variometer 0–100 and 200–100. The lower frequencies will have a setting on the lower scale (0–100), the lowest frequency near 10; high frequencies will have a setting on the higher scale (200–100) the highest near 110.

WARNING. The positions where you change from one scale to another are marked by red bands. Never use a setting covered by either of these bands if you can avoid it. If you find a setting on or a little below either red band, say between 80 and 100 or between 180 and 200, always see if you can get better results at the top of the other range; for example, if you get a reading of 8 volts on meter at 92 on variometer scale you may find you can get 9 volts on meter at about 187.

If there are two positions, choose the one which gives the greatest dip at AVC or greater radiation on $\mathcal{A}E$ on the meter, unless it is on a red band of the variometer.

- (e) *R/T, C.W. and M.C.W* The set can be used for three kinds of working.

R/T—meaning Radio Telephony (that is, speech).

C.W.—meaning Continuous Wave.

M.C.W.—meaning Modulated Continuous Wave.

C.W. and M.C.W. are two kinds of morse working. On "C.W.", pressing the morse key sends out a signal which can only be heard when the receiving station is switched to "C.W." On "M.C.W.," pressing the key has the same effect as whistling into the microphone when working R/T; that is to say, a signal is sent out which can be heard even if the receiving station is switched to "R/T."

Advantages of M.C.W. are:

- (1) If there is interference on your frequency from other groups using C.W. you may get less interference if you use M.C.W.
- (2) You can hear your own morse signals in the phones. (On C.W. you only hear clicks.)

Advantages of C.W. are:

- (1) You get greater range.
- (2) If there is interference on your frequency from other groups using R/T or M.C.W., you may get less interference if you use C.W.

"Send-Receive" switching.

On speech, the pressel switch does this (see page 8).

On morse, the key-plug must be plugged fully into the set while sending. When receiving, it must be pulled half out.

- (f) *While working, if signals become worse and worse, or fail altogether, keep calm. You can't do much but you CAN:*

- (i) Check the netting. If your set is going off net, re-net it on the Control Station (see page 14).
- (ii) Check your "ends"—batteries, headset and aerial and their connections. Check the meter reading on $\mathcal{A}E$. Is there sidetone?
- (iii) Call a nearer station, to prove your own set O.K.
- (iv) If still no answer, put up another aerial section and call again. (Remember the variometer, page 14).

- (v) If this fails, call Control on M.C.W., DON'T try C.W. unless ordered to do so.
- (vi) Failing this, move your vehicle; trees, power lines, houses, etc., may be screening you.
- (vii) If on FLICK, turn A FREQUENCY flick lever to TUNE. If on TUNE already, make a pencil mark on the right hand tuning dial so that you can bring it back to EXACTLY the same setting. Search up to one division (100 kc/s) either side of this pencil mark to see if you can pick up Control Station, RETURN to FLICK or to the pencil mark for calling him if you do not find him when searching.
- (viii) If all this fails, your set MAY be at fault, in which case turn to "*Running Repairs*" (page 25). This will tell you what may be wrong and how to put it right.

6. Tuning and netting the "B" set.

Before starting you will have been told what frequency to use, what the code names of the stations on the group are and when the netting will be done. Just before this time *all* stations:—

- (1) Put the "A ONLY-ALL" switch to "ALL" (if it is not already there) and WAIT at LEAST $\frac{1}{2}$ a minute. If you do not wait, you may damage the valve V7A.
- (2) Put the "OFF-ON B" switch to "ON" (if not already done).
- (3) Turn the switch on the control unit to "B."
- (4) Turn the knob "GAIN B" to the right as far as it will go (see *frontispiece*).
- (5) Put the "B TUNING" disc to the ordered setting.

Netting.

- (6) Control Station presses his pressel switch and calls the group
- (7) During this call OUT stations adjust their "B TUNING" discs till they hear control, turn the knob "GAIN B" down till control can only just be heard, and adjust the tuning discs for the *clearest* possible signal. They may then turn "GAIN B" up, if necessary, to hear control comfortably.
- (8) Outstations answer in turn. During each answer control tunes his "B" set to the outstation's signal as in (7), and notes the setting of his tuning disc. If this is more than one division different from the ordered frequency, the outstation is badly off net.
- (9) Control station calls all outstations one by one and tells them "O.K. off" if they have netted properly. If a station

is badly off the net he tells him to alter the setting of his tuning discs up or down, according to the notes made in (8) above, and to answer him again

The "QUENCH" Adjuster. This should NEVER be touched except on orders from CONTROL.

- (10) Sometimes a whistle invades the group. If this happens, Control orders all outstations to screw their quench adjusters right IN (see *frontispiece*), and does so himself. He then orders all outstations but one to switch their "B" sets off; call this one station "No. 1." If there is still a whistle, Control orders No. 1 to screw his adjuster slowly out again, and listens. When the pitch of the whistle is too high to be heard No. 1 stops screwing and tells Control "O.K."
- (11) Control tells another outstation (call him No. 2), by shouting or other means, to switch his "B" set on. If there is a whistle No. 2 screws his adjuster slowly out. When he can hear no more loud whistles, he stops screwing and tells Control "O.K."
- (12) The same drill is done again for the rest of the outstations.

It should never be necessary to touch the "QUENCH" adjusters again until a new set joins the group.

N.B.—At an headquarters "A" sets will be on different frequencies. Troop sets will each have a different "B" tuning disc setting, but all troops of the Squadron will have the same "A" frequency.

CHAPTER III

LOOKING AFTER THE SET

1. Your job—and why it is important.

This chapter is NOT written to make you an expert electrician, able to repair every sort of breakdown. There are plenty of electricians in R. Signals to do that, and you have plenty of work of your own without trying to do theirs. But you MUST be able to do THREE things:

- (a) Test the set, to see whether every bit of it is working. This is described on page 20 under "*Daily Maintenance.*"

- (b) Go all over the outside of the set, cleaning and straightening, to keep the controls, etc., running smoothly, and looking for parts which are beginning to wear out or come undone; you will often be able to put in "a stitch in time" and prevent a breakdown which would otherwise have happened. The "Weekly Maintenance" paragraph, page 21, tells you how to do it.
- (c) Repair the more common faults which may occur in the field. Some rules to help you in this are given in "Running Repairs" (below).

The VITAL thing is that you should find out and report anything wrong AS SOON AS POSSIBLE so that the electricians can repair it BEFORE THE BATTLE; halfway through is TOO LATE, SO IT ALL DEPENDS ON YOU!



OH NO SARG !!! LOST THAT THREE WEEKS AGO

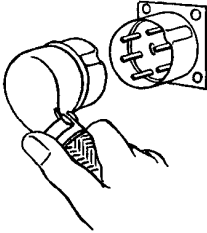
2. Connecting up the set and changing parts.

Normally the set will be ready for working when you first meet it. But you may have to disconnect various parts for cleaning or replacement—the kit for your set includes spares for most removeable parts, so here is how to do it:

- (a) Connecting the power supply (see Figs 8 & 9).
 - (b) Connecting aerial feeders (see Figs. 1 & 8).
- } Do NOT disconnect unless replacing.

- (c) Connecting up the headsets (see Figs. 8 & 4). The "Snatch Plugs" are made so that if you jump out of the tank wearing your headset they will come undone and you will not break your neck.

Fig. 9.
PLUGGING IN A CON-
NECTOR PLUG.



Turn plug till these two grooves are opposite each other and plug in GENTLY and STRAIGHT.

- (d) Changing an H.T. fuse (see Figs. 8 and 10).
- (e) Changing an indicator bulb (see Fig. 8).
- (f) Changing an "A" aerial pigtail. Remove the aerial base by unscrewing the six fixing bolts. Then see Fig. 11. Get the Electrician Signals to do this if possible.
- (g) Taking off the grill (see Fig. 12).
- (h) Changing a fuse in Control Unit No. 1 (see Fig. 13).
- (k) Adjusting driver's buzzer (in "Junction Distribution No. 1"). Take off the box as for "Control Unit No. 1" (Fig 8 inset).

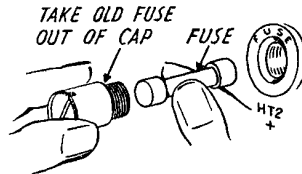
Adjust buzzer as in Fig 14. DO NOT ADJUST except when buzzer fails.

- (l) Taking the set and power unit out of their cases (see Fig. 8). Never take the set out, except to change valves; never take power unit out, except to put in a new one.

- (m) Changing valves. Valves need never be touched unless the set breaks down. If this happens you may have to change a valve or two (see "Running Repairs," p. 25, which will tell you which valves).

To take out or put in a valve, take the set from its case and see Fig. 15. A diagram on the cover of the "B" set also shows where each valve goes. Leave changing valves to the Electrician Signals whenever possible; especial care is necessary with valve V7A.

Fig. 10.
CHANGING AN H.T. FUSE.



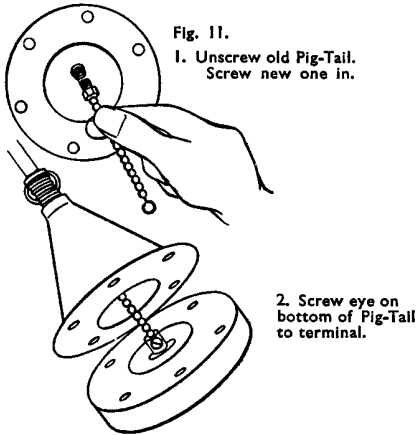
Replace with new fuse from Spare Parts box.

3. Daily Maintenance.

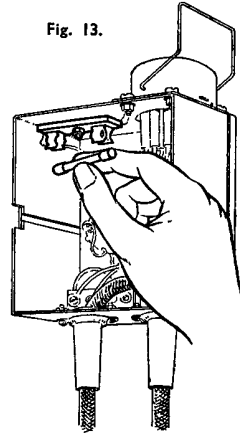
As already explained, the set must be tested every time before it is used. Table I (pp. 26, 27) shows how to test it. The tests should be done DAILY, even though the set is not going to be used. They MUST be done in the order given. For instance, test 9 will not work unless you have just done 7.

If doing the tests shows that something is wrong and you cannot put it right with the help of this book, REPORT IT AT ONCE and an electrician will be sent for. DON'T take the set to pieces in the hopes of finding the fault, even though you may think you know something about the works.

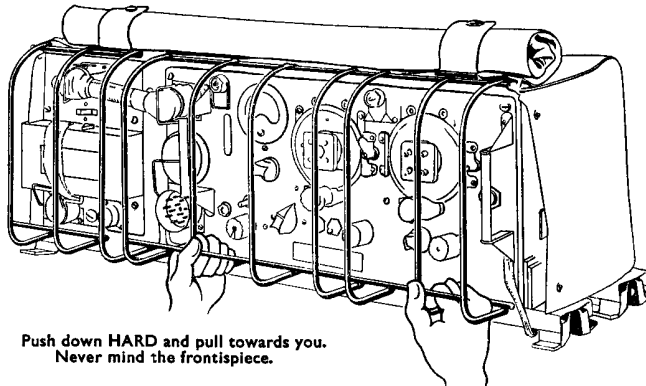
CHANGING AN "A" AERIAL PIG-TAIL.



CHANGING A FUSE IN CONTROL UNIT No. 1.



TAKING OFF THE GRILL. Fig. 12.



4. Weekly maintenance.

The reasons for this are given in Section 1 (b) of this chapter. EVERY week, without waiting to be told, you should:—

- (a) Do your "Daily Maintenance Tests" for the day (see p. 26).

- (b) *Clean* the outside of the set, supply unit and variometer with a cloth to take off dirt and grease. Don't use water, brasso, petrol or anything for making it shine.
- (c) *Aerials* (see Fig. 16).
- (d) *Try all the controls* and see that they are not jamming, nor turning so easily that their settings would alter through the shaking of the vehicle. See that no knobs are coming off their spindles, if they are, get the Electrician Signals to tighten the "grub screws" which hold them on.
- (e) *General*: Look at Fig. 17 and do as shown on it.
- (f) *Kit check*: See that you have got all your spare parts, valves and headsets. There are lists on the lids of the spare parts and spare valve cases.
- (g) *Report*: (a) Any faults which you have found and cannot put right.
(b) Any missing pieces of kit.

Your maintenance is USELESS unless you do this AT ONCE.

5. Monthly maintenance.

This is NOT your job. Once a month a R. Signals electrician will inspect your set thoroughly and overhaul it where necessary.

6. Running repairs.

If the set or any part works badly or stops working, try the cure for the particular failure as shown in Table 2, p. 28.

When replacing valves work on the lines of these two examples:—

- (1) (Failure No. 4—due to V.1.B. burning out.) Put in new V.1.A.; test set—no result. Put in new V.1.B.; test set—set working, therefore V.1.B. faulty. Put old V.1.A. back—test set—set still works—therefore old V.1.A. is sound.
- (2) (Failure No. 5—due to V.2.B. and V.5.A. BOTH burning out). Put in new V.2.B.—test set—no result. Put in new V.4.A.—test set—no result. Put in new V.5.A.—test set—set works, therefore V.5.A. faulty. Put old V.2.B. back—test set, set does not work, so V.2.B. faulty; put new V.2.B. in again. Put old V.4.A. back—test set—set works, therefore old V.4.A. is sound.

DO NOT put faulty valves back in the spare valve case, exchange them for sound ones as soon as possible and put the sound ones back in the case

TABLE 1
TABLE OF TESTS FOR DAILY MAINTENANCE OF No. 19 SET

<i>Part of set tested.</i>	<i>No.</i>	<i>Test.</i>	<i>What should happen.</i>	<i>What should NOT happen.</i>	<i>What is likely to be wrong.</i>	<i>What to do about it.</i>
Power supply.	1	Put switch on supply unit to O.N. (Warning: see that "B" set is switched OFF to start with; switch it on after 30 seconds.) Set A ONLY-ALL to ALL.	Red lamp on Supply Unit lights and machine runs.	(a) Machine does not run. Lamp does not light.	(i) Lead from battery not plugged in. (ii) Vehicle master switch OFF. (iii) Battery not properly connected.	Plug in, check connections. Switch on. Correct if possible. Other-report.
			(b) Machine runs but lamp does not light.		Bulb burnt out.	Replace bulb.
			(c) Lamp lights steadily but machine does not run properly.		Machine out of order.	Report. In emergency open Unit and check L.T. brushes.
L.T. voltage supply.	2	METER switch to L.T.	Meter reads at least normal about 11-12 v.	Meter reads below 10.5 v. or 10 volts.	Batteries need charging.	Run engine.
H.T. voltage supply.	3	METER switch to H.T. 1.	Meter about 275 v.	Meter reads zero.	(i) Fuse blown. (ii) Internal fault.	Replace fuse. Report. In emergency check H.T. brushes.
	4	METER switch to H.T. 2.	Meter about 500 v.			Clean and check.
IC system and headsets.	5	Switch Control Unit to IC. Press pommel and speak. Test all headsets.	Your voice is heard in all the headsets of the tank, including your own.	Your voice cannot be heard.	(i) Snatch plug connection bad. (ii) Faulty headset. (iii) Internal fault.	Replace headset. Report. See Running Repairs 13 and 14.
	6	Press button on Driver's Box (Junction Distribution No. 1.)	Buzz heard in phones.	No buzz in phones.	Buzzer needs adjusting.	Adjust buzzer.
"A" Receiver.	7	Switch on Control Unit to "A," R/T-MCW-CW to R/T and METER to A.V.C. Tune in to any strong R/T station (a broadcast will do).	(a) Station is heard in phones. (b) Meter reading is less when set is tuned to station than when it is not.	(1) No station can be heard. (2) Station is heard, but very noisy. Meter reading does not alter.	(i) Aerial disconnected. (ii) Receiver faulty. Loose connections. Internal fault.	Examine all connections, including digital. Report. See Running Repairs 3 and 6. Check aerial connections. Report. See Running Repairs 11. Report.

<i>Part of set tested.</i>	<i>No.</i>	<i>Test.</i>	<i>What should happen.</i>	<i>What should NOT happen.</i>	<i>What is likely to be wrong.</i>	<i>What to do about it.</i>
	8	Press NET button with strength 5 signal. Adjust A FREQUENCY MCS.	Whistle is heard.	No whistle heard.	Internal fault.	Report. See Running Repairs 5.
"A" sender NOT TO BE TESTED IF UNDER WIRELESS SILENCE.	9	Put meter switch to AE, press APA TUNING and VARIO METER for highest possible meter reading.	Meter reads according to Maintenance Chart.	Meter does not read or reads very low.	(i) Pressel switch not working. (ii) Aerial connections faulty. (iii) Sender faulty.	Try another headset. If still no good, report. Check all connections. Report. See Running Repairs 4, 6, 7, 8 and 9.
	10	Speak loudly into microphone.	(a) Meter needle kicks. (b) Sidetone is heard.	Meter reading does not alter. No sidetone.	Internal fault. Internal fault.	Report. See Running Repairs 6. Report, but set may still read well. See Running Repairs 6.
Morse key and C.W. reception AS ABOVE.	11	(a) Switch set to C.W. Plug in key and press. (b) Switch to MCW and back.	Meter reads as in Test 9. Whistle heard in phones.	Meter does not read or reads very low. No whistle.	(i) Fault in key or key lead. (ii) Internal fault. Internal fault.	Check key, lead and plug. Report. See Running Repairs 10. Report. See Running Repairs 5.
	12	Pull key plug half out.	Distorted speech and whistle heard.	No whistle heard.	Internal fault.	Report. See Running Repairs 5.
"B" receiver.	13	Switch OFF-ON B to ON. Put switch on control unit to "B."	HISS in phones.	(a) Nothing heard in phones. (b) HISS in phones; reception very noisy.	Internal fault. Loose connections.	Report. See Running Repairs 16. Check aerial leads. Report. See Running Repairs 17.
"P" sender NOT UNDER WIRELESS SILENCE.	14	Press pressel switch and speak.	HISS disappears and sidetone is heard.	HISS is still heard or your own voice is not heard.	Internal fault.	Report. See Running Repairs 15.
Pilot lamp.	15	Put switch on both control units to "B."	Red lamp lights on operator's control unit.	Lamp does not light.	(i) Bulb burnt out. (ii) Fuse blown.	Replace bulb. Replace fuse in Control Unit No. 1.
General.	16	Check all controls when receiving.	Controls should feel "smooth" and work.	Controls jam, feel "rough" or fail to work.	Internal fault.	Report.

TABLE 2
RUNNING REPAIRS

<i>Failure.</i>	<i>Possible cause.</i>	<i>Possible cure.</i>
<i>Power.</i>		
1. Set completely dead.	Failure of power.	Do tests 1 to 5 of daily maintenance tests.
<i>"A" Set.</i>		
2. All working except "A" set sender and receiver.	(1) Aerial disconnected. (2) V _{4A} , V _{2A} , V _{3A} , V _{1A} .	Examine and replace pig tail if necessary. Replace valves in turn.
3. All working except "A" receiver.	V _{1A} , V _{1B} , V _{1C} .	Replace valves in turn.
4. All working except "A" sender.	V _{2B} , V _{4A} , V _{5A} , V _{6A} .	Replace valves in turn.
5. All working except "A" sender though "A" receiver gives no C.W. note or netting whistle.	V _{2B} .	Replace valve.
6. All working except "A" receiver and meter reading does not rise when sending R/T. (See Daily Maintenance Test No. 10.)	V _{3A} .	Replace valve.
7. "A" sender and receiver not working but your own voice heard in 'phones on sending R/T.	V _{2A} .	Replace valve.
8. All working except "A" sender, but meter reads with switch set to "drive."	V _{4A} .	Replace valve.
9. All working except "A" sender. No reading or only a very low reading with switch set to "drive."	V _{2B} , V _{5A} .	Replace valves in turn.
10. All working except "A" sender on morse.	(1) Faulty key, key-lead or plug. (2) Internal fault.	Examine. Repair if possible, otherwise report.
11. "A" receiver very noisy.	(1) Loose aerial connections. (2) Loose valves.	Report. Check, tighten where loose and replace pig-tail if necessary.
12. Pilot light on operator's control out.	(1) Bulb burnt out. (2) Fuse " "	See Daily Maintenance Test No. 15.
13. All working except "I-C."	V _{1F} , V _{8B} .	Replace valves in turn.
14. "B" and "I-C" not working.	V _{1F} , V _{1E} , V _{8B} , V _{8A} .	Replace valves in turn.
<i>"B" Set.</i>		
15. All working except "B" set sender and receiver.	V _{7A} , V _{1D} , V _{1E} , V _{8A} .	Replace valves in turn.
16. All working except "B" set receiver.	V _{1D} .	Replace valve.
17. "B" receiver very noisy.	(1) Loose aerial connections. (2) Loose valves.	Check, tighten where loose. WARNING. "B" aerial feeder is very fragile.

