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STATION, RADIO, A43R, MK 2

TECHNICAL HANDBOOK - UNIT REPAIRS

This EMER must be read in conjunction with Tels F 532 Part 2 which contains figures and tables to which reference is made.

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INTRODUCTION

General

1. The equipment is sealed and will not normally be opened for unit repairs. The only occasions when unit repairs to the interior of the equipment may be carried out, are when it is absolutely necessary to attempt to restore essential communications. Internal repairs and adjustments are to be confined to changing the power amplifier valve, securing electrical connectors and changing channel tuners.

2. If, in an emergency, the unit is opened, the following provisions must be observed:-

- (a) It must be opened under the driest possible conditions and in any case should not remain open for more than three hours.
- (b) A recently re-activated silica-gell (green canister) desiccator must be refitted before resealing (see para 7 and 8).
- (c) The SRA43R, Mk 2 must be returned to workshops for drying and seal testing as soon as possible after emergency repair.

Warning

3. It is important to note the following before any repair action is carried out:-

- (a) The A43R case is connected to the battery positive and not to the battery negative as normal. When operating from an auxiliary supply it will therefore be connected with the positive line to case.
- (b) If normal battery operated types of equipment are being operated from the same supply, their cases will be connected to the negative supply line.
- (c) The set case or any uninsulated part of the A43R, the battery adaptor and charging unit are not to be allowed to make contact with any part of any other set or damage to one or both may occur. The webbing carrying bag will usually provide adequate insulation for the case of the A43R.

- (d) For the reasons outlined in (c) no part of the A43R, the battery adaptor and charging unit are to be allowed to make contact with any part of the vehicle or its fittings.
- (e) The tuners in Case, radio frequency tuner, are aligned to the A43R with which they are issued. Some loss of performance will occur if tuners from another set are used and therefore care must be taken to ensure that the tuners are only used in the correct set. The Case, radio frequency tuner, is marked with the serial number of the A43R to which it belongs.
- (f) Tuners removed from an A43R during frequency changes must be put into the Case, radio frequency tuner, bearing the same serial number as the A43R from which they were removed.

4. The following repairs or adjustments must not be undertaken without the test equipment detailed in Tels F 534.

- (a) Transmitter:-
 - (i) C302 on each of the tuners, radio frequency. Red code.
 - (ii) C324 on the transmitter deck.
 - (iii) C341 on the transmitter deck.
- (b) Receiver:-
 - (i) C148 on each of the tuners, radio frequency. Green code.
 - (ii) C163 in the 2nd oscillator stage.
 - (iii) T107 in the 2nd oscillator stage.
 - (iv) Any of the iron cored adjusters in the i.f. amplifier or filter stages.
- (c) Altering the positions of the wiring of the transmitter and receiver decks, as the layout is critical and must not be disturbed.
- (d) Displacing the position of components on the transmitter and receiver where these are secured by the wire terminations.
- (e) The clearance between the turret stators and the insulant of the tuners, radio frequency is 14 thousands of an inch and this should be maintained at all times, otherwise the efficiency of the equipment will be reduced. Too much pressure will risk distorting stator contact when the turret rotor is moved.
- (f) Care is required when dismantling or assembling the front panel as damage to the wiring or attached components can occur due to the pillars supporting the front panel fouling when handling.

ELECTRICAL TESTS

Set testing

5. To check whether a set is serviceable, carry out the following tests:-
- (a) Fit the whip antenna into the antenna socket on the set and turn the locking ring fully clockwise; this is a precautionary measure to avoid internal damage to the equipment if it is switched to transmit. Connect the cable termination of head or handset to the handset socket and turn the locking ring fully clockwise. Ensure the OFF-PHONE-BEACON switch is to OFF. Fit a charged battery into position on the back of the set, engage the dzus fasteners and give each a quarter turn until fully secured.
 - (b) Set the channel selector to CHANNEL 1, turn the volume control to the mid-way position, the OFF-PHONE-BEACON switch to PHONE. A noise will be heard indicating that the receiver is operating.
 - (c) Depress the pressel switch on the head or handset. Two spots of light should appear in the upper and lower ends of the tuning indicator window. As the transmitter warms up, the lower spot will extend until it forms a column approximately half way up the window. To allow the transmitting valve time to reach full sending efficiency a slight pause should be made between depressing the pressel switch and starting to speak.
 - (d) Speak normally into the microphone. Sidetone will be heard in the earphone(s) and the light column in the tuning indicator will flicker. (Sidetone can be checked more easily by blowing into the microphone.) This will also test if the microphone element is serviceable (see Repair procedures, para 13, 14 and 15).
 - (e) Release the pressel switch.
 - (f) The tests listed in para 5(a) to (d) should be repeated for the five remaining channels, 2, 3, 4, 5 and 6.
 - (g) The beacon facilities can be checked while testing with another serviceable set which should be sited not less than a quarter of a mile away. Carrier hiss will be heard with the receiving set switched to PHONE and the transmitting set switch to BEACON - CW, or, an audible note when the transmitting set is switched to BEACON TONE. The transmitting set should be switched back to PHONE after a pre-determined period as the receiver is inoperative while the set is on beacon transmission.
 - (h) The ground beacon facilities may be conveniently tested at the same time as those detailed in (g) are carried out, by erecting the mast as detailed in the User Handbook, Chap 2.

Testing the A43R on an auxiliary 12V d.c. supply

6. If the battery connections are accidentally reversed no damage will be done, but the set will not work. See also Warning, para 3(a) to (f).
7.
 - (a) Set the OFF-PHONE-BEACON switch to OFF.
 - (b) Detach the battery from the set.
 - (c) Fit the battery adaptor to the A43R, Mk 2 and secure the dzus fasteners; connect the battery connector cable to the cable of the battery adaptor and turn the locking ring fully clockwise.
 - (d) Connect the battery lead to the auxiliary 12V d.c. supply, black negative (-) to battery negative (-), and red positive (+) to battery positive (+).
 - (e) The set is now ready for use.

Recharging the battery

8.
 - (a) The charging unit can be set to charge either of two dissimilar types of battery, Magnatex or Nife. A small label attached to the rim of the front panel shows for which type of battery the unit has been set. Ensure that the charging unit is set for the type of battery to be charged.
 - (b) At some future date the Magnatex battery will be entirely superseded by Battery, secondary, 12V, Redifon 6227, edition C, (nickel-cadmium). As these batteries become available and as the Magnatex types reach the end of their useful working life, the Magnatex batteries used with each set should be exchanged for a similar number of the new type. This will avoid a mixture of battery types and the necessity for continual re-adjustment of the charging unit.
9.
 - (a) Connect the DC INPUT lead to 12 or 24V battery, or, to a d.c. supply between 11 and 30V. No adjustment is necessary as the charging unit is self-compensating for voltages within these ranges.
 - (b) The black negative (-) lead should go to battery or d.c. supply negative (-), and the red positive (+) lead to battery or d.c. supply positive (+). The red panel lamp will light when the charging supply input is connected. (If the charging supply input connections are reversed no damage will be done but the charger will not work. There will be no meter reading.)
 - (c) Fit the discharged battery on the back of the battery charging unit. Engage the dzus fasteners and, using a coin, give each fastener a quarter turn clockwise.

- (d) When the battery is first connected, the meter in the charging unit will read in the blue area on the dial. The meter needle should gradually move into the red area as charging proceeds, remaining stationary in the red area after about seven hours.
- (e) If the meter needle remains in the blue area and shows no sign of movement towards the red area, especially after several hours, then the battery is probably faulty and should be handed to a technician for checking.
- (f) The battery is fully sealed and requires no maintenance other than recharging.
- (g) If the battery charger overheats it should be immediately disconnected and should be handed to a technician for checking.

Operating from a set battery being float charged

- 10. See Warning, para 3(a) to (f).
- 11. The output voltage of the battery charging unit is fully controlled and it is permissible to operate from a set battery which is being recharged from an auxiliary supply.
- 12. To connect for this method of operation proceed as follows:-
 - (a) Remove the battery from the back of the set and attach it to the back of the battery charging unit.
 - (b) Attach the battery adaptor to the back of the set in place of the battery.
 - (c) Set the OFF-PHONE-BEACON control on the set to OFF. (The battery charging unit may be either connected or disconnected.)
 - (d) The lead to the battery adaptor is normally in two sections joined by a plug and socket. Disconnect the two sections of this lead by turning the locking ring of the plug anti-clockwise then holding the metal shells of the plug and socket (not the cables) pull them apart.
 - (e) Insert the plug on the lead from the battery adaptor into the socket on the front panel of the battery charging unit.
 - (f) Connect the battery charging unit to the auxiliary supply (para 6), and set the OFF-PHONE-BEACON control on the set to the service required.
 - (g) The set is now ready for use in the normal way.

REPAIR PROCEDURESHandset and headset repairs

13. If sidetone, as detailed in Electrical tests, para 5(d), cannot be heard the alternative head or handset should be substituted and the tests repeated. It can then be readily established if the head or handset is serviceable.

14. Circuit and wiring diagrams of the two types of headgear are given in Fig 1 and 2.

15. (a) Part numbers for the various components are as follows:-

Handset, SI type with switch, with 2 ft coiled cord, terminated with plug, 6-pole	Y1/5965-99-901-1503
Headset, microphone, SI type; magnetic type earphones, carbon type microphone, terminated with plug, 6-pole	Y1/5965-99-901-1502
Cord assembly, electrical, approximately 1 ft 7 in. long overall (neckband)	Y1/5995-99-901-0407
Cord assembly, electrical, 2 tinsel conductors, 22.1/8 in long overall, nylon braid processed both ends	Y1/5965-99-103-1361
Cord assembly, electrical, 3 tinsel conductors, 2 ft 2.1/4 in. long overall, nylon braid processed both ends	Y1/5965-99-103-1362

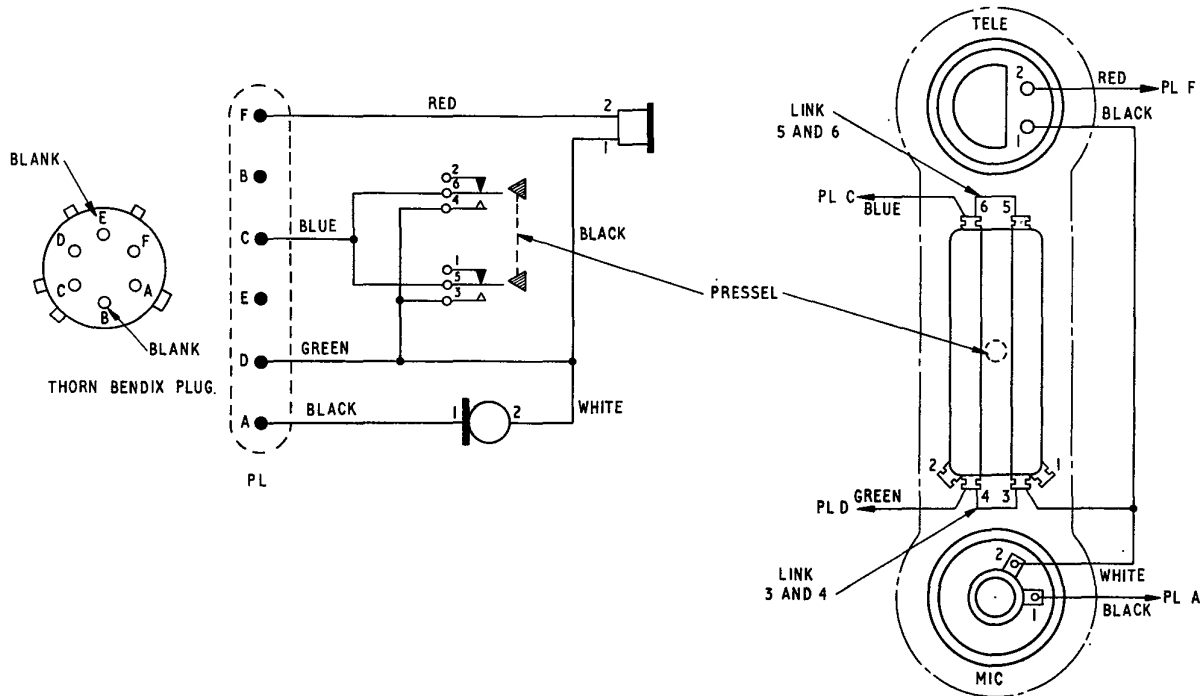
(b) The items that follow are common to either type of headgear:-

Microphone - earphone element. Used in electro-magnetic microphone or earphone, 1.83 in. o.d., 0.85 in. overall depth, 300Ω impedance	Y1/5965-99-940-2368
Microphone, element, carbon, 1.757 in. dia by 0.45 in. deep, 2 screw type terminals	Y1/5965-99-100-1944
Plug, electrical, free, female shell, 6-pole, 4A, 500V a.c.	Y1/5935-99-949-3853
Cord, electrical, 4 conductors, 55/044 tinned copper, VIR insulated neoprene, sheathed, 0.26 in. dia, 0.83 in. coil dia, 36 in. long	Y3/6145-99-900-8739

16. The internal wiring of handsets may vary. The earth wire being terminated at either the switch or the microphone element. The use of Hellerene lubricant, electrical sleeving 10 (9150-99-220-2837) is essential when replacing microphone elements and cords.

Instructions for opening A43R, Mk 2

17. The TRA43R, Mk 2 is a sealed set and must not be opened for unit repairs except in an emergency as detailed in para 1 and 2.



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Fig 1 - Handset, SI type with switch

18. Remove the four socket-headed No 2 BA steel screws using a Wrench, set screw, 5/32 in. The two anti-tamper caps which will be found can be most easily removed by piercing with a sharp instrument, and then withdrawing. Care should be taken to ensure that the wrench is fully home in the socket heads before unscrewing, otherwise the screw and wrench may be damaged.

19. The desiccant container dehumidifier should be removed, before the set is uncased. The set should be placed upon its front panel, the case can then be lifted clear, care should be exercised in handling the sealing gasket as this may become stretched if strained during uncasing, it should therefore be removed and placed with the set case during servicing.

20. When replacing the case, make sure that the rubber gasket is correctly seated in its channel in the front panel flange and check that an active desiccant container dehumidifier has been fitted.

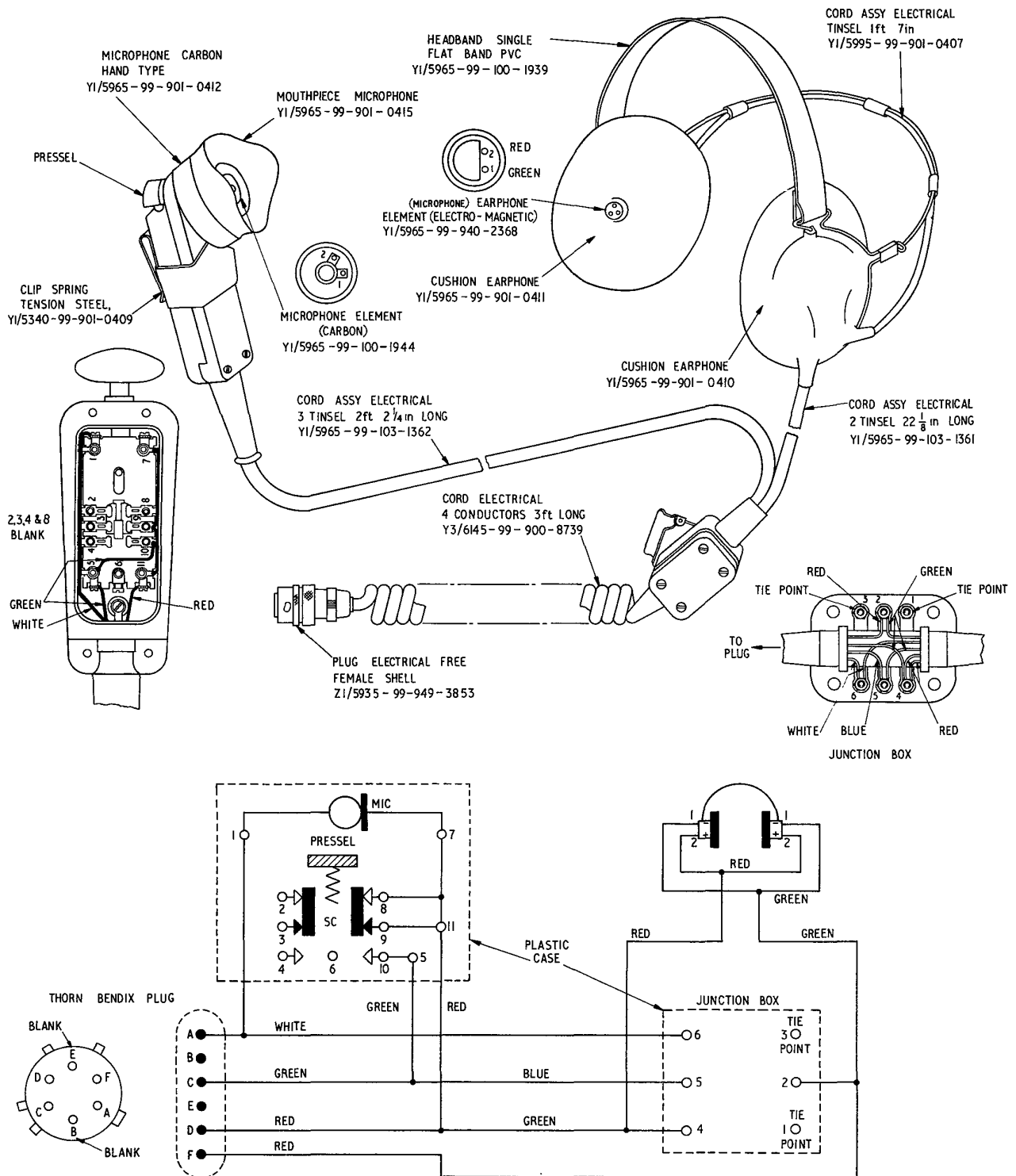


Fig 2 - Headset, microphone, SI type, magnetic earphones and carbon microphone

Mechanical repairs and adjustments

21. A control knob can be removed (after setting in the central position) by holding the plastic body firm by hand and unscrewing the central dome-headed cap, this will prevent unscrewing torque being taken by the mechanical stop of the control.

22. To replace, refit the knob over the spindle and tighten the dome-headed cap, with the control set in the central position. Check to see that calibration is maintained.

Internal repairs

23. The 14-pole sockets SKTD, SKTF and SKTK should be secured by tightening the screwlock at each end alternately 1/2 a turn at a time. Similarly loosening should be carried out by unscrewing 1/2 a turn at a time to each screwlock alternately. If the above procedure is not carried out, 14-pole plugs PLD, PLF and PIK will be damaged beyond repair.

24. The pins of PLA should be clean and maintain a good contact when the A43R is cased.

25. In order to maintain the performance specification, PLC, PLE and PLJ should be kept tight (pliers should not be used for this purpose).

26. The screws securing the transmitter or receiver assemblies require the use of a Wrench, set screw, 3/32 in. dia; and unless these are loose they should not be disturbed.

27. The method of checking the battery is to connect it to a battery charging unit (see para 8 and 9) and allow ten to fifteen minutes for the battery to stabilize. If the charging unit meter reads in the red area, the battery is well up. If the meter reads in the blue area, the battery needs recharging.

Fault location

28. Fault location is shown in Table 1.

Symptom	Possible fault	Remedy
Set appears lifeless	(1) Battery needs recharging (2) Faulty head or handset (3) Internal fault	(1) Change and recharge (2) Change (3) Report to technician
Weak signals	(1) Battery needs recharging (2) Poor antenna contact (3) Faulty head or handset (4) Dirty audio sockets (5) Internal fault	(1) Change and recharge (2) Clean antenna socket and base and retest (3) Change head or handset (4) Clean and retest (5) Report to technician
Weak or no sidetone or weak speech on transmit (Reported from other station)	(1) Faulty head or handset (2) Dirty audio sockets (3) Battery needs recharging (4) Carbon granules 'packed' in microphone (5) Internal	(1) Change (2) Clean and retest (3) Change and recharge (4) Gently tap microphone casing several times against palm of hand (5) Report to technician

Table 1 - Fault location

Adjusting the charging unit

29. Initially, two dissimilar types of battery may be encountered for use with the A43R. These require different charging voltages and the battery charging unit must be adjusted accordingly.

30. Adjustments to the battery charging unit must be made by qualified technicians.

31. Preliminary to para 32 and 33:-

- (a) Connect the battery charging unit to a suitable d.c. supply continuously variable between 10 and 31V at 3A.
- (b) Switch on the d.c. supply and note that the relay RLA (Fig 3) operates at $19 \pm 1V$.
- (c) If the relay operates at any other voltage the unit should be returned to workshops. (R1 must be changed for a resistor of suitable value to obtain correct relay operation.)

32. To set the battery charging unit for Magnatex (lead-acid) batteries:-

- (a) Set the d.c. input voltage to 11V and adjust RV1 (Fig 4) for an output of $13.2 \pm 0.1V$ on no load.
- (b) Increase the d.c. input to 22V and check that relays RLA and RLB (Fig 3) are operated. Check that the output is $13.2 \pm 0.1V$.

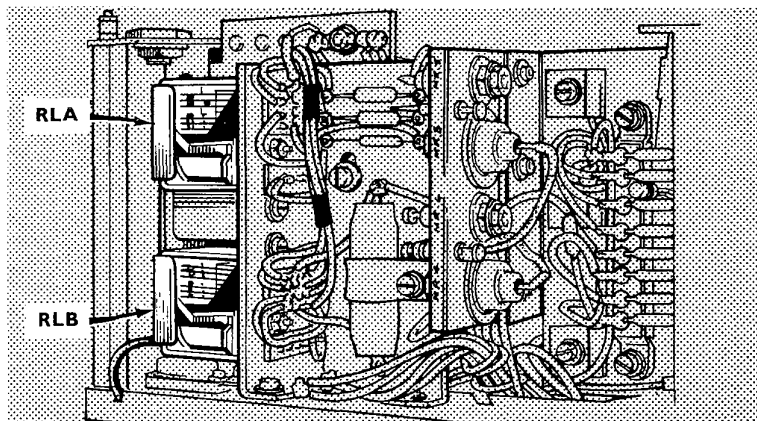


Fig 3 - Relays - battery charging unit

- (c) Increase the d.c. input to 30V and check that the output remains $13.2 \pm 0.1V$.
 - (d) Load the output to $25 \pm 5mA$ and check that the meter needle coincides with the calibration mark between the red and blue sections of the scale. If the meter needle reads any other position, adjust RV2 until the discrepancy is corrected.
33. To set the battery charging unit for Nife (nickel-cadmium) batteries:-
- (a) Reduce the d.c. input to 11V and adjust RV1 for an output of $14.6 \pm 0.1V$ on no load.
 - (b) Increase the d.c. input to 16V and check that the output remains at $14.6 \pm 0.1V$.
 - (c) Increase the input to 22V, then to 30V, checking that the output remains at $14.6 \pm 0.1V$.
 - (d) Load the output to $150 \pm 25mA$ and check that the meter needle coincides with the calibration mark between the red and blue sections of the scale. If the meter needle reads any other position adjust RV2 until the discrepancy is corrected.
34. Setting the 'tell-tale' plate:-
- (a) A small plate will be found screwed to the inside of the flange round the front panel of the charging unit. The plate is engraved for Magnatex batteries on one side and for Nife batteries on the reverse.

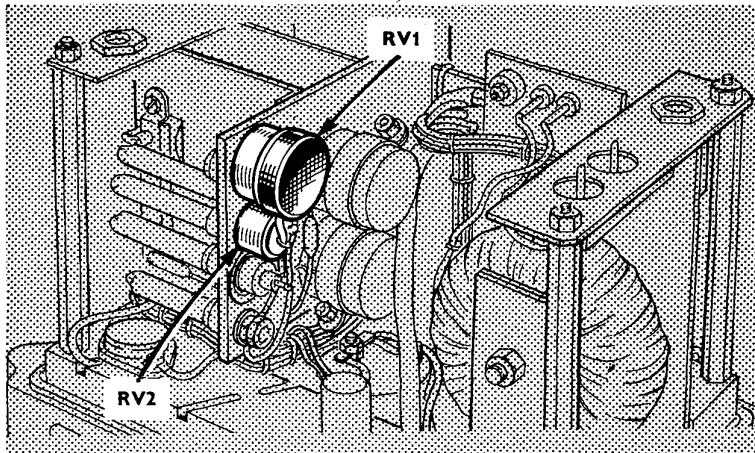


Fig 4 - Potentiometers - battery charging unit

- (b) After any change in the charging voltage of the unit the plate must be removed and refitted, showing to which type of battery the unit has been adjusted.

35. When the unit has been opened it must be returned to workshops at the earliest opportunity for drying and resealing.

Changing frequency

General

36. The following information whether used by a technician or operator is for emergency use only in the field.

37. After a frequency change of this nature the set must be returned to workshops at the earliest opportunity for drying and resealing.

38. It is essential that while the set is open it is kept clean and dry. A clean working surface should be used and, when necessary a rainproof cover must be available.

39. A No 2 BA hexagon socket wrench (Allen key) will be required for removing the case securing screws. Ordinary screwdrivers are not suitable.

40. A special alignment tool is provided with the kit for lifting the biscuits from the turret drums. WARNING: A normal hexagon socket wrench must not in any circumstances be used in place of the special tool. Small capacitors will be irreparably damaged if this instruction is disregarded.

41. In the following text the term 'biscuit' is used in preference to the designation radio frequency tuner.

42. Spare biscuits covering the frequency range of the set kit will be found in Case, radio frequency tuner (5820-99-949-2952) of the same serial number as the set (para 3(e) and (f) refers). This must be available before the set is opened.

43. Changing frequency should not prove too difficult if the sequence of operations is closely followed. For obvious reasons the greatest possible care should be taken while the set is open not to damage or disturb vulnerable components or fittings. It is important that the turret drum is not rotated when the biscuits are removed, as the stator contacts setting can be altered.

Preliminary

44. When multiple frequency changes are to be made, it is suggested that each channel be treated individually. The complete change may take a little more time but there will be no possibility of mis-placing biscuits of different frequencies.

45. Find out the new frequency or frequencies and the channels to which they are allocated.

46. Four biscuits will be required for each frequency, two for the transmitter and two for the receiver.

47. Select from Case, carrying, radio frequency tuners the four biscuits. If the new frequency is 282.8Mc/s, the biscuits required will be:-

RF 282.8	5820-99-949-4432)	Receiver
RR 282.8	5820-99-949-4408)	
TF 282.8	5820-99-949-4456)	Transmitter
TR 282.8	5820-99-949-4383)	

48. The letter coding indicates the nature of the biscuit and its position in the turret, that is:-

TF	- transmitter biscuit, front turret drum	- yellow
TR	- transmitter biscuit, rear turret drum	- red
RF	- receiver biscuit, front turret drum	- blue
RR	- receiver biscuit, rear turret drum	- green

49. When the correct biscuits have been found, remove them from their packing. Retain the packing and temporarily place the biscuits in a safe place.

Removing the set from the case

50. Set the OFF-PHONE-BEACON control to OFF.

51. Using the No 2 BA socket wrench (Allen key) release the four captive screws (Fig 5).

52. Gently part the front panel from the case. If the two sections cannot be parted by hand carefully insert a knife blade between the two sections of one of the lugs (see Fig 5) and apply a gently twisting movement. Note that from now onwards hand-holds must be on the chassis or metalwork not on valves or components.

53. Once the front panel is free of the case, carefully slide the set out, taking care not to damage valves or components projecting above the transmitter and receiver chassis.

54. Put the case in a clean dry place until required for refitting.

Changing the biscuits

55. All biscuits can be changed with the set positioned as shown in Fig 6, that is with the turret uppermost.

56. For each channel there are four biscuits (para 48), two for the transmitter and two for the receiver. The related transmitter and receiver biscuits for any channel are on opposite sides of the drums, 180 degrees apart.

57. Set the CHANNEL control (Fig 5) to the first channel the frequency of which is to be changed. This will bring the receiver biscuits into their operating positions under the row of spring contacts. The channel number and biscuit coding will be found marked on the front face of each drum (Fig 6).

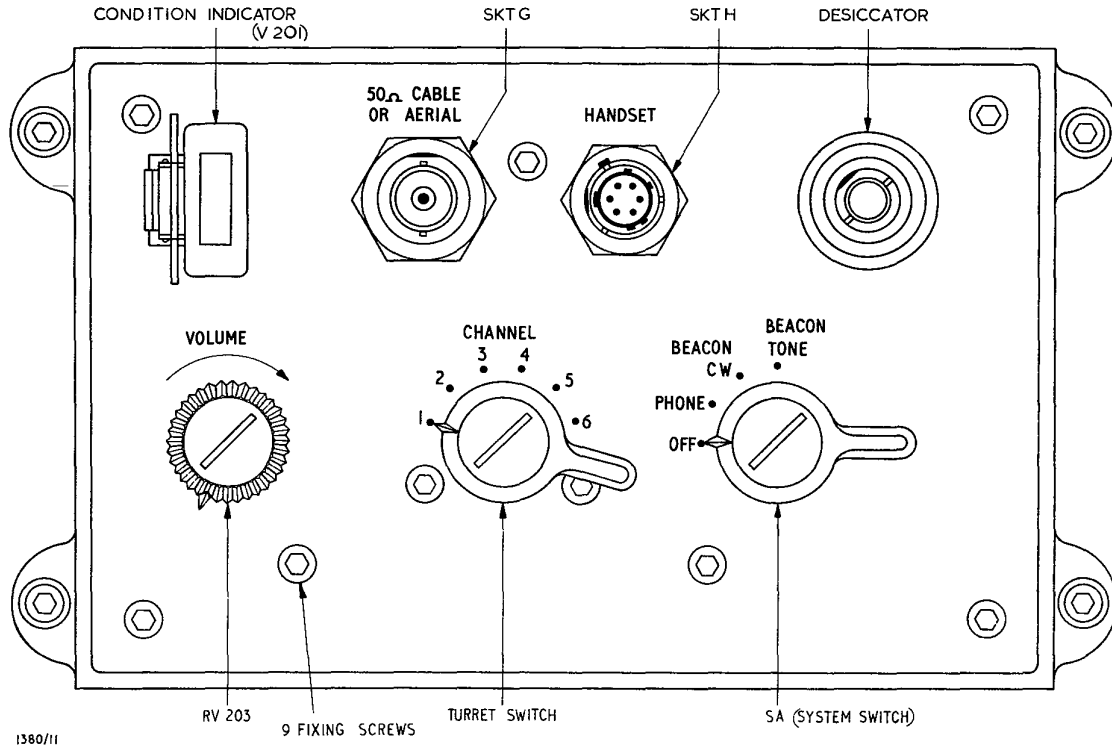


Fig 5 - Front panel layout

58. Now turn the CHANNEL control anti-clockwise. This will bring the biscuits clear of the contacts and make them accessible for removal.

59. To remove any biscuit, take the special tool in the right hand and insert the short bent end into the slot in the front face of the turret. With the thumb of the left hand apply pressure on the spring clip located almost in the centre of the biscuit and at the same time gently lift the special tool. The biscuit will rise from its seating and can be taken out of the drum.

60. The biscuits must be handled by the mouldings not by the small capacitors, the settings of the small capacitors must not be changed.

61. To fit the new biscuit, take the correct biscuit for the position in the right hand with the contact studs uppermost and away from the operator. Insert the left-hand end into the slot in the rear face of the drum then lower it over the spring clip. Apply light pressure centrally on the moulding and the biscuit will clip into position.

62. Change both the receiver biscuits as described in para 59 and 61.

63. Now turn the CHANNEL control approximately 180 degrees anti-clockwise to bring the transmitter biscuits into the accessible position. To avoid any possibility of error, check the marking on the ends of the drums for the correct channel.

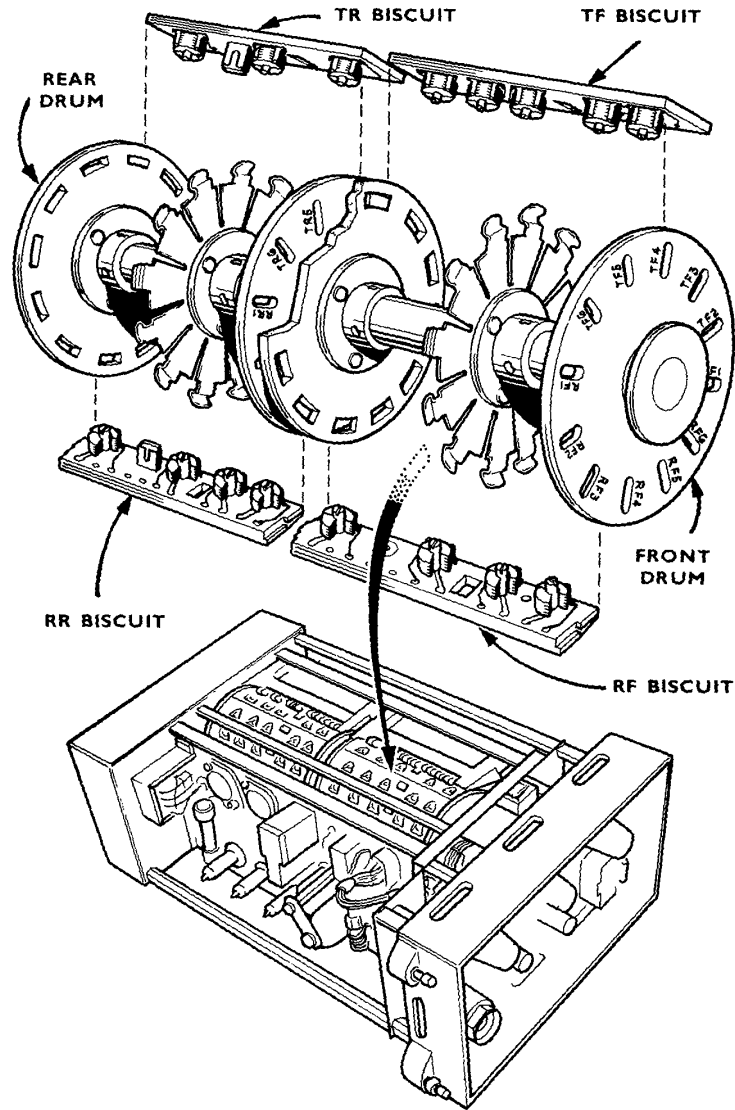


Fig 6 - Turret and tuners, radio frequency

64. Remove the old biscuits from their positions using the procedure described in para 59.

65. Fit the new biscuits into the turret drums as described in para 59 and 61.

66. The four biscuits removed from the set should be placed in the packing removed from the replacement biscuits and the frequency and catalogue number amended to correspond with those on the biscuits.

67. To change frequency on any other channel repeat para 57 to 66.

Refitting the set into the case

68. The projecting components on both the transmitter and receiver chassis are prone to damage while refitting the case; care must be taken.

69. The position of the two battery pins on the rear end of the set must be observed. Then look inside the case and note the placing of the two battery sockets. The set will not fit fully into the case if the pins and sockets are incorrectly aligned.

70. Lift the set and stand it on the guard-rim around the front panel (with battery connector pins pointing upwards).

71. Fit the rubber gasket into the groove on the back of the front panel and make certain of a good fit all the way round.

72. Suspend the case over the set (the right way round), carefully lower it until the battery connector pins and sockets engage, then push the case and front panel together taking care not to disturb the rubber gasket.

73. Now hold the front panel and case with both hands and turn completely over. Stand it with the front panel facing upwards. Re-engage the four captive screws and tighten these firmly using the No 2 BA socket wrench. The screws should only be tightened firmly, excessive force need not be used.

Retesting

74. After any frequency change the set must be tested as detailed in para 5 before being used.

Resealing

75. The set should be fitted with a recently re-activated 1.1/4 in. x 5/8 in. silica-gel (green canister) desiccator and replaced in its case immediately on completion of the repair. If no unit repair is possible and the set is to be sent to a workshop for further action, then a re-activated desiccator should not be fitted.

76. This regulation is not an authority for the issue of stores or equipment but if suitable facilities are available, silica-gel desiccators may be re-activated by drying in an oven at 140°C for 2 hours.

77. At the first available opportunity a set which has undergone emergency repair must be sent to a Field workshop for inspection and specification tests. Brief details of emergency repairs carried out will be noted in the AF G 1045.

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END