

RADIO SET PRC-F1

UNIT REPAIRS

INTRODUCTION

1. The Receiver-Transmitter RT-F1/PRC (the RT-unit) of the Radio Set PRC-F1 is pancrimatically sealed and operators are forbidden to break the seal and open the set. Qualified radio tradesmen are to open the set only when dessicating and resealing equipment is available.

GENERAL

2. Unit repairs are restricted generally to external components and accessories. Because of the self-contained and sealed nature of the equipment, unit repair is necessarily limited. Testing for correct operation is to be carried out as described in para 34 to 43.

SAFETY

Discarded Batteries

3. Discarded batteries must not be burned, as they are liable to explode if heated excessively.

Power Sources

4. The Radio Set must not be operated from any power source other than those for which it is designed, namely, the internal battery BB-F1 or the Power Supply PP-F1.

Proximity to Transmitters

5. The set must not be operated in close proximity to other radio transmitters operating in the same frequency range. If this is unavoidable the distance separating the antennas should be as great as possible, but should never be less than that tabulated below.

TABLE 1 - MINIMUM DISTANCE BETWEEN TRANSMITTERS

Nearby Transmitter Type	Possible Power Output	Minimum Antenna Spacing for 8 ft & 16 ft Vertical Antennas
PRC-F1	10 watts	15 ft
PRC-47	100 watts	15 ft
GRC-106	400 watts	36 ft

ROUTINE MAINTENANCE - RT UNIT

6. Examine the general condition of the set, paying particular attention to any dents or deformations of the case which could destroy the airtight seal with the front panel.
7. Clean all plugs and sockets, ensuring that no foreign matter remains in the receptacle or the screw threads. All plug and socket pins must be straight and perpendicular to the connector body.

CAUTION: TO AVOID DAMAGE TO CONTACT SURFACES, DO NOT USE ABRASIVE MATERIALS OR SHARP TOOLS.

8. Ensure that the dummy plug PLA is securely attached to the set with nylon cord. If this plug is lost, the RT unit cannot be operated from the internal battery.
9. Inspect the battery compartment. Ensure that the spring clips which secure the cover are operating correctly. Check that the synthetic rubber O ring is in place and is free from any signs of damage. Test the 9 nuts and screws accessible in the battery compartment for tightness. A crinkle washer should be under each nut. Inspect the soldered joints.

10. Battery contact springs should stand at least 3/16 in above the white plastic moulding. If the springs are bent or distorted they should be replaced (para 29 d). The contacts should be wiped with a soft cloth to remove any dirt or grease.

WARNING: THE CONTACT SURFACES ARE PLATED WITH PRECIOUS METAL AND MUST NOT BE CLEANED WITH FILES OR ABRASIVES OF ANY KIND.

11. All knobs should be tested for tightness on the spindles. The grub screw fits in a hole in the spindle, which has a flat milled on the side to engage in a D shaped hole in the knob.

12. Clean the windows through which the battery test lamp and the humidity indicator are viewed. Examine the colour of the humidity indicator. If it has turned pink, moisture is present inside the unit and it must be returned as soon as practicable to the nearest RAEME workshop for drying and resealing.

13. Test the tightness of the screws holding the perspex designation panel, and the four screws holding the protective case to the front panel.

14. Clean the Earth and Wire Antenna terminals, and the whip antenna socket. They must be free from dirt both on the contact surfaces and the external screw threads.

ROUTINE MAINTENANCE - ACCESSORIES

Handset

15. Clean the outside of the handset, cable and plug. Unscrew the moulded caps and clean the inserts. Check that the rubber ring is in place under the insert. Inspect the cable wiring. If broken or damaged, it may be replaced as described in para 30.

Key

16. This is a standard Key, Telegraph, lightweight (Aust) No 1 (repair as described in TELS L863-4), except for the cable plug. For repairs to wiring see para 30.

Microphone

17. Clean the microphone, cable and plug. Examine the sealing between the two halves of the case, and around the Pressel switch and cable clamp. For wiring to the plug and headset adaptor, see para 32.

Headset

18. This is a sealed unit with a replaceable cable. Clean and protect when not in use.

Coupler, Antenna CU-F1

19. Inspect the coupler for mechanical damage. Clean out the collet at the top and the plug connector at the bottom. Make sure that the collar on the lower part of the housing is securely tightened. Test that the tuning indicator knob operates properly and that the coloured indicator inside the window moves correctly when the knob is turned.

Antenna, AS-F1

20. The 8 ft whip antenna sections must be inspected for damage and cleaned, paying attention to the ends, which must be clean and tight to make good electrical contact. For repairs to the nylon cord, see para 33.

Dummy Plug

21. This is a 3-pin plug with a shorting link between pins A and B, to connect the internal battery to the +28V power input of the RT unit. Test the shorting link and check that the seal is in place in the plug cover.

Battery

22. When using the Installation Kit, Electronic Equipment MK-F8, the battery of the RT unit should be charged as follows: -

- a. Set the charge rate on the Power Supply PP-F1 to FULL for a period equal to 1.4 times the period of use since the last charge. For example, if the RT unit has been used for 4 hours, charge at the FULL rate for 5.6 hours.
- b. At the end of this period, set the charge rate to TRICKLE and leave it in this position.

WARNING: DO NOT LEAVE THE BATTERY ON FULL CHARGE FOR LONGER THAN SPECIFIED ON THE BATTERY CASE.

Whenever possible, use should be made of the Regulator Set MX-F1. This equipment will charge up to 10 batteries simultaneously. A description of this equipment, and the precautions to be observed when charging nickel-cadmium batteries, will be found in the User Handbook for the Regulator Set MX-F1.

WARNING: THE BATTERIES MUST NOT BE CHARGED BY ANY MEANS OTHER THAN EITHER THE POWER SUPPLY PP-F1 OR THE REGULATOR SET MX-F1.

Cable, RF, RT Unit to Coupler CU-F2

23. For information on this cable, and the correct procedure for fitting the BNC connector to the coaxial cable, refer TELS L133.

Cable, Electrical, Power Supply PP-F1 to RT Unit

24. For repairs to this cable, refer to TELS K573.

Bag, Cotton Duck

25. Clean the bag with water and a stiff brush. Remove grease with cleaning fluid or gasoline.

Transit Case

26. Inspect the sealing ring around the inside of the lid, and the small rubber O ring in the air valve. If necessary, lightly grease the eccentric movements of the spring clamps.

APPARATUS AND TOOLS

27. No special tools are needed. All work can be carried out using the tools contained in the Tool Kit, Wireless Mechanic? lightweight, 5810-66-018-3581.

TEST EQUIPMENT

28. The following items of test equipment are required: -

- | | |
|---|------------------------------------|
| a. Marconi Test Set | TF 1065A |
| b. Multimeter | AVO No 8 or Multimeter (Aust) No 2 |
| c. Audio Oscillator | HP 208A |
| d. Signal Generator | AVO No 2 |
| e. Dummy Loads as described in Table 3 (para 42). | |

REPAIR INSTRUCTIONS - RT UNIT

29. a. Clean the outside of the RT unit thoroughly. Clean terminals, sockets as described in para 7.

- b. If dirt is present under the perspex cover panel, remove the knobs, unscrew the panel and clean the front panel of the RT unit and the rear of the perspex cover. If the perspex cover is damaged it may be replaced by the same procedure.

CAUTION: DO NOT USE CLEANING FLUID OR ABRASIVES ON THE PERSPEX PANEL, OR THE LETTERING MAY BE DAMAGED. USE A CLEAN, SOFT DAMP CLOTH ONLY.

- c. Replace the perspex cover (if removed) and tighten all knobs.
- d. The battery contact springs should be replaced if they become corroded, worn or damaged in any way. To replace, remove the rear cover and battery, unscrew the 4 small nuts and replace the contacts, making sure that the lug on the + terminal spring and the earth strap on the - terminal spring are in place.

REPAIR INSTRUCTIONS - ACCESSORIES

Handset

30. The handset is of the standard pattern except for the microphone insert and the cable plug. The microphone insert is a dynamic type and may be replaced in a similar manner to the standard type. The 5-pin cable plug consists of a hollow metal body with a moulded plastic insert carrying the contact pins. The insert is held between a shoulder in the body and the rear clamping nut by a plastic spacer. Three steel locating pins inside the body engage in slots on the corresponding socket on the RT unit, the pins being offset to prevent misalignment. The wiring may be inspected or renewed by unscrewing the cable clamp nut at the rear, pushing the insert back from the front end and then withdrawing the cable and insert. The wire ends are crimped into small brass sleeves which are a press fit in the hollow rear ends of the pins in the insert (Fig 1). A restraining cord in the cable is knotted and fitted into a slot in the plastic spacer.

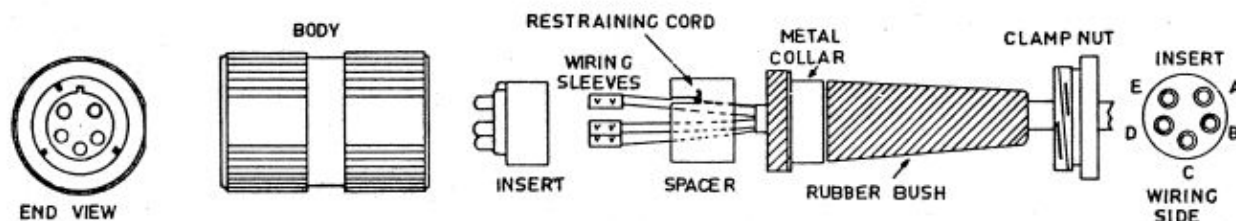


FIG 1 - FIVE PIN PLUG

CAUTION: THE PLASTIC SPACER AROUND THE PINS AT THE REAR OF THE INSERT IS AN ESSENTIAL PART OF THE PLUG AND MUST BE REPLACED OR CONTACT WITH THE SOCKET PINS WILL NOT BE MADE.

When reassembling, ensure that the locating key on the insert is in the keyway in the metal body. The pin connections are listed in Table 2.

Microphone, Dynamic

31. This component uses a replaceable dynamic insert of the same type as that used in the handset (para 30). The moulded case is in two halves which may be separated after undoing 4 screws. The Pressel switch spring, the rubber seal over the pressel button and the microswitch may be lifted from the case and replaced as necessary. Before reassembling, the Silastic cement between the two halves of the case, and around the pressel switch and the cable end should be removed and replaced with a fresh application of Silastic or other approved sealing compound.

Microphone Cable and Adaptor

32. The cable plug is similar to that used on the handset, except that an adaptor for the headset plug is mounted at the rear, between the body of the connector and the cable clamp. The adaptor carries a socket into which the miniature plug on the headset cable is inserted. The arrangement is shown in Fig 2 and the wiring connections are listed in Table 2.

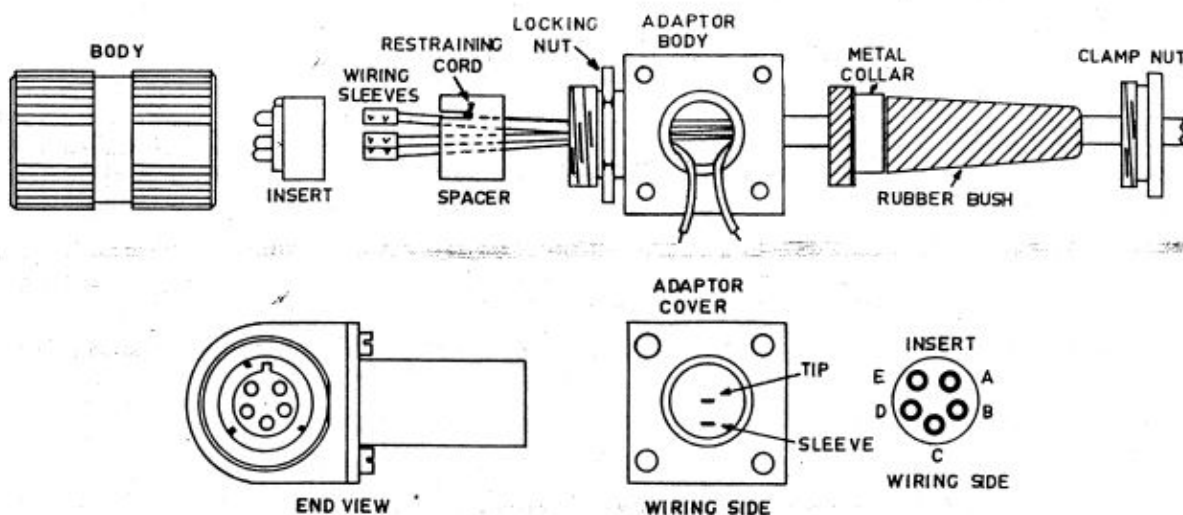


FIG 2 - FIVE PIN PLUG WITH ADAPTOR

TABLE 2 - PLUG CONNECTIONS

Plug Pin	Function	Wire Colour		
		Handset Plug	Microphone Plug	Key Plug
A	Earth	Braid & White	Green (2 wires)	Red
B	Receiver	Red	Blue	—
C	Key/Pressel	Green	White	Braid
D	Microphone	Blue	Red	—
E	Not Used	—	—	—
Headset Adaptor				
Sleeve	Earth	Green		
Tip	Receiver	Blue		

Antenna, AS-F1, Cord Replacement

33. If the nylon cord which holds the sections of the whip antenna together is broken or frayed, it may be replaced as follows:—

- Remove the old cord.
- Fit the antenna sections together to check the correct order.
- Disassemble and lay out the sections in order.
- Secure the free end of the new cord in an eye at the end of a 15 in (minimum) length of suitable wire, e.g., 22 SWG copper.
- Feed the wire through the hole in the lowest section and pull the cord right through.
- Feed the wire through the other sections in order, pulling the cord right through each time, and make a knot at the top of the last section.

ELECTRICAL TESTS**General**

34. If possible, power the RT unit with the Power Supply PP-F1 during the tests outlined hereunder. If the internal battery

is used, it must be a known good battery, fully charged. Check that the dummy plug PLA is in place on the EXT PWR socket SKA and test the battery with the BAT lamp.

35. If the set has just been returned from a workshop or depot where the protective case may have been removed, rotate all the decade dials (kHz switches) through their complete range to ensure that they are all engaged with the synthesiser circuits.

Transmitter Power Output Tests

36. a. Connect the Audio Oscillator HP 208A to the microphone input SKCC and connect the Marconi Test Set TF1065A to the coaxial output socket SKEE. Connect the telegraph key to SKDD.
- b. Set the MATCH switch to O, the Mode switch to SSB, the WHISPER-SPEECH-BAT switch to SPEECH and the Power switch to HI.
- c. Set the audio oscillator frequency to 1 kHz and the output level to 2 mV.
- d. Operate the key and measure the power output on each MHz band from 2 to 8. The output should be greater than 9 watts.
- e. Repeat for the 9 to 11 MHz bands. The output should be greater than 7 watts.
- f. Set the MHz switch to 2. An output greater than 9 watts should be obtained for all positions of the kHz x 100 switch.
- g. Reset the kHz x 100 switch to O and repeat for all positions of the kHz x 10 switch.
- h. Reset the kHz x 10 switch to O and repeat for all positions of the kHz switch. The power output in all cases should be greater than 9 watts.
37. Set the WHISPER-SPEECH-BAT switch to WHISPER and reduce the audio input level to 0.7 mV. The output should be greater than 9 watts at 2.0 MHz.
38. Set the Mode switch to AM and the Power switch to HI. The power output between 2 and 8 MHz should be greater than 5 watts, and greater than 4 watts between 9 and 12 MHz.

Functional Tests

39. a. Remove the audio oscillator and plug in the handset.
- b. With the Mode switch set to AM, operate the Pressel and speak into the microphone. Check for the presence of sidetone in the earpiece and a reading on the power output meter.
- c. Switch to SSB and check for sidetone and output as in step b.
- d. Switch to CW1, HI power. Operate the key and check for the presence of sidetone at approximately 2 kHz. The power output should be greater than 6 watts from 2 to 8 MHz and greater than 5 watts from 9 to 12 MHz.
- e. Switch to CW2 and repeat the procedure of step d at 2 MHz only.

Antenna Matching and Tuning

40. a. Disconnect the test set from SKEE and connect it to the WIRE antenna (red) terminal. Earth the test set to the earth terminal of the RT unit.
- b. Set the kHz switches to 2.0 MHz, the Power switch to TUNE, the Mode switch to CW1, and carry out the tuning and matching instructions as given in the PRC-F1 User Handbook. When the RT unit is matched into the test set, turn the Power switch to HI. The power output should be approximately 5 watts.
- c. Repeat the procedure given in step b at 6 and 11 MHz.
- d. Remove the test set and connect the Coupler CU-F1 and the 8 ft whip antenna. Set the Power switch to TUNE. A dip in the frequency of the tuning tone should be heard as the CU-F1 is tuned to the operating frequency. Carry out this test at 2, 6 and 11 MHz.

Receiver Tests

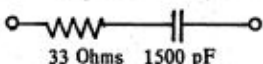
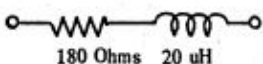
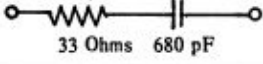
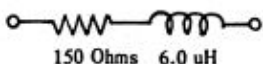
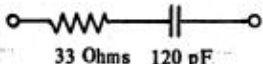

41. a. Connect the AVO signal generator to the coaxial socket SKEE and the handset to SKCC or SKDD.

- b. Set the signal generator to CW emission and the output to 10 μ V.
- c. On the RT unit, set the VOL control fully anticlockwise and the Mode switch to SSB. Set the Power switch to TUNE, LO or HI and advance the VOL control clockwise until receiver noise is heard in the handset.
- d. Set the kHz switches to 2.0 MHz and tune the signal generator around 2 MHz until an audio tone is heard in the handset. Adjust the generator tuning until this tone is in the vicinity of 1 kHz.
- e. If necessary, reset the generator output level to 10 μ V. Adjust the VOL control and verify that adequate audio level is available in the earpiece.
- f. Tune the RT unit successively to 2001, 2002, to 2009 kHz and adjust the generator tuning each time until the audio tone is in the vicinity of 1 kHz. The audio output should be maintained at approximately constant level.
- g. Repeat the procedure of step f with the RT unit tuned in 10 kHz steps from 2010 to 2090 kHz.
- h. Repeat step f with the RT unit tuned in 100 kHz steps from 2100 to 2900 kHz.
- i. Repeat with the RT unit tuned in MHz steps from 2 to 11 MHz.
- j. Turn the Mode switch to CW1 and repeat the procedure given in steps d and e only.
- k. Turn the Mode switch to CWN and repeat steps d and e, except that in this case, owing to the narrow band filter, the audio tone will be heard only around 2 kHz and the tuning will be very sharp.
- l. Without disturbing the signal generator, turn the Mode switch to CW2 and adjust the BFO for a tone in the vicinity of 1 kHz. Check that adequate audio output power is available.
- m. Set the Mode switch to CWN and with the RT unit tuned to 2000 kHz adjust the generator tuning until a 2 kHz tone is heard. Turn the Mode switch to AM and switch on the signal generator modulation at 1 kHz. Check that the audio output can be adjusted to an adequate level by the VOL control.

Tests with Dummy Loads

42. The following tests will verify the proper functioning of the internal coupling circuits of the RT unit. The dummy loads required are shown in Table 3. These loads represent the design limits of the matching and tuning circuits. All antennas fall within these limits.

TABLE 3 - DUMMY LOADS FOR PRC-F1

Load No	Configuration	Details of Components
1	 33 Ohms 1500 pF	Resistor: 33 Ohms $\pm 5\%$, 5W, metal oxide Welwyn F33 Capacitor: 1500 pF $\pm 5\%$, metallised mica Simplex MS
2	 180 Ohms 20 μ H	Resistor: 180 Ohms $\pm 5\%$, 5W, metal oxide Welwyn F33 Inductor: 103 turns of 36 SWG enam copper on 3/16 in former, winding length 1/2 in.
3	 33 Ohms 680 pF	Resistor: 33 Ohms $\pm 5\%$, 5W, metal oxide Welwyn F33 Capacitor: 680 pF $\pm 5\%$, metallised mica Simplex MS
4	 150 Ohms 6.0 μ H	Resistor: 150 Ohms $\pm 5\%$, 5W, metal oxide Welwyn F33 Inductor: 59 turns of 36 SWG enam copper on 3/16 in former, winding length 1/2 in.
5	 33 Ohms 120 pF	Resistor: 33 Ohms $\pm 5\%$, 5W, metal oxide Welwyn F33 Capacitor: 120 pF $\pm 5\%$, metallised mica Simplex MS
6	 100 Ohms	Resistor: 100 Ohms $\pm 5\%$, 5W, metal oxide Welwyn F33

Notes: All capacitors 500 VDCW. All inductors wound on ceramic (or equivalent) formers.

- a. Set up the RT unit with the handset plugged into SKCC. Set the Power switch to TUNE and the Mode switch to CW1.
- b. Set the frequency to 2.0 MHz and fit Dummy Load No 1 to the Wire (red) terminal and earth.
- c. Set the MATCH, TUNE and FINE controls fully anticlockwise.
- d. Using the TUNE and FINE controls, adjust for the lowest pitch tuning tone.
- e. Adjust the MATCH switch for lowest pitch tone.
- f. Repeat steps d and e until the lowest tone is achieved. Compare the switch positions with those shown in Table 4.
- g. Note that whilst manipulating the TUNE, FINE and MATCH controls, no sudden change in tone should be heard in any switch position except at one or two steps on either side of the correct matching or tuning setting. There may be changes in pitch BETWEEN switch positions. A discontinuity in pitch other than at the correct tuning position, or between switch positions, may indicate broken connections or faulty components in the internal coupling circuits.
- h. Connect Load No 2 and repeat steps c to g.
- i. Change the frequency to 5MHz and fit Load No. 3. Repeat steps c to g.
- j. Connect Load No 4 and repeat steps c to g.
- k. Change the frequency to 11.999 MHz and fit Load No 5. Repeat steps c to g.
- l. Fit Load No 6 and repeat steps c to g.

43. Table 4 shows the approximate settings of the MATCH and TUNE controls when the RT unit is correctly matched to the dummy loads.

TABLE 4 - CONTROL SETTINGS WITH DUMMY LOADS

Frequency (MHz)	Dummy Load No	Match	Tune
2	1	At or near anticlockwise end.	At or near clockwise end (position 11).
2	2	At or near clockwise end.	At or near position 8.
5	3	At or near anticlockwise end.	At or near position 10.
5	4	At or near clockwise end.	At or near position 8.
12	5	At or near anticlockwise end.	At or near position 10.
12	6	Near clockwise end (little change in tone).	At or near position 10.

NOTE: The position of the FINE tuning control is not critical.

END