133. **Netting**

(a) Place function switch to **R.**

(b) **A-B-Net** switch to **Net.**

(c) Listening in head set, turn the receiver **frequency** knob gently moving the frequency dial around the ordered frequency.

(d) A high pitched whistle should be heard with the pitch dropping until it is inaudible and then rising until it is again audible (see figure 24). The receiver frequency is adjusted to that point of inaudibility (zero beat).

Turn Carefully about required frequency on dial scale until whistle is heard. Reduce to Zero Beat, or "Silent Point" as in the diagram below.

46

Turn CAREFULLY about required frequency on dial scale until whistle is heard. Reduce to ZERO BEAT, or "SILENT POINT" as in the diagram below.

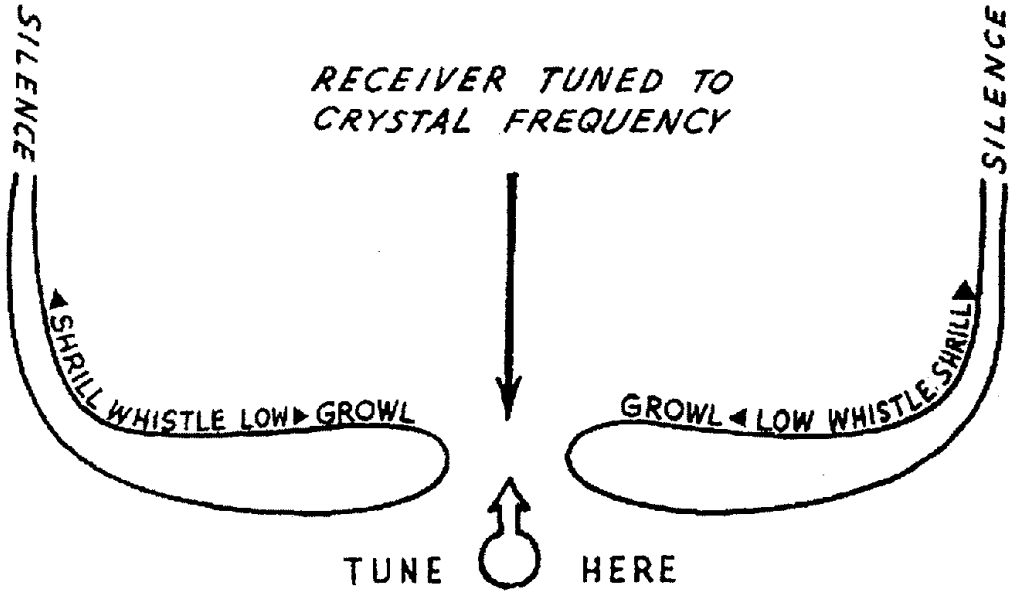

Figure 24 — Tuning the Receiver to Zero Beat

134. **Aerial Loading**

(a) **A-B-Net** switch to B

(b) Hold the function switch on **voice.**

(c) Adjust the rod tuner knob so that the meter needle is as far to the right as possible. Do this **Gently** otherwise the tuned point may be passed. The operator must keep his head as far as possible from the aerial otherwise he will produce a false reading.

(d) If this reading is only slight, increase it by adjusting the **Transmitter** frequency knob.

(e) Allow function switch to return to R.

Ground Station Rod Working

135. (a) Carry out the procedure detailed above in paragraph (134).

(b) **Counterpoise.** Remove the counterpoise from the satchel and drive its spike into the ground. Spread the four black wires to form a cross. Connect the green lead to the Earth terminal on the rear face of the transmitter. Carry out the aerial loading as detailed in paragraph 134.

Long Wire Working

136. A long vertical wire may be used instead of the vertical rod to obtain greater efficiency when operating as a ground station.

(a) Set the wireless set up as for rod working but do not use the rod tuner.

(b) Suspend a vertical wire of approximately 30 feet length above the transmitter. (Use one of the 68 feet aerials and a cords aerial (throwing line)).

(c) Insert the end of the vertical wire into one of the holes in the side of the aerial terminal by pressing the centre of the terminal down.

Caution. Do not allow the long wire (Wire aerial) to touch its means of support.

(d) Load this aerial in the normal fashion, using the **matching** switch (0-6) and the transmitter **frequency** knob.

Sky Wave Aerials

137. Two ready made aerials, aerials adjustable 135 feet (an end fed aerial) and a dipole aerial are supplied with the set. To set up either of these aerials proceed as follows:—

(a) **End fed aerial.** Instructions for the erection of this aerial are shown on the front and back charts of the aerial spool. The aerial consists of 8 black leads and one orange lead. The black leads, numbered 1 to 8 are of varying calculated lengths, these numbers are stamped on the hook and eye at the end of each length. Instruction cards indicate the number of lengths to be coupled together for any particular frequency. The free end (the small insulator) is suspended to the required height by one of the aerial cords. The aerial is connected to

the aerial terminal on the wireless set by hooking the orange lead to the eye of the last length indicated.

(i) **The A-B-Net** switch is in the position nominated on the card.

(ii) **Aerial Loading.** Placing the function switch to voice, this is carried out using the **matching** switch.

(iii) A lack of aerial efficiency will result if this aerial is erected at too vertical an angle.

(iv) Site the aerial so that its length is at right angles to the distant station.

(v) The counter poise must be used with this aerial. Drive the spike through the hole in the aerial card, this will keep the aerial taut.

(b) **Centre fed Dipole Aerial.** This aerial may be erected either as an inclined or horizontal dipole. Erected in the horizontal, it is more efficient. The dipole comprises the following components:—

(i) Two aerials lightweight 68 feet.

(ii) One 70 ohm aerial feeder.

(iii) Two aerial cords

(iv) Method of assembling and details of the length of wire required for any frequency are shown inside the metal flaps of the aerial 68 feet.

138. **Successful operation of the Dipole Aerial**

(a) The distance between the red markers on the aerial wires is 12 ins. When re-winding the aerials, keep the lays of wire neatly alongside of each other.

(b) The laid down instructions concerning the connecting of the aerial to the 70 ohm feeder must be adhered to otherwise the aerial will detach from the feeder when strain is put upon it.

(c) Place the wireless set directly under the feeder. Unwind only as much feed as is required to reach the set.

(d) No earthing or counterpoise will be used with this aerial.

(e) Keep the aerial no higher than one quarter wavelength above the ground. (This is equal to half the length of the aerial.)

(f) Raising or lowering the aerial about this quarter wavelength height may improve its operation in a particular locality. This will be learnt by experience.

(g) Site the aerial so that its length is at right angles to the distant station.

(h) **To load.**

(i) Place **A-B-Net** switch to B.

(ii) **Matching** switch to O.

(iii) Hold function switch to **voice.**

(iv) Adjust the transmitter **frequency knob** for maximum aerial loading. If no meter reading results, try the other matching positions.

CW Operation

139. To receive

(a) Plug the lightweight key into its socket, situated below the **A-B-Net** switch.

(b) Place the function switch to R.

(c) **Note:** No CW signal will be received until the key is plugged into the set.

140. To Transmit

(a) Place the function switch to CW.

(b) **Note:** Always move function switch back to R at completion of transmission.

(c) Before returning to voice working, key plug must be removed.

Maintenance

141. The WS A 510 has been found in field use to be an efficient working radio set. If the operator uses common sense in the care of his equipment, there is little need for repairs under normal circumstances. Attention to the following detail will aid him considerably in keeping his wireless set working continuously.

(a) Keep the set and its components clean and dry.

(b) Inspect the set daily for dents and broken or loose switches.

(c) Keep all plug holes dry.

(d) Keep the aerial rods clean.

(e) Keep the hand set and head gear assemblies clean and dry. Look for frayed and damaged leads.

(f) Do not leave the batteries in the set when it is not being used.

(g) Check humidity indicators daily, should they turn pink replace the set as soon as posible.

(h) Ensure that the main housing of the rod tuner is tight on its ball socket. The ring clamp on the conical shaped holder must also be kept tight.

(j) Inspect the connecting leads from transmitter and receiver. Do not subject these to undue strain and twists. Undue strain will tear away the outside insulation where the leads come out of the housings on the top of the set. The connecting plug rings should be screwed hand tight.

(k) Before rewinding wire aerials or aerial cords, remove any knots or kinks.

(l) Do not carry spare crystals in the pocket. If the crystal compartment on the set is full use the spares box. Pack the crystals into the box with paper.

(m) Although the equipment is strong and will stand fair wear and tear, do not use it as a seat or a footstool.

Ranges

142. The following ranges are to be normally expected:—

	Expected Range in Miles	
	Voice	**CW**
(a) **Rod Working**		
(i) Manpack role	2	4
(ii) Vehicle	2	4
(iii) Ground station using counterpoise	3	6

	Ground Wave		**Sky Wave**	
	Voice	**CW**	**Voice**	**CW**
(b) **End Fed Aerial**	6	12	25	75
(c) **Dipole Aerial**				
(i) Inclined dipole	6	12	30	90
(ii) Horizontal dipole	4	8	40	120

143. When using the above range table, it should be realised that the terrain and vegetation will influence the ground wave working of the set. For example, when working in the manpack role using the rod aerial in secondary jungle, the working range may well drop down to the region of from a quarter to a half mile.

Siting

144. Ground wave and sky wave operation will follow the principles outlined in chapter six aerials for low powered HF and VHF radio sets.

Frequency Variations

145. It has been noticed in field operation of this wireless equipment that during extreme variations in temperature and as the batteries get towards the end of their working life, slight alterations will occur in the receiver operating frequency. It is therefore a useful operating drill once every 15 to 20 minutes, when operating in the manpack role on rod to check the receiver against the transmitter or better still against the distant station. Only constant use of any one particular wireless set will give the operator an intimate knowledge of its habits.

146. **Ghost Signals.** When the batteries start to fade, there is a tendency for the equipment to develop a "ghost" signal of its own transmitter signal while on net. This ghost appears about 30 kcs **above** the true frequency. Weaker ghosts may be found further along the band. Ghost signals may be identified by the fact that there is a background noise (hash) behind the netting signal whereas the true netting signal has no such noise.

Conclusion

147. This wireless equipment has proved itself to be robust and trustworthy in its field operation. However it appears to perform most efficiently when using skywave transmission. In its manpack role operating on vertical rod, experience has shown that the ranges given in paragraph 142(a) may be slightly in advance of its true performance.

CHAPTER 7

Method of Testing Dry Batteries in the Field

217. One of the most common problems associated with the operation of radio sets powered by dry battery packs is to determine the right time for a battery change and to accurately estimate the hours of life remaining in the used battery that is still "good". Battery packs are expensive items and re-supply to forward units is often difficult. It is vital that communications are not impaired by battery failure and excessive wastage of batteries is equally dangerous.

Testing by Operators

218. When using the WS A510 it is possible for the operator to carry out the battery testing procedure laid down in para 70 page 45 of "User Hand Book, A510 Wireless Station". The meter of the set gives an indication of the condition of the battery operating under load, and this provides a reliable test.

219. When using AN PRC 10 the operator has two methods available to give a rough indication of battery condition. These are:—

(a) Connect a spare dial light bulb between antenna output (centre at AUX ANT jack J3) and case of set. Switch to send and the dial lamp will glow. Brilliance of the lamp will indicate output strength of the transmitter, which is directly related to battery condition.

(b) The setting of the "squelch control" knob will vary as battery voltage drops. The variation is slight and an operator requires much practice and knowledge of his individual set to achieve results from this method. However, it is worth study by operators, and it is possible to achieve a reasonable standard of battery prediction by this method.

220. There is no possible method of determining battery condition on C PRC 26 whilst the set is in operation. The operator must change the battery when he suspects it of causing communication failure.

Testing by Regimental Storeman

221. Batteries issued from store must be in good condition. The date of expiration of "shelf-life" should be carefully watched and issues made in such a manner that a reason-

able margin of shelf life is always in hand. In addition all dry batteries should be tested before issue by the methods outlined in following paragraphs.

222. It is most important that dry batteries be tested "under load". The battery packs are made up from combinations of dry cells, each of which has a terminal voltage of 1.5 volts. After some hours of work the terminal voltage starts to drop, and when it goes below 1 volt the cell is considered to be completely exhausted. However, if left for some time and then re-tested the voltage will be found to be restored to 1.5 volts. This "restoration" effect is the danger which has to be taken into account when testing.

223. The only method of testing a dry cell is to put it under a comparatively heavy load for at least one minute and then read the terminal voltage. If the cell is still reading at least 1.4 volts it can be passed as suitable for radio power supply. For example, the HT battery of AN PRC 10 (BA-279/U) in its 135 volt section should deliver at least 126 volts under load.

Test Methods for BA-279/U (AN PRC 10)

224. The methods of carrying out the tests for BA-279/U battery pack is as follows:—

(a) Here is the wiring diagram of battery BA-279/U socket:—

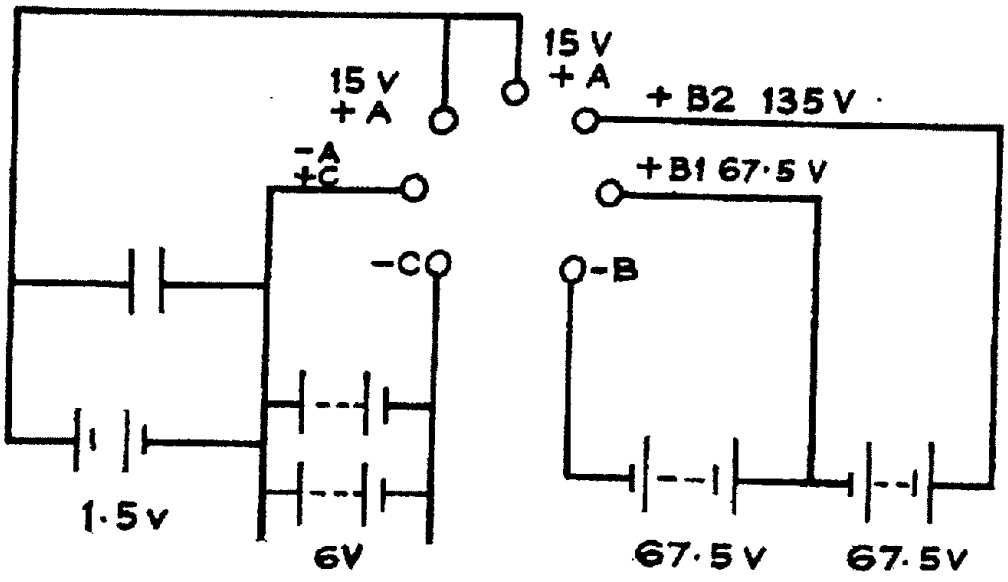

Figure 37 — Battery BA-279/U Wiring Diagram

(b) An examination of the above diagram shows that the battery splits up into:—

(i) **A battery.** This is of 1.5 volt potential and has its positive (+) terminal connected to the two top pins marked "Plus A". The negative (—) terminal is connected to the pin marked "—A + C".

(ii) **B Battery.** This is made up to two 67.5 volt sections connected in series to give a total potential of 135 volts. Negative terminal is marked "—B" and "+B1" is positive 67.5 volts with "+B2" positive 135 volts.

(iii) **C Battery.** The C battery is of 6 volt potential and has its positive terminal connected to the pin marked "—A + C". The negative terminal is connected to the pin marked "—C".

Testing the "A" Battery (BA-279/U)

225. The "A" battery has the voltage of only a single cell. The "Cell test" facility of a Mulimeter (Aust) No. 1 Mk 1 (ZA-WYA 431) is ideal for this test. By switching to "cell test" and applying test prods to the "A" battery for one minute the meter should read at least 4.5 if the A battery is in good condition.

Testing the "B" Battery (BA-279/U)

226. Both sections of the "B" battery can be conveniently tested as one battery. It is desirable to load the battery with the maximum current drain of the radio set plus fifty per cent. To do this it is necessary to connect a resistance of 2,200 ohms across the terminals of the Multimeter (Aust) No. 1 Mk 7, switch the instrument to the 250 volt DC scale and apply the test prods across pin "+B2" and "—B". The voltage reading after one minute should be at least 126 volts. (The 2,200 ohm resistance should be a "ten watt type". RAAOC stock "Resistors fixed WW-Z/AZ 0324 — low-2.2K ohms" and this resistor should be obtained and held for battery testing).

Testing the "C" Battery (BA-279/U)

227. If the "A" and "B" sections of the battery pack are both good the "C" battery will be invariably good also, as the current drain from this section is less than either of the others. A voltage check with Multimeter (Aust) No. 1 Mk 1 between pins "—A+B" and "—C" should show a reading of 6 volts. If there is still doubt about the "C" section a resistance of 100 ohm (1 watt rating) should be connected across the battery for one minute after which the reading should be at least 5.5 volts.

Test Methods for BA-289/U (C PRC 26)

228. The method of carrying out the tests for BA-289/U is as follows:—

(a) The wiring diagram of battery BA-289/U socket is:—

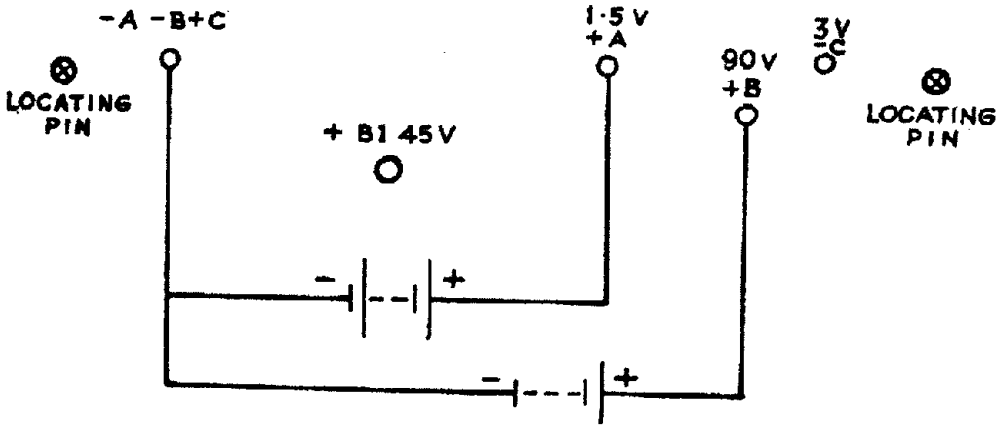

Figure 38 — Battery BA-289/U Socket

(b) An examination of the above diagram shows that the battery splits up into:—

(i) **A battery.** This is of 1.5 volt potential and has its positive terminal connected to the pin marked "+A". The negative terminal is connected to the pin marked "—A".

(ii) **B battery.** This is made up of two 45 volt sections connected in series to give a total of 90 volts. Negative terminal is marked "—B" and "+B1" is positive 45 volts with "+B2" positive 90 volts.

(iii) **C battery.** The C battery is of 3 volt potential and has its positive terminal connected to the pin marked "—A—B+C". The negative terminal is connected to the pin marked "—C".

229. **Testing the "A" Battery (BA-289/U)**

This battery has the voltage output of a single cell and may be tested by the "cell test" described in para (9) for the A battery of the BA-279/U.

230. **Testing the "B" Battery (BA-289/U)**

As with the BA-279/U "B" battery, both sections of this B battery can be tested as one. The 2200 ohm resistor described for the BA-279/U test will produce approximately

a 30 per cent. overload on the battery when connected between terminals "—A — B + C" and "+B 90V". To carry out the test the steps are:—

(a) Connect 2200 ohms ten watt resistor across the terminal of the volt meter.

(b) Apply the volt meter prods to the battery terminals (—A —B +C and +90V) for one minute.

(c) If after one minute the voltage reading has fallen below 82½ volts the battery is not suitable for issue.

231. **Testing the C battery (BA-289/U)**

If the A and B sections of the battery have been proved to be good it is most unlikely that there will be anything wrong with the C battery section. A voltmeter check to ensure that it is intact and supplying 3 volts is all that is necessary. The meter is connected between terminal (—A —B +C) and —C3V.

Test Methods for WS A510 Batteries

232. In addition to the tests for batteries installed in sets as detailed in para 70 of WS A510 User Handbook the following test should be carried out by storemen prior to issue of batteries.

(a) **A battery.** (Y3/YCA 0362 - LT 1.5V). This cell test procedure for use with Multimeter (Aust) No. 1 Mk 1 as previously described for battery packs BA-279/U and BA-289/U.

(b) **B battery.** (Y3/YCA 0395 - 90/7½V). This is the same voltage as the B battery of BA-289/U (90 volts). The current drain of the two batteries is similar, therefore the same test routine will apply. A voltmeter with a 2200 ohm ten watt resistor connected across the terminals should read at least 82½ volts after connection for one minute. If the reading falls below 82½ volts the battery should not be issued.