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RADIO SET CPRC-26

Unit Repair

GENERAL

1. This instruction outlines the action to be taken to effect unit repair and maintenance of the radio set CPRC-26.
2. All maintenance and repair to the radio set CPRC-26 must be carried out by qualified personnel. Field and base repair must not be attempted by unit personnel, but must be requested through the normal repair channels.

BRIEF OPERATING INSTRUCTIONS

3. The instructions which follow are to enable repair personnel to put the equipment into working condition and give it operating tests. Two complete and similar type stations are required.
 - (a) Assemble the equipment, using fresh batteries, attach the antennae and good handsets and switch to the LOUD position.
 - (b) By pressing the pressel switch on the handset transmit to the receiving station, and vice-versa on all six channels.
 - (c) Check the operation on QUIET position. The aural output from the ear-piece should drop considerably, and it will be necessary to speak only above a whisper for satisfactory transmission.

CARE AND MAINTENANCE

4. Removal and Replacement of Parts
 - (a) To Replace Microphone Capsule of Handset H 5001/PRC
 - (i) Unscrew microphone retaining cap on handset.
 - (ii) Remove microphone capsule and replace.
 - (iii) Reassemble.
 - (iv) Check operation of microphone.
 - (b) To Replace Receiver Capsule of Handset H-5001/PRC
 - (i) Remove screw holding receiver capsule to body of handset.
 - (ii) Remove receiver seal.

- (iii) Loosen the two screws on the edge of capsule and remove both connections to capsule.
- (iv) Replace capsule and reassemble.
- (v) Check operation of receiver.

(c) To Replace Receiver Capsule of Headset H 5002/PRC

- (i) Remove screw holding receiver assembly to buckle of headband.
- (ii) Remove rubber cover from receiver capsule.
- (iii) Loosen the two screws on the edge of capsule and remove both connections to capsule.
- (iv) Replace capsule and reassemble.
- (v) Check operation of receiver.

(d) To Replace Receiver Assembly of Headset H 5002/PRC

- (i) Remove screw holding receiver assembly to buckle on headband.
- (ii) Replace complete headset receiver assembly (including cord and plug).
- (iii) Reassemble new receiver assembly to headband.

NOTE: If any of the following parts of either the handset or headset become unserviceable, the complete item (less nylon headband and buckle in the case of the headset) is to be replaced and the unserviceable item sent for repair.

- (i) Cord or plug of handset or headset.
- (ii) Pressel switch of handset.

(e) To Remove Set from Case

- (i) Remove battery box by releasing the holding clamps on side of set case.
- (ii) Remove the six screws located at bottom of set case.
- (iii) Using a No. 8 Allen wrench, loosen the four screw clamps located around the outer edge of the control panel. Swing clamps back. DO NOT LOSE THEM.
- (iv) Pull the set assembly from the set case by the control panel.

(f) To Change Crystals (see Fig 2)

- (i) Remove set from case as detailed in para 4 (e) above.
- (ii) Invert chassis and release spring clips holding crystal bank in place.
- (iii) Remove crystal bank.
- (iv) Plug new crystal bank in place making certain the channel numbers (1 to 6) on the top of crystal bank correspond with numbers on edge of trimmer deck shield.
- (v) Realign set using the test set, as detailed in para 9.
- (vi) Reseal set in the case as detailed in para 10 and 11.

(g) To Replace Plug-in Units (see Fig 3)

- (i) Remove set from case as detailed in para 4 (e) above.
- (ii) Remove the screw and lockwasher from one end of the unit retainer and release the spring clip at the other end. Remove the unit retainer and the plastic retaining plate.
- (iii) Remove plug-in unit by pulling straight up as if removing a tube.

NOTE: Use extraction tool provided with test set, radio, to remove plug-in unit. If extraction tool is not available, the blade of a small screwdriver placed between the chassis and the edge of the plug-in unit will aid in removing the unit. Do not rock unit from side to side when removing. It may cause damage to the socket and intermittent operation will result.

- (iv) When replacing plug-in units, care must be taken to avoid damaging pins through misalignment and force. Check to ensure all pins are straight and in their proper position before inserting plug-in unit. If necessary, use pin straightener supplied with test set, radio.
- (v) Replace plastic retainer plate and unit retainer.
- (vi) Realign set as detailed in para 9.

TESTING

5. General

Test set radio CTS-3/PRC and Test set battery CST-4/PRC described below are supplied on demand to test the radio and battery respectively. No special

tools other than the tools supplied with the test sets and those available in the radio mechanic's tool chest are required to test the radio set.

TEST SET, RADIO CTS-3/PRC (see Fig 4)

6. (a) This is a milliammeter-vacuum tube voltmeter with switching facilities to permit measurement of various circuit conditions.
- (b) The following accessories and tools are used with the test set:
- (i) Power Supply
Battery, dry, BA-289/U (same as used in Radio set CPRC-26).
 - (ii) Dummy Load Electrical 4Z 1011967
When connected to the radio, set homing antenna socket provides correct loading for the radio set while under test.
 - (iii) Alignment Tool, Electronic CPRC-26 1Z 1011762
A socket-type tool for trimmer adjustments.
 - (iv) Wrench, hex L-shaped 5/64 in 1F 209062
Used to dismantle radio set.
 - (v) Extractor-Guard 4Z 1011969
For removing plug-in units. In transit it protects the pins on the test cable from damage.
- (c) The following table lists the controls and their functions for test set radio CTS-3/PRC.

TABLE 1

CONTROLS AND THEIR FUNCTIONS

Switch control or facility	Function
A DRAIN	Filament supply current drain
B ₁ DRAIN	Battery HT ₁ (45 volts) current drain of radio set
B ₂ VOLTS	Battery HT ₂ (90 volts) supply voltage of radio set
B ₂ DRAIN	Battery HT ₂ (90 volts) current drain of radio set
A VOLTS	Filament supply voltage of radio set

Switch control or facility	Function
AFC TEST	Bias voltage developed by AFC amplifier tube
(RF	Bias voltage by IF limiter
(MO	Voltage at "hot and cold" end of AFV discriminator as
TUNE(selected by the OFF-ON-MO switch
(PA	Voltage drop from HT ₂ to the screen grid of PA tube
3B4	Checks emission of tube only (half filament)
AF	Checks emission only of tube in plug-in unit
MOD	Checks emission only of tube in plug-in unit
AFC	Checks emission only of tube in plug-in unit
XLO	Checks emission only of tube in plug-in unit
MIX	Checks emission only of tube in plug-in unit
AMP RF	Checks emission only of tube in plug-in unit
IF & LIM	Checks emission only of tube in plug-in unit
METER	Measurement of total emission of the sub-miniature tube used in the test as a check on the operation of the test set.
SOCKET	A 7-pin socket set in panel of test set. It is associated with test switch and takes the various plug-in units and tubes under test.
OFF-ON-MO	A three pole, three position rotary switch in the battery supply to the test set. The MO position is spring-loaded and associated with the TUNE MO position of the test switch. This position allows the potential at the "cold" end of the AFC discriminator to be measured (ie, MO grid bias). In the ON position, it measures the DC output from the discriminator, superimposed on the MO grid bias. When both ends have the same potential, the MO is correctly tuned (ie, discriminator output voltage of zero volts).
METER SET	A potentiometer control for adjusting the test set meter in the AFC, Test, RF Tune and MO position of the test switch.
RESET	A circuit breaker, resettable from the front panel for meter protection.
TEST CABLE	A 5-conductor cable terminating in a 7-pin miniature plug. It plugs into the radio set TEST socket.
POWER CABLE	A 5-conductor cable terminating in a 5-pin plug. It connects to battery dry, BA 289/U to provide to the test set and the radio set under test.
SET CABLE	A 5-conductor cable terminating in a 5-pin connector. It connects to the radio set battery plug to provide power from the test set battery to the radio set under test.
PIN STRAIGHTENER	A built-in socket for straightening plug-in unit pins.

TEST SET, CTS-4/PRC (see Fig 1)

7. Test set, battery, CTS-4/PRC is a special pocket-type test set and is provided for determining the condition of battery, BA-289/U and BA-279/U. It incorporates loads which draw currents similar to those drawn by radio set CPRC-26 and radio set CPRC-510 on transmit. The test set plugs directly into the battery, the condition of each section being shown as "GOOD" or "BAD" by means of a meter. A four-position rotary switch is provided for selecting individual battery sections for test.

TESTING PROCEDURE - USING TEST SET CTS-3/PRC

8. (a) Preliminary Tests

- (i) Connect a serviceable battery to test set, radio CTS-3/PRC (a serviceable battery from the radio set CPRC-26 under test may be used if desired).
- (ii) Turn OFF-ON-MO switch to ON.
- (iii) Turn test switch to METER.
- (iv) Needle should come to rest in the GOOD range on the meter scale, indicating a serviceable tube in the test set.
- (v) Turn OFF-ON-MO switch to OFF.
- (vi) Connect test set power cable to radio set battery plug.
- (vii) Connect dummy load to homing antenna socket.
- (viii) Plug handset into audio socket.
- (ix) Turn set switch on test set to A VOLTS.
- (x) Turn OFF-ON-MO switch to ON.
- (xi) Turn OFF-QUIET-LOUD switch on radio set to either QUIET or LOUD.
- (xii) Check meter reading of test set on both transmit and receive.
- (xiii) Meter needle should come to rest in GOOD range on meter scale.
- (xiv) Turning test switch, check remaining current and voltage in a similar manner. Meter readings should be approximately as shown in Table 2 below.

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TABLE 2
TESTS AND EXPECTED METER READINGS

"TEST SET" switch setting	Meter Reading	
	Receive	Transmit
A VOLTS	"GOOD"	"GOOD"
A DRAIN	0.56 amp	0.85 amp
B ₁ DRAIN	14 ma	10 ma
B ₂ VOLTS	"GOOD"	"GOOD"
B ₂ DRAIN	3 ma	30 ma

NOTE: Figures in the above table are average and will vary depending on the condition of the battery used. If the meter reading is off scale in any one of the drain positions, it indicates a possible short in that portion of the circuit. In that case switch off the radio set. Test each unit as a separate entity until the faulty one is found; replace with a serviceable (tested) one and retest the current drains.

(b) To Test Plug-in Units and Tubes (see Fig 3)

WARNING: Observe the following sequence. Do not plug unit or tubes into test socket until the test switches have been set to the correct position for the unit under test; damage to the unit or tube may result.

- (i) Connect battery to test set and check as detailed in (i) to (v) of Preliminary Tests above.
- (ii) Remove set from case as detailed in para 4 (e).
- (iii) Remove unit retainer.
- (iv) Turn TEST SET switch on test set to IF and LIM.
- (v) Remove IF plug-in unit from radio set and insert in UNITS socket on test set.
- (vi) Turn OFF-ON-MO switch on test set to ON.

- (vii) Read condition of IF unit directly from meter scale (GOOD-BAD). If needle comes to rest in BAD section or goes off scale, return unit to RCOC and replace with a new one. Test the new unit in the same manner before installing in the ratio set.
- (viii) Test remaining IF units as detailed above. Then proceed with remaining units and tubes, setting test switch to the appropriate position in each case before plugging unit into test socket.
- (ix) See Table 3 below and realign set as detailed in para 9.

NOTE: When a plug-in unit is replaced, complete realignment of the set may not be necessary. A table listing the units and realignment required is shown below.

TABLE 3
UNITS REPLACED AND ACTION REQUIRED

Unit	Realignment Required
DISC (AUDIO & AFC)	Nil
XLO (Crystal Oscillator)	Nil
IF	Nil
LIM	Nil
AMP AFC	Nil
AMP AF	Nil
XFMR (Transformer)	Nil
AMP RF	as detailed in para 9 (b) and (d)
MIXER	as detailed in para 9 (b)
PA (3B4)	as detailed in para 9 (c), (d) and (e)
MO (3B4)	as detailed in para 9 (c), (d) and (e)
MO COIL	as detailed in para 9 (c), (d) and (e)
MOD	as detailed in para 9 (c), (d) and (e)

TABLE 4

RADIO SET CPCR-26 COMMON FAULT

Symptom	Probable Fault	Action To Be Taken
RECEIVE - Weak or dead	Mixer unit defective AMP AF unit defective	Replace defective unit and refer to Table 3 for realignment required.
TRANSMIT - No sidetone	Transformer unit or crystal oscillator unit defective	
RECEIVE - Weak or dead	Mixer unit defective AUDIO DISC unit defective	Replace defective unit and refer to Table 3 for realignment required.
TRANSMIT - Normal	LIM unit defective IF unit defective AMP RF unit defective Transformer unit defective	
RECEIVE - Normal	Mixer unit defective MOD unit defective	Replace defective unit and refer to Table 3 for realignment required.
TRANSMIT - No sidetone	AMP AFC unit defective AFC DISC unit defective Transformer unit defective MO Tube unit defective PA tube defective	

NOTE: (a) In addition to the above faults, weak signals or inaccuracy of transmitter signal can be caused by misalignment of the tunable RF circuits. Try realignment in accordance with para 9.

(b) The AFC TEST position of the test switch may be used to assist fault finding. For example on TRANSMIT the presence of a voltage indicates that the crystal oscillator and mixer are working properly.

ALIGNMENT - USING TEST SETS CTS-3/PRC

9. (a) General

Align the various stages in the order described. The following preliminary steps and information hold for all sections.

- (i) Connect up and check test set, radio, as detailed in para 8 (a).
- (ii) Remove set from case as detailed in para 4 (e).
- (iii) Remove unit retainer.
- (iv) Remove desiccator and insert test cable plug of test set in radio set test socket.
- (v) Connect dummy load to homing antenna socket.
- (vi) Plug handset into audio socket.
- (vii) Using alignment tool (held in clip inside test set cover) turn all condenser (MO, PA, RF) COUNTERCLOCKWISE until no thread shows on the condenser shaft. DO NOT UNSCREW CONDENSERS TOO MUCH OR THEY WILL SHORT AGAINST THE SHIELD.

(b) RF and Initial PA Tuning

- (i) Turn test switch on test set to TUNE RF.
- (ii) Turn OFF-QUIET-LOUD switch on radio set to either QUIET or LOUD.
- (iii) Turn channel switch to 1.
- (iv) Adjust METER SET on test set to bring meter needle to left hand zero on meter scale.
- (v) Tune RF condenser (Channel 1) for maximum reading on the meter. (See Fig 2 for location and markings of condensers).
- (vi) Tune PA condenser (Channel 1) for maximum reading on the meter; repeat (v) at least once more.
- (vii) Turn channel switch to 2, 3, etc and repeat (v) and (vi) above for each channel, tuning the RF and PA condenser associated with each channel. If necessary and as tuning progresses, keep needle at centre scale by METER SET.

(c) Initial MO Tuning

- (i) Turn channel switch to 1.
- (ii) Turn test switch on test set to TUNE MO.
- (iii) Switch radio set to transmit.

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- (iv) Adjust METER SET to bring needle on meter to the centre demarcation line.
 - (v) Turn MO condenser (Channel 1) clockwise gradually. As the master oscillator approaches the correct operating frequency, the meter needle will move sharply to the right and go off scale. Continue tuning SLOWLY in this direction until the needle returns and moves off scale to the left. Back off condenser and leave at point where needle stops at centre demarcation line.
 - (vi) Turn channel switch to 2, 3, etc and repeat (iv) and (v) above for each channel, tuning MO condenser (2, 3, etc) associated with each channel.
- (d) Final PA Tuning
- (i) Turn test switch on test set to TUNE PA.
 - (ii) Turn channel switch on radio to 1.
 - (iii) Switch radio set to transmit.
 - (iv) Turn PA condenser (Channel 1) for maximum reading on the meter; this will be maximum brightness of the dummy load.
 - (v) Turn channel switch to 2, 3, etc and repeat (iv) above for each channel, tuning the PA condenser (2, 3, etc) associated with each channel.
- (e) Final MO Tuning
- (i) Turn test switch on test set to TUNE MO.
 - (ii) Turn channel switch on radio set to 1.
 - (iii) Switch radio set to transmit. Turn OFF-ON-MO switch to MO and adjust METER SET to bring the meter needle to the centre demarcation line. Release MO switch.
 - (iv) Switch radio set to receive for approximately 5 seconds to allow for hysteresis in modulation transformer and return to transmit.
 - (v) Tune MO condenser (Channel 1) to bring meter needle back to centre demarcation line.
 - (vi) Check tuning by turning OFF-ON-MO switch to MO. When the channel is correctly tuned there will be no deflection of the meter needle from the centre demarcation line, indicating that the voltage at each end of the AFC discriminator is the same.

- (vii) Turn channel switch to 2, 3, etc and repeat (iii) to (vi) above for each channel, tuning MO condenser (2, 3, etc) associated with each channel.

(f) Sidetone Check

With the handset plugged into the audio socket check that sidetone is present on all channels. The presence of sidetone gives a good indication that all stages of the transmitter are functioning properly and that the transmitter signal is being modulated and is approximately at its correct frequency.

(g) Frequency Check Using Radio Set CPRC-26 as a Standard

A suggested method of determining if the transmitter frequency is correct is as follows:

- (i) Obtain one set which is known to be correctly aligned and place it beside the one to be checked.
- (ii) Place a third set near the other two and switch it to receive.
- (iii) Turn channel switch on all sets to 1.
- (iv) Switch both the standard set and the one to be checked to transmit.
- (v) Listen for the beat note of the two transmitter handset of the third receiver.
- (vi) If channel 1 is correctly tuned a beat note (up to 5 Kc) will be heard.
- (vii) If the beat note is above 5 Kc or not audible at all the channel tuning, crystals, or discriminator should be rechecked.
- (viii) Repeat (iv) to (vi) produce for each of the remaining channels.

VISUAL INSPECTION OF ASSEMBLY

10. Whenever the radio set had been removed from its case, a visual inspection of the following points should be carried out before the set is returned to its case:

- (i) Check overall assembly to ensure that no components are damaged or broken.
- (ii) Check top of chassis to ensure all plug-in units and tubes are firm in their sockets.

- (iii) Check unit retainer to ensure it is properly secured in place.
- (iv) Check spring clips on top of crystal bank to ensure they are in place.
- (v) Check rubber gaskets in groove on inside of control panel and on bottom of set case to ensure they are clean, undamaged and fitting properly.

DRYING AND SEALING

11. As components of radio set CPRC-26 may be affected by dampness, the chassis should be thoroughly dry whenever testing and aligning is being carried out. If at all possible the set should NOT be opened (ie, unsealed) in a damp atmosphere. Before returning assembly to set case, ensure that there is no apparent film of moisture on any components. If possible dry the set in an oven at a temperature not exceeding 170°F, or in a stream of warm dry air. Plug in a fresh desiccator unit and immediately return assembly to case and seal. **THE DESICCATOR UNIT MUST NOT BE REMOVED FROM ITS WRAPPING UNTIL THE SET IS READY FOR SEALING.**

- NOTE:
- (i) When resealing, care should be exercised that just sufficient tightening of the four screw clamps on the front of the set and the six screws at the rear battery plug is employed so that a good seal is obtained. Further tightening will not result in a better seal, but could well damage screw clamps or battery plug.
 - (ii) Used desiccators will NOT be discarded; they will be returned to RCEME workshops where they will be dried out, sealed and placed into stock for re-issue.

EXAMINATION AND STORAGE

12. Before long periods of storage, the complete equipment should be inspected for damage. Sets and accessories which require repair should be serviced before being stored. Equipment should be stored indoors where temperature and humidity can be controlled. Upon removing the sets from long periods of storage, they should be opened and inspected. Sets should be thoroughly dried, tested and new desiccators fitted prior to them being resealed in accordance with para 11.



Fig 1 - Test Set, Battery CTS 4/PRC

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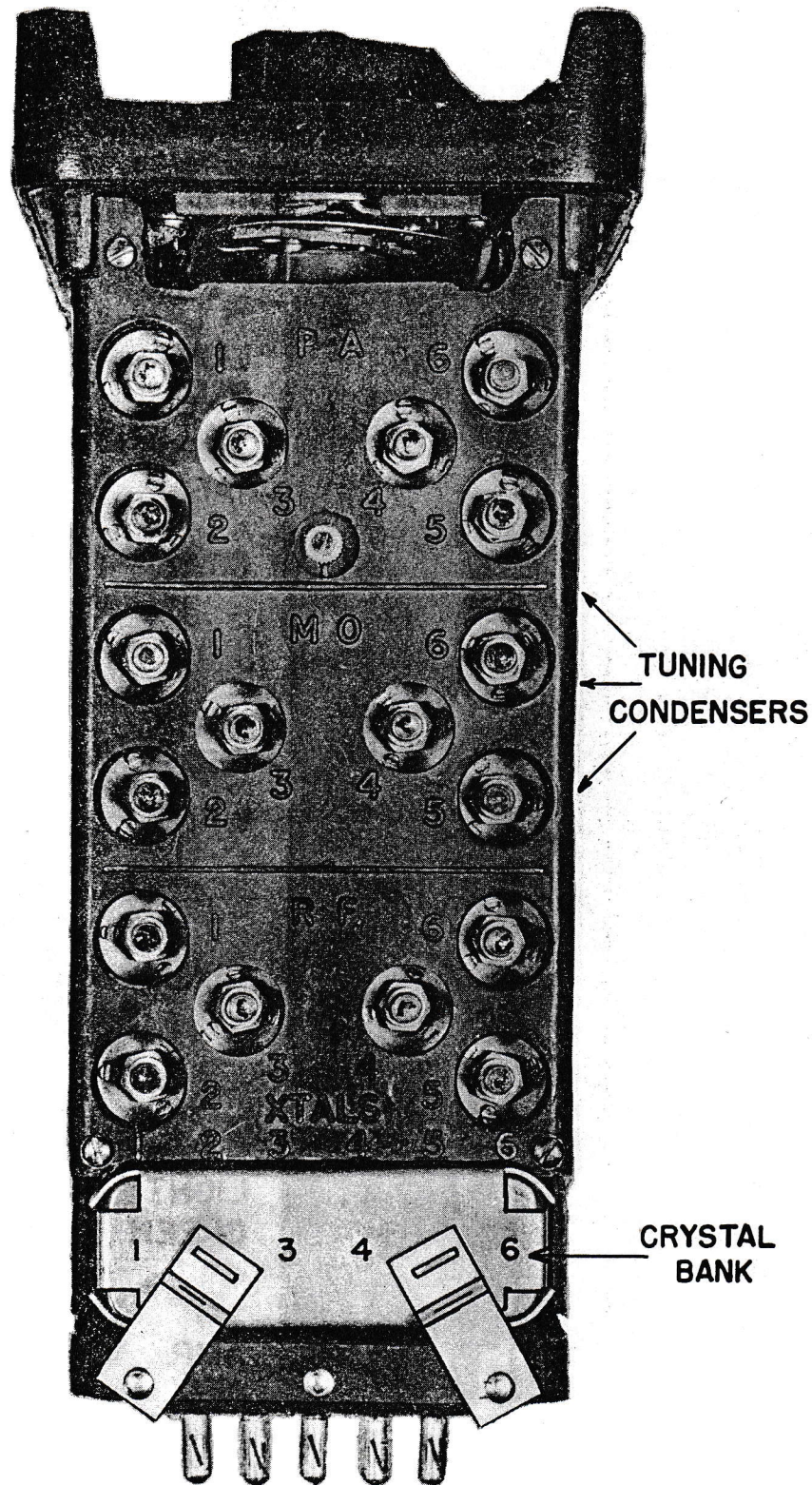


Fig 2 - Radio Set CPRC 26 Showing Crystal Bank & Trimming Condensers
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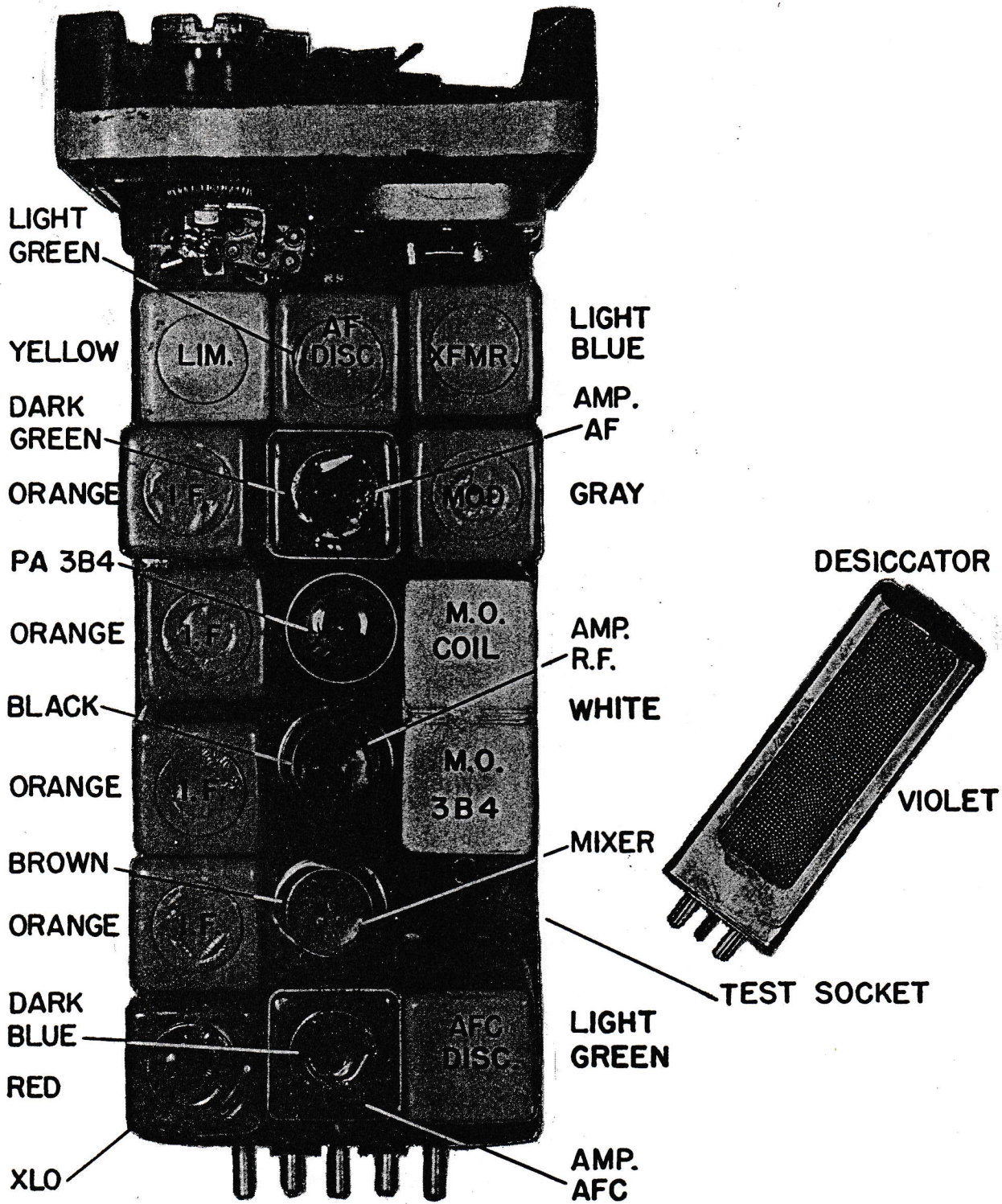


Fig 3 - Radio Set CPRC 26 Showing Plug-in Units

CPSB 5214

TD 15

C 6001-Radio Set/1

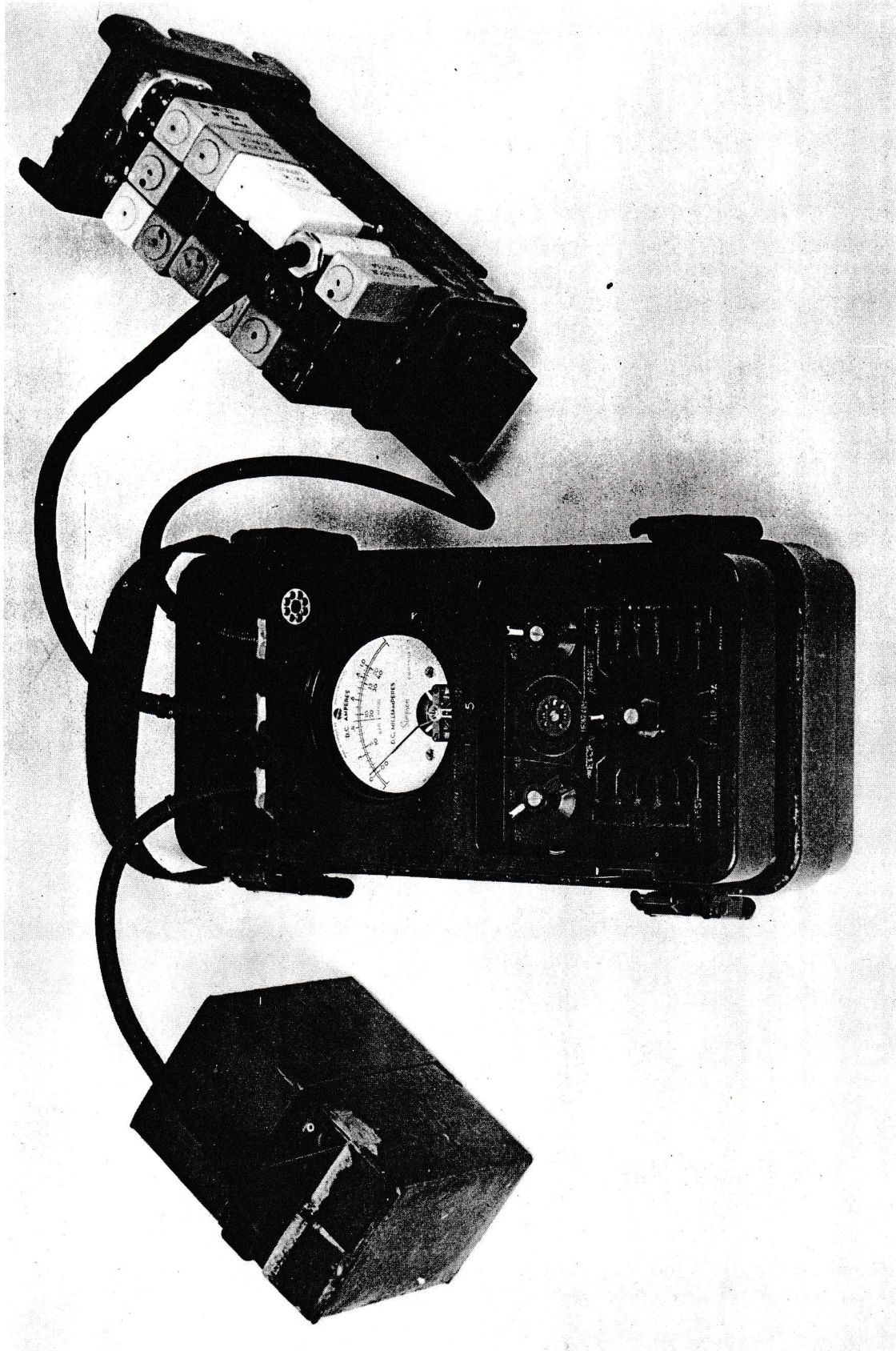


Fig 4 - Test Set, Radio CTS 3/PRC