STATION, RADIO, UK/PRC 351 AND UK/PRC 352

TECHNICAL HANDBOOK - FIELD REPAIRS

This Regulation must be read in conjunction with Tels F 582. Base Repair Information will not be published as Part 2 of this regulation. A separate Base Repair Information Folder (BRIF) will be published and issued to nominated workshops.

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INTRODUCTION

1. This regulation is divided into two parts: Part 1 is concerned with the equipment using the Test Rig Electronic Equipment (TRE - see Tels M 380), whilst Part 3 is concerned with the equipment in use on the Automatic Test Equipment (ATE - see Tels M 390). Each part is divided into three sections, as follows:-

Section 1 - UK/PRC 351 (RT 351)

Section 2 - Amplifier RF 20W (AM 352)

Section 3 - Selective Unit, Radio Frequency (SURF).

2. Base repair information will not be published as Part 2 of this regulation, a separate Base Repair Information Folder (BRIF) will be issued to nominated workshops.

PART 1

SECTION 1 - UK/PRC 351

GENERAL

3. WARNING This equipment uses components containing beryllium or beryllium oxide. In certain circumstances they can constitute a hazard to health. Before working on the equipment, consult Gen K 050 - Beryllium Toxic Hazard in Electronic Equipments which gives general information, handling and disposal instructions.

Scope of repairs

4. Repairs at field workshop level will be confined to the replacement of faulty assemblies and certain discrete components as listed in Tels F 582 Table 2001.

Field repair test equipment

5. The equipments detailed in Table 1 are required to carry out field repairs, testing and alignment.

Table 1 - Field repair test equipment common to RT 351 and AM 352

Item	Cat. No	Designation	Purpose and remarks
1	-	Test rig electronic equipment	Contains test equipment together with all connectors and control units to carry out specification testing, alignment and fault finding.
2	Z4/6625-99-622-5189	Test kit radio field repair RT 351	Fault finding and alignment of RT 351 (open) (see Tels M 720).
3	Z4/6625-99-105-7049	Multimeter set CT498A	Fault finding on RT 351 (open)
4	F1/5180-99-120-3922	Tool kit telecom (Technician)	
5	F1/5180-99-445-8208	Tool kit telecom (supp)	
6	F1/3439-99-136-7370	Desoldering set electrical	Used on motherboard soldered connections.

GENERAL REPAIR INFORMATION

Field repair test kit (FRTK) (see Tels M 720)

6. When carrying out alignment, fault diagnosis or repairs, the RT 351 under test (EUT) is removed from its case, opened, and secured to the test jig (see para 17).

7. With the EUT secured to the test jig, the frequency setting switches (FSS) and system switch (SSW), which are controlled by knobs on the front panel, are now controlled by similar switch knobs on the test jig. The remote panel assembly is fitted to the jig as a complete item, thus the operation of remote switch (ROS) and the use of remote line terminals remains unchanged.

8. The test jig is fitted with two BNC coaxial sockets, marked RECEIVE and TRANSMIT respectively. Care must be taken to connect external test equipment to the correct socket to prevent possible damage.

Note: Because the RECEIVE and TRANSMIT sockets are separate, sidetone on transmit will only be obtained with the RT 351 system switch set to ✳ (NOISE ON). To check the complete sidetone facility, a connection must be made (using FRTK Item 6) between RECEIVE and TRANSMIT socket on the test jig.

Use of test rig electronic (TRE)

9. The TRE is fully described in Tels M 382, and no attempt is made in this document to describe TRE functions. Two types of TRE exist, one containing a Schlumberger rf signal generator and the other a Racal rf signal generator. The differences between the two types are explained in Tels M 382.

10. When referring to the test equipment, the following abbreviations are used throughout this document:-

Control supply	CS	Loudspeaker	LS
Control test conditions	CTC	RF generator	RFG
Clansman interface	IF(C)	AF generator	AFG
Digital voltmeter	DVM	RF attenuator	RFA
Frequency counter	Counter	Cathode ray oscilloscope	CRO
Modulation meter	MM	Field radio test kit	FRTK

11. The controls and terminations on CS, CTC and IF(C) are referred to by the numbers shown in Tels M 382 Table 2003, eg the push on - push off switch marked EUT on the control, test conditions, is referred to as CTC 6. Instructions are given as 'Depress (or release) CTC 6'. Instructions for rotary switches are given as 'Set CTC 1 to CW Tx'. Connections to terminations are given as 'Connect ..... to CTC 20'.

12. This document details the TRE switch settings required to carry out each specific function. For specification testing each switch position is detailed at the commencement of each test to allow any particular specification test to be carried out.

13. Range settings of individual test equipments (counter, DVM etc) are not detailed unless specifically required. Instructions are given as 'Tune MM' or 'DVM shall indicate' and correct operation and range selection is implied.

Internal identification

14. The screws used to secure the motherboard to the web are indicated by a green circle. Internal test points are identified by their circuit references, TP1, TP2 etc.

Labels

15. Replacement of internal and external labels, when necessary, will be carried out at field level.

Repainting

16. At field workshop level, re-touching of damaged surfaces may be carried out, but not re-painting. Only the following paints are to be used:-

a. H1a/8010-99-224-2079 Paint Priming, 1½ litre pack.

b. H1a/8010-99-224-8663 Paint Finishing, polyurethane, matt finish, deep bronze green, 1½ litre pack.

Note: These are two-part paints which must be mixed in the proportions shown on the package. Do not mix more than is necessary as its mixed life is 8 hours at 20°C and 4 hours at 33°C. Do not apply the paint in low temperatures or in high humidities.

GENERAL REPAIR INSTRUCTIONS

Opening the equipment

17. To remove the RT 351 from its case, proceed as follows:-

a. Set frequency setting switches (FSS) to 30000.

b. Set system switch (SSW) to 0 (off).

c. Remove remote assembly by undoing the four hexagon socket captive screws securing the remote casting to the sleeve. Ease casting away from sleeve and withdraw 2SK1 from 23PL1 (2SK1 is located at the end of the motherboard flexible).

d. Note position of, and extract, the two sachet-type desiccators.

e. Remove sleeve by undoing four captive screws securing sleeve to front panel.

f. Identify the receiver side of the equipment containing assemblies 5, 6, 7, 9, 13 etc (see Tels F 582 Fig 2002). Disconnect rf connector 17PL1-5SK1.

g. From the transmitter side of the equipment, identify and remove the pillar retaining screw located between the front panel and assembly 17 (adjacent to connector rf no 2).

h. On the receiver side, remove six pillar retaining screws identified by a green circle. The receiver side is now free from the web.

j. Remove pull off connector at rear of battle antenna socket.

k. Unsolder the following leads; (identified in Tels F 582 Fig 2004):-

(1) at pcb, lead from 50Ω antenna socket.

(2) at pcb, two leads from (17)2.

l. Remove pull off connector, coloured red, to 2PL1.

m. Remove all retaining screws, encircled green, in the following order:-

(1) Two captive pillar screws through assembly 18.

(2) Five captive screws through assembly 16.

(3) Two pillar screws adjacent to 2LK1.

(4) Two pillar screws adjacent to 2ML1.

(5) One pillar screw between assemblies 14 and 19.

(6) One pillar screw adjacent to assemblies 14 and 18.

n. Remove the four screws on the front panel near the frequency setting switches.

p. Remove the four screws on the front panel near the system switch and ease the switch assembly away from rear of front panel.

18. The motherboard and flexibles are now free from the front panel and web. Note carefully the method of folding the flexibles to the two switch assemblies. It cannot be over-emphasised that incorrect folding or the use of undue force can easily cause damage to the flexibles and switch assemblies.

Fitting and removal of RT 351 to test jig

19. Remove the motherboard assembly from the front panel and web (para 17).

20. Remove tool roll from FRTK tool box, and supply protection unit (SPU) from test jig.

21. Ensuring that the perspex doors on the test jig are closed, place jig on bench with doors downwards.

22. On test jig, set FSS switch knobs to 30000 and SSW knob to 0.

23. On EUT, inspect FSS and SSW assemblies and ensure that plastic dots on switch rotors and assembly body are coincident.

24. Place the opened and unfolded EUT, assembly side uppermost, on the test jig, with 22PL1 adjacent to remote panel test. Ensure that the SSW flexible wiring is above and between the receive and transmit sides of the motherboard.

25. Using four knurled pillar screws from FRTK tool roll, secure the transmit side of the motherboard to test jig, using the holes in motherboard adjacent to assemblies 2ML1, 18, 17 and 10. Tighten captive screws in assemblies 16 and 18.

26. Using four knurled pillar screws from tool roll, secure receive side of motherboard to test jig, using holes adjacent to assemblies 6, 8, 11 and 13. To locate holes in motherboard with respective holes in test jig, it may be necessary to push the receive side towards the secured transmit side of the EUT.

27. Fold flexible 1 to the position occupied when EUT was secured to front panel. Locate FSS assembly to rear of frequency switch knobs on test jig and secure with two captive knurled screws. Ensure that all four switches are operating.

28. Locate EUT system switch behind system switch knob on test jig, and secure using two captive knurled screws. Ensure that switch is operating.

29. Connect the following test jig connectors to EUT as shown:-

a. SK3 to PL1 (battery input)

b. SK6 to 17PL1

c. PL3 to 5SK1

30. Fit EUT remote casting, with wire stripper uppermost, to bracket on test jig and secure using four knurled captive screws. Connect socket on flying leads from remote panel test box to 23PL1 on EUT remote panel.

31. If equipment is to be used on an unprotected supply, connect supply protection unit to battery input terminals on test jig.

32. If equipment is to be used on TRE (protected supply) connect supply lead (TRE item 4) from CS7 to battery input terminals on test jig.

33. Removal of equipment from test jig is achieved by carrying out the above instructions (paras 19-32) in reverse order.

Re-assembly of EUT on front panel and web

34. Re-assembly is essentially carrying out, in reverse order, the procedure contained in para 17 but the instructions are repeated to take account of the minor differences.

Note: The flexibles must be handled with extreme care and undue force must not be used, particularly when fitting switch assemblies to the front panel.

35. a. Inspect web and ensure that red flying lead is connected to 1PL1, and that 1PL2 is connected to earth.

b. Place the transmit side of the motherboard on the web. The correct side may be ascertained by ensuring that FSS assembly is on same side as FSS knobs on front panel.

c. Ensure that two leads (17PL1 and battle antenna connector) are fed through appropriate holes in web.

d. Ensure that FSS knobs on front panel are set to 30000 and that on FSS switch assembly dots on switch rotors and assembly body are coincident.

e. Fold flexible 1 around FSS assembly in correct manner, and secure behind front panel using four slot-headed screws.

Note: Difficulty may be experienced in carrying out this operation. A suggested method is to obtain slight purchase with two diagonally-opposite front panel screws and ensuring that all four frequency switches are correctly located (verified by listening for a click as each switch is rotated) before tightening all four screws.

f. Connect lead (push on connector) to 2PL1.

g. Secure transmit side to web but do not tighten securing screws until all have been correctly located as follows:-

(1) Two through assembly 18.

(2) Five through assembly 16.

(3) Two adjacent to 2LK1.

(4) Two adjacent to 2ML1.

(5) One between assemblies 14 and 19.

(6) One adjacent to assemblies 14 and 18.

h. Re-solder leads removed in para 17k.

j. Connect lead to rear of battle antenna.

k. Ensure system switch knob on front panel is set to OFF, and that two dots on switch assembly plastic mouldings are coincident. Fold motherboard flexible in the correct manner and secure system switch to rear of front panel by four front panel screws. Same precautions and procedures should be taken as with the FSS (sub-para e).

l. Fold receive side of EUT around web, and secure using six pillar screws. From transmit side of web, insert pillar screw adjacent to assembly 17.

m. Connect 17PL1 to 5SK1.

n. Tighten all securing screws. Check operation of front panel switches and ensure that 2LK1 is undamaged.

p. Insert set into sleeve casting, ensuring that rubber seal is in position. Secure using four hexagon socket captive screws.

q. Insert two desiccators (para 17d).

r. Replace remote assembly as follows:-

(1) Connect 2SK1 to 23PL1.

(2) Ensure that rubber seal is in position.

(3) Secure remote assembly to sleeve using four captive screws.

Removal and replacement of remote assembly from remote panel

36. a. Remove hexagon nuts securing audio sockets 22SK1 and 22SK2.

b. Set ROS to L and remove four screws securing switch assembly to panel.

c. Unsolder leads connected to remote terminals.

d. Remove four screws (encircled green) securing remote assembly to panel, and withdraw complete assembly.

37. Replace in reverse order, ensuring that the plastic dots on the switch assembly are coincident.

Removal and replacement of discrete components

38. a. Battle antenna. Secured to the front panel by four hexagon socket captive screws, with toroidal rubber seal between antenna assembly and front panel.

b. Battery terminals. Qty 2, push-fit in side of front panel.

c. Latch assembly (battery clips). One fitted to side of front panel, and one on remote assembly. Removal is by extracting pivot pin.

d. Knob designation. Four FSS and one SSW on front panel, one ROS on remote assembly; secured by circlip and washer. On replacement, ensure that rubber seals are correctly fitted.

e. Remote switch. Unsolder from remote flexible using desoldering tool.

f. 50Ω antenna socket. Secured to front panel by four screws. Soldered connection at rear of socket.

g. Socket electrical (2SK1). Secured to motherboard by two screws and nuts. Unsolder from motherboard using desoldering tool.

h. Audio sockets (22SK1, 22SK2). Secured to remote casting by hexagonal nut. Unsolder connections to remote flexible using desoldering tool.

j. All other discrete components are replaced using normal techniques.

Removal and replacement of assemblies on motherboard

39. To remove any assembly mounted on the motherboard, unsolder all connections on or inside the assembly boundary lines marked on the mother-

board. When all connections are completely solder free, remove any assembly securing screws which are located on the motherboard side, and lie on or within the assembly boundary lines. Gently ease the assembly can and assembly away from the motherboard. To assist in the removal of Assemblies 7, 9 and 19, a cord is fitted to the assembly cans.

40. To replace an assembly, ensure that the assembly connection and securing can pins are straight. Offer the assembly to the motherboard, and ensure that all pins protrude through their respective holes. Insert the assembly securing screws. Before fully tightening, ensure that all pins are located centrally through their respective holes, and do not touch the land around the holes. Using suction soldering tool, solder all connections.

Soldering techniques

41. The physical size of the set and the close proximity of adjacent soldered connections requires that extreme care must be taken when desoldering or soldering within the equipment. Prolonged application of heat could cause damage to the motherboard and flexibles, particularly when desoldering assembly pins.

42. The suction soldering tool must be used for all desoldering on the motherboard to prevent solder running down assembly pins to the other side of the motherboard, thus making removal of an assembly extremely difficult and possibly causing damage to the assembly or equipment.

43. When using the suction soldering tool, select the soldering head compatible with the size of joint required. To avoid any contact with adjacent soldered points or tracking the actual bit diameter should not be greater than the land around the pin to be desoldered.

44. When resoldering module pins, solder should not be allowed to build-up on the joint. This is particularly important where the connection lies under a flexible when the equipment is folded in its case.

45. The suction soldering tool must be carefully maintained. The hole in the bit must be kept clear and the extracted solder sump emptied regularly.

Caution: It is essential that the ac mains supply to the suction soldering tool should be not less than 225V, or difficulty in desoldering will be experienced.

Replacement of desiccators

46. Two desiccators (Desiccators, Silica-gel, Sachet Style DS2) are placed between the sleeve and assembly cans (para 17d). New desiccators must be fitted whenever an equipment has been opened.

Drying and sealing

47. On receipt of an equipment for repair, adopt the following procedure:

a. Pressurise the equipment to 5 lb/in^2 using dry air.

b. Using the leak locator carry out a dip test in a water tank to check for operation of spindle seals or gaskets. The addition of a wetting agent will assist in the detection of leaks.

c. Open equipment in the driest possible conditions and carry out all obvious repairs and replacements.

d. Place the opened equipment in the dehumidifier (see Tels M 602) and dry for at least one hour at 50°C with dry air from the pump passing through the oven.

e. After cooling, electrically test the equipment and carry out any repairs and realignment necessary.

f. As soon as possible after realignment place the equipment in the oven for 15 mins at 50°C.

g. Fit new silica-gel desiccators.

h. Fit new gaskets as required after smearing with grease (XG 271) and reseal the equipment in its case.

j. Connect the leak locator to the equipment and pressurize to 5 lb/in^2 using dry air from the dehumidifier.

k. Repeat dip test. There shall be no air bubbles.

l. Details of time constant testing is given under Base Repair Inspection Standards.

48. Toroidal rubber seals are fitted to the equipment in the following positions:-

a. Battle antenna

b. Frequency setting switch knobs

c. System switch knob

d. Sealing plug (on front panel)

e. Between front panel and sleeve

f. Between remote panel casting and sleeve

g. Remote switch

h. 50Ω antenna

Mechanical repairs

49. Mechanical repairs to RT 351 are detailed in para 38. Repairs to accessories are detailed in Tels F 583.

SPECIFICATION TESTING

General

50. Due to the limited front panel indications available on the RT 351, specification testing will be carried out as an initial check wherever an

equipment is received into Field Workshops. Interpretation of specification test results will form the basis for fault diagnosis which are dealt with in para 83.

51. Specification testing will be carried out with the equipment sealed, using either Automatic Test Equipment (ATE, see Part 3 of this regulation) or Test Rig Electronic (TRE).

52. The specification tests using TRE follow a logical sequence, but testing is not sequential, and TRE and EUT switch settings are repeated at the commencement of each test. This allows any particular test to be carried out, and also enables test results obtained using ATE to be rechecked using TRE.

Connection of equipment under test (EUT) to TRE

53. Set SSW on EUT to 0 (off). Using connectors listed in Tels M 382 Table 2001, connect as follows:-

a. Using item 4, connect CS7 to battery terminals 1PL1, 1PL2 on EUT, ensuring correct polarity.

b. Using item 7, connect CTC 20 to 50Ω antenna socket (1SK1) on EUT.

c. Using item 10, connect 1F(C)5 to audio socket 22SK1 on EUT.

54. The above connections, together with any others required, are repeated for each specific test.

55. On TRE, all power switches must be set to ON, and the equipment allowed to warm up for approximately 20 min (stabilization time).

SPECIFICATION TESTS

Test 1 - Current consumption

56. a. Limits. With the dc supply set to 24 ± 0.2V, the current consumption of the EUT shall be:-

(1) Less than 125mA on receive.

(2) Less than 870mA on both high and low bands transmit.

b. Method.

(1) Set TRE and EUT switches as given in Table 2.
Note DVM indication which shall be 24 ± 0.2V.

(2) On EUT, set SSW to ✱, and note noise heard in LS.

(3) Set CS2 to VEH A and note DVM indication which shall be 12.5mV max. (mV x 10 = mA).

(4) Set CTC1 to CW Tx (Tx ENABLED lamp illuminated).
Note counter indication which shall be 30.050MHz.
Note DVM indication which shall be 87mV max.

Table 2 - Test 1 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 NORMAL	FSS 30050 SSW 0 ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C) 5 to 22SK1 (item 10)

(5) Set FSS on EUT to 48050.
Note counter indication which shall be 48.050MHz.
Note DVM indication which shall be 87mV max.

(6) Set CTC1 to Rx FM.

Test 2 - Transmitter power output into 50Ω load

57. a. Limits.

(1) With a dc supply voltage of 22 ± 0.2V, the transmitter power output shall be not less than 3W at all permitted frequencies.

(2) With the dc supply voltage set to 32 ± 0.2V the transmitter power output shall be not greater than 6.8W at all permitted frequencies.

Note: Using TRE to measure rf power output, (DVM indication)^2 = Power Output on all DVM ranges except 180V and 750V eg 1.7V = 3W, 2.6V = 6.8W.

b. Method.

(1) Set TRE and EUT switches as given in Table 3.
Note DVM indication, and adjust CS4 until DVM indicates between 21.8V and 22.2V.

(2) Depress CTC 7.
Note that Tx ENABLED lamp illuminates and noise in LS is muted.
Note counter display which shall be EUT frequency.
Note DVM indication which shall be not less than 1.7V.

Table 3 - Test 2 switch settings

CS	CTC	IF(C)	EUT
1 VEH 14-33 2 VEH V 6 Released (ON)	1 CW Tx 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 30050 SSW ✳ ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(3) Repeat with FSS on EUT set to the following frequencies (kHz) in turn:-

39050, 47950, 48050, 62050, 76050.

(4) Depress CTC 5.

(5) Adjust CS4 until DVM indicates between 31.8V and 32.2V.

(6) Depress CTC 7.
Note counter display which shall be EUT frequency.
Note DVM indication which shall be not greater than 2.6V.

(7) Repeat with FSS on EUT set to the following frequencies (kHz) in turn:-

62050, 48050, 47950, 39050, 30050.

(8) Set CTC 1 to Rx FM.

Test 3 - Transmitter inhibit

58. a. Limit. With EUT set to a prohibited frequency, the transmitter shall produce no power output.

b. Method.

(1) Set TRE and EUT switches as given in Table 4.

(2) Adjust CS4 until DVM indicates between 19.8V and 20.2V.
Note that EUT is receiving (noise in LS).

(3) On EUT, set FSS to 79050 and note that noise in LS is muted.

(4) Depress CTC 7, and ensure DVM is set to 18V range.

Table 4 - Test 3 switch settings

CS	CTC	IF(C)	EUT
1 VEH 14-33 2 VEH V 6 Released (ON)	1 CW 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 30050 SSW ✳ ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(5) Depress CTC 11.
Note that DVM indicates not more than 2mV, and that there is no display on counter.

Test 4 - Transmitter power output from battle antenna

59. a. Limits. With a dc supply of 20 ± 0.2V the rf power output from the battle antenna shall be not less than 9V for the following frequencies (MHz):-

32.050, 36.050, 45.550, 53.050, 65.050, 73.050.

b. Method.

(1) Set TRE and EUT switches as given in Table 5.

Table 5 - Test 4 switch settings

CS	CTC	IF(C)	EUT
1 VEH 14-33 2 VEH V 6 Released (ON)	1 CW 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 32050 SSW ✳ ROS L

EUT connections:-

CS7 to battery terminals (item 4)
IF(C)5 to 22SK1 (item 10)

(2) Connect antenna simulator (part of FRTK) to EUT.

(3) Connect DVM rf probe between antenna simulator output socket and CTC 16-17.

(4) Depress CTC 3 and CTC 11.
Note DVM indication which shall be greater than 9V.

(5) Repeat (sub-para 4) with FSS on EUT set to the frequencies detailed under sub-para a. and note DVM indication for each frequency.

(6) Set SSW on EUT to 0, and disconnect antenna simulator.

Test 5 - Unwanted deviation

60. a. Limits. The deviation caused by noise shall not exceed 11 ppm of carrier frequency.

b. Method.

(1) Set TRE and EUT switches as given in Table 6.

Table 6 - Test 5 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 PILOT TONE 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 39050 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Depress CTC 11.

(3) Tune the MM and set its meter range to 3kHz fsd.
Note the MM reading and correct it using the calibration chart (see para 192). Call this reading R(Hz).

(4) Determine the squelch/noise (S/N) ratio as described in para 193 to 195.
Note the S/N ratio must be equal to or greater than $\frac{R - 430}{430}$.

Test 6 - Deviation, noise +150Hz

61. a. Limits.

(1) The deviation of the transmitter output due to the internal 150Hz tone and noise shall be between 1.56kHz and 1.93kHz.

(2) The frequency of the internal tone shall be between 149Hz and 151.5Hz.

b. Method.

(1) Set TRE and EUT switches as given in Table 7.

Table 7 - Test 6 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 PILOT TONE 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 39050 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Depress CTC 11.

(3) Tune the MM and set its meter range to 3kHz fsd.
Note the MM reading and correct it using the calibration chart (see para 192). Call this reading Rhz.

(4) Release CTC 11.

(5) Determine the S/N ratio as described in para 193 to 195.
R shall be between $\frac{1560\ (1 + S/N\ ratio)}{S/N}$ and $\frac{1930\ (1 + S/N\ ratio)}{S/N}$

(6) Depress CTC 11.
Note counter display which shall be between 149Hz and 151.5Hz.

Test 7 - Deviation 1kHz

62. a. Limits. The amplitude of a 1kHz tone applied to the MIC sockets to produce a deviation of the transmitter output of ± 3.5kHz ± 0.2kHz shall be:-

(1) 0.6mV to 1.2mV pd with SSW set to L.

(2) With SSW set to W, between 1/6th and 1/4th that obtained in (1).

b. Method.

(1) Set TRE and EUT switches as given in Table 8.

Table 8 - Test 7 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 PILOT TONE 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 39050 SSW L ROS L

EUT connections:-

CS7 to battery terminals	(item 4)
CTC 20 to 50Ω ANT	(item 7)
IF(C)5 to 22SK1	(item 10)

(2) Depress CTC 11.

(3) Tune the MM and set its meter range to 3kHz fsd.
Note the MM reading and correct it using the calibration chart (see para 192). Call this reading R.

(4) Release CTC 11.

(5) Switch the MM to its 10kHz range.

(6) Set CTC 1 to MOD ST.

(7) Set the AFG to produce a single tone of 1kHz.

(8) Set the AFG output voltage multiplier to X 0.1.

(9) Depress CTC 11.

(10) Adjust the AFG output attenuator until the MM reads (R + 3.5kHz) ± 0.2kHz.

(11) Release CTC 11.
Note the AFG attenuator setting (R1) which shall be between 12mV and 24mV emf.

(12) Depress CTC 11 and note the MM reading.

(13) Set SSW to WHISPER.

(14) Reduce the AFG output until the MM reading equals that noted above.

(15) Release CTC 11.
Note AFG attenuator setting (R2). R2 shall be between 1/6th and 1/4th of R1.

Test 8 - Modulation control

63. a. Limit. With a 1kHz tone applied to the MIC socket at a level of 20mV ± 2mV the deviation of the transmitter output due to this modulating tone only shall be not greater than ± 6.7kHz.

b. Method.

(1) Set TRE and EUT switches as given in Table 9.

Table 9 - Test 8 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 PILOT TONE 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 39050 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Depress CTC 11.

(3) Tune the MM and set its meter range to 10kHz fsd.

(4) Release CTC 11.

(5) Set the AFG to produce a single tone of 1kHz.

(6) Set the AFG output voltage multiplier to 0.1.

(7) Set the AFG attenuator to 400mV emf.

(8) Depress CTC 11.
Note MM indication (S + N).

(9) Release CTC 11.

(10) Set CTC 1 to MOD ST.

(11) Depress CTC 11.
Note MM indication (S + N + 1kHz) and (S + N + 1kHz) - (S + N) shall be not greater than ± 6.7kHz.

Test 9 - Variation of deviation

64. a. Limit. With a standard af tone applied to the MIC socket, the deviation of the transmitter output, due to this tone, shall not vary from its nominal value of ± 5kHz by more than ± 10% for any transmitter frequency.

b. Method.

(1) Set TRE and EUT switches as given in Table 10.

Table 10 - Test 9 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 PILOT TONE 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 DC 3 Released 4 Released 7 Normal	FSS 39050 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Depress CTC 11.

(3) Tune the MM and set its meter range to 10kHz fsd.
Note the MM indication (S + N).

(4) Release CTC 11.

(5) Set the AFG to produce a single tone of 1kHz.

(6) Set the AFG output voltage multiplier to 0.1.

(7) Switch CTC 1 to MOD ST.

(8) Depress CTC 11.

(9) Adjust the AFG attenuator setting to give a MM reading of (S + N) + (5kHz ± 0.35kHz) and maintain this setting for the remainder of test.

(10) Release CTC 11.

(11) Set FFS to 30050.

(12) Set CTC 1 to PILOT TONE.

(13) Depress CTC 11.

(14) Tune the MM and set its meter range to 10kHz fsd. Note the MM indication $(S + N)_1$.

(15) Release CTC 11.

(16) Switch CTC 1 to MOD ST.

(17) Depress CTC 11 and note MM reading (R1).

(18) Release CTC 11. $(S + N)_1 - R_1$ shall be between ± 4.5kHz and ± 5.5kHz.

(19) Repeat the above for the following frequencies:-

47.950, 48.050, 62.050 and 76.050 MHz.

Test 10 - Sidetone

65. a. Limits. With an af input of 1kHz at a level of 10mV rms, the af output into 150Ω, with the EUT set to any transmit frequency, shall be between 0.8mW and 2.25mW. (0.346V and 0.581V.)

b. Method.

(1) Set TRE and EUT switches as given in Table 11.

Table 11 - Test 10 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 MOD ST 2 AF LOAD 150 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 48050 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Set AFG Tone B to 1000Hz at 200mV output.

(3) Depress CTC 11.
Note DVM indication which shall be between 0.346V and 0.581V.

Test 11 - Sidetone inhibit

66. a. Limit. With an af input of 1kHz at a level of 10mV rms, the af output with the EUT set to a prohibited frequency shall be not greater than 0.06μW (3mV).

b. Method.

(1) Set TRE and EUT switches as given in Table 12.

Table 12 - Test 11 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 MOD ST 2 AF LOAD 150 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 79050 SSW L ROS L

EUT connections:-

CS7 to battery terminals	(item 4)
CTC 20 to 50Ω ANT	(item 7)
IF(C)5 to 22SK1	(item 10)

(2) Set AFG to 1000Hz at 200mV output.

(3) Depress CTC 11.
Note DVM indication which shall be less than 3mV.

Test 12 - Accuracy of radiated carrier

67. a. Limits. The radiated frequency shall be within 5 ppm of the selected frequency.

b. Method.

(1) Set TRE and EUT switches as given in Table 13.

(2) Set CTC 1 to TX CW.
Note counter display which shall be 30.100MHz ± 150Hz.

Table 13 - Test 12 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 CW 2 AF LOAD 150 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 30100 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(3) Repeat with FSS on EUT set to the following settings in turn; at each setting, note display on counter, which shall be within the limits shown:-

FSS setting	Frequency indicated
31800	31.800MHz ± 159Hz
42225	42.225MHz ± 210Hz
43350	43.350MHz ± 215Hz
55475	55.475MHz ± 275Hz
57500	57.500MHz ± 285Hz
68625	68.625MHz ± 340Hz
69750	69.750MHz ± 345Hz
74975	74.975MHz ± 375Hz
76000	76.000MHz ± 380Hz

Test 13 - Spurious radiation

68. a. Limits.

(1) The radiated power of the second and third harmonic shall be greater than 36dB down and any other harmonic, within the range 1-500MHz, of the selected frequency shall be greater than 40dB down on the selected carrier level.

(2) The level of non-harmonically related spurious emissions, other than frequencies within 10% of the selected frequency, shall be greater than 80dB down on the selected carrier level.

b. Method. See para 196 for details.

Test 14 - Receiver sensitivity

69. a. Limit. The signal + noise-to-noise ratio caused by a 1μV emf rf signal with standard modulation, shall be not less than 16dB.

Caution: Do not depress CTC 11 whilst carrying out this, or any other receiver test.

b. Method.

(1) Set TRE and EUT switches as given in Table 14.

Table 14 - Test 14 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 S + N:N 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 30025 SSW X ROS A

EUT connections:-

CS7 to battery terminals	(item 4)
CTC 20 to 50Ω ANT	(item 7)
IF(C)5 to 22SK1	(item 10)

(2) Set RFG frequency to 30.025MHz, internally modulated by 1000Hz at ± 5kHz deviation. Set output attenuator to 120dB (1μV).
Note demodulated 1kHz tone in LS, and output waveform on CRO.

(3) Set CTC 14 to MOD OFF.
Note and record DVM indication as reading A.

(4) Set CTC 14 to SIGNAL, and adjust CTC 15 until DVM indicates as reading A.
Note setting of CTC 15, and read dB equivalent from dB chart on CTC front panel. It shall be not less than 16dB.

(5) Repeat test with EUT and RFG set to the following frequencies (kHz) in turn:

39025, 47975, 48025, 62025, 76025.

Test 15 - Limiting

70. a. Limit. With a modulated rf signal applied to the receiver antenna, the receive audio output shall not change by more than 0.75dB when the rf signal level is increased from 1μV to 100mV emf.

Caution: Do not depress CTC 11 during this test.

b. Method.

(1) Set TRE and EUT switches as given in Table 15.

Table 15 - Test 15 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 AF LOAD 150 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 62025 SSW ✳ ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Set RFG frequency to 62.025MHz modulated by 1000Hz at ± 5kHz deviation. Set attenuator to 120dB (1μV).
Note DVM indication as reading A.

(3) Set RFA to 20dB (100mV).
Note DVM indication as reading B. Reading B shall not be greater than 0.75dB above reading A.

(4) Repeat test with EUT and RFG set for a frequency of 39.025MHz.

Test 16 - Squelch sensitivity (160Hz internal)

71. a. Limits.

(1) The sensitivity of the squelch circuit due to the internal 160Hz tone is such that at the 4.5dB quieting level the squelch will be closed, and at 9dB quieting level the squelch will be open.

(2) The squelch will not be affected by the application of an rf signal modulated by a 153Hz tone at ± 1.3kHz deviation.

Caution: Do not depress CTC 11 during this test.

b. Method.

(1) Set TRE and EUT switches as given in Table 16.

(2) Set RFG frequency to 39.025MHz unmodulated.

(3) Set RFA to 139dB.

Table 16 - Test 16 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx CW 2 QUIETING 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 39025 SSW ✱ ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(4) Set CTC 15 to 60 (4.5dB).
Note and record DVM indication as reading A.

(5) Set CTC 14 to SIGNAL.

(6) Adjust RFA until DVM indicates reading A.

(7) On EUT, set SSW to L and note that squelch is closed (no noise in LS).

(8) On EUT set SSW to ✱.

(9) Set CTC 14 to CARRIER OFF.

(10) Set CTC 15 to 36 (9dB).
Note and record DVM indication as reading B.

(11) Set CTC 14 to SIGNAL.

(12) Adjust RFA until DVM indicates reading B.

(13) On EUT, set SSW to L and note that squelch is open (noise in LS).

(14) Set CTC 1 to Rx FM.

(15) Modulate RFG with 153Hz at ± 1.3kHz deviation.

(16) Set RFA to 120dB.
Note that squelch remains open (noise in LS).

Test 17 - Squelch sensitivity (150Hz external)

72. a. Limit. The sensitivity of the squelch circuit due to an external 150Hz tone is such that at the 4.5dB quieting level the squelch will

be closed, and at the 8.5dB quieting point the squelch will be open.

Caution: Do not depress CTC 11 during this test.

b. Method.

(1) Set TRE and EUT switches as given in Table 17.

Table 17 - Test 17 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 QUIETING 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 39025 SSW ✳ ROS A

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Set RFG to 39.025MHz modulated by 150Hz at ± 1.3kHz deviation.

(3) Set CTC 15 to 60 (4.5dB).
Note DVM indication as reading A.

(4) Set CTC 14 to SIGNAL.

(5) Adjust RFA until DVM indicates reading A.

(6) Set SSW on EUT to L, and note that squelch is closed (no noise in LS).

(7) Set SSW on EUT to ✳.

(8) Set CTC 14 to CARRIER OFF.

(9) Set CTC 15 to 38 (8.5dB).
Note DVM indication as reading B.

(10) Set CTC 14 to SIGNAL.

(11) Adjust RFA until DVM indicates reading B.

(12) Set SSW on EUT to L and note that squelch is open (noise in LS).

Test 18 - Spurious responses

73. a. Limits. The second channel rejection will be greater than 100dB at any low band frequency, and greater than 95dB at any high band frequency.

Caution: Do not depress CTC 11 during this test.

b. Method.

(1) Set TRE and EUT switches as given in Table 18.

Table 18 - Test 18 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 QUIETING 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 47975 SSW ✳ ROS A

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Set RFG frequency to 47.975MHz unmodulated.

(3) Set RFA to 120dB.
Note DVM indication as reading A.

(4) Set RFG frequency to 71.025MHz (fs + 2IF).

(5) Adjust RFA until DVM indicates reading A.
Note RFA setting which shall be not greater than 20dB.

(6) Set FSS on EUT to 76025.

(7) Set RFG frequency to 76.025MHz unmodulated.

(8) Set RFA to 120dB.
Note DVM indication as reading B.

(9) Set RFG frequency to 99.075MHz (fs + 2IF).

(10) Adjust RFA until DVM indicates as reading B.
Note RFA setting which shall be not greater than 25dB.

Test 19 - AF power output and distortion

74. a. Limits.

(1) With an rf signal modulated by 1kHz at ± 5kHz deviation at a level of 1mV emf applied to the 50Ω antenna socket, the audio outputs shall be:-

(a) 3.1mW to 6.3mW into 300Ω at the remote terminals.

(b) 1.6mW to 2.4mW into 150Ω at pins G and E of both audio sockets with SSW set to ✳.

(c) With SSW set to W, the outputs at pins G and E of the audio socket shall be 21dB to 16dB less than the output in (b).

(2) The distortion of the audio output at the remote terminals and audio socket shall be not greater than 8.5%.

Note: The facilities of the TRE do not include the measurement of distortion. Details will be issued if and when facilities are provided.

Caution: Do not depress CTC 11 during this test.

b. Method.

(1) Set TRE and EUT switches as given in Table 19.

Table 19 - Test 19 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 LOC → REM 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 47975 SSW ✳ ROS A
		EUT connections:- CS7 to battery terminals (item 4) CTC 20 to 50Ω ANT (item 7) IF(C)5 to 22SK1 (item 10)	

(2) Using TRE items 16 and 17, connect EUT remote terminals to IF(C) harness fan-out pins A and B.

(3) Check if a call tone is heard (2kHz), reverse connections at remote terminals.

(4) Set RFG frequency to 47.975MHz, modulated by 1kHz at ± 5kHz deviation and 150Hz at ± 1.3kHz deviation.

(5) Set RFA to 60dB (1mV).
Note DVM indication which shall be between 0.49V and 0.6V.

(6) Set CTC 2 to AF LOAD 150.
Note and record as reading A, the DVM indication which shall be between 0.5V and 0.574V.

(7) Transfer connection from EUT 22SK1 to 22SK2.
Note that DVM indicates reading A.

(8) On EUT, set SSW to W.
Note and record DVM indication, which shall be 1/10th to 1/18th of reading A.

(9) Observe display on CRO and note that the distortion does not appear excessive in the above tests.

Test 20 - Low battery warning

75. a. Limit. The low battery warning shall operate with a dc input voltage between 17V and 20V.

b. Method.

(1) Set TRE and EUT switches as given in Table 20.

Table 20 - Test 20 switch settings

CS	CTC	IF(C)	EUT
1 VEH 14-33 2 VEH V 6 Released (ON)	1 Rx FM 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 47975 SSW L ROS L

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Adjust CS4 until DVM indicates between 23.8V and 24.2V.

(3) Slowly reduce CS4 setting until bursts of noise are heard in LS.
Note DVM indication which shall be between 17V and 20V.

Test 21 - Call output

76. a. Limit. With the equipment in CALL condition, the call tone measured at pins G and E of the audio socket shall be 2kHz ± 15% at a level of greater than 2mW into 150Ω.

b. Method. Set EUT and TRE switches as given in Table 21.

Table 21 - Test 21 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 AF LOAD 150 3 Released 4 Released 5 Released 6 Released 7 Depressed 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 47975 SSW L ROS C

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

Note call tone heard in LS.
Note counter display which shall be between 1700Hz and 2300Hz.
Note DVM indication which shall be greater than 0.548V.

Test 22 - DC voltages to line and 22SK2 pin C

77. a. Limits.

(1) With ROS set to R, A or I, a dc voltage between 16V and 19V shall appear at the remote terminals.

(2) With EUT in any condition except OFF, the dc supply voltage shall appear at audio socket 22SK2 pin C wrt earth.

b. Method.

(1) Set TRE and EUT switches as given in Table 22.

(2) Using TRE items 16 and 17, connect EUT remote terminals to IF(C) harness fan-out pins A and B (ensuring correct polarity).

(3) Adjust CS 4 until DVM indicates between 19.8V and 20.2V.

(4) Depress CTC 6.
Note DVM indication which shall be between 16V and 19V.

(5) Set ROS to A and I in turn. At each position note DVM indication which shall be between 16V and 19V.

(6) Depress CTC 5 and adjust CS 4 until DVM indicates between 31.8V and 32.2V.

Table 22 - Test 22 switch settings

CS	CTC	IF(C)	EUT
1 VEH 14-33 2 VEH V 6 Released (ON)	1 RC 2 LOC → REM 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 CARRIER OFF 26 INT	1 LINE CURRENT 3 Released 4 Released 7 Normal	FSS 47975 SSW ✳ ROS R

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK2 (item 10)

(7) Depress CTC 6 and note DVM indication which shall be between 16V and 19V.

(8) Set ROS to A and R in turn, at each position note DVM indication which shall be between 16V and 19V.

(9) Set ROS to L and note DVM indication which shall be not greater than 1V.

(10) Set CS1 to VEH 24.

(11) Depress CTC 5.
Note DVM indication and record as reading A.

(12) Depress CTC 6.

(13) Depress IF(C)4.
Note DVM indication which shall be reading A ± 0.02V.

Test 23 - Remote line currents

78. a. Limits. With ROS set to R or A:-

(1) With a current of not greater than 4mA flowing in the remote lines, the EUT must be in the receive condition.

(2) With a current of between 8mA and 14.5mA flowing in the remote lines, the EUT must be in the transmit condition.

(3) With a current of between 20mA and 30mA flowing in the remote lines, the EUT must be in the call condition.

b. Method.

(1) Set TRE and EUT switches as given in Table 23.

Table 23 - Test 23 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 RC 2 LOC → REM 3 Released 4 Released 5 Released 6 Depressed 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 CARRIER OFF 26 INT	1 LINE CURRENT 3 Depressed 4 Released 7 Normal	FSS 47975 SSW ✳ ROS R

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) Using TRE Items 16 and 17, connect EUT remote terminals to IF(C) harness fan-out pins A and B, ensuring correct polarity.

(3) Set IF(C)2 fully counter-clockwise.

(4) Check that EUT is in receive condition (noise in LS).
Note DVM indication which shall be less than 4mV (=4mA).

(5) Slowly adjust IF(C)2 until DVM indicates 4mV. Check that EUT is in receive condition.

(6) Slowly adjust IF(C)2 until EUT changes to transmit condition (determined by loss of noise in LS and display of EUT frequency on counter).
Note DVM indication which shall be between 4.01mV and 8mV.

(7) Increase IF(C) setting until DVM indicates 14.5mV. Check that EUT is in transmit condition.

(8) Increase setting of IF(C)2 until EUT changes to call condition (determined by 2kHz tone in LS).
Note DVM indication which shall be between 14.6mV and 30mV.

(9) On EUT set ROS to A and repeat (3) to (8).

Test 24 - Remote line resistance

79. a. Limits. When the EUT is operating in remote mode:-

(1) With the remote lines open circuit, the EUT shall be in receive condition.

(2) A resistance of 1400Ω across the remote terminals shall cause the EUT to be in the transmit condition.

(3) A resistance of 500Ω across the remote terminals shall cause the EUT to be in the call condition.

(4) A short circuit across the remote terminals shall cause the EUT to be in the call condition.

b. Method.

(1) Set TRE and EUT switches as given in Table 24.

Table 24 - Test 24 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 RC 2 LOC → REM 3 Released 4 Released 5 Released 6 Depressed 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 CARRIER OFF 26 INT	1 LINE CURRENT 3 Depressed 4 Released 7 Normal	FSS 47975 SSW ✳ ROS R
		EUT connections:- CS7 to battery terminals (item 4) CTC 20 to 50Ω ANT (item 7) IF(C)5 to 22SK1 (item 10)	

(2) Using TRE items 16 and 17, connect EUT remote terminals to IF(C) harness fan-out, pins A and B ensuring correct polarity.

(3) Check that EUT is in receive condition (indicated by noise in LS and DVM indication of less than 4mV).

(4) Set IF(C) to Tx 1400. Check that EUT is in transmit condition (indicated by no noise in LS) and counter and DVM indication of 8mV to 14.5mV).

(5) Set IF(C)1 to CALL IN 500Ω. Check that EUT is in CALL condition; indicated by call tone in LS and DVM indication of 14.6mV to 30mV.

(6) Set IF(C)1 to CALL IN SC. Check that EUT is in call condition (indications as (5) above).

Test 25 - Auto-rebroadcast operation, local - remote

80. a. Limit. With the EUT in Auto - rebroadcast working, in receive condition, a modulated rf signal at a level of 1μV shall produce a demodulated tone at the remote terminals, and place a load across the remote terminals, such that an externally applied dc voltage of 18V shall cause a current of 8-11mA to flow.

b. Method.

(1) Set TRE and EUT switches as given in Table 25.

Table 25 - Test 25 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 RC 2 LOC → REM 3 Released 4 Released 5 Released 6 Depressed 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 18V AUTO 3 Released 4 Released 7 Normal	FSS 47975 SSW L ROS A

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

(2) With CTC 1 set to RC, the remote control of the RFG is inhibited, and the modulation must be set manually.

(a) Using Racal equipment:-

i. On signal processor, set mode REMOTE/LOCAL switch to LOCAL.

ii. Set MODE switch to 0-10kHz fm deviation.

iii. On two-tone generator, switch tone A OFF, set tone B frequency to 1000Hz and output level to 300mV.

iv. On signal processor, adjust modulation level control until deviation meter indicates 5kHz deviation.

v. On two-tone generator, switch tone B OFF, switch tone A ON.

vi. Set tone A frequency to 150Hz, and adjust tone A output level until deviation meter on signal processor indicates 1.3kHz.

vii. On two-tone generator, switch tone B ON.

(b) Using Schlumberger equipment:-

i. On three-tone generator, set A tone ON, B tone OFF.

ii. Set level A and B to 50mV.

iii. Set CONTROL/LOCAL to LOCAL.

iv. Set CARRIER to ON.

v. Set C tone to ON.

vi. Set level C to 13mV.

vii. Set AM to OFF and FM to INT.

viii. Set output multiplier to x1.

ix. Set generator A frequency to 1000Hz.

x. Set generator C frequency to 150Hz.

xi. Set attenuator on attenuator control unit to 120dB.

xii. Set frequency synthesizer to 47.975MHz.

(3) Using TRE Items 16 and 17, connect EUT remote terminals to IF(C) harness fan-out pins A and B, ensuring correct polarity.

(4) Continue.

(a) If using Racal equipment:-

i. Set MODE switch on signal processor to OFF.
Note DVM indication which shall be between 16V and 19V.

ii. Set MODE switch on signal processor to fm 0-10kHz deviation.
Note 1kHz tone in LS (EUT receiving).

iii. Depress IF(C)3.
Note DVM indication which shall be between 8mV and 11mV.

iv. On signal processor, set MODE switch to OFF and mode remote/local switch to remote.

(b) If using Schlumberger equipment:-

i. Set CARRIER switch on three-tone generator to OFF.
Note DVM indication which shall be between 16V and 19V.

ii. Set CARRIER switch on three-tone generator to ON.
Note 1kHz tone in LS (EUT receiving).

iii. Depress IF(C)3.
Note DVM indication which shall be between 8mV and 11mV.

Test 26 - Line modulation sensitivity

81. a. Limits.

(1) With the EUT set to R, and a resistance of 1400Ω connected across the remote terminals, an af signal of 1kHz at a level of 250mV ± 5% applied to the remote terminals shall cause the transmitted rf output to be deviated by more than ± 3.3kHz.

(2) Increasing the level of the af signal to 1.7V ± 10% shall cause the deviation to increase to less than 6.7kHz. The distortion shall be less than 13%.

(3) With conditions as (2), and EUT set to A, the distortion shall be less than 13%.

b. Method.

(1) Set TRE and EUT switches as given in Table 26.

Table 26 - Test 26 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 RC 2 REM → LOC 3 Released 4 Depressed 5 Released 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 CARRIER OFF 26 INT	1 Tx 1400 3 Released 4 Released 7 Normal	FSS 47975 SSW 0 ROS R
		EUT connections:- CS7 to battery terminals (item 4) CTC 20 to 50Ω ANT (item 7) IF(C)5 to 22SK1 (item 10)	

(2) Using TRE Items 16 and 17 connect EUT remote terminals to IF(C) harness fan-out pins A and B, ensuring correct polarity.

(3) On AFG, set tone B frequency to 1000Hz, output level to 200mV.

(4) Using TRE items 14 and 15, connect EUT remote terminals to CTC 16 and 17.
Note DVM indication, and adjust tone B output level until DVM indicates between 237.5mV and 262.5mV.

(5) Depress CTC 6.

(6) Set SSW on EUT to L. Check that EUT is in transmit condition (indicated by counter display of EUT frequency).

(7) Using MM, measure deviation which shall be greater than 3.3kHz.

(8) On AFG, set LEVEL MULTIPLIER to X10.

(9) Measure deviation on MM, which shall be less than 6.7kHz. Observe display on CRO, and check that distortion is less than 13%.

(10) Set ROS on EUT to A.
Observe display on CRO, and check that distortion is less than 13%.

Test 27 - Intercom

82. a. Limits. With EUT in intercom mode:-

(1) the equipment shall not transmit.

(2) a received signal will be heard at the AUDIO sockets and remote terminals.

(3) with the local pressel pressed, an af signal applied to the local MIC socket will be heard at the AUDIO socket and remote terminals.

(4) an af signal applied to the remote terminals will be heard at the AUDIO socket.

b. Method.

(1) Set TRE and EUT switches as given in Table 27.

Table 27 - Test 27 switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH A 6 Released (ON)	1 CW 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 47975 SSW L ROS I

EUT connections:-

CS7 to battery terminals (item 4)
CTC 20 to 50Ω ANT (item 7)
IF(C)5 to 22SK1 (item 10)

Note DVM indication which shall be less than 12.5mV (receive current).

(2) Depress CTC 11 and note DVM indication which shall be less than 12.5mV.

(3) Set CTC 1 to Rx FM.

(4) Set RFG to 47.975MHz modulated by 1kHz at ± 5kHz deviation and 150Hz at 1.3kHz deviation.

(5) Set RFA to 120dB.

(6) Set CTC 14 to SIGNAL.
Note 1kHz tone in LS.

(7) Using TRE items 16 and 17, connect EUT remote terminals to IF(C) harness fan-out pins A and B, ensuring correct polarity.

(8) Set CTC 2 to LOC → REM.
Note 1kHz tone in LS.

(9) Set CTC 14 to CARRIER OFF.

(10) Set CTC 1 to MOD ST.

(11) Set CTC 2 to AF LOAD 150.

(12) Depress CTC 11, and note 1kHz tone in LS.

(13) Set CTC 2 to LOC → REM.

(14) Depress CTC 11 and note 1kHz tone in LS.

(15) Set CTC 2 to REM → LOC.

(16) Set IF(C)1 to line current.

(17) On AFG set tone B output level to 2V.

(18) Set CTC 1 to RC and note 1kHz tone in LS. (CRO display indicates af tone at remote terminals. Depress CTC 7, DVM indicates level of tone at audio socket.)

FAULT FINDING

General

83. The modular construction of the RT 351 may require the removal of connections to an assembly pin. This can be achieved by careful use of the suction soldering tool, to remove the solder and isolate the assembly pin from the surrounding land. The isolation obtained is minimal, and it is essential that all solder is removed from both the pin and the land. Care must be taken, when making measurements so that the pin is not shorted to the land.

84. It cannot be over-emphasised that care must be taken at all times during such operations due to the fragile nature of the motherboard, tracking and module pins.

85. Initial fault indication will be from results of specification tests carried out on TRE or ATE. Fault diagnosis will be, in the first instance, by interpretation of results obtained, leading to fault location at assembly or discrete component level.

86. The basic approach to proving an assembly failure will be:-

a. Check that all dc voltages are correct (see Table 4001).

b. Check input conditions.

c. Check output conditions.

87. Table 28 lists the specification tests carried out, with an indication of the possible suspect assembly/assemblies related to the fault indications for each test.

Table 28 - RT 351 fault diagnosis

Specification Test No.	Indication	Suspect
1	No current	2LK1, 2S1, (19) and dc input wiring on web.
1 a. (2) a. (1)	Tx current normal Rx current outside limits	Confirm Rx current on high and low bands. If on one band only suspect (5) and (11) or (12). If both bands suspect (5) (6) (7).
1 a. (2)	Tx current outside limits	Confirm Tx current on high and low bands. If one band only, suspect (14)(15)(17)(18). If both bands suspect all Tx assemblies and remote unit.
1 a. (1) and (2)	Rx and Tx currents outside limits	(19)(2)
2 a. (1) and (2)	No rf output	Recheck with EUT on FRTK. If power correct, suspect antenna matching (3). If no rf output suspect (20)(14)(15)(16)(17)(18).
2 a. (1) and (2)	No output on one band	(20)(14)(15)(17)(18)
2 a. (1) and (2)	Output low	(16)(18)
2 a. (2)	Outside limits	(18)(19)
3	Tx power output	(3)(10)
4	Outside limits	(3) Conn RF No 1, 1SK2
5	Outside limits	(13)(14)
6	Outside limits	(13)(14)
7	Outside limits	(13)(14) Remote assy.
8	Outside limits	(13)
9	Outside limits	(13)(14)
10	Outside limits	(13)(7)(5)(9)
11	Outside limits	(10)(3)(20)

Table 28 - (cont)

Specification Test No.	Indication	Suspect
12	Outside limits	2ML1, (8)(14)
13	Outside limits	(16)(17)(3)
14	Rx inoperative	(7) Check for OVM If correct suspect (7)(6)(5) If incorrect suspect (9).
	Rx inoperative on one band	(5) and (11) or (12)
	Outside limits	Alignment
15	Outside limits	(6)
16 a. (1)	Squelch inoperative	(13)(12)(11)(9)(7)
	Outside limits	Alignment
a. (2)	Outside limits	(13)
17	Squelch inoperative	(5)(6)(7)(9)
	Outside limits	Alignment
18	Outside limits on one band only	Alignment
	Outside limits on both bands	(5)
19 a. (1) (a)	No output or outside limits	Remote assembly
a. (1) (b)	Outside limits	(7)
a. (1) (c)	Outside limits	2S1, (7)
a. (2)	Outside limits	Remote assembly, (6)(7)
	No output from one audio socket	Remote assembly
20	Outside limits	(9)
21	No output	(20) Remote assembly
	Outside limits	(20)
22 a. (1)	No output or outside limits	Remote assembly
a. (2)	Outside limits	Remote assembly
23	Outside limits	Remote assembly
24	Outside limits	Remote assembly
25	Outside limits	(9) Remote assembly
26	Outside limits	Remote assembly

Table 28 - (cont)

Specification Test No.	Indication	Suspect
27 a. (1)	EUT transmits	(20) Remote assembly
a. (2)	No Rx signal	(9) Remote assembly
a. (3)	No tone	Remote assembly
a. (4)	No audio	Remote assembly

Use of field repair test kit

88. With the EUT fitted to the test jig, access to all internal test points is available on the assembly side of the EUT. The motherboard side of the equipment is covered by the two perspex doors of the test jig. These are engraved with the assembly boundary lines and assembly pin numbers, and have holes corresponding to the assembly pins. Access to the motherboard is achieved by opening the respective door, one of which covers the transmitter side, and the other receiver side.

89. Typical voltage and signal levels are given in Table 4001.

Connection of equipment on test jig to TRE

90. When the EUT is to be used on an unprotected supply, connect the supply protection unit to the battery input terminals on the test jig.

91. When EUT is to be used on TRE (protected supply) connect supply lead (Item 4) from CS7 to battery input terminals on test jig.

92. Using connector (Item 10), connect the audio socket on CI to the audio socket on EUT remote panel.

93. For receiver tests, connect CTC 20 to RECEIVE socket on test jig.

94. For transmitter tests, connect CTC 20 to TRANSMIT socket on test jig.

Note: As an additional aid to fault finding, it is suggested that the M and $\overline{M}$ conditions, detailed in Tels F 582 para 68 and repeated below, should be checked.

95. A non-mute command ($\overline{M}$) is produced at (9)3 according to the following boolean equation:-

$$\overline{M} = Lk\ (S + No + P.Tw) + C + Ic.P$$

ie, the receive audio assembly is not muted if:-

a. in the receive mode, the synthesizer is locked and a signal is being received.

b. in the receive and transmit modes, the synthesizer is locked and the on/off switch is set to noise on.

c. in the transmit mode, the synthesizer is locked, the local pressel is pressed and the transmitter is working.

d. the set is switched to call.

e. the set is switched to intercom and the local pressel is operated.

ALIGNMENT

General

96. Alignment of RT 351 is carried out with the equipment opened and fitted to the FRTK test jig (para 17 to 32).

97. With EUT fitted to test jig and before commencing alignment, carry out a functional check.

Functional check

98. Set TRE and EUT as given in Table 29.

Table 29 - Functional check switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 RF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 30050 SSW O ROS L
		EUT connections:- CS7 to battery terminals (item 4) CTC 20 to test jig Rx (item 7) IF(C)5 to 22SK1 (item 10)	

a. On EUT set SSW to ✱ , and note noise in LS.
Note DVM indication which shall be between 23.98V and 24.02V.

b. Set RFG to 30.050MHz modulated by 1kHz at ± 5kHz deviation and 150Hz at ± 1.3kHz deviation.

c. Set RFA to 120dB.
Note 1kHz tone in LS.

d. Set CS2 to VEH A.
Note DVM indication which shall be not greater than 13mV.

e. Set FSS on EUT to 62050.

f. Set RFG frequency to 62.050MHz.
Note 1kHz tone in LS.

g. Using TRE items 16 and 17 connect EUT remote terminals to IF(C) harness fan-out pins A and B, ensuring correct polarity.

h. Set ROS on EUT to R.

j. Set CTC 2 to loc-rem and note 1kHz tone in LS.

k. Set ROS on EUT to A, and note 1kHz tone in LS.

l. Set ROS on EUT to I, and note 1kHz tone in LS.

m. Transfer connection from test jig Rx socket to test jig Tx socket.

n. Set CTC 1 to CW and depress CTC 7.

o. Set ROS on EUT to L.

p. Depress CTC 11 and note counter display which shall be 62.050MHz.

q. Depress CTC 5 and CTC 11.
Note DVM indication which shall be not greater than 87mV rms.

r. Set CTC 1 to MOD ST and depress CTC 11.
Note 1kHz tone in LS.

s. Set ROS on EUT to R and CTC 1 to RC.

t. Depress CTC 11 and note 1kHz tone in LS.

u. Set IF(C)1 to Tx 1400.
Note 1kHz tone in LS and note DVM indication which shall be not greater than 87mV.

v. Set IF(C)1 to CALL IN SC and note call tone in LS.

w. Set CTC 2 to AF LOAD 150, IF(C)1 to OC.

x. Set ROS on EUT to C and note call tone in LS.

y. On EUT, set ROS to L, FSS to 30050.

z. Set CTC 1 to CW.

aa. Depress CTC 11 and note counter indication which shall be 30.050MHz.

Alignment procedures

99. Alignment must be carried out in the order specified and adjustments made in the order given.

Caution: Do not adjust any component not detailed, particularly on assemblies (15) and (17).

100. Set TRE and EUT switches as given in Table 30.

Table 30 - Alignment procedure switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 Rx FM 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal EUT connections:- CS7 to battery terminals (item 4) IF(C)5 to 22SK1 (item 10) Using item 7, connect CTC 20 to test jig Rx socket.	FSS 30000 SSW ✳ ROS A

101. Converter output voltages.

a. Note DVM indication which shall be 24 ± 0.2V.

b. Depress CTC 3.

c. Using suitable leads connected to DVM ACCESS terminals (CTC 16 and 17), measure the dc voltage at 2TP4 wrt chassis (earth) which shall be 6.1 ± 0.01V. Adjust (19) R1 as necessary to obtain this voltage.

d. Using DVM, measure the voltage at the following pins (wrt earth) which shall be within the limits stated:-

(1) (19)1 3.003V to 3.246V

(2) (19)3 8.739V to 9.260V

(3) (20)24 16.17V to 17.83V

(4) (19)5 98.80V to 112.3V

102. Oscillator alignment.

a. Disconnect lead to test jig Rx socket.

b. Using FRTK item 8 (22pf cable), connect CTC 21 to 2TP2 and earth.

c. Using TRE items 20 and 21, connect CTC 16 and 17 to 2TP1 and earth.

d. Set CTC 12 to ACCESS, CTC 1 to CW.

e. With CTC 11 depressed or released as detailed in Table 31, and FSS on EUT set to the settings specified, check DVM and counter indications for each condition, adjusting the variable component shown to achieve the limits. Repeat test until no further improvement is obtained.

Note: Under certain conditions, the EUT may not produce LK signal with CTC 11 depressed. If this occurs, set CTC 12 to AF, depress CTC 11 and allow EUT to lock. Keeping CTC 11 depressed, set CTC 12 to ACCESS, and counter will indicate correctly.

Table 31 - Oscillator alignment test data

CTC 11	FSS	DVM (V)		COUNTER (MHz ± 0.001)	ADJUST
		LL	UL		
Depressed	30000	4.480	4.520	30.000	(14) L1
Released	30000	4.480	4.520	41.525	(12) L1
Released	47975	81.60	82.40	59.500	(12) C4
Depressed	47975	81.60	82.40	47.975	(14) C4
Depressed	48000	4.480	4.520	48.000	(14) L4
Released	48000	4.480	4.520	59.525	(11) L1
Released	76000	81.60	82.40	87.525	(11) C4
Depressed	76000	81.60	82.40	76.000	(14) C17

f. Record DVM indication, after final adjustment, as reading A.

g. Remove DVM lead from 2TP1, and connect to (8)4.

h. Note DVM indication, which shall be within -1.0V to +0.6V of reading A.

103. Loop amplifier alignment.

a. Transfer DVM access connections from (8)4 to 2TP3.

b. Adjust (8)R2 as necessary to obtain a DVM indication of 2.278V to 2.322V.

c. Set FSS on EUT to 48000.

d. Adjust (8)R7 as necessary to obtain a DVM indication of 4.278V to 4.322V.

104. Reference oscillator.

a. This procedure must only be carried out at an ambient temperature of +15°C to +30°C.

b. Note and record the OFFSET frequency, marked on 2ML1, as FO.

c. Set FSS on EUT to 52475.

d. Note and record counter display as reading A.

e. Calculate the difference, in Hz, between reading A and 64.000000MHz + 10FO, noting whether the difference is high or low. Proceed as follows:-

(1) If the error is equal to or less than ± 100Hz, no adjustment is required.

(2) If the error is greater than 770Hz, replace 2ML1 and carry out complete alignment of EUT.

(3) If the error is between 100Hz and 770Hz, carry out the following adjustments to 2ML1:-

(a) Examine 2ML1 and if there are any links between its ageing pins, carefully unsolder and remove them.

(b) Re-check the frequency indicated on the counter. It must be 64,000,000 ± 770Hz. If not renew 2ML1.

(c) Using Table 32, select the appropriate combination for the ageing links on 2ML1 and make the necessary interconnections using suitable wire and sleeving (eg 24 swg tinned copper wire and 1mm heat resistant sleeving).

Notes: 1. For a LOW error, connect pins detailed to EARTH.

2. For a HIGH error, connect pins detailed to 2ML1 pin 8.

Table 32 - Ageing pins frequency error correction

ERROR (Hz)	2ML1 Pin
100 - 190	5
190 - 290	6
290 - 380	5 and 6
380 - 480	7
480 - 580	5 and 7
580 - 670	6 and 7
670 - 770	5, 6 and 7

f. After carrying out adjustment, repeat procedure.

105. Frequency selection.

a. Connect CTC 20 to test jig Tx socket.

b. Set CTC 1 to CW Tx.

c. Set FSS on EUT to the following frequencies in turn and, at each frequency, note counter display which shall be within ± 1kHz of the frequency selected:-

(1)	30000	(6)	57500
(2)	31800	(7)	68625
(3)	42225	(8)	69750
(4)	43350	(9)	74975
(5)	55475	(10)	76100

d. Set CTC 1 to CW.

e. Remove connections to 2TP2 and earth.

Transmitter modulation settings

106. Transmitter deviation due to microphone input.

a. The aim is to set the transmitter deviation such that the transmitter oscillators are deviated by ± 3.5kHz due to a modulation frequency of 1kHz applied to the microphone input terminals at a level of 1mV pd.

Note: The MM must be calibrated on its ± 3kHz and ± 10kHz ranges as detailed in para 192.

b. Method.

(1) Set CTC 1 to PILOT TONE.

(2) Set CTC 12 to AF.

(3) Set CTC 13 to AF.

(4) Set FSS to 62.025MHz.

(5) Set SSW to ✳ (noise on).

(6) Set ROS to L.

(7) Depress CTC 11 as and when required.

(8) Tune the MM and switch to the ± 3kHz range.

(9) Adjust (13)R9 for minimum deviation reading.

(10) Switch MM to the ± 10kHz range.
Note the MM reading (N). This deviation is due to noise and shall be less than ± 0.6kHz.

(11) Set CTC 1 to MOD ST.

(12) Set AFG to a single tone of 1kHz.

(13) Set AFG output voltage attenuator to X0.1.

(14) Set AFG attenuator to 200mV emf.

(15) Adjust (14)R15 for a MM indication of N + 3.5kHz.

(16) Set CTC 1 to PILOT TONE.

(17) Set FSS to 39.025MHz.

(18) Tune the MM and switch to the ± 10kHz range. Note the MM reading (N1). This deviation is due to noise and shall be less than ± 0.4kHz.

(19) Set CTC 1 to MOD ST.

(20) Adjust (14)R2 for a MM indication of N1 + 3.5kHz.

107. Loud/whisper control.

a. Set SSW to WHISPER.

b. Decrease AFG attenuator setting until the MM indication equals N1 + 3.5kHz. The AFG attenuator setting shall be between 33mV and 50mV emf.

108. Modulation control.

a. Set SSW to ✳ (noise on).

b. Increase the AFG attenuator setting to 400mV emf.

c. Set AFG output voltage attenuator to X1. MM indication shall not exceed N1 + 6.3kHz.

109. Modulation response.

a. Set AFG attenuator to 10mV.

b. Note the MM reading (N2).

c. Note the difference in MM indication for the modulation frequencies listed in Table 33 with respect to N2.

Table 33 - Modulation response limits

Mod Frequency	Response wrt 1kHz
100Hz	Greater than 14dB down
400Hz	Between 1 and 7dB down
600Hz	Between 0 and 4.5dB down
3,000Hz	Between 0 and 5.5dB down
6,000Hz	Greater than 10dB down
20,000Hz	Greater than 16dB down

110. Modulation distortion.

a. Set AFG attenuator to 600mV.

b. Set AFG frequency to 1kHz.

c. Note CRO display and verify that waveform is not distorted.

111. Variation of deviation with channel frequency.

a. Adjust AFG attenuator for MM indication of N1 + 5kHz.

b. Maintaining the AFG input constant, note the deviation at channel frequencies of 30.050MHz and 47.950MHz. The MM shall indicate between ± (N1 + 4.5)kHz and ± (N1 + 5.5)kHz.

c. Set FSS to 62.025MHz.

d. Tune the MM and switch to the ± 10kHz range.

e. Adjust AFG attenuator for MM indication of N + 5kHz.

f. Maintaining the AFG input constant, note the deviation at channel frequencies of 48.050MHz and 76.050MHz. The MM shall indicate between ± (N + 4.5)kHz and ± (N + 5.5)kHz.

112. Transmitter deviation due to 150Hz internal tone.

a. The aim is to set the transmitter deviation such that the transmitter oscillators are deviated by ± 1.65kHz due to the 150Hz internal tone.

b. Method.

(1) Set FSS to 39.025MHz.

(2) Set CTC 1 to PILOT TONE.

(3) Tune the MM and switch to the ± 3kHz range.

(4) Note the MM reading (N3). This deviation is due to noise.

(5) Adjust (13)R9 for a MM indication of N3 + 1.7kHz.

(6) Adjust (13)R4 for a counter indication of 150Hz.

Receiver modulation setting

113. Receiver squelch tone and deviation.

a. The aim is to ensure that the receiver squelch tone is approximately 160Hz and to verify that this tone deviates the receiver oscillators by ± 1.5kHz.

Note: The MM must be calibrated on its ± 3kHz range as detailed in para 192.

b. Method.

(1) Set CTC 1 to PILOT TONE.

(2) Set CTC 12 to AF.

(3) Set CTC 13 to AF.

(4) Set FSS to 39.025MHz.

(5) Set SSW to ✱ (noise on).

(6) Set ROS to L.

(7) Unplug the TRE feeder at the rf input point to the MM.

(8) Connect the FRTK item 8 (22pF cable) from the MM rf input point to the MM and to 2TP2 and earth.

(9) Tune the MM to the receiver oscillator frequency (50.550MHz) and switch to the ± 3kHz range.

(10) Verify on the CRO that the 160Hz squelch tone is present.

(11) Set ROS to A.

(12) Verify on the CRO that the 160Hz squelch tone is inhibited.

(13) Note MM indication (N) which shall be less than ± 0.35kHz. This deviation is due to noise.

(14) Set ROS to L.

(15) Adjust (12)R2 for a MM indication of N + 1.5kHz.

(16) Note counter indication which shall be 157.5 to 161.5Hz.

(17) Set FSS to 62.025MHz.

(18) Tune the MM to the receiver oscillator frequency (73.550MHz) and switch to the ± 3kHz range.

(19) Verify on the CRO that the 160Hz squelch tone is present.

(20) Set ROS to A.

(21) Verify on the CRO that the 160Hz squelch tone is inhibited.

(22) Note MM indication (N1) which shall be less than ± 0.35kHz. This is deviation due to noise.

(23) Set ROS to L.

(24) Adjust (11)R2 for a MM indication of N1 + 1.5kHz.

(25) Note counter indication which shall be 157.5Hz to 161.5Hz.

(26) Disconnect the FRTK item 8 (22pF cable) from the MM rf input point and 2TP2 and earth.

(27) Reconnect the TRE feeder at the MM rf input point.

114. Transmitter output.

a. On EUT, set FSS to 47975, and SSW to L.

b. Connect CTC 16 and 17 to EUT (18)12 (+ve) and (18)4.

c. Set CS 1 to VEH 14-33.

d. Ensure CS 2 is set to VEH V.

e. Depress CTC 5 and adjust CS 4 for DVM indication of between 19.9V and 20.1V.

f. On EUT, set (18)R6 fully clockwise.

g. Depress CTC 3, set CTC 1 to CW Tx.

h. Adjust (18)R13 until DVM indicates between 1.04V and 1.08V.

j. Depress CTC 5 and adjust CS 4 until DVM indicates between 26.4 and 26.6V.

k. Set CS 2 to VEH A and adjust (18)R6 until DVM indicates 84.8mV. Adjust for maximum if this indication cannot be obtained.

l. Set CS 2 to VEH V, and adjust CS 4 for DVM indication between 21.9V and 22.1V.

m. Set FSS on EUT to 30050.

n. Set CS2 to VEH A.

o. Note DVM indication which shall be less than 84.8mV.

p. Depress CTC 7.

q. Note and record DVM indication which shall be not less than 1.897V (= 3.6W rf power output).

r. Repeat from sub-para m. with FSS on EUT set to the following frequencies (kHz) in turn:-

39050, 47950, 48050, 62050, 76050.

Note: If the rf power output is generally high, set FSS to the frequency which produced the lowest output, and adjust (18)R6 to obtain a DVM indication of greater than 1.897V, then repeat from sub-para m.

s. Set CTC 1 to CW.

115. Spurious radiation - second harmonic. A spectrum analyser is required to carry out these tests. Practical details will depend on the type of analyser used. For further details see para 196.

116. Receive audio output.

a. Set CTC 1 to Rx FM.

b. Set CTC 14 to SIGNAL.

c. Transfer connector at test jig Tx socket to Rx socket.

d. On EUT set FSS to 39025, SSW to L.

e. Set RFG to 39.025MHz modulated by 1kHz at ± 5kHz deviation.

f. Set RFA to 20dB.

g. Depress CTC 7.

h. Adjust (7)R1 until DVM indicates 615mV.

j. Set SSW on EUT to W.

k. Note DVM indication which shall be between 61.5mV and 98.24mV.

117. Receiver sensitivity.

a. On EUT, set FSS to 30000, ROS to A, SSW to ✳.

b. Set RFG to 30.000MHz modulated by 1kHz at ± 5kHz deviation.

c. Set RFA to 106dB (5μV).

d. Depress CTC 3.

e. Connect HP rf probe type 11096 (DVM CES item) between CTC 16/17 and 6TP1/earth.

f. Note DVM indication (180V range) and adjust the following components in the order given for maximum DVM indication, reducing RFG output where necessary to prevent limiting:-

5dL1, 5hL1, 5hL2, 5kL1, 5kL2, 5bT1, 5bL1.

g. Set FSS and RFG frequency to 47.075MHz.

h. Adjust the following components, in the order given for maximum DVM indication:-

5cC1, 5gC1, 5gC2, 5jC1, 5jC2, 5aC1.

j. Set FSS and RFG frequency to 48.000MHz.

k. Adjust the following components in the order given for maximum DVM indication:-

5qL1, 5uL1, 5uL2, 5wL1, 5wL2, 5nT1.

l. Set FSS and RFG frequency to 76.000MHz.

m. Adjust the following components, in the order given for maximum DVM indication:-

5pC1, 5fC1, 5fC2, 5vC1, 5vC2, 5mC1.

n. Disconnect lead between 6TP1 and CTC 16/17.

118. Signal to noise + noise check.

a. Set CTC 2 to S + N.N.

b. Set FSS and RFG to 30.025MHz.

c. Set RFA to 120dB (1μV).

d. Depress CTC 7, set CTC 14 to MOD OFF.

e. Note and record DVM indication as reading A.

f. Set CTC 14 to SIGNAL and adjust CTC 15 until DVM indicates reading A.

g. Note setting of CTC 15 which shall be not less than 14 (greater than 17dB).

h. Repeat test with FSS and RFG set to the following frequencies:-

39.025, 47.975, 48.025, 62.025, 76.025MHz.

119. Limiting.

a. Set CTC 2 to AF LOAD 150, CTC 14 to SIGNAL.

b. Note and record DVM indication as reading A.

c. Set RFA to 20dB.

d. Note DVM indication which shall be not greater than 1dB above reading A.

120. Receiver spurious response.

a. Set RFA to 120dB.

b. Ensure EUT and RFG frequency is 76.025MHz.

c. Set CTC 14 to MOD OFF.

d. Note and record DVM indication as reading A.

e. Set RFG frequency to 99.075MHz.

f. Reduce RFA setting until DVM indicates reading A. Note RFA setting which shall be not greater than 24dB.

g. Set FSS and RFG frequency to 47.975MHz.

h. Set RFA to 120dB.

j. Note and record DVM indication as reading B.

k. Set RFG frequency to 71.025MHz.

l. Reduce RFA setting until DVM indicates reading B.

m. Note RFA setting which shall be not greater than 19dB.

121. Squelch setting.

a. On EUT, set FSS to 76025, ROS to A, SSW to ✳.

b. Set RFG frequency to 76.025MHz, modulated by 150Hz at ± 1.3kHz deviation using tone B. (Switch off tone A.)

c. Set CTC 1 to Rx FM, CTC 2 to QUIETING, CTC 14 to CARRIER OFF, CTC 15 to 60.

d. Depress CTC 7 and note DVM indication as reading A.

e. Set CTC 14 to SIGNAL.

f. Adjust RFA until DVM indicates reading A.

g. On EUT, set SSW to L and adjust (9)R2 until squelch just closes (no noise in int LS).

h. Set CTC 15 to 38 (8.5dB quieting).

j. Set SSW to ✳.

k. Set CTC 14 to CARRIER OFF.

l. Note DVM indication as reading B.

m. Set CTC 14 to SIGNAL and adjust RFA until DVM indicates reading B.

n. Set SSW to L and note that EUT is not muted (noise in LS).

o. Depress CTC 3, and connect remote panel test pin 12 and earth to CTC 16, 17.

p. Set CTC 14 to CARRIER OFF.

q. Note DVM indication which shall be less than 0.5V.

r. Set CTC 14 to SIGNAL and note DVM indication which shall be between 2.5V and 6.1V.

s. Remove connections to pin 12 and earth.

t. Depress CTC 7.

u. On signal processor, slowly reduce set level control until EUT mutes.

v. Note dB level on output level meter as reading D.

w. Increase set level control until output level meter indicates 0dB. Note that mute is lifted.

x. On AFG set tone A to 148Hz.

y. Repeat from sub-para u, noting dB level at which EUT mutes, which shall be -0 to +2dB of reading D.

z. On AFG set tone A to 162Hz.

aa. Repeat from sub-para u, noting dB level at which EUT mutes, which shall be -0 to +2dB of reading D, and ± 1dB of reading at 148Hz.

Note: If either the 148Hz or 162Hz result is outside limits, adjust (9)R1 as follows:-

(1) Depress CTC 3.

(2) Using suitable leads, connect (9)8 and earth to CTC 16/17.

(3) Set RFG frequency to 76.025MHz modulated by 150Hz at ± 1.3kHz deviation, (using tone A).

(4) Adjust (9)R1 for a flat frequency response for modulating frequencies of 148Hz to 162Hz.

(5) Disconnect leads to (9)8 and earth.

(6) Depress CTC 7.

(7) Repeat procedure starting at sub-para a.

ab. On AFG, set tone B to 160Hz and repeat from sub-para u, using limits as for 162Hz.

ac. Set ROS to R. Switch off tone B.

ad. Adjust (11)R2 until squelch opens.

ae. Set SSW to ✳.

af. Note DVM indication as reading E.

ag. Set CTC 14 to CARRIER OFF.

ah. Adjust CTC 15 until DVM indicates as reading E.

aj. Note setting of CTC 15 which shall be between 40 and 50 (6-8dB).

ak. Set FSS and RFG frequency to 47.950MHz.

al. Set CTC 14 to SIGNAL, and adjust RFA until DVM indicates reading E.

am. Set SSW to L.

an. Adjust (12)R2 until squelch opens.

ao. Set SSW to ✳ .

ap. Note DVM indication as reading F.

aq. Set CTC 14 to CARRIER OFF.

ar. Adjust CTC 15 until DVM indicates reading F.

as. Note setting of CTC 15 which shall be between 40 and 50.

122. Remote panel voltages

a. Set CS 1 to VEH 24, CS 2 to VEH V.

b. Depress CTC 5 and note DVM indication which shall be between 23.8V and 24.2V.

c. Depress CTC 3, and using DVM access terminals (CTC 16, 17) and TRE items 20, 21 measure the voltage at remote panel test pin 1 wrt earth which shall be between 23.8V and 24.2V.

d. Measure the voltage at remote panel test pin 8 wrt earth which shall be between 3.003 and 3.246V.

SECTION 2 - AMPLIFIER RF 20 WATT

GENERAL

123. WARNING: This equipment uses components containing beryllium or beryllium oxide. In certain circumstances they can constitute a hazard to health. Before working on the equipment, consult Gen K 050, Beryllium Toxic Hazard in Electronic Equipments, which gives general information, handling and disposal instructions.

Scope of repair

124. Repair at Field workshop level is by replacement of faulty components and assemblies as listed in Tels F 582, Table 2002.

Field repair test equipment

125. The test equipments listed in Table 34 are required, in addition to those listed in Table 1, to carry out Field repairs, testing and alignment. A requirement exists for the Amplifier RF 20W (AM 352) to be serviced without use of the TRE. The discrete items of test equipment required for this purpose are items 3 to 8 in Table 34.

GENERAL REPAIR INFORMATION

VHF drive unit

126. The VHF drive unit (VHFDU) is used to provide rf power and certain test conditions for the AM 352. For details see Tels M 720. No attempt is made in this regulation to describe VHFDU functions.

Table 34 - Additional field repair test equipment for AM 352

Item No.	Cat. No.	Designation	Purpose and Remarks
1	Z4/6625-99-622-5191	Test Kit Radio Field Repair AM 352	Fault finding and alignment amplifier removed from case.
2	Z4/6625-99-622-5165	Drive Unit Set VHF for AM 352	Testing and alignment.
3		DC Power Supply Unit 0 to 32V 5A	See para 125.
4	Z4/6625-99-620-8813	Voltmeter Set Digital CT 577/3	See para 125.
5	Z4/6625-99-111-5703	Counter Electronic Freq	See para 125.
6	Z4/6625-99-105-7049	Multimeter CT 498A	See para 125.
7		Spectrum Analyser	See para 125.
8		Wattmeter Absorption CT 499/3	See para 125.

Field repair test kit (FRTK) (see Tels M 720)

127. When carrying out alignment, fault diagnosis or repairs, the equipment under test (EUT) is removed from its case and secured to the test jig (see para 133).

Use of test rig electronic (TRE)

128. Use of the TRE is as described in para 9.

Internal identification

129. Screws used to secure the amplifier into its case are encircled green. There are no internal test points.

Labels

130. Replacement of internal and external labels, where necessary, is carried out at field workshop level.

Repainting

131. At field workshop level, retouching of damaged surfaces may be carried out, but not repainting. The following paints are to be used:-

a. H1a/8010-99-224-2079 paint priming, 1½ litre pack.

b. H1a/8010-99-224-8663 paint finishing, polyurethane, matt finish, deep bronze green, 1½ litre pack.

Note: These are two-part paints which must be mixed in the proportions shown on the packages. Do not mix more than is necessary as its 'mixed' life is 8 hours at 20°C and 4 hours at 33°C. Do not apply in low temperatures or high humidities.

GENERAL REPAIR INSTRUCTIONS

Dismantling and re-assembly of equipment

132. To remove the AM 352 from its case, proceed as follows:-

a. Undo the six hexagon socket captive screws on baseplate, and remove baseplate.

b. Remove two sachet desiccators.

c. Disconnect co-ax connectors 1PL1-2SK1 and 1PL2-2SK2 (rf input and output).

d. Disconnect battery input lead 1SK2 (4)7.

e. Set selector switch to 0. Slacken two hexagon socket screws on switch coupling, and ease coupling along switch shaft away from front panel.

f. Unscrew five slot head screws (encircled green) securing chassis to case.

g. Remove chassis from case.

h. Re-assemble in reverse order, ensuring that switch and switch knob are set to 0 (switch is at 0 when flats on switch shaft are horizontal and switch wafer 2S1A is in position shown in Tels F 582 Fig 2007).

Fitting and removal of AM 352 on test jig

133. a. Remove AM 352 from case (see para 132).

b. Place chassis on test jig, and secure with three captive screws through heatsink.

c. Connect battery supply lead on test jig to (4)7.

d. Connect input co-ax connector to 2SK1.

e. Connect output co-ax connector to 2SK2.

f. Fit test jig switch knob to switch shaft and tighten locking collar. Ensure that switch is set to 0 (para 132 h).

g. Removal of AM 352 from test jig is in reverse order to sub-para a. to f. above.

Connection of equipment on test jig to TRE

134. a. Connect supply lead (item 4) from CS 7 to battery input terminals on test jig.

b. Connect rf connector (660 mm) from rf output socket on VHFDU to input socket on test jig. Note: Use correct connector as length is critical.

c. Connect rf output socket on test jig to CTC 20 using rf connector (800 mm).

d. Connect FREQ MONITOR socket on VHFDU to CTC 21 using rf connector (800 mm).

e. Set CTC 12 to ACCESS.

Connection of equipment using alternative facilities

135. a. Connect supply protection unit to battery input terminals on test jig, and dc supply unit.

b. Connect FREQ MONITOR socket of VHFDU to input socket of counter using connector (800 mm).

c. Connect rf output socket on VHFDU to input socket on test jig using connector (660 mm). Note: Use correct connector as length is critical.

d. Connect rf socket on test jig to input socket on wattmeter absorption CT 499/3 OR to input socket of antenna simulator AM 352 using connector (800 mm).

e. Connect hf probe (part of DVM) from output socket of antenna simulator to DVM input terminals.

Removal and replacement of assemblies

136. The AM 352 contains two assemblies which are replaceable at field workshop level; AGC (assembly 3) and protection (assembly 4).

137. To remove assembly (3), unsolder connections to assembly pins 1, 2, 3 and 4; remove three securing screws and withdraw assembly. Replace in reverse order.

138. To remove assembly (4), unsolder connections to assembly pins 4, 3, 9, 1, 2, 8, 5, 10, 6 and 11. Remove connection to pin 7, remove four retaining screws and withdraw assembly. Replace in reverse order.

Removal and replacement of discrete components

139. With the exception of TR2, TR3 and switch S1, all components are readily accessible and may be removed and replaced using normal workshop practice. No special soldering tool is required.

140. TR2. Remove hexagon nut and washer holding TR2 to heatsink. Remove three screws securing heatsink to chassis, and remove heatsink. Unsolder

leads on TR2 pins, and withdraw TR2. On replacement, ensure that soft metal coiled spring is in position around transistor body, then re-assemble in reverse order.

141. TR3. Remove four securing screws on assembly (4). Unsolder connection to (4)6, tilt assembly (4) to gain access, and unsolder connections to TR3 pins. Remove securing screws, nuts and insulating bushes holding TR3 and mica insulating gasket. Replace in reverse order.

142. Switch S1. Proceed as follows:-

a. Wafer S1C (S1C b and S1C f): Unsolder connections to S1C b. Remove two hexagonal nuts and washers holding retaining plate. Withdraw switch spindle towards rear. Unsolder connections to S1C f. Replace in reverse order.

b. Wafer S1B (S1B b and S1B f): Remove hexagonal nuts and washers holding retaining plate. Withdraw switch spindle towards rear. Remove wafer retaining screws and spacers. Unsolder connections to S1B wafer. Replace in reverse order.

c. Wafer S1A (S1A f, S1A Ba and S1A Bb): Unsolder all connections to S1A. Remove hexagonal nuts and washers from rear of securing screws. Withdraw switch wafer and clickplate assembly forward, taking care not to dislodge brass spacers. Replace in reverse order.

d. S1A clickplate. As for sub-para c.

Desiccators

143. Two desiccators, silica-gel, sachet, style DS2 are placed within the AM 352, one in the corner of the case adjacent to 1SK1 (rf input), and one on the inside of the case wall adjacent to assembly (4). The desiccators must be replaced whenever an equipment has been opened.

Drying and sealing

144. On receipt of an equipment for repair, the following procedure will be adopted:-

a. The equipment will be pressurized to 5 lb/in^2 using dry air.

b. Using leak locator, carry out a dip test in a water tank to check for the necessity to replace any spindle seals or gaskets. The addition of a wetting agent to the water will assist in detection of leaks.

c. Open equipment in driest possible conditions and carry out obvious repairs and replacements.

d. Place opened equipment in dehumidifier and dry for at least one hour at $50^{o}C$ with dry air from the pump unit passing through the oven. (Tels M 602 gives full details of dehumidifier).

e. After cooling, electrically test the equipment and carry out any repairs and re-alignment necessary.

f. As soon as possible after re-alignment place the opened equipment in oven for 15 min.

g. Fit new silica-gel desiccators.

h. Fit new gaskets as required after smearing with grease (XG 271) and reseal equipment in its case.

j. Connect leak locator to equipment and pressurize to 5 lb/in^2 using dry air from dehumidifier.

k. Repeat the dip test. There shall be no air bubbles.

l. Details of time constant testing is given under Base Repair Inspection Standards.

145. Toroidal rubber seals are fitted to the equipment in the following positions:-

a. System switch knob.

b. Sealing plug; located at end of case adjacent to rf input socket.

c. Between case and baseplate.

Mechanical repairs

146. Repairs to accessory items are detailed in Tels F 583. Mechanical repairs to AM 352 are detailed in para 139.

SPECIFICATION TESTING

General

147. Specification testing may be carried out either on a sealed equipment, or on an equipment fitted to the test jig. The following tests detail the procedure to be followed for a sealed equipment. The testing sequence is sequential, and should be carried out in the order shown.

148. Facilities do not exist for the AM 352 to be tested using Automatic Test Equipment (ATE).

149. Specification testing is carried out as an initial check whenever an equipment is received into Field Workshops. Interpretation of specification test results will form the basis for fault diagnosis, and is dealt with in para 174.

150. The tests detailed in para 152 to 162 are to be used with the EUT connected to the TRE.

151. Tests using discrete test equipment are detailed in para 163 to 173.

SPECIFICATION TESTS USING TRE

Setting up

152. Proceed as follows:-

a. Set MHz switch on EUT to 0.

b. Using TRE item 4, connect CS 7 to battery terminals of EUT, ensuring correct polarity.

c. Using a rf connector 800 mm long, connect VHFDU FREQ MONITOR socket to CTC 21.

d. Set TRE switches as given in Table 35.

Table 35 - Setting up AM 352 switch positions

CS	CTC	IF(C)
1 VEH 14-33 2 VEH V 6 Released (ON)	1 CW 2 OC 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Released 11 Released 12 ACCESS 13 ACCESS 14 CARRIER OFF 26 INT	1 OC 3 Released 4 Released 7 Normal

Test 1 - Leakage current

153. a. Limits: With the equipment set to 0 and a dc supply voltage of 32 ± 0.2V, the leakage current shall be less than 1mA.

b. Method.

(1) Disconnect TRE Item 4 from CS 7.

(2) Adjust CS 4 until DVM indicates between 31.8V and 32.2V.

(3) Set CS 2 to VEH A. Note DVM indication (standing current).

(4) Connect TRE Item 4 to CS 7.

(5) Note DVM indication, which shall be less than standing current +0.1mV.

Test 2 - Standing dc levels

154. a. Limits: With no rf input applied, the dc supply voltage shall be present at the rf input socket, 1SK1, when the MHz switch is in any position except 0.

b. Method.

(1) Depress CTC 3 and set CS 2 to VEH V.

(2) Using TRE items 14 and 15, connect CTC 16/17 to EUT 1SK1/earth.

(3) Note DVM indication which shall be 0V.

(4) Set MHz switch on EUT to 30-40 and note DVM indication, which shall be between 31.8V and 32.2V. Repeat for positions 40-55 and 55-76.

(5) Disconnect leads from 1SK1/earth.

Test 3 - Power transfer

155. a. Limits: With a dc supply of 20 ± 0.2V and the MHz switch to 0, the power transfer of an rf signal at any operating frequency shall be ± 1dB.

b. Method.

(1) Set MHz switch on EUT to 0.

(2) Depress CTC 5 and adjust CS 4 until DVM indicates between 19.8V and 20.2V.

(3) Using rf connector 660 mm long, connect wattmeter to RF OUTPUT socket on VHFDU.

(4) On VHFDU, set frequency to 40MHz, set HIGH/LOW switch to LOW, adjust SET LEVEL and depress LOAD EXT switch.

(5) Note and record wattmeter indication as reading A.

(6) Transfer connection from wattmeter to RF INPUT socket of EUT.

(7) Connect rf connector 800 mm long between wattmeter and RF OUTPUT socket of EUT.

(8) Depress LOAD EXT switch on VHFDU.

(9) Note wattmeter indication which shall be reading A ± 1dB.

Test 4 - Low power input

156. a. Limits: With a dc supply of 20 ± 0.2V, the rf output of all operating frequencies shall be not less than 14.5W.

b. Method.

(1) Depress CTC 5.

(2) Adjust CS 4 until DVM indicates between 19.8V and 20.2V.

(3) Set MHz switch on EUT to 30-40.

(4) Set VHFDU to 30.025MHz (indicated on counter).

(5) On VHFDU, set HIGH/LOW switch to LOW, adjust SET LEVEL and depress LOAD EXT switch.

(6) Note wattmeter indication which shall be not less than 14.5W.

(7) Repeat test of sub-para (5) and (6) with VHFDU frequency set to 35.025MHz and 40.025MHz in turn.

(8) Set MHz switch on EUT to 40-55.

(9) Repeat test of sub-para (5) and (6) with VHFDU frequencies of 40.025MHz, 45.025MHz and 55.025MHz in turn.

(10) Set MHz switch on EUT to 55-76.

(11) Repeat test of sub-para (5) and (6) with VHFDU frequencies of 55.025MHz, 66.025MHz and 76.025MHz in turn.

Test 5 - Current drain

157. a. Limits: With a dc supply of 32 ± 0.2V, and a high rf input, the current drain shall be not greater than 1.85A at all operating frequencies.

b. Method.

(1) Depress CTC 5.

(2) Adjust CS 4 until DVM indicates between 31.8V and 32.2V.

(3) Set CS 2 to VEH A.

(4) On VHFDU set HIGH/LOW switch to HIGH.

(5) Repeat tests as for test 4, at each frequency note DVM indication which shall be not greater than 185mV (= 1.85A).

Test 6 - Current drain into mismatch load

158. a. Limits: With a dc supply of 32 ± 0.2V and a high rf input, the current drain, when the equipment is connected into mismatch loads of 3 : 1 and 1 : 3, shall be not greater than 2.1A.

b. Method.

(1) Disconnect lead from wattmeter and connect to antenna simulator AM 352.

(2) Set antenna simulator to 150Ω.

(3) On EUT, set MHz switch to 30-40.

(4) Set VHFDU frequency to 30.025MHz.

(5) Depress LOAD EXT switch on VHFDU and note DVM indication which shall be not less than 210mV (2.1A).

(6) Set antenna simulator to 16.5Ω.

(7) Depress LOAD EXT switch on VHFDU, and note DVM indication which shall be not greater than 210mV.

(8) Repeat from sub-para (2) with MHz switch on EUT and VHFDU frequency in turn as given in Table 36.

Table 36 - AM 352 test 6 frequency settings

EUT (MHz switch)	VHFDU Frequency (MHz)
30-40	35.025 40.025
40-55	40.025 45.025 55.025
55-76	55.025 66.025 76.025

Note: During the switching process of the antenna simulator from one resistance to another, the EUT may trip. If this occurs, depress LOAD EXT switch on VHFDU. The EUT should then not trip.

Test 7 - Low voltage trip

159. a. Limits: The amplifier shall trip at a dc input voltage of between 12V and 17.5V.

b. Method.

(1) Transfer connection from antenna simulator to CTC 20.

(2) Set CS 2 to VEH V.

(3) Adjust CS 4 until DVM indicates between 23.8V and 24.2V.

(4) Depress CTC 7.

(5) On EUT, set MHz switch to 40-55.

(6) On VHFDU, set HIGH/LOW switch to LOW, set frequency to 45.025MHz, adjust SET LEVEL and depress LOAD EXT switch.

(7) Note DVM indication which shall be not less than 3.5V (indication of rf output from EUT).

(8) Slowly reduce setting of CS 4 until EUT trips (DVM indicates OV).

(9) Depress CTC 5 and note DVM indication which shall be between 12V and 17.5V.

Test 8 - Negative voltage trip

160. a. Limits: The EUT shall not trip when the VHFDU low dc trip is applied, but shall trip when the high dc trip is applied.

b. Method.

(1) Set CS 1 to VEH 24.

(2) Depress CTC 7.

(3) On VHFDU set HIGH/LOW switch to HIGH, adjust SET LEVEL and depress LOAD EXT switch.

(4) Note DVM indication, which shall be not less than 3.5V (indication of rf output from EUT).

(5) On VHFDU depress DC TRIP LOW switch and note that DVM indication does not change (EUT has not tripped).

(6) On VHFDU depress DC TRIP HIGH switch and note that DVM indication reduces to OV (EUT tripped).

Test 9 - Harmonic rejection

161. a. Limits: All harmonics of the selected frequency up to 500MHz shall be attenuated by not less than 40dB with respect to the fundamental.

b. Method.

(1) Connect RF OUTPUT socket on EUT to spectrum analyser.

(2) At each frequency detailed in Table 37, measure the level of the harmonic frequency specified, which in all cases shall be not less than 40dB below the fundamental.

Note: Further details are given in para 196.

Test 10 - Non-harmonic rejection

162. a. Limits: All non-harmonically related emissions, other than those within 10% of the fundamental up to 500MHz shall be attenuated by not less than 70dB with respect to the fundamental.

b. Method.

(1) Depress CTC 5.

(2) Set CS 1 to VEH 14-33.

(3) Set CS 2 to VEH V.

(4) Adjust CS 4 until DVM indicates between 31.8V and 32.2V.

(5) Set EUT MHz switch to 30-40.

(6) On VHFDU set frequency to 30.025MHz, and LOW/HIGH switch to HIGH.

(7) Use spectrum analyser to measure the level of all non-harmonically related emissions over the frequency ranges 0 to 27.0125MHz and 33.0275MHz to 500MHz.

(8) All levels measured shall be not less than 70dB below the fundamental.

Note: Further details are given in para 196.

Table 37 - AM 352 harmonic frequencies of up to 500MHz

Fundamental (MHz)	Harmonics (MHz)							
	2	3	4	5	6	7	8	9
30.025	60.050	90.075	120.100	150.125	180.150	210.175	240.200	270.225
35.025	70.050	105.075	140.100	175.125	210.150	245.175	280.200	315.225
40.025	80.050	120.075	160.100	200.125	240.150	280.175	320.200	360.225
45.025	90.050	135.075	180.100	225.125	270.250	315.175	360.200	405.225
55.025	110.050	165.075	220.100	275.125	330.150	385.175	440.200	-
66.025	132.050	198.075	264.100	330.125	396.150	462.175	-	-
76.025	152.050	228.075	304.100	380.125	456.150	-	-	-

SPECIFICATION TESTING USING DISCRETE TEST EQUIPMENT

Setting up

163. Connect supply protection unit between EUT battery input and dc supply unit, ensuring correct polarity.

Test 1 - Leakage current

164. a. Limits: With the EUT MHz switch set to 0 and a dc supply voltage of 32 ± 0.2V, the leakage current shall be less than 1mA.

b. Method.

(1) Using multimeter set to DC VOLTS connected to V socket on supply protection unit (SPU).

(2) Set output of dc supply unit to 32V.

(3) Set MHz switch on EUT to 0.

(4) Using multimeter set to DC CURRENT, measure, at SPU I sockets, the dc supply current which shall be not greater than 1mA.

Test 2 - Standing dc levels

165. a. Limits: With no rf input applied, the dc supply voltage shall be present at the RF INPUT socket, 1SK1, when the MHz switch is in any position except 0.

b. Method.

(1) Connect shorting lead between SPU I sockets.

(2) Use multimeter set to DC VOLTS to measure the voltage at EUT RF INPUT socket, which shall be 0V.

(3) Set EUT MHz switch to 30-40 and measure voltage at RF INPUT socket which shall be 32V. Repeat for positions 40-55, 55-76 in turn.

Test 3 - Power transfer

166. a. Limits: With a dc supply of 20 ± 0.2V and the MHz switch to 0, the power transfer of an rf signal at any operating frequency shall be ± 1dB.

b. Method.

(1) Using rf connector 800 mm long, connect FREQ MONITOR socket on VHFDU to counter input socket.

(2) Using rf connector 660 mm long, connect VHFDU OUTPUT socket to wattmeter.

(3) Set VHFDU frequency to 40MHz (indicated on counter) and HIGH/LOW switch to LOW.

(4) Depress LOAD EXT switch on VHFDU and note wattmeter indication as reading A.

(5) Transfer lead from wattmeter to RF INPUT socket on EUT.

(6) Connect rf connector 800 mm long between RF OUTPUT socket on EUT to wattmeter.

(7) On VHFDU, depress LOAD EXT switch, and note wattmeter indication which shall be reading A ± 1dB.

Test 4 - Low power input

167. a. Limits: With a dc supply of 20 ± 0.2V, the rf output at all operating frequencies shall be not less than 14.5W.

b. Method.

(1) Set dc supply unit output to 20 ± 0.2V.

(2) Set MHz switch on EUT to 30-40.

(3) On VHFDU, set frequency to 30.025MHz, set HIGH/LOW switch to LOW, adjust SET LEVEL and depress LOAD EXT switch.

(4) Note wattmeter indication which shall be not less than 14.5W.

(5) Repeat test of sub-para (3) and (4) but with VHFDU set to 35.025MHz and 40.025MHz in turn.

(6) Set MHz switch on EUT to 40-55.

(7) Repeat test of sub-para (3) and (4) but with VHFDU set to 40.025MHz, 45.025MHz and 55.025MHz in turn.

(8) Set MHz switch to 55-76.

(9) Repeat test of sub-para (3) and (4) but with VHFDU set to 55.025MHz, 66.025MHz and 76.025MHz in turn.

Test 5 - Current drain

168. a. Limits: With a dc supply of 32 ± 0.2V, and a high rf input, the current drain shall be not greater than 1.85A at all operating frequencies.

b. Method.

(1) Set dc supply unit output to 32 ± 0.2V.

(2) Connect multimeter set to DC AMPS, to I sockets on SPU.

(3) Set HIGH/LOW switch on VHFDU to HIGH.

(4) Repeat test 4 (para 167), ensuring that multimeter indicates not greater than 1.85A at each frequency.

Test 6 - Current drain into mismatch load

169. a. Limits: With a dc supply of 32 ± 0.2V and a high rf input, the current drain when the equipment is connected into mismatch loads of 3:1 and 1:3 shall be not greater than 2.1A.

b. Method.

(1) Set MHz switch on EUT to 30-40.

(2) Set VHFDU frequency to 30.025MHz and HIGH/LOW switch to HIGH.

(3) Connect antenna simulator to RF OUTPUT socket.

(4) Set antenna simulator to 150Ω.

(5) Depress LOAD EXT switch on VHFDU.

(6) Note multimeter reading which shall be not greater than 2.1A.

(7) Set antenna simulator to 16.5Ω.

(8) Note multimeter reading which shall be not greater than 2.1A.

(9) Repeat test with MHz switch on EUT and VHFDU frequencies as given in Table 36.

Test 7 - Low voltage trip

170. a. Limits: The amplifier shall trip at a dc input voltage of between 12V and 17.5V.

b. Method.

(1) Re-connect shorting lead to I sockets on SPU.

(2) Connect wattmeter to RF OUTPUT socket of EUT.

(3) Connect multimeter, set to DC VOLTS, to V sockets on SPU.

(4) Set dc supply unit output to 24V.

(5) Set HIGH/LOW switch on VHFDU to LOW.

(6) Set VHFDU frequency to 45.025MHz and range switch on EUT to 40-55.

(7) Depress LOAD EXT switch on VHFDU.

(8) Note wattmeter indication which shall be not less than 17W.

(9) Reduce dc supply unit output voltage until EUT trips (wattmeter indicates OW).

(10) Note multimeter reading which shall be between 12V and 17V.

Test 8 - Negative voltage trip

171. a. Limits: The EUT shall not trip when the VHFDU low dc trip is applied, but shall trip when the high dc trip is applied.

b. Method.

(1) Set dc supply unit output to 24 ± 0.2V.

(2) Depress LOAD EXT switch on VHFDU.

(3) Note wattmeter indication which shall be not less than 17W.

(4) On VHFDU depress DC TRIP LOW switch, and note that wattmeter indication does not change (EUT does not trip).

(5) On VHFDU depress DC TRIP HIGH switch and note that wattmeter indication reduces to OW (EUT tripped).

Test 9 - Harmonic rejection

172. This test is the same as test 9 using TRE, given in para 161.

Test 10 - Non-harmonic rejection

173. a. Limits: All non-harmonically related emissions, other than those within 10% of the fundamental up to 500MHz, shall be attenuated by not less than 70dB with respect to the fundamental.

b. Method.

(1) Set dc supply unit output to 32 ± 0.2V.

(2) On EUT, set MHz switch to 30-40.

(3) On VHFDU, set frequency to 30.025MHz, and LOW/HIGH switch to HIGH.

(4) Use spectrum analyser to measure in turn the level of all non-harmonically related emissions over the frequency ranges 0 to 27.0125MHz and 33.0275MHz to 500MHz.

(5) All levels measured shall be not less than 70dB below the fundamental.

Note: Further details are given in para 196.

FAULT FINDING

General

174. Initial fault indication will be from results of specification tests carried out. Fault diagnosis will be by interpretation of results obtained, leading to fault location at component or assembly level.

175. Table 38 lists the specification tests carried out, with an indication of the probable fault area related to the fault indication for each test.

Note: The use of Table 38 is dependent upon sequential testing having been carried out.

Table 38 - AM 352 fault diagnosis

Specification Test No.	Indication	Suspect
1	Outside limits	(4), TR3, C54
2	No dc volts	LK1, S1CB, R4, RLA1, 1PL1, 2SK1
3	No output	1PL1, 2SK1, RLA1, C9, RLB2, 2SK2
	Outside limits	RLA1, C9, RLA2

Table 38 - (cont)

Specification Test No.	Indication	Suspect
4	No output at all frequencies	Check EUT has not tripped TR3, TR2 and associated circuitry
	4W (nominal) output at all frequencies	RLA, RLB and associated circuitry
	Correct output on one or two bands only	Band switching circuits
	Low output (but not less than 4W) at all frequencies	TR2, (3) and associated circuits, or alignment
5	If Test 4 satisfactory, but Test 5 outside limits	(4)
6	If Tests 4 and 5 satisfactory but 6 outside limits	(3)
7	Outside limits	(4) D6, D7, C56, C57, R13, C44
8	Outside limits	(4)
9	Outside limits	(4) R2, R3, R11
10	Outside limits	RF tuned circuits
11	Outside limits	RF tuned circuits

ALIGNMENT

General

176. Alignment of the amplifier is carried out with the equipment connected to the test jig (para 133) using TRE or discrete test equipment.

177. The alignment procedure using TRE is detailed in para 180 to 185.

178. The alignment procedure using discrete test equipment is detailed in para 186 to 191.

179. In both configurations, alignment procedures must be carried out in the order specified and adjustments made in the order given.

Alignment procedure using TRE

180. Setting up.

a. Using TRE item 4, connect CS 7 to battery terminals of test jig.

b. Connect FREQ MONITOR socket of VHFDU to CTC 21 using a rf connector 800 mm long.

c. Set TRE switches as given in Table 39.

Table 39 - AM 352 alignment procedure switch settings

CS	CTC	IF(C)
1 VEH 14-33 2 VEH V 6 Released (ON)	1 CW 2 OC 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Released 11 Released 12 ACCESS 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal

d. Connect RF OUTPUT socket on VHFDU to RF INPUT socket on test jig using a rf connector 660 mm long.

e. Connect RF OUTPUT socket on test jig to CTC 20 using a rf connector 800 mm long.

181. Low frequency alignment.

a. Adjust CS 4 until DVM indicates between 21.8V and 22.2V.

b. Depress CTC 7.

c. Set MHz switch on EUT to 30-40.

d. Set VHFDU to 30MHz (indicated on counter).

e. On VHFDU, set HIGH/LOW switch to LOW, depress LOAD EXT switch, and adjust SET LEVEL control until DVM indicates 3.3V (approx 10W).

f. On EUT adjust (2)L1 for maximum indication on DVM.

182. AGC adjustment.

a. Depress CTC 5.

b. Adjust CS 4 until DVM indicates between 31.8V and 32.2V.

c. On VHFDU, set HIGH/LOW switch to HIGH, adjust SET LEVEL control, and depress LOAD EXT switch.

d. Set CS 2 to VEH A.

e. Note DVM indication, and adjust (3)R8 on EUT until DVM indicates 180mV. (If unable to obtain this figure, set VHFDU frequency to 35MHz, and output level to HIGH, then adjust (3)R8 until DVM indicates 180mV.)

f. Using TRE items 14 and 15 connected to CTC 16/17, depress CTC 3 and measure the voltage at (4)2 wrt earth on EUT, which shall be between 23.3V and 25.7V.

183. High frequency alignment.

a. Depress CTC 5.

b. Set CS 2 to VEH V and adjust CS 4 until DVM indicates between 19.8V and 20.2V.

c. Depress CTC 7.

d. Set MHz switch on EUT to 55-76.

e. On VHFDU, set frequency to 76MHz, set HIGH/LOW switch to LOW, depress LOAD EXT switch and adjust SET LEVEL control until DVM indicates 3.3V (≃ 10W).

f. On EUT, adjust (2)C37 for maximum indication on DVM.

g. On VHFDU, set frequency to 66MHz, adjust SET LEVEL control to read set level and depress LOAD EXT switch.

h. Note DVM indication which shall be not less than 3.937V (≃ 15.5W).

Note: If DVM indication is low, adjust (2)C37 for maximum indication on DVM, and repeat from sub-para e. until no further improvement can be obtained. However, if a peak reading cannot be obtained, remove link 2LK1 to increase the effect of (2)C37. If secondary adjustment of (2)C37 had been necessary, repeat low frequency alignment (para 181).

184. Power transfer.

a. Set EUT MHz switch, VHFDU frequency switch and output level as detailed in Table 40 in turn.

b. Check that at each frequency the DVM indicates not less than 3.873V (≃ 15W).

185. On completion of alignment, carry out specification tests (para 152 to 162).

Alignment procedure using discrete test equipment

186. Setting up.

a. Connect supply protection unit (SPU) to battery terminals of test jig.

b. Connect dc power supply unit to input leads of SPU.

c. Connect FREQ MONITOR socket of VHFDU to counter input socket using a rf connector 800 mm long.

d. Connect VHFDU output socket to RF INPUT socket on test jig using a rf connector 660 mm long.

e. Connect RF OUTPUT socket of test jig to wattmeter using a rf connector 800 mm long.

Table 40 - AM 352 power transfer alignment frequency settings

EUT MHz	VHFDU FREQ (MHz)	VHFDU Output
30-40	30	LOW
	35	LOW
	40	LOW
40-55	40	LOW
	45	LOW
	50	LOW
	55	LOW
55-76	55	LOW
	66	LOW
	76	LOW

187. Low frequency alignment.

a. Set dc power supply unit to produce an output of 22 ± 0.2V.

b. On EUT, set MHz switch to 30-40.

c. On VHFDU, set frequency to 30MHz (indicated on counter), set HIGH/LOW switch to LOW, depress LOAD EXT switch, and adjust SET LEVEL control until wattmeter indicates ≈ 10W.

d. Note wattmeter indication, and adjust (2)L1 on EUT for maximum indication on wattmeter, using peaking facility.

e. Depress LOAD INT switch on VHFDU.

188. AGC adjustment.

a. Set dc supply unit to produce an output of 32 ± 0.2V.

b. Connect multimeter, set to DC AMPS, to I sockets of SPU.

c. On VHFDU set HIGH/LOW switch to HIGH, adjust SET LEVEL control until set level meter indicates set level, and depress LOAD EXT switch.

d. On EUT, adjust (3)R8 until multimeter indicates 1.8A. (If unable to obtain this figure, set VHFDU frequency to 35MHz, set HIGH/LOW switch to HIGH, set output level, depress LOAD EXT switch, then adjust (3)R8 until multimeter indicates 1.8A.)

e. On VHFDU depress LOAD INT switch.

f. On SPU, disconnect multimeter from I sockets and connect shorting link.

g. On VHFDU, depress LOAD EXT switch.

h. Using multimeter set to DC VOLTS, measure the voltage at EUT (4)2 wrt earth, which shall be 24 ± 1.7V.

j. On VHFDU depress LOAD INT switch.

189. High frequency alignment.

a. Set dc supply unit to produce an output of 20 ± 0.2V.

b. On EUT, set MHz switch to 55-76.

c. On VHFDU set frequency to 76MHz, depress LOAD EXT switch and adjust SET LEVEL control until wattmeter indicates ≈ 10W.

d. Note wattmeter indication, and adjust (2)C37 on EUT for maximum indication on wattmeter, using peaking facility.

e. On VHFDU, set frequency to 66MHz, set HIGH/LOW switch to LOW, depress LOAD EXT switch, and adjust SET LEVEL control.

f. Note wattmeter indication which shall be not less than 15.5W.

Note: If wattmeter indication is low, adjust (2)C37 for maximum indication on wattmeter, then repeat from sub-para c. until no further improvement can be obtained. However, if a peak reading cannot be obtained, remove link 2LK1 to increase the effect of (2)C37. If secondary adjustment of (2)C37 is necessary, repeat low frequency. alignment (para 187).

190. Power transfer

a. Set EUT MHz switch, VHFDU frequency and output as detailed in Table 40 in turn.

b. Check that at each frequency the wattmeter indication is not less than 15W.

191. On completion of alignment, carry out specification tests, (para 163 to 173).

SPECIAL PROCEDURES

Local calibration of the modulation meter (MM) CT 409

192. The MM is insufficiently accurate for some specification tests and alignment settings. Its accuracy can be improved to the required level by calibrating it using the radio frequency generator (RFG) and associated modulator (AFG) of the TRE, providing these instruments are within their specification. Proceed as follows:—

a. Connect the rf output point of the RFG to the input point of the MM.

b. Set the RFG output to 1mV emf at 46.025MHz.

c. Set the AFG to produce f MOD = 1kHz and a deviation of ± 5kHz (AFG attenuator = 50mV) and make sure only one af generator is active.

d. Tune the MM carefully and using its 10kHz scale check the deviation registered is approximately ± 5kHz.

e. If necessary, re-adjust the output level of the RFG and re-tune the MM to be sure the signal is adequate.

f. Taking the AFG attenuator as standard, note the MM readings for various settings of the AFG attenuator (eg AFG = 50mV = ± 5kHz MM = ...).

g. Repeat sub-para f. for the 3kHz range on the MM.

h. Plot the MM error deviation against standard deviation.

Deviation measurement

193. Current provisioning of test equipment does not allow simple and accurate measurement of the various components making up total deviation. The difficulty exists because it is not possible in a simple manner to differentiate between the deviation caused by the transmit squelch tone (S) and the deviation caused by noise (N). Both sources are always present in a sealed equipment and they could have the same order of magnitude. The problem is minimised in the following procedure which hinges on the ability of the technician to assess the S/N ratio from observation of the MM demodulated output on a CRO. Proceed as follows:-

a. Set the transmit channel frequency of the RT 351 as demanded by the particular tests.

b. Do not apply a modulating tone to the equipment. Observe the indication on the MM (R) after tuning and making any correction for errors. R is due to (S + N).

c. Adjust the CRO controls for a locked display of the demodulated S + N at the MM audio output point.

d. Assess the ratio of S/N from observation of the CRO.

e. The specification tests are written in terms of R and S/N and permitted limit.

194. Assess the S/N ratio as follows:-

Adjust the CRO to display several cycles of the demodulated squelch tone (150Hz) at a convenient Y amplitude. The peak positive (or negative) value of S will be seen to increase and decrease about a mean value in a way dependent on the frequency and magnitude of the noise components. The mean peak value is the peak value which would exist in the absence of noise. Estimate this mean peak value in terms of horizontal graticule markings (S). Without further adjustment to the CRO, observe the variation in peak amplitude in

terms of horizontal graticule markings (N). Permitted values of the S/N ratio vary with transmit frequency and if the test so demands, it may be necessary to repeat this procedure when changing frequency.

195. To gain experience in assessing the S/N ratio it may be found helpful as a prelude to the foregoing procedure to observe the effect of modulating the RFG of the TRE with two tones, each producing a known deviation. For this purpose:-

a. Connect the RFG to the MM.

b. Connect the CRO to the af output point of the MM.

c. Set the RFG to the required frequency and maximum output.

d. Tune the MM to the RFG.

e. Modulate the RFG to produce known deviations with two tones, one simulating the squelch tone, should be 150Hz producing a deviation in the range of ± 1.3kHz to ± 2.0kHz and a second tone, simulating the noise, should initially be 1kHz producing a deviation similar to that expected from the noise (0 to ± 0.5kHz).

f. For various settings of S and N observe the CRO and estimate the S/N ratios.

g. Compare the estimated S/N ratios with the standard ratio from the RFG attenuator settings.

h. It must be remembered however, that the noise simulating tone can never be truly representative of the noise signal and while this imposes limitations, the procedure may nevertheless be found helpful in gaining experience.

196. Transmitter spurious radiation.

a. Set TRE and EUT switches as given in Table 41.

Notes: 1. A spectrum analyser is required to carry out these tests and is issued to nominated workshops. Practical details of testing will depend on the type of analyser. Consult the appropriate handbook.

2. This test is to be carried out when a transmitter is suspected of causing interference to other equipments.

b. Using a suitable dispersion bandwidth of the spectrum analyser, record the maximum level of each harmonic of the test frequency up to 500MHz. The second and third harmonic shall be attenuated to a level not less than 36dB below the carrier level, and the remaining harmonics shall be attenuated to a level not less than 40dB below the carrier level.

c. Using a suitable dispersion bandwidth of the spectrum analyser, record the maximum level of non-harmonic related spurious emissions other than those frequencies within ± 10% of the transmitter carrier

frequency in the band 1 to 100MHz. These shall be attenuated to a level greater than 80dB down on the carrier level.

d. Repeat sub-para b. and c. for the following frequencies: 47.950, 48.050 and 76.050MHz.

Table 41 - Transmitter spurious radiation test, switch settings

CS	CTC	IF(C)	EUT
1 VEH 24 2 VEH V 6 Released (ON)	1 CW Tx 2 AF LOAD 150 3 Released 4 Released 5 Depressed 6 Released 7 Released 8 Released 9 Released 10 Depressed 11 Released 12 AF 13 AF 14 SIGNAL 26 INT	1 OC 3 Released 4 Released 7 Normal	FSS 30050 SSW WHISPER ROS L

EUT connections:-

CS7 to battery terminals (item 4)
IFC(5) to 22SK1 (item 10)

SECTION 3 - SELECTIVE UNIT RADIO FREQUENCY

Details to follow

Table 4001 - RT 351 voltage and signal levels

This table of voltage and signal levels must be read in conjunction with the RT 351 systems diagram, (Tels F 382 Fig 2001).

The information in this table is issued as an aid to fault finding only, and it must be accepted that variations between different equipments will occur.

This table was compiled using the TRE and all level readings are TRE indicated voltage levels with AF LOAD set to OC and LS INT depressed.

DC supplies

BATT.	Nominal 24V	LL 23.99V		UL 24.01V
CURRENT CONSUMPTION.	Receive	UL 125mA	Transmit	UL 870mA

Converter assembly (19)

Pin	Nominal	LL	UL
1	3	3.003	3.246
2	6	6.09	6.11
3	9	8.739	9.26
4	17	16.17	17.83
5	100	98.8	112.3

Switched dc supply voltages assembly (20) and (14)

Nominal	Transmit		Receive	
	High Band	Low Band	High Band	Low Band
3$\overline{\text{VT}}$	<0.4	<0.4	≈3	≈3
3V$\underline{\text{T}}$	0.9 to 1.5	0.9 to 1.5	<0.4	<0.4
6V$\underline{\text{TI}}$	≈6	≈6	<0.4	<0.4
6V$\underline{\overline{\text{TH}}}$	<0.4	<0.4	<0.4	≈6
6V$\underline{\text{TH}}$	<0.4	3 to 5	<0.4	<0.4
6V$\overline{\text{TH}}$	<0.4	<0.4	≈6	<0.4
6V$\overline{\text{TH}}$	3 to 5	<0.4	<0.4	<0.4
9$\overline{\text{VT}}$	<0.4	<0.4	≈9	≈9
9V$\underline{\text{T}}$	≈9	≈9	<0.4	<0.4
9V$\overline{\text{TH}}$	<0.4	<0.4	<0.4	≈9
9V$\underline{\overline{\text{TH}}}$	<0.4	<0.4	≈9	<0.4
15VTH	<0.4	≈15	<0.4	<0.4
15V$\underline{\text{TH}}$	≈15	<0.4	<0.4	<0.4
17V$\underline{\overline{\text{TH}}}$	<0.4	<0.4	<0.4	≈15
17V$\overline{\text{TH}}$	≈14	≈17	<0.4	<0.4
17V$\overline{\text{TH}}$	<0.4	<0.4	≈15	<0.4
17VTH	≈17	≈14	<0.4	<0.4

Table 4001 - (cont)

Band switching assembly (17) and (18)

	High Band	Low Band
BSw $\underline{\quad}$	23	23
BSw $\overline{H}$	50	20
$\underline{BSw\ H}$	20	50
$\overline{H}$	40	20
H	20	40
VPA	20	20
AGC	5 to 9	5 to 9

These voltages may vary with different equipment.

BSw $\overline{H}$, $\overline{H}$, BSw H and H indicate which filter is in operation, eg, with the EUT switch to HIGH BAND, a low voltage on BSw H and $\underline{H}$ indicates the high band filter is in use, while the high voltage on BSw $\overline{H}$, and H indicates the low band filter is not in use.

Synthesizer input voltages assembly (10)

1. Frequency settings 30.000-30.075MHz

Pin		0	25	50	75
6	0-75kHz	3	-	3	-
7	0-75kHz	3	-	-	3

2. Frequency settings 30.000-30.900MHz

Pin		0	100	200	300	400	500	600	700	800	900
8	0-900kHz	3	-	-	-	-	-	-	-	3	3
9	0-900kHz	3	-	-	-	3	3	3	3	3	3
11	0-900kHz	3	-	3	-	-	3	-	3	-	3
12	0-900kHz	3	-	-	3	-	-	3	3	-	-

3. Frequency settings 30.000-39.000MHz

Pin		0	1	2	3	4	5	6	7	8	9
13	0-9MHz	3	-	3	-	-	3	-	3	-	3
14	0-9MHz	3	-	-	3	-	-	3	3	-	-
17	0-9MHz	3	-	-	-	-	-	-	-	3	3
18	0-9MHz	3	-	-	-	3	3	3	3	3	3

4. Frequency settings 30.000-70.000MHz

Pin		30	40	50	60	70
15	30-70MHz	3	-	3	-	3
16	30-70MHz	3	-	-	3	3
19	30-70MHz	-	3	3	3	3

Table 4001 - (cont)

Oscillator control voltages assembly (8) and (10)

	Low Band		High Band	
	30.000	47.975	48.000	76.000
Vc	4.3	2.3	4.3	2.3
Vt(RF)	4.5	82	4.5	82
Vt(OSC)	4.5	82	4.5	82

Command voltages

EUT logic commands		Opposite condition	
OV	E	$\overline{OV}$	E
$OV\overline{C}$	<0.4	$\overline{C}$	≈6
$OV\overline{Cs}$	<0.4	$\overline{Cs}$	0.7 to 1.5
OVH	≈1.2	$\overline{H}$	≈17
$OV\overline{Ic}$	<0.4	$\overline{Ic}$	≈3
$OV\overline{Lk}$	<0.4	$\overline{Lk}$	2.5 to 5
$OV\overline{M}$	<0.4	$\overline{M}$	2.5 to 3
$OV\overline{No}$	E	$\overline{No}$	2.5 to 5
$OV\overline{Rb}$	<0.4	Rb	≈3
$OV\overline{So}$	<0.4	$\overline{So}$	2 to 5
$OV\overline{T}$	≈1.2	$\overline{T}$	≈17
$OV\overline{Tw}$	<0.4	Tw	4 to 6
$OV\overline{Trb}$	<0.4	Trb	1.5 to 3
$OV\overline{P}$	≈0.9	$\overline{P}$	≈3
$OV\overline{W}$	E	$\overline{W}$	≈0.4
$OV\overline{W}$	E	W	≈0.1

AC VOLTAGE CONDITIONS

RECEIVE

Receiver audio assembly (7)

EUT 2S1 to LOUD, WHISPER or OFF, but NOT to NOISE ON (✱).
22S1 to LOCAL.

	Input		Output	
Pin	Frequency	Level	Pin	Level
3	1000Hz	0.8V	22SKID	0.5V

Table 4001 - (cont)

EUT 2S1 to NOISE ON (✳).
22S1 to LOCAL

Input			Output	
Pin	Frequency	Level	Pin	Level
4	1000Hz	10mV	22SKID	1.0V
1	1000Hz	70mV	22SKID	1.0V

Squelch assembly (9)

EUT 2S1 to LOUD
22S1 to AUTO

	Input		Output	
Pin	Frequency	Level	Pin	Level
1	150Hz	ZERO	3	2.5V dc
1	150Hz	30mV	3	0.1V dc
1	160Hz	ZERO	3	2.5V dc
1	160Hz	30mV	3	0.1V dc

DC switching assembly (20)

EUT 2S1 to LOUD
22S1 to CALL

	Output	
Pin	Frequency	Level
19	2000Hz	20mV

IF amplifier assembly (6)

EUT 2S1 to NOISE ON (✳).
22S1 to LOCAL

Table 4001 - (cont)

Input					Output	
Pin	Frequency	Mod. Freq	Deviation	Level	Pin	Level
TP1	11.525MHz	1000Hz	± 5kHz	000db	22SKID	1V
1	11.525MHz	1000Hz	± 5kHz	70db	22SKID	1V

EUT 2S1 to LOUD

22S1 to AUTO

Input					Output	
Pin	Frequency	Mod. Freq	Deviation	Level	Pin	Level
1	11.525MHz	1000Hz 150Hz	± 5kHz ± 1.3kHz	70db	22SKID	1V

RF head assembly (5)

EUT 2S1 to NOISE ON (✳)

22S1 to LOCAL

Input					Output	
Pin	Frequency	Mod. Freq	Deviation	Level	Pin	Level
5SK1	EUT FREQ	1000Hz	± 5kHz	120db	22SKID	1V
1SK1	EUT FREQ	1000Hz	± 5kHz	120db	22SKID	1V
1SK2	EUT FREQ	1000Hz	± 5kHz	120db	22SKID	1V

Receiver oscillator assemblies (11) and (12)

EUT 2S1 to NOISE ON (✳)

22S1 to LOCAL

Output			
Frequency	Pin	Unit 11 level	Unit 12 level
LOW BAND	2	-	100-300mV
LOW BAND	4	-	40mV
HIGH BAND	2	100-300mV	-
HIGH BAND	4	40mV	-

Table 4001 - (cont)

TRANSMITTER

Transmitter audio assembly (13)

EUT 2S1 to NOISE ON (✳)
22S1 to LOCAL
EUT to TRANSMIT
Input frequency 1kHz

Input		Output	
Pin	Level	Pin	Level
22SK1A	100mV	1	40mV
22SK1A	100mV	5	400mV
22SK1A	100mV	7	10mV
22SK1A	Zero	5	370mV

EUT 2S1 to NOISE ON (✳)
22S1 to LOCAL
EUT to RECEIVE

Output	
Pin	Level
6	300mV

Transmitter assemblies (14), (15) and (17)

EUT 2S1 to NOISE ON (✳)
22S1 to LOCAL
EUT to TRANSMIT

Outputs						
Frequency	Unit 14		Unit 15		Unit 17	
	Pin	Level	Pin	Level	Pin	Level
LOW BAND	14	30-130mV	5	0.6-1.1V	2	15-28V
HIGH BAND	13	30-130mV	5	0.6-1.1V	2	15-28V

END

2582/Tels