

SCREWS AND WASHERS

61. Refer to Table 3 for the details of all screws, washers, circlips and seals.

Table 3 - Screws, washers, circlips and seals

Type	Qty	Positions used
Screw, slotted, pan-head M2 x 4 mm long	3	Sub assy 10a to 10b fixing.
Screw, slotted head, countersunk M2 x 5 mm long	3	Synthesizer screening cover fixing.
Screw, slotted pan-head M2 x 5 mm long	2	Escutcheon plate fixing.
Screw, slotted pan-head M2.5 x 4 mm long	5	Synthesizer assy to motherboard fixing.
Screw, slotted pan-head M2.5 x 6 mm long.	10	Lid to box fixing.
Screw, slotted pan-head M3 x 6 mm long	8	Motherboard assy to box fixing. Antenna socket to box fixing.
Screw, socket head cap M3 x 8 mm long	6	Frequency setting switch to box fixing. System switch to box fixing.
Spacer, (screw special)	6	Synthesizer spacers.
Washer, crinkle M2 (black)	2	Escutcheon plate screws.
Washer, crinkle M2 (stainless steel)	9	Synthesizer 10a and 10b screws.
Washer, crinkle M2.5 (black)	10	Lid to box screws.
Washer, crinkle M2.5 (stainless steel)	5	Synthesizer assy to motherboard screws.
Washer, crinkle M3	4	Antenna, socket screws.
Washer, flat (5310-99-662-4912)	4	Frequency setting switches and system switch knobs.
Circlip	4	Frequency setting switches and system switch knobs.
Seal bonded, 6 BA	10	Motherboard assy frequency setting switch and system switch to box screws.

Note: These Pages 25-28 supersede Pages 25-28 Issue 2 dated Sept. 78.
Items marked thus • have been amended.

SPECIFICATION TESTING

INTRODUCTION

62. Specification testing can be carried out, with the equipment sealed (lid fitted) or unsealed (lid removed), using either the test rig, electronic (t.r.e.) or the automatic test equipment (a.t.e., refer to Part 3 of this regulation). Specification testing, less tests 9 and 11, can also be carried out with the motherboard (with all assemblies) fitted into the motherboard assembly test jig (item 1, Table 2). The specification tests using the t.r.e. follow a logical sequence, but the testing is not sequential, and the t.r.e. and e.u.t. settings are repeated at the commencement of each test. This allows a particular test to be carried out in isolation. The preliminary test in para 67 must be carried out before any other tests. When using the t.r.e., a headset must not be connected to the e.u.t. since this could cause damage to the t.r.e.

CONDITIONS OF TEST

63. The specification figures given in the 'Limits' definition are true values and constitute fundamental terms of reference.

64. All tests shall be carried out at room temperature (+15 °C to +35 °C).

CONNECTION OF THE EQUIPMENT-UNDER-TEST (E.U.T.) TO THE T.R.E.

65. a. Set the SSW on the e.u.t. to 0 (off).
- b. Connect CS7 (t.r.e.) to 1PL4/5 (battery connections of the e.u.t., using the power lead (item 4, Table 2).
- c. Fit the antenna adaptor (item 3, Table 2) to 1SK2 (antenna socket) of the e.u.t.
- d. Connect the antenna adaptor to CTC20 (t.r.e.) using a 50 Ω BNC coaxial connector (item 7, Table 2001 of Tels M 382).
- e. Connect IF(C)5 (t.r.e.) to 1SK1 (audio socket) of the e.u.t. using a 7 point audio connector (item 10, Table 2001 of Tels M 382).
- f. Set all the power switches on the t.r.e. to 'on' and allow a 20 minute (approx) warm-up (stabilization) time.

66. The above connections, together with any others required, are repeated in abbreviated form in each of the following specification test procedures.

TEST 1 - PRELIMINARY TEST

67. a. Limits. With the d.c. supply set to 12 ±0.2V, and
- (1) With the SSW on the e.u.t. set to 0 (off), there shall be no current drawn.
- (2) With the SSW on the e.u.t. set to W and the pressel line open-circuited (ie receive mode), the power output shall not exceed 0.02µW.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: 0
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 RF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for supply voltage of LL 11.8V,
UL 12.2V.

(3) Set CS2 to MP A and check, using the d.v.m., that
no current is drawn.

(4) Set the SSW to W.

(5) Depress CTC7 and check, using the d.v.m. that
no significant power is transmitted.

TEST 2 - CURRENT CONSUMPTION

68. a. Limits. With the d.c. supply set to $12 \pm 0.2V$, the current
consumption of the e.u.t. shall be:

(1) Between 57 and 78mA in the receive mode.

(2) Between 4 and 9mA in the low state of the battery
standby mode.

(3) Between 130 and 166mA in the transmit mode.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C) to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF (C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 RF		
	13 AF		
	14 CARRIER OFF		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Set CS2 to MP A and note d.v.m. indication which shall be LL 5.7mV (57mA) UL 7.8mV (78mA).

(4) Set SSW to L. The d.v.m. indication should vary, approximately every one second, between a high and low state. Check that the d.v.m. indication on the low state is UL 1mV. (10mA).

(5) Set CTC1 to CW TX and note the d.v.m. indication which shall be LL 13.0mV (130mA) UL 16.6mV (166mA).

(6) Re-set CTC1 to RX FM.

TEST 3 - POWER OUTPUT INTO 50Ω LOAD

69. a. Limits. (1) With a d.c. supply of $9.5 \pm 0.2V$, the transmitted power output shall not be less than 100mW at all frequencies.

(2) With a d.c. supply of $16 \pm 0.2V$, the transmitted power output shall not be greater than 475mW at all frequencies.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 37.050
2 MP V	2 AF LOAD300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 RF		
	13 RF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 9.3V, UL 9.7V.

(3) Depress CTC7; depress and hold CTC11 and note the following:

(a) The counter display which shall be the nominal frequency setting on the e.u.t.

(b) d.v.m. indication which shall be LL 316mV (100mW)

(c) The c.r.o. display which shall be approximately sinusoidal.

(4) Repeat operation (3) but with the FSS on the e.u.t. set, in turn, to the following frequencies:

39.050, 42.050, 45.050, 46.950

(5) Depress CTC5.

(6) Adjust CS3 until the d.v.m. indicates LL 15.8V, UL 16.2V.

(7) Depress CTC7; depress and hold CTC11 and note the d.v.m. indication which shall be UL 689mV (475mW)

(8) Repeat operation (7) but with the FSS on the e.u.t. set, in turn, to the following frequencies:

45.050, 42.050, 39.050, 37.050

TEST 4 - ACCURACY OF RADIATED CARRIER

70. a. Limits. The radiated frequency shall be within $\pm 500\text{Hz}$ of the selected frequency.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 37.000
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 RF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Depress CTC7 and set CTC1 to CW TX; note the counter display which shall be LL 36.999500MHz UL 37.000500MHz

(4) Repeat operation (3) but with the FSS on the e.u.t. set, in turn, to the following frequencies; the counter display shall be within the limits shown.

<u>FSS setting</u>	<u>LL</u>	<u>Counter display</u>	<u>UL</u>
38.125	38.124500	38.125500	
39.250	39.249500	39.250500	
40.375	40.374500	40.375500	
41.400	41.399500	41.400500	
42.500	42.499500	42.500500	
43.600	43.599500	43.600500	
44.700	44.699500	44.700500	
45.800	45.799500	45.800500	
46.900	46.899500	46.900500	

TEST 5 - 150Hz MODULATION

71. a. Limits. (1) The deviation of the transmitter output due to the internal 150Hz tone shall be between $\pm 1.55\text{kHz}$ and $\pm 2.5\text{kHz}$.
- 5 (2) The frequency of the internal tone shall be between 148Hz and 152Hz.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 PILOT TONE	1 OC	FSS: 46.900
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Ensure that the 150Hz bandstop filter on the mod. meter is IN, and the 3kHz bandpass filter is OUT.
- (4) Depress and hold CTC11, note the mod. meter indication due to the noise.
- (5) Switch the 150Hz bandstop filter to OUT, and note the mod. meter indication due to the 150Hz squelch-tone and noise.
- (6) Calculate the deviation, due to the 150Hz squelch-tone only, by subtracting the reading obtained in (5) from that obtained in (4). The result should be LL 1.55kHz, UL 2.5kHz.
- (7) Repeat (3) to (6) with the FSS set to 42.000 and 37.000.
- (8) Depress CTC11 and note the counter display which shall be LL 148.0, UL 152.0. Release CTC11.

TEST 6 - MODULATION SENSITIVITY

72. a. Limits. (1) The amplitude of a 1kHz tone applied to the microphone socket to produce a deviation of the transmitter output of $\pm 3.5\text{kHz} \pm 0.3\text{kHz}$ shall be between 0.08 and 0.3mV p.d. with the SSW set to W.
- (2) With the input maintained as above and the SSW set to L, the deviation shall be between ± 0.68 and $\pm 1.48\text{kHz}$.

b. E.U.T. connections

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

- c. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T</u>
1 MP 9-21	1 MOD S.T.	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: W
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Ensure that the 150Hz bandstop and 3kHz bandpass filters of the mod. meter are IN.
- (4) Set the a.f. gen. to produce a single tone of 1kHz.
- (5) Depress and hold CTC11, and adjust the a.f. gen. output attenuator until the mod. meter indicates 3.5kHz; release CTC11.
- (6) Note the a.f. gen. setting which shall be LL 1.6mV e.m.f. (0.08mV p.d.), UL 6mV e.m.f. (0.3mV p.d.).
- (7) Set the SSW to L.
- (8) Maintain the above input and note the mod. meter indication which shall be LL 0.68kHz, UL 1.48kHz.

TEST 7 - MODULATION CONTROL

73. a. Limits. With 1kHz $\pm 10\%$ tone applied to the microphone socket at a level of 20 ± 2 mV p.d., the deviation of the transmitter output due to this modulating tone only shall not be greater than ± 6.5 kHz.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 MOD S.T.	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Ensure that the 150Hz bandstop and 3kHz bandpass filters of the mod. meter are IN.

(4) Set the a.f. gen. to produce a single tone of 1kHz at 400mV e.m.f. (20mV p.d.)

(5) Depress and hold CTC11; note the mod. meter indication which shall be UL 6.5kHz.

TEST 8 - SIDETONE

74. a. Limits. With an a.f. input of 1kHz $\pm 10\%$ at a level of 10mV r.m.s., the a.f. output into 300 Ω with the e.u.t. set to any frequency shall be between 240 and 360mV.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C) to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 MOD S.T.	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Set the a.f. gen. to produce a single tone of 1kHz at 200mV e.m.f. (10mV p.d.).

(4) Depress CTC7.

(5) Depress and hold CTC11; note the d.v.m indication which shall be LL 240mV, UL 360mV.

TEST 9 - RECEIVER SENSITIVITY

75. a. Limits. The signal-plus-noise-to noise ratio caused by a r.f. signal of 2μV e.m.f., with standard modulation, shall not be less than 14dB.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 37.025
2 MP V	2 S+N:N	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		

CS

CTC

IF(C)

E.U.T.

- 9 Released
- 10 Depressed
- 11 Released
- 12 AF
- 13 AF
- 14 SIGNAL
- 26 INT

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Set the r.f. gen. to 37.025MHz, internally
modulated by 1kHz $\pm 10\%$ at ± 5 kHz deviation.

(4) Set the r.f. gen. output attenuator to 114dB
(2 μ V e.m.f.).

(5) Depress CTC7; check that there is a modulated tone
in the loudspeaker and an output waveform on the c.r.o.

Method 1 - GO/NO GO

(6) Set CTC15 to 18.

(7) Set CTC14 to SIGNAL; note the d.v.m. indication as
'reading A'.

(8) Set CTC14 to MOD OFF; the d.v.m. indication shall be
less than 'reading A'.

(9) Repeat operations (3) to (8) with the FSS and the
r.f. gen. set, in turn, to the following frequencies:

39.025, 42.025, 45.525, 46.925MHz.

Method 2 - Obtaining results

(6) Set CTC14 to MOD OFF; record the d.v.m. indication
as 'reading A'.

(7) Set CTC14 to SIGNAL, and adjust CTC15 until the d.v.m.
indication is the same as 'reading A'.

(8) Note the setting of CTC15 and read the dB
equivalent (from dB chart on CTC front panel) which shall
be LL 14dB.

(9) Repeat operations (3) to (8) with the FSS and r.f.
r.f. gen. set, in turn, to the following frequencies:

39.025, 42.025, 45.525, 46.925MHz.

TEST 10 - LIMITING

76. a. Limits. With a modulated r.f. signal applied to the antenna socket, the audio output in the receive mode shall not change by more than 1.5dB when the r.f. signal level is increased from 2µV e.m.f. to 100mV e.m.f.

b. E.U.T. connections.

CS7 to 1PI4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Set the r.f. gen. to 42.050MHz modulated by 1kHz $\pm 10\%$, and a deviation of ± 5 kHz.

(4) Set the r.f. gen. attenuator to 114dB (2µV e.m.f.).

(5) Depress CTC7; note the d.v.m. indication as 'reading A'.

(6) Re-set the r.f. gen. attenuator to 20dB (100mV).

(7) Note the d.v.m. indication as 'reading B'; 'reading B' shall not be greater than 1.5dB (18%) above 'reading A'.

TEST 11 - SQUELCH SENSITIVITY

77. a. Limits. The sensitivity of the squelch circuit to an external 150 ± 2 Hz tone is such that at the 2dB quieting level the squelch will be closed and at the 9dB quieting level the squelch will be open.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 QUIETING	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 CARRIER OFF		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Set the r.f. gen. to 42.050MHz modulated by 150
 ± 2 Hz and with a deviation of ± 1.3 kHz.

(4) Depress CTC7.

(5) Set CTC15 to 79 (2dB); note the d.v.m. indication as
'reading A'.

(6) Set CTC14 to SIGNAL.

(7) Adjust the r.f. gen. attenuator until the d.v.m.
indication is the same as 'reading A'.

(8) Set the SSW on the e.u.t. to L and note that the
squelch is closed (no noise in the loudspeaker).

(9) Re-set SSW on e.u.t. to *.

(10) Set CTC14 to CARRIER OFF.

(11) Set CTC15 to 36 (9dB); note d.v.m. indication as
'reading B'.

(12) Re-set CTC14 to SIGNAL.

(13) Adjust the r.f. gen. attenuator until the d.v.m.
indication is the same as 'reading B'.

(14) Set the SSW on the e.u.t. to L and note that the
squelch is open (noise in the loudspeaker).

TEST 12 - A.F. POWER OUTPUT

78. a. Limits. With a r.f. signal modulated by 1kHz $\pm 10\%$ at ± 5 kHz deviation and 150 ± 2 Hz at ± 1.5 kHz deviation, and at a level of 1mV e.m.f., the audio output shall be:

- (1) Between 460 and 640mV into 300 Ω in L mode, or
- (2) Between 17.5 and 22.5dB below the L level when in W mode.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Depress CTC7.

(4) Set the r.f. gen. to 42.050MHz modulated by 1kHz $\pm 10\%$ at ± 5 kHz deviation and 150 ± 2 Hz at ± 1.5 kHz deviation.

(5) Set the r.f. gen. attenuator to 60dB (1mV) and note the d.v.m. indication which shall be LL 460mV, UL 640mV.

(6) Set the SSW on the e.u.t. to W and note the d.v.m. indication which shall be LL 17.5dB UL 22.5dB below that noted in operation (5). (This is equivalent to between 8% and 12% of that noted in operation (5)).

TEST 13 - LOW BATTERY WARNING

79. a. Limits. The low battery warning shall operate with a supply voltage of between 9.4 and 9.8V d.c.

b. E.U.T. connections.

CS7 to 1PL4/5
IF(C)5 to 1SK1

Note: Disconnect the r.f. input lead.

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 CARRIER OFF		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Slowly reduce the setting of CS3 until bursts of noise are heard in the loudspeaker. Note the d.v.m. indication which shall be LL 9.4V, UL 9.8V.

TEST 14 - BATTERY-SAVING PERIOD AND DELAY

80. a. Limits. (1) The time-interval after transmitting and before battery-saving occurs shall be between 9 and 17 seconds.
(2) The period of the supply switching shall be between 1.25 and 1.95 seconds.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 RF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V. Set CS2 to MP A.

(3) Depress CTC11; note that the d.v.m. indicates the transmit supply current (LL 12mV, UL 15mV).

(4) Release CTC11 noting the time. The d.v.m. will indicate the receive supply current (LL 5.3mV, UL 7.6mV).

(5) After a time interval of LL 9 seconds, UL 17 seconds, the d.v.m. reading will start to fluctuate between a high (LL 5.3mV, UL 7.6mV) and a low (UL 1mV) state.

(6) The time interval for 10 such fluctuations should be LL 12 seconds, UL 20 seconds.

ADDITIONAL TESTS

81. Tests 15 and 16 are additional tests to be carried out when the equipment is suspected of having a fault in that specific area covered by these tests.

Test 15 - Variation of deviation with channel frequency

82. a. Limits. With a standard a.f. tone applied to the microphone socket, the deviation of the transmitter output, due to this tone, shall not vary from its nominal value by more than $\pm 15\%$ for any transmitter frequency.

b. E.U.T. connections.

CS7 to 1PI4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MF 9-21	1 MOD S.T.	1 OC	FSS: 37.050
2 MF V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Set the a.f. gen. to produce a single tone of 1kHz.

(4) Ensure that the 150Hz bandstop and 3kHz bandpass
filters of the mod. meter are IN.

(5) Depress and hold CTC11; adjust the a.f. gen.
attenuator setting to give an indication of 5kHz on the
mod. meter and maintain this setting for the remainder of
the test.

(6) Set the FSS on the e.u.t. to each of the following
frequencies in turn: 39.050, 41.050, 43.050, 45.050 and
46.950MHz.

Note the maximum and the minimum deviation readings. Add
the max. and min. readings together and divide the answer
by 2. Call this answer 'A'.

Subtract 'A' from the maximum deviation noted. Call this
answer 'B'.

Calculate the percentage variation of deviation as
 $\pm \frac{B}{A} \times \frac{100}{1} \%$ which shall be UL $\pm 15\%$.

Test 16 - spurious responses

83. a. Limits. The second channel rejection shall be greater than 100dB
at any frequency.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 37.025
2 MP V	2 QUIETING	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of IL 11.8V
UL 12.2V.

(3) Depress CTC7.

(4) Set the r.f. gen. frequency to 37.025MHz.

(5) Set the r.f. gen. attenuator to 120dB; note the
d.v.m. indication as 'reading A'.

(6) Set the r.f. gen. frequency to 79.825MHz
($f_s + 2f_{if}$).

(7) Adjust the r.f. gen. attenuator until the d.v.m.
indication is the same as 'reading A'; note the r.f.
attenuator setting which shall be UL 20dB.

SPECIAL TESTS

84. These tests are to be carried out only when an equipment is suspected of causing interference to other equipments; they are to be carried out at a nominated workshop. The tests are to be carried out with the antenna adaptor (item 3, Table 2) fitted to the antenna socket on the radio.

Transmitter spurious radiation (non-harmonic)

85. a. Limits. The output power of non-harmonically-related spurious emission, other than frequencies within 10% of the transmitted carrier, shall be attenuated to a level of not less than 60dB below the carrier level.

Transmitter spurious radiation (harmonic)

86. a. Limits. The output power of each harmonic of the nominal carrier frequency shall be attenuated to a level of not less than 40dB below the carrier level.

Receiver spurious emission

87. a. Limits. The level of any internally-generated unwanted signal, within the frequency range 1 to 500MHz, shall not exceed 100µV e.m.f. when measured at the antenna adaptor output terminated in a 50Ω load.

ALIGNMENT

INTRODUCTION

88. All RT-349 alignment procedures may be carried out with the equipment unsealed (lid removed) except the adjustments associated with assembly 10 as given in para 94; access to 3TP1 and 3TP2 is obtained by withdrawing assembly 8. All alignment procedures may also be carried out when the motherboard, fitted with all assemblies, is mounted in the motherboard assembly test jig. When the motherboard and all assemblies is refitted into the box assembly, the SET SQU preset control may need to be rechecked. Some adjustment or re-alignment may be required after fitting replacement assemblies into the RT-349; these should be carried out before any specification tests are attempted. A summary of the adjustments required, for a particular replacement assembly, is given in Table 4. If required, special test probes are provided in the f.r.t.k. for monitoring on the motherboard when using the motherboard test jig.

Assembly 4 must not be adjusted for optimum r.f. power output.

Table 4 - Adjustment and alignment summary

Replacement assembly fitted	Adjustment/alignment check if required	Paragraph
4	4T3 (assembly 4)	90
	SET SQU (assembly 5)	91
5	SET SQU (assembly 5)	91
6	4T3 (assembly 4)	90
	SET SQU (assembly 5)	91
7	7L1 and 7C3 (assembly 7)	92
	7L2 and 7C4 (assembly 7)	92
	SET 150Hz (assembly 8)	93
	SET MOD (assembly 8)	93
8	SET 150Hz (assembly 8)	93
	SET MOD (assembly 8)	93
9	-	-
10	7L1 and 7C3 (assembly 7)	92
	7L2 and 7C4 (assembly 7)	92

89. Adjustment holes in the assembly screening cans, which give access to preset controls used during manufacture, are either blanked off or circled and inscribed in red. No adjustments should need to be made to these controls at field level.

ASSEMBLY 4 (SETTING OF 4T3)

90. When a new assembly 4 or 6 is fitted, transformer 4T3 may need to be adjusted to minimise i.f. ripple.

a. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

CAUTION: DO NOT depress CTC11 during this alignment.

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Set the r.f. gen. frequency to 42.050MHz modulated
by 1kHz at ± 5 kHz deviation.

(4) Set the r.f. gen. attenuator to 114dB (2 μ V e.m.f.).

(5) Observe the c.r.o. display and adjust 4T3 for
minimum distortion.

ASSEMBLY 5 (SETTING OF SET SQU)

91. The SET SQU control (assembly 5) may need to be re-set when a new
assembly 4, 5 or 6 is fitted.

a. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 QUIETING	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 CARRIER OFF		
	26 INT		

CAUTION: DO NOT depress CTC11 during this adjustment.

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Set the r.f. gen. to 42.050MHz modulated by
150 \pm 2Hz at 1.2kHz deviation.

(4) Depress CTC7.

(5) Set CTC15 to 50 (6dB); note the d.v.m. indication
as 'reading A'.

(6) Set CTC14 to SIGNAL.

(7) Rotate the SET SQU control fully clockwise.

(8) Adjust the r.f. gen. attenuator for a d.v.m.
indication the same as 'reading A'.

(9) Set the SSW on the e.u.t. to L.

(10) Slowly rotate the SET SQU control counter-clockwise
until audio noise is produced (squelch opens).

(11) Set CTC15 to CARRIER OFF and confirm that the
squelch closes.

ASSEMBLY 7 (SETTING OF TX AND RX OSCILLATORS)

92. If a new assembly 7 is fitted or assembly 10 is repaired, the Rx and
Tx oscillators should be re-aligned.

a. E.U.T. connections.

CS7 to 1PI4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

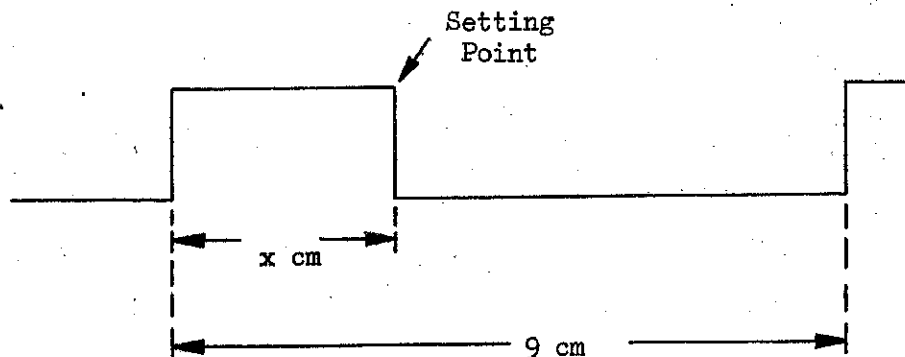
b. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 37.500
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 CARRIER OFF		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

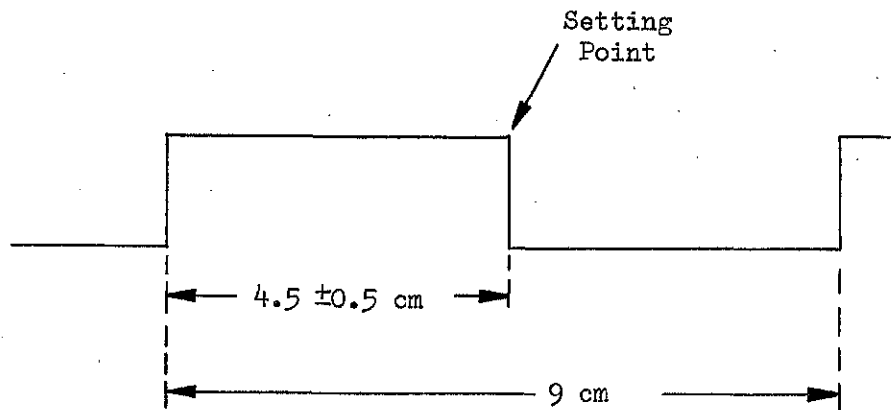
(3) Connect the c.r.o. CH1 input to either 3SK8/1 or 3TP1 via a high-impedance (X10-11pF) probe (when the motherboard with all its assemblies is in the box, remove assembly 8 for access to 3TP1).

(4) Set the c.r.o. to 'positive trigger', and check that positive polarity is displayed upwards. Adjust the timebase to 1 cycle equals 9 cm, and note that the display is of the form illustrated below.



The purpose of the following alignment procedure is to ensure that 'x' lies between 2 and 7 cm at all frequencies in both the 'receive' and 'transmit' modes.

(5) Adjust 7L1 at 37.50MHz and 7C3 at 46.50MHz to obtain the setting-point illustrated below; repeat as necessary.



(6) With the FSS on the e.u.t. set to each of the following frequencies, in turn, check that x lies between 2 and 7 cm; 37.000, 37.900, 42.000, 42.900, 46.000 and 46.900MHz.

(7) If operation (6) cannot be achieved, eg x is less than 2 cm, repeat operation (5) in order to obtain a slightly higher setting-point of say 4.8 ± 0.5 cm. Repeat operation (6).

(8) Set CTC1 to CW TX; repeat operations (5) to (7) but making adjustments to 7L2 at 37.500MHz and 7C4 at 46.500MHz.

ASSEMBLY 8 (SETTING OF SET 150HZ AND SET MOD)

93. If a new assembly 8 or 7 is fitted, the SET 150HZ and SET MOD preset controls should be adjusted.

a. E.U.T. connections

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method (1) Set the t.r.e. and e.u.t. switches as follows:

Note: These Pages 47-48 supersede Pages 47-48 Issue 1 dated Jul 77.
Items marked thus ● have been amended.

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 MOD S.T.	1 OC	FSS: 37.000
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 Depressed		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 Depressed		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Ensure that the 150Hz bandstop and 3kHz bandpass filters on the mod. meter are IN.
- (4) Rotate the SET 150Hz control fully counter-clockwise in order to remove deviation caused by the 150Hz tone.
- (5) Set the a.f. gen. to 1kHz \pm 10% at 200mV e.m.f. (10mV p.d.).
- (6) Depress and hold CTC11; set the FSS on the e.u.t. to 37.050, 39.050, 41.050, 43.050, 45.050 and 46.975 in turn. At the frequency which gives the highest deviation, adjust the SET MOD control to produce a deviation of \pm 5.7kHz.
- (7) Set CTC1 to PILOT TONE.
- (8) Set the 3kHz bandpass filter on the mod. meter to OUT.
- (9) Note the deviation due to the noise, as indicated on the mod. meter.
- (10) Set the 150Hz band-stop filter on the mod. meter to OUT.
- (11) At the frequency which produced the highest deviation, adjust the SET 150Hz control to produce a deviation of \pm 2.3kHz plus the deviation due to the noise as determined in (9) above.

ASSEMBLY 10

94. After replacing a sub assembly within the synthesizer, the following alignment procedure should be carried out with the motherboard, with all assemblies, in the motherboard assembly test jig.

a. F.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 46.000
2 MP V	2 AF LOAD 300	3 Released	SSW *
3 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 ACCESS		
	13 AF		
	14 CARRIER OFF		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Replace the normal assembly screening cover with the
dummy synthesizer cover (item 7, Table 7) screwed on.

Set 6 volts

(4) Connect the d.v.m. (CTC16/17) to 3SK7/8 (VT COARSE).

(5) Depress CTC3.

(6) Adjust 10aR18 (SET 6V) for a d.v.m. indication of
LL 5.98V, UL 6.00V.

Set reference oscillator frequency

(7) Connect the counter (CTC21) to 10TP5 (REF) on the
dummy cover.

(8) Adjust 10bC17 (SET REF) for a counter display of
LL 3.200 000MHz, UL 3.200 100MHz.

Rx and Tx oscillators (assembly 7)

(9) The Rx and Tx oscillators in assembly 7 should now
be aligned as in para 92.

Set Rx oscillator frequency

- (10) Replace the synthesizer dummy cover with the normal screening cover.
- (11) Set the FSS on the e.u.t. to 37.000MHz.
- (12) Connect the counter (CTC21) to 3SK4/12 (RXO).
- (13) Adjust 10aC1 ~~(RX)~~ ^{to its mid-position and then adjust 10aL1 (RX)} for a counter display of LL 58.399 800MHz, UL 58.400 100MHz.
- (14) Set the FSS on the e.u.t. to 46.975MHz.
- (15) Check that the counter display is LL 68.374 800MHz, UL 68.375 100MHz. If not, re-adjust 10aC1 and verify that the frequency is within the limits required with the FSS set to 37.000MHz.

Set Tx oscillator frequency

- (16) Set the FSS on the e.u.t. to 46.975MHz.
- (17) Set CTC1 to CW TX.
- (18) Connect the counter (CTC21) to 3SK4/6 (TXO).
- (19) Adjust 10aC13 ~~(TX)~~ ^{to its mid-position and then adjust 10aL6 (TX)} for a counter display of LL 46.974 800MHz, UL 46.975 100MHz.
- (20) Set the FSS to 37.000MHz.
- (21) Check that the counter display is LL 36.999 800MHz, UL 37.000 100MHz. If not, re-adjust 10aC13 and check at FSS of 46.975 that the frequency is within the required limits.
- (22) Finally, check for the correct operation of the complete synthesizer by connecting the c.r.o. CH1 input to 3SK8/1 via a high-impedance (X10 - 11pF) probe; look for stable pulses of 3.125kHz on the c.r.o., for various combinations of the three FSS, on Tx and Rx (CTC11 depressed and released).

CRYSTAL AGEING ADJUSTMENT

95. The following adjustments may be made to compensate for crystal ageing when the transmit frequency exceeds ± 500 Hz of its nominal setting.

- a. Resetting of Rx oscillator frequency as per para 94b (11) to (15).
- b. Resetting of Tx oscillator frequency as per para 94b (16) to (21).

ADJUSTMENTS NOT NORMALLY CARRIED OUT

96. The pre-set controls for the following adjustments are inscribed and ringed in red on the RT-349, and SHOULD NOT be touched during normal repair and alignment procedures. However, if they are accidentally adjusted, they should be re-set as follows.

Set 9 volts (assembly 9)

97. a. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Connect the d.v.m. (CTC 16/17) to 3SK5/2
(9V CONST); when the motherboard, with all its
assemblies, is in the box assembly, remove assembly 5 for
access to 3SK5/2.

(4) Depress CTC3.

(5) Adjust the SET 9V control for a meter indication of
LL 9.00V, UL 9.10V.

Set low-battery-warning voltage (assembly 9)

98. a. E.U.T. connections

CS7 to 1PL4/5
IF(C)5 to 1SK1
Disconnect r.f. input

b. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	

- 5 Depressed
- 6 Released
- 7 Released
- 8 Released
- 9 Released
- 10 Depressed
- 11 Released
- 12 AF
- 13 AF
- 14 CARRIER OFF
- 26 INT

- (2) Adjust CS3 for a supply voltage of 9.6V.
- (3) Rotate SET LB to the fully counter-clockwise position.
- (4) Slowly rotate SET IB clockwise to the position where bursts of noise are heard in the loudspeaker.

Set audio output (assembly 5)

99. a. E.U.T. connections

- CS7 to 1PL4/5
- CTC20 to 1SK2 via the antenna adaptor
- IF(C)5 to 1SK1

- b. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Depress CTC7.
- (4) Set the r.f. gen. to 42.050MHz modulated by 1kHz at ± 5 kHz deviation.
- (5) Set the r.f. gen. attenuator to 60dB (1mV).
- (6) Adjust the SET AF control for a d.v.m. indication of LL 520mV, UL 580mV.

Set 150Hz rejection (assembly 5)

100. Before attempting to adjust the SET REJ control, the SET AF procedure (para 99) must be carried out.

a. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Set the r.f. gen. to 42.050MHz modulated by 150 ± 2 Hz at ± 1.5 kHz deviation.
- (4) Set the r.f. gen. attenuator to 60dB (1mV).
- (5) Depress CTC7
- (6) Adjust the SET REJ control for a minimum indication on the d.v.m.

Note: These Pages 53-56 supersede Pages 53-56 Issue 1 dated Jul 77.
Items marked thus ● have been amended.

FAULT FINDING

INTRODUCTION

101. Information is given for the location and correction of faults in accordance with the Field repair policy viz:

- a. To assembly level within the RT-349.
- b. To sub assembly level for assembly 10 (synthesizer).
- c. To sub assembly level or mechanical parts for the box assembly.

Note: An enlarged version of Tels F 602, Fig 2001, RT-349 functional diagram, suitable for bench working, can be obtained on application to:

Commanding Officer,
Telecommunications and Radar Branch REME,
Leigh Sinton Road,
Malvern,
Worcs.

102. Initially, the following functional tests should be carried out in order to ascertain the nature of the fault; reference is then made to Table 5 for interpretation of the test results. The results of the actions specified in Table 5 lead to Table 6 which locates the faulty assembly. If assembly 10 is identified as faulty, paras 111 to 121 give the information required for fault-location to synthesizer sub assembly level.

FUNCTIONAL CHECK 1 (POWER OUTPUT)

103. a. Limits. With a d.c. supply of 12V $\pm 0.2V$, the transmitter power output shall lie between 130 and 350mW at any permitted frequency.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		

CS

CTC

IF(C)

E.U.T.

11 Released
12 RF
13 AF
14 SIGNAL
26 INT

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Depress CTC7.

(4) Depress and hold CTC11; note the following:

(a) the counter display shall be the nominal
frequency setting on the e.u.t.

(b) the d.v.m. indication shall be LL 360mV
(130mW) UL 592mV (350mW).

(5) Repeat the above procedure at frequency settings of
37.000 and 46.975MHz.

FUNCTIONAL CHECK 2 (150HZ MODULATION)

104. a. Limits.

(1) The deviation of the transmitter output caused by
the internal 150Hz tone shall be between ± 1.55 and
 ± 2.5 kHz.

(2) The frequency of the internal tone shall be between
148 and 152Hz.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method.

(1) Set the t.r.e. and e.u.t. switches as follows:

CS

CTC

IF(C)

E.U.T.

1 MP 9-21
2 MP V
6 Released

1 PILOT TONE
2 AF LOAD 300
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: 42.050
SSW: L

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Ensure that the 150Hz bandstop filter on the mod. meter is IN and the 3kHz bandpass filter is OUT.
- (4) Depress and hold CTC11 and note the mod. meter indication due to the noise.
- (5) Switch the 150Hz bandstop filter to OUT and note the mod. meter indication due to the 150Hz squelch tone and noise.
- (6) Calculate the deviation due to the 150Hz squelch tone only by subtracting the reading obtained in (5) from that obtained in (4) which shall be LL 1.55kHz UL 2.5kHz.
- (7) Depress CTC11 and note the counter display which shall be LL 148Hz, UL 152Hz. Release CTC11.

FUNCTIONAL CHECK 3 (AUDIO MODULATION)

105. a. Limits. With an a.f. input of 3mV r.m.s. p.d., the transmitter deviation shall lie between 4.1 and 6.4kHz.

b. Connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method

- (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 MOD S.T.	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

- (2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.
- (3) Ensure that the 150Hz bandstop filter on the mod. meter is IN.
- (4) Set the a.f. gen. to produce a single tone of 1kHz at 60mV e.m.f. (3mV p.d.)

(5) Depress and hold CTC11; note the mod. meter indication which shall be LL ± 4.1 kHz UL ± 6.4 kHz.

FUNCTIONAL CHECK 4 (SIDETONE)

106. a. Limits. With an a.f. input of 1kHz $\pm 10\%$ at a level of 10mV r.m.s., the a.f. output into 300 ohms, with the e.u.t. set to any frequency, shall be between 240 and 360mV.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 MOD S.T.	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: L
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V, UL 12.2V.

(3) Set the a.f. gen. to produce a single tone of 1kHz at 200mV e.m.f. (10mV p.d.).

(4) Depress CTC7.

(5) Depress and hold CTC11; note the d.v.m. indication which shall be LL 240mV, UL 360mV.

FUNCTIONAL CHECK 5 (A.F. OUTPUT IN NOISE-ON (*) AND/OR L MODES)

107. a. Limits. With an r.f. signal of 1mV, modulated by both a 1kHz $\pm 10\%$ at ± 5 kHz and a 150Hz ± 2 Hz at ± 1.5 kHz deviation, the audio output in 'L' or '*' mode shall be between LL 460mV and UL 640mV into 300 ohms.

b. E.U.T. connections.

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

c. Method. (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 RX FM	1 OC	FSS: 42.050
2 MP V	2 AF LOAD 300	3 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 AF		
	13 AF		
	14 SIGNAL		
	26 INT		

CAUTION: DO NOT depress CTC11 during this test.

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Depress CTC7.

(4) Set the r.f. gen. to 42.050MHz modulated by 1kHz
 $\pm 10\%$ at ± 5 kHz deviation and 150 ± 2 Hz at ± 1.5 kHz
deviation.

(5) Set the r.f. gen. attenuator to 60dB (1mV).

(6) Note the d.v.m. indication which shall be LL 460mV,
UL 640mV; check for the presence of a 1kHz tone in the
loudspeaker.

(7) Set the SSW on the e.u.t. to L.

(8) Check that the d.v.m. indication is as in (6) above;
also check for the presence of the 1kHz tone.

FAULT FINDING TO ASSEMBLY LEVEL

108. From the results of the previous functional tests, the nature of the
fault is identified using Table 5; the last column of Table 5 indicates the
action(s) to proceed to in Table 6 in order to rectify the fault. The
motherboard with all assemblies must be fitted into the motherboard test jig
(item 1, Table 2) when carrying out the actions in Table 6.

a. E.U.T. connections

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS:) That position
2 MP V	2 AF LOAD 300	2 Released) at which the
6 Released	3 Released	4 Released) fault
	4 Released	7 NORMAL	SSW:) occurs.
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 ACCESS		
	13 ACCESS		
	14 CARRIER OFF		
	26 INT		

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Depress CTC3.

Table 5 - Fault identification

Fault ref.	R.F. power output?	Audio/squelch (150Hz) modulation on transmitted signal?	Sidetone?	Audio output in * Mode?	Proceed to Table 6, action No:-
A	No	-	No	No	1
B	No	-	No	Yes	22
C	No	-	Yes	Yes	27
D	No	No	Yes	No	43
E	Yes	No	Yes	Yes	31
F	Yes	Yes	No	Yes	37
G	Yes	Yes	Yes	No	38
H	Yes	Yes	No	No	35
J	Yes	No	No	No	42
K	Yes	No	Yes	No	44
L	Yes	No	No	Yes	30
Fault description					
<u>Receiver faults</u>					
M	No audio in L and W, but present in *.				46
N	Noise present in L and W modes.				46
O	Audio output at some frequencies only.				45
P	Low sensitivity.				41
Q	Audio distorted.				41
R	No difference between L and W positions of SSW.				49
<u>Transmitter faults</u>					
S	R.F. power output at some frequencies only.				45
T	Low r.f. power output.				29
U	Audio distorted.				47
V	No difference between L and W positions of SSW.				48

FAULT RECTIFICATION

109. If, after replacing an assembly, no change results, ALWAYS REFIT THE ORIGINAL ASSEMBLY TO THE RADIO. Continuity and short-circuit (S/C) checks should be made with the multimeter set to the ' Ω ' range, and the battery supply disconnected. In Table 6, the 'result' column gives the further action procedures for the 'Yes' and 'No' conditions. Where a possible double fault is indicated, (actions 26, 42, 43, 44), follow the first indicated action through to its conclusion in the Table before attempting the second action given.

Table 6 - Fault rectification

Action No	Action	Result and next action	
1	Disconnect 1PL3: check 1PL3 pin 1 for presence of +V BATT.	Yes 12	No 2
2	Check 1LK1 for continuity.	Yes 21	No 3
3	Renew 1LK1; connect 1PL3: fault cleared?	Yes 50	No 4
4	Check 1LK1 for continuity.	Yes 1	No 5
5	Set SSW to '0'. Check 3SK9/6 (9VRx) for S/C to earth.	Yes 16	No 6
6	Check 3SK8/7 (9VTx) for S/C to earth)	Yes 17	No 7
7	Check 3SK9/11 (9V) for S/C to earth)	Yes 18	No 8
8	Check 3SK9/12 (BATT) for S/C to earth)	Yes 19	No 9
9	Check 3SK5/2 (9V CONST) for S/C to earth)	Yes 20	No 10
10	Insert new assembly 9: fault cleared?	Yes 50	No 11
11	Remove test point location overlay and check appropriate connections.	- -	- -
12	Connect the d.v.m. (CTC16/17) to 3SK9/6 (9VRx). Check for 9V.	Yes 13	No 10
13	Connect the d.v.m. (CTC16/17) to 3SK9/11 (9V). Check for 9V.	Yes 14	No 10
14	Connect the d.v.m. (CTC16/17) to 3SK9/3 (L_k). Check for 0V (L_k information).	Yes 10	No 15

Table 6 (continued)

Action No	Action	Result and next action	
		Yes	No
15	Remove test cover and check wiring of flying leads 10SK8 (VT COARSE), 10SK10 (VT FINE), 10SK13 (VCO); attempt alignment of oscillators (para 92); if unsuccessful, fit new assembly 7. Fault cleared?	50	Syn [†]
16	Remove, in turn, assemblies 4, 6 and 7 and disconnect flying lead 10SK9 (9VRx) until S/C disappears; insert new assembly, as appropriate, or fault-find within assembly 10 (para 111 to 121). Fault cleared?	50	10
17	Remove, in turn, assemblies 7 and 8 and disconnect flying lead 10SK6(9VTx) until S/C disappears; insert new assembly, as appropriate, or fault-find within assembly 10. Fault cleared?	50	10
18	Remove test cover and disconnect flying lead 10SK11(9V). If S/C disappears, fault-find within assembly 10.	Syn [†]	10
19	Remove, in turn; assemblies 4 and 8 and disconnect flying leads 10SK12 (+V BATT) and 10SK2 (+V BATT O/P) until S/C disappears; insert new assembly as appropriate or fault-find within assembly 10. Fault cleared?	50	10
20	Remove assembly 5; if S/C disappears, fit new assembly 5; fault cleared?	50	10
21	Check battery connections and wiring continuity of the audio socket, SSW and wiring harness assembly: fault cleared?	50	- -
22	Connect the d.v.m. (CTC16/17) to 3SK9/3 (L _k); depress CTC11 and check for OV (L _k information correct).	26	23
23	Connect the d.v.m. (CTC16/17) to 3SK8/7 (9VTx); depress CTC11 and check for 9V.	15	24
24	Check 3SK8/7 (9VTx) for S/C to earth.	17	25
25	Insert new assembly 9: fault cleared?	50	- -

[†] para 111 to 121

Table 6 (continued)

Action No	Action	Result and next action	
		Yes	No
26	Possible double fault: carry out 27 and then 37.	-	-
27	Connect the d.v.m. (CTC16/17) to 3SK9/12 (+V BATT) and check for battery volts.	28	29
28	Connect the d.v.m. (CTC16/17) to 3SK9/1 (T _w); depress CTC11 and check for 9V.	29	10
29	Insert new assembly 4, followed by 7 if necessary; fault cleared?	50	-
30	Insert new assembly 8: fault cleared?	50	33
31	Insert new assembly 8: fault cleared?	50	32
32	Insert new assembly 7: fault cleared?	50	-
33	Check continuity between 3SK8/11 (mic) and 1SK1, pin A.	50	34
34	Insert new audio socket, SSW and wiring harness assembly: fault cleared?	50	-
35	Insert new assembly 5: fault cleared?	50	36
36	Check continuity between 3SK5/4 (AF) and 1SK1, pin D.	25	34
37	Insert new assembly 8, followed by assembly 5 if necessary; fault cleared?	50	11
38	Connect the d.v.m. (CTC16/17) to 3SK9/6 (9VRx) and check for 9V.	39	40
39	Connect the d.v.m. (CTC16/17) to 3SK9/3 (L _k) and check for OV (L _k information correct).	41	15
40	Check 3SK6/9 (9VRx) for S/C to earth.	16	10
41	Insert new assemblies 4, 6 and 5, in turn, and check that radio is satisfactory.	50	11
42	Possible double fault: carry out 38 then 30.	-	-
43	Possible double fault: carry out 27 then 38.	-	-
44	Possible double fault: carry out 38 then 31.	-	-

Note: These Pages 63-64 supersede Pages 63-64 Issue 1 dated Jul 77.
Items marked thus Ⓢ have been amended.

Table 6 (continued)

Action No	Action	Result and next action	
45	Try re-alignment of oscillators, or fitting new assembly 7 and/or fault-find within assembly 10; fault cleared?	Yes 50	- -
46	Try re-setting squelch level (SET SQU) or fitting new assembly 5, followed by assembly 9; fault cleared?	Yes 50	- -
47	Insert new assembly 8, followed by assembly 7; fault cleared?	Yes 50	- -
48	Insert new assembly 8: fault cleared?	Yes 50	No 11
49	Insert new assembly 5: fault cleared?	Yes 50	No 11
50	Carry out specification tests after any necessary re-alignment.		

110. Having located and replaced faulty assemblies, check alignment and re-align as necessary.

Ⓢ FAULT FINDING WITHIN ASSEMBLY 10 (SYNTHESIZER) (Fig 6, 2003 and 2005)

111. Fault finding is carried out with the motherboard, with all assemblies, fitted into the motherboard test jig (item 1, Table 2); refer to para 33 and Fig 6.

112. a. E.U.T. connections

CS7 to 1PL4/5
CTC20 to 1SK2 via the antenna adaptor
IF(C)5 to 1SK1

b. Method (1) Set the t.r.e. and e.u.t. switches as follows:

<u>CS</u>	<u>CTC</u>	<u>IF(C)</u>	<u>E.U.T.</u>
1 MP 9-21	1 CW	1 OC	FSS: See text
2 MP V	2 AF LOAD 300	2 Released	SSW: *
6 Released	3 Released	4 Released	
	4 Released	7 NORMAL	
	5 <u>Depressed</u>		
	6 Released		
	7 Released		
	8 Released		
	9 Released		
	10 <u>Depressed</u>		
	11 Released		
	12 ACCESS		

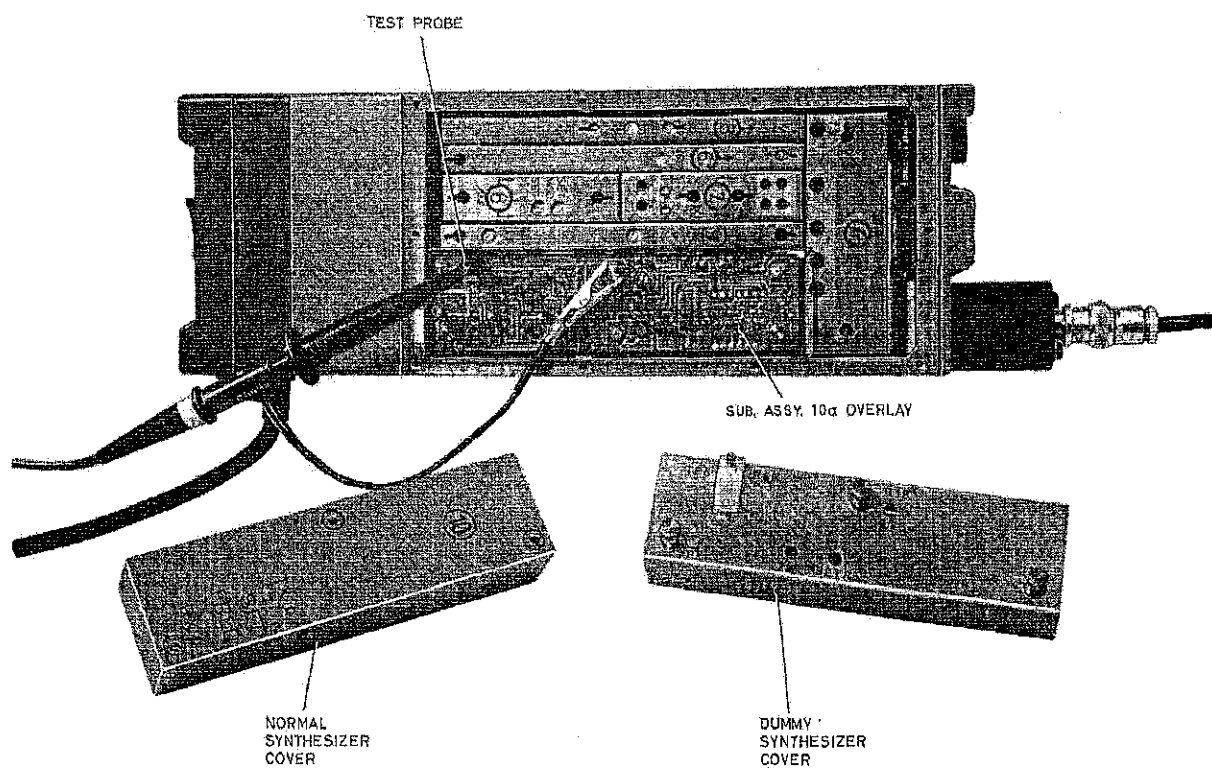


Fig 6 - Fault location : synthesizer (assembly 10)

CS

CTC

IF(C)

E.U.T.

13 ACCESS
14 CARRIER OFF
26 INT

(2) Adjust CS3 for a supply voltage of LL 11.8V,
UL 12.2V.

(3) Depress CTC3.

113. Remove the synthesizer cover and fit the sub assy 10a overlay (item 8, Table 2). Carry out a physical check of all flying leads to the synthesizer.

114. Connect the c.r.o. CH1 input to 3SK8/1 (3TP1) (comparison frequency output) on the motherboard via a high-impedance (X10 - 11pF) probe; check for stable 3.125kHz pulses, with CTC11 depressed and released. Repeat these checks for a number of settings of the FSS.

115. If in para 114, the pulses are present in only the transmit or receive mode, connect the d.v.m. (CTC16/17) to 10aTP2 and check for 9VRx and to 10aTP3 and check for 9VTx with CTC11 depressed. If the correct voltage is present, board 10a is faulty (Tx or Rx oscillator). Fit the dummy synthesizer cover (item 7, Table 2) and attempt to align the faulty oscillator (para 94(11) to (15) and/or (16) to (21)); if the oscillator cannot be aligned, change board 10a.

116. If, in para 114, the pulses are not present at certain MHz settings of the FSS, connect the d.v.m. (CTC16/17) to 3SK7/8 (V_T COARSE STEP VOLTS) and, for these FSS settings, refer to F 602, Table 2004 and check for a correct d.v.m. indication; if incorrect, change board 10b.

117. If, in para 116, the step voltages measured are present and correct, observe the effect of various settings of the 100kHz and kHz switches; if the synthesizer fails at certain settings, proceed as follows:

- a. Set the MHz switch to one of the settings (para 114) which gave the expected step voltages.
- b. Set the 100kHz and kHz switches to one of the positions which indicated a fault condition.

If, on each of the MHz steps, the 100kHz and kHz do not function correctly, the data information is incorrect. Remove and dismantle the synthesizer, desolder the appropriate data line. Check the switch data (Table 2003, F 602); if this data is correct, board 10b is faulty.

118. If, in para 114, the pulses are not present at any frequency setting in both the transmit and receive modes, connect the d.v.m. (CTC16/17) to 10aTP4 and check for 9 volts and to 10aTP10 and check for 6 volts. If 9 volts is present but 6 volts is incorrect, attempt to re-set 6 volts (para 94); if unsuccessful, change board 10a.

119. If 6 volts is present, check the divide-by-four pre-scaler as follows:

- a. Disconnect the flying lead at 10SK13 (VCO IN).
- b. To this flying lead, or to 10aTP1, connect the r.f. gen. set to 38.475MHz c.w. at 100mV e.m.f.; the r.f. gen. connection is made as follows:
 - (1) Disconnect the coaxial lead from the r.f. gen. r.f. fuse to the CTC; take the r.f. gen. output direct from the r.f. fuse.
 - (2) Set the LOCAL/REMOTE/MODE switch, on the Signal Processor Unit (9062), to LOCAL.
 - (3) Set the MODE switch, on the 9062, to CW.
 - (4) Set the ATTENUATOR, on the 9062, to 20dB (100mV).
 - (5) When the following check has been carried out, remake the original connection and switch settings on the r.f. gen.
- c. Connect the counter (CTC21) to 10aTP6.
- d. Depress CTC11.
- e. Check for a 1MHz output (see Note) at 10aTP6; if correct, change board 10b, or if not, change board 10a.

Note: This particular frequency of 1MHz is a result of the r.f. gen. setting of 38.475MHz; it can be derived from the following expression:-

$$\frac{f_1 - f_2}{4} \quad \text{where } f_1 = \text{r.f. gen. frequency.}$$

and $f_2 = \text{the Transmit Crystal Oscillator frequency, ie } 34.475\text{MHz.}$

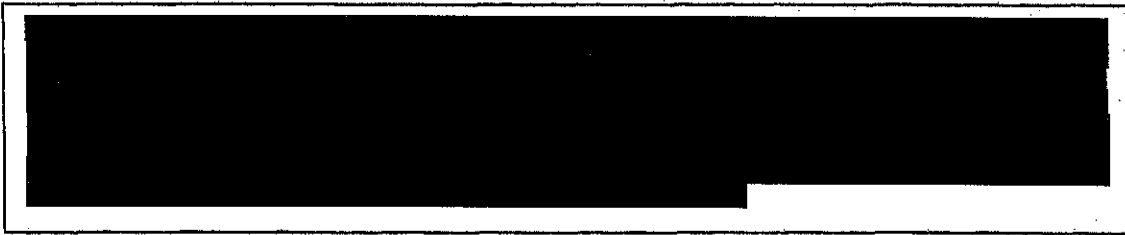
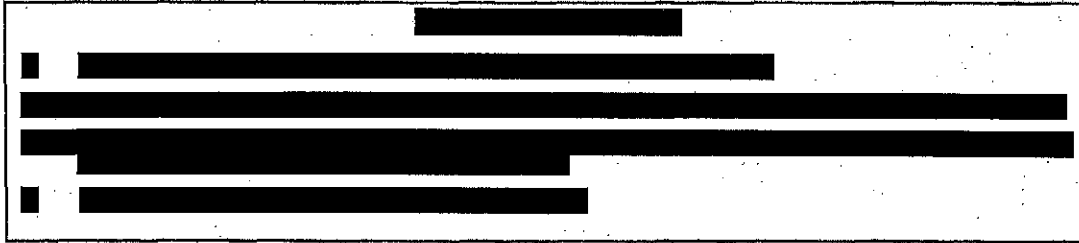
Hence, signal frequency at 10aTP6

$$= \frac{38.475 - 34.475}{4} = 1\text{MHz}$$

120. If the radio does not function, and a synthesizer fault is suspected, but the check in para 114 proves that the synthesizer is operational, proceed as follows:
- a. Disconnect flying lead 10SK3.
 - b. To this flying lead, connect the d.v.m. (CTC16/17).
 - c. Measure the lock output which should be zero; if 6.0 volt, the lock pulse monostable is faulty and board 10a should be changed.
121. If when switching from 'receive' to 'transmit', or vice-versa, the audio does not momentarily mute, proceed as follows:
- a. Disconnect flying lead at 10SK3.
 - b. To this flying lead connect the d.v.m. (CTC16/17).

- c. Measure the lock output which should be zero.
- d. Disconnect 10SK8 (VT COARSE) which artificially unlocks the synthesizer; note the d.v.m. reading which would be 6 volts. If not, the lock pulse monostable is faulty and hence board 10a should be changed.





UK/PRC 349

TECHNICAL HANDBOOK - FIELD REPAIR

ERRATA

Note...

This Page 0 is to be filed immediately in front of Page 1, Issue 1, dated Feb 95.

1. The following amendments must be made to the regulation:

Delete: Page 1, Issue 1 dated Feb 95.
Insert: Page 1, Issue 2 dated May 02.

Delete: Page 5, Issue 1 dated Feb 95.
Insert: Page 5, Issue 2 dated May 02.

Delete: Page 9, Issue 1 dated Feb 95.
Insert: Page 9, Issue 2 dated May 02.

Delete: Page 10, Issue 1 dated Feb 95.
Insert: Page 10, Issue 2 dated May 02.

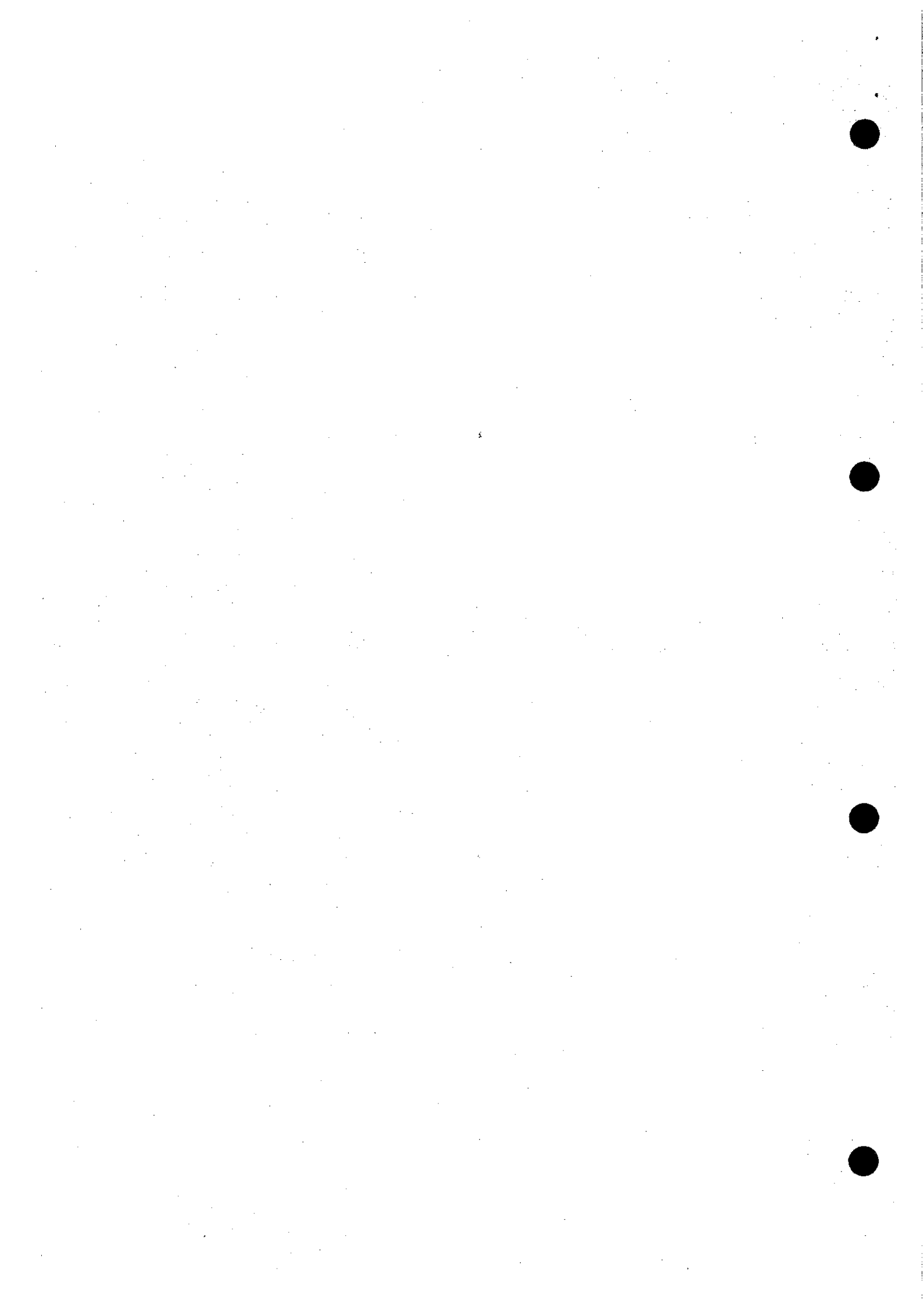
Delete: Pages 28-30, Issue 1 dated Feb 95.
Insert: Pages 28-30, Issue 2 dated May 02.

Delete: Pages 33-35, Issue 1 dated Feb 95.
Insert: Pages 33-35, Issue 2 dated May 02.

Insert: Pages 75 to 84, Issue 2 dated May 02.





END

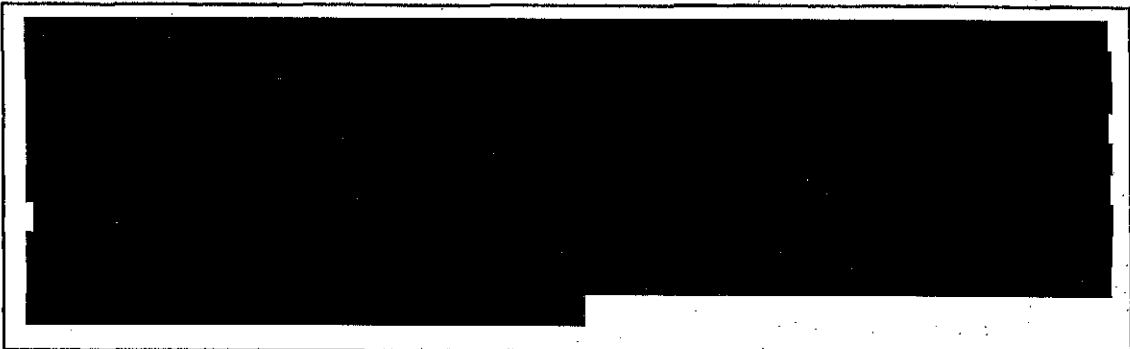






CONDITIONS OF RELEASE

1. 


4. 



UK/PRC-349

TECHNICAL HANDBOOK - FIELD REPAIRS

CONTENTS

Para

- INTRODUCTION
- 1 Hazardous substances (WARNING)
- 2 Scope of repairs
- 3 Specification testing, alignment and repair procedures
- 4 Radio test system 8920C
- 9 Use of the 8920C in the automatic mode
- GENERAL REPAIR INFORMATION
- 10 RT-349 internal identification
- 11 Fixing of labels
- 12 Repainting
- 14 Field repair equipment
- 15 Field repair test kit (FRTK)
- 26 Drying and sealing
- 27 Soldering and desoldering (CAUTION)



CONTENTS (continued)

Para

REMOVAL AND REPLACEMENT PROCEDURES

Removal

- 28 RT-349 box lid
- 29 Assemblies 4 to 9 (CAUTION)
- 31 Motherboard (with all assemblies)
- 32 Synthesizer (assembly 10)
- 33 Synthesizer sub-assemblies 10a, 10b and 10c (CAUTION)
- 34 Synthesizer sub-assembly 10a
- 35 Synthesizer sub-assemblies 10b and 10c
- 36 Motherboard
- 37 Audio socket, system switch (SSW) and wiring harness
- 38 Knobs

Replacement

- 40 Battery fixing Insert
- 41 Knobs
- 42 Synthesizer sub-assemblies 10b and 10c
- 43 Synthesizer sub-assembly 10a
- 44 Synthesizer (assembly 10)
- 45 Audio socket, system switch (SSW) and wiring harness
- 46 Fitting assemblies to the motherboard
- 47 Motherboard (with all assemblies)
- 48 Lid
- 49 Screws and washers

**FITTING THE MOTHERBOARD (WITH ALL ASSEMBLIES) INTO THE MOTHERBOARD
ASSEMBLY TEST JIG**

50 General

SPECIFICATION TESTING - 8920C MANUAL MODE

- 52 Introduction (CAUTION)
- 54 Condition of test
- 56 Specification test initial setting up
- 60 PSU settings
- 61 2955B settings
- 62 Selecting a skeleton test set-up
- 63 Selecting additional skeleton test set-up facilities
- 64 EUT-to-8920C interconnections
- Test 1 - preliminary test
 - 65 Test limits
 - 67 Initial settings
 - 69 Test methods
- Test 2 - current consumption
 - 71 Test limits
 - 72 Initial settings
 - 74 Test methods
- Test 3 - power output into a 50 ohm load
 - 77 Test limits
 - 79 Initial settings
 - 81 Test methods
- Test 4 - accuracy of radiated carrier
 - 83 Test limits
 - 84 Initial settings
 - 86 Test method

CONTENTS (continued)

Para

	Test 5 - 150 Hz modulation
87	Test limits
89	Initial settings
91	Test methods
	Test 6 - modulation sensitivity
92	Test limits
94	Initial settings
96	Test methods
	Test 7 - modulation control
98	Test limits
99	Initial settings
101	Test method
	Test 8 - sidetone
102	Test limits
103	Initial settings
105	Test method
	Test 9 - receiver sensitivity
106	Test limits
107	Initial settings
109	Test method
	Test 10 - limiting
110	Test limits
111	Initial settings
113	Test method
	Test 11 - squelch sensitivity
114	Test limits
115	Initial settings
117	Test method
	Test 12 - AF power output
118	Test limits
119	Initial settings
121	Test methods
	Test 13 - low battery warning
123	Test limits
124	Initial settings
126	Test methods
	Test 14 - battery-saving period and delay
127	Test limits
129	Initial settings
131	Test methods
133	Additional tests
	Test 15 - variation of deviation with channel frequency
134	Test limits
135	Initial settings
137	Test method
	Test 16 - spurious responses
138	Test limits
139	Initial settings
141	Test method

CONTENTS (continued)

Para

- 142 Special tests
 - Transmitter spurious radiation (non-harmonic) test
 - 144 Test limits
 - Transmitter spurious radiation (harmonic) test
 - 145 Test limits
 - Receiver spurious emission test
 - 146 Test limits
- ALIGNMENT**
- 147 Introduction
 - 150 Assembly 4 (4T3 setting)
 - 151 Initial settings
 - 153 Method
 - 154 Assembly 5 (SET SQU setting)
 - 155 Initial settings
 - 157 Method
 - 158 Assembly 7 (Rx and Tx oscillator settings)
 - 159 Initial settings
 - 161 Methods
 - 163 Assembly 8 (set 150 Hz and set mod settings)
 - 164 Initial settings
 - 166 Method
 - 167 Assembly 10
 - 168 Initial settings
 - Set 6 volts
 - 170 Method
 - Set reference oscillator frequency
 - 171 Method
 - 172 Rx and Tx oscillators (assembly 7)
 - 173 Set Rx oscillator frequency
 - 174 Set Tx oscillator frequency
 - 175 Crystal ageing adjustment
 - 176 Adjustments not normally carried out
 - Set 9 volts (assembly 9)
 - 177 Initial settings
 - 179 Method
 - Set low battery warning voltage (assembly 9)
 - 180 Initial settings
 - 182 Method
 - Set audio output (assembly 5)
 - 183 Initial settings
 - 185 Method
 - Set 150 Hz rejection (assembly 5)
 - 186 Initial settings
 - 188 Method
- FUNCTIONAL TESTS**
- 189 General
 - Functional test 1 (power output)
 - 190 Test Limits
 - 191 Initial settings
 - 193 Test Method

CONTENTS (continued)

Para

Functional test 2 (150 Hz modulation)

194 Test Limits

196 Initial settings

198 Test Method

Functional check 3 (audio modulation)

199 Test Limits

200 Initial settings

202 Test Method

Functional test 4 (sidetone)

203 Test limits

204 Initial settings

206 Test method

Functional test 5 (AF output in Noise-on (*) and/or L modes)

207 Test limits

208 Initial settings

210 Test method

FAULT FINDING

211 Introduction

212 Fault identification

214 Initial settings

215 Fault finding to assembly level

217 Fault finding within assembly 10 (synthesizer)

218 Initial settings

219 Fault finding procedure

MANUAL TESTING /AUTOMATIC TESTING

500 Auto testing and cross reference table

Fig

Page

1	RT-349 Field repair test kit (FRTK)	11
2	Use of assembly extractor tool	15
3	Fitting synthesizer-to-motherboard mechanical alignment jig	19
4	Screw tightening sequence	21/22
5	Motherboard assembly fitted into test jig	25
6	Tx and Rx oscillator alignment waveform	50
7	Frequency measurement B interconnection diagram	55
8	Fault location - Synthesizer (assembly 10)	71

Table

Page

1	Field repair equipment	9
2	FRTK items list	10
3	RT-349 screws, washers, circlips and seal.....	23
4	Adjustment and alignment summary	47
5	Fault identification	67
6	Fault rectification	68

INTRODUCTION

HAZARDOUS SUBSTANCES

1 Before using any hazardous substance or material, the user must be conversant with the safety precautions and first aid instructions:

1.1 On the label of the container it was supplied in.

1.2 On the material Safety Data Sheet.

1.3 In local Safety Orders and Regulations.

WARNING

TOXIC SUBSTANCE. IN ASSEMBLY 4 OF THIS EQUIPMENT, THE RF TRANSISTOR HEATSINK CONTAINS BERYLLIUM OXIDE. IN CERTAIN CIRCUMSTANCES, IT CAN CONSTITUTE A HEALTH HAZARD. BEFORE WORKING ON THE EQUIPMENT, CONSULT HEALTH AND SAFETY MANAGEMENT IN THE EQUIPMENT SUPPORT ORGANISATION AND ES/REME UNITS - ARMY CODE No 63723, CHAPTER 15 - BERYLLIUM HAZARDS AND PRECAUTIONS.

SCOPE OF REPAIRS

2 This regulation gives repair information for use by Field and Base workshops. Field repair is confined to the replacement of faulty assemblies except for the box assembly and the synthesizer where repair is by replacement of faulty sub-assemblies, mechanical parts and certain discrete components. Base repair is not envisaged, but when equipments are presented to a Base workshop, the level of repair will be to the standard of that at Field level.

SPECIFICATION TESTING, ALIGNMENT AND REPAIR PROCEDURES

3 The procedure contained in this Part 2 of this regulation involves the use of the 8920C in the manual mode of operation and the RT-349 Field Repair Test Kit (FRTK). Specification testing of the RT-349 can be carried out with the equipment sealed (lid fitted) or unsealed (lid removed). With the exception of tests 9 and 11, all other specification tests can be carried out with the motherboard (with all assemblies) mounted in the motherboard assembly test jig (Table 2, Serial 1). All RT-349 alignment procedures may be carried out with the equipment unsealed (lid removed) except the adjustments associated with assembly 10 which are detailed in Para 167 to 172 (to gain access to test points 3TP1 and 3TP2, assembly 8 has to be withdrawn). All alignment procedures may also be carried out when the motherboard (fitted with all assemblies) is mounted in the motherboard assembly test jig. When the motherboard and all assemblies is refitted into the box assembly the SET SQU preset control setting may need to be rechecked.

RADIO TEST SYSTEM 8920C

4 The Radio Test System 8920C is fully described in the 8920C Operating Manual, and no attempt is made in this regulation to describe 8920C functions.

5 When referring to the 8920C, the following abbreviations are used throughout this document:

- 5.1 DMM Digital multimeter
- 5.2 CRO Cathode ray oscilloscope
- 5.3 EUT Equipment under test
- 5.4 CIP Connector interface panel
- 5.5 RIU Radio interface unit
- 5.6 PSU Farnell power supply unit
- 5.7 LL Lower limit
- 5.8 UL Upper limit

6 Controls and connectors on the 8920C equipment are referred to by their panel designations (e.g. AF GEN output on the 2955B unit).

7 This document details the 8920C control settings and connections required to carry out each specific function. For specification testing, the 8920C control settings and connections are repeated at the start of each test to allow any particular test to be carried out in isolation.

8 Range settings of individual test equipments (e.g. DMM, CRO) are not detailed unless specifically required. Instructions are given as '... DMM shall indicate ...', and correct operation and range selection is implied.

USE OF THE 8920C IN THE AUTOMATIC MODE

9 Specification testing for inspection purposes will normally be carried out using the 8920C in the automatic mode. In Part 4 of this regulation, the test numbers associated with the automatic tests are cross-referenced to the paragraph numbers in Part 2 of this regulation.

GENERAL REPAIR INFORMATION

RT-349 INTERNAL IDENTIFICATION

10 The following colour coding, symbols and inscriptions are used to provide internal identification within the RT-349:

- 10.1 White circles : to identify test-points on the motherboard.
- 10.2 Green circles or inscriptions : to identify screws or controls on assemblies which may be removed or adjusted at field repair level.
- 10.3 Red circles and inscriptions : to identify preset controls which should never need to be adjusted.

FIXING OF LABELS

11 The nameplate label and the modification label (recessed) are both self adhesive, after removing the protective backing paper. The serial number should be suitably marked on the nameplate label **before** fixing to the box of the radio.

REPAINTING

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

- 12.1 H1a/8010-99-224-2079 paint, priming, 1.5 litre pack.
- 12.2 H1a/8010-99-224-8663 paint, finishing polyurethane, matt finish, deep bronze green, 1.5 litre pack.

13 The paints specified in Para 12.1 and 12.2 are two-part paints which must be mixed in the proportions as printed on the package. Do not mix more than is necessary as the 'mixed' life is 8 hours at 20°C or 4 hours at 33°C. Do not apply the paint in conditions of low temperature or high humidity.

FIELD REPAIR EQUIPMENT

14 The items of test equipment shown in Table 1 are required to carry out the procedures contained in this Part 2 of this regulation.

TABLE 1 FIELD REPAIR EQUIPMENT

Serial (1)	Cat No (2)	Designation (3)
1	Z4/6625-99-152-4750	8920C Radio test system
2	Z4/6625-99-744-2009	Digital Voltmeter (HP34401A)
3	Z4/6625-99-883-8750	Oscilloscope GP 100 MHz
4	W3/4440-99-114-0440	Dehumidifier Desiccant series 1, Mk 3
5	Z4/6625-99-200-2271	Leak locator CT509
6	Z4/6625-99-965-7922	RT-349 Field Repair Test Kit (FRTK)
7	F1/5180-99-120-3922	Tool kit telecom (technician)
8	F1/5180-99-445-8208	Tool kit telecom (supplementary)
9	F1/3439-99-136-7370	Desoldering set electrical
10	TBA	Power lead (Part of Serial 1)
11	Z4/6625-99-940-4784	Audio lead (Part of Serial 1)
12	Z4/6625-99-125-8252	BNC-to-BNC coaxial lead, 1m (Part of Serial 1)

FIELD REPAIR TEST KIT (FRTK)

15 When carrying out alignment, fault diagnosis or repairs, the RT-349 motherboard (with all assemblies) can be removed from the RT-349 box assembly and inserted into the motherboard assembly test jig (Table 2, Serial 1). Table 2 lists of the items contained in the FRTK (Fig 1).

TABLE 2 FRTK ITEMS LIST

Serial (1)	NSN (2)	Designation (3)
1	6625-99-649-5580	Motherboard assembly test jig
2	5120-99-649-5581	Assembly extractor tool
3	6625-99-649-5582	Antenna adaptor (2 off)
4	6625-99-649-5584	Power supply lead
5	6625-99-649-5585	Power supply lead
6	6625-99-649-5586	Dummy synthesizer cover
7	6625-99-649-5587	Synthesizer sub-assembly 10a overlay
8		Trimming tools:
	5120-99-622-5472	Metal tipped
	7520-99-620-6308	Pencil clutch
	5120-99-649-5588	Plastic tips for pencil clutch
9	6625-99-649-6593	Synthesizer-to-motherboard mechanical alignment jig
10	5120-99-649-6594	Mandrel
11	6625-99-649-8719	Motherboard test plug
12	6625-99-649-5605	Carrying case
13	6625-01-131-3383	Probe assembly

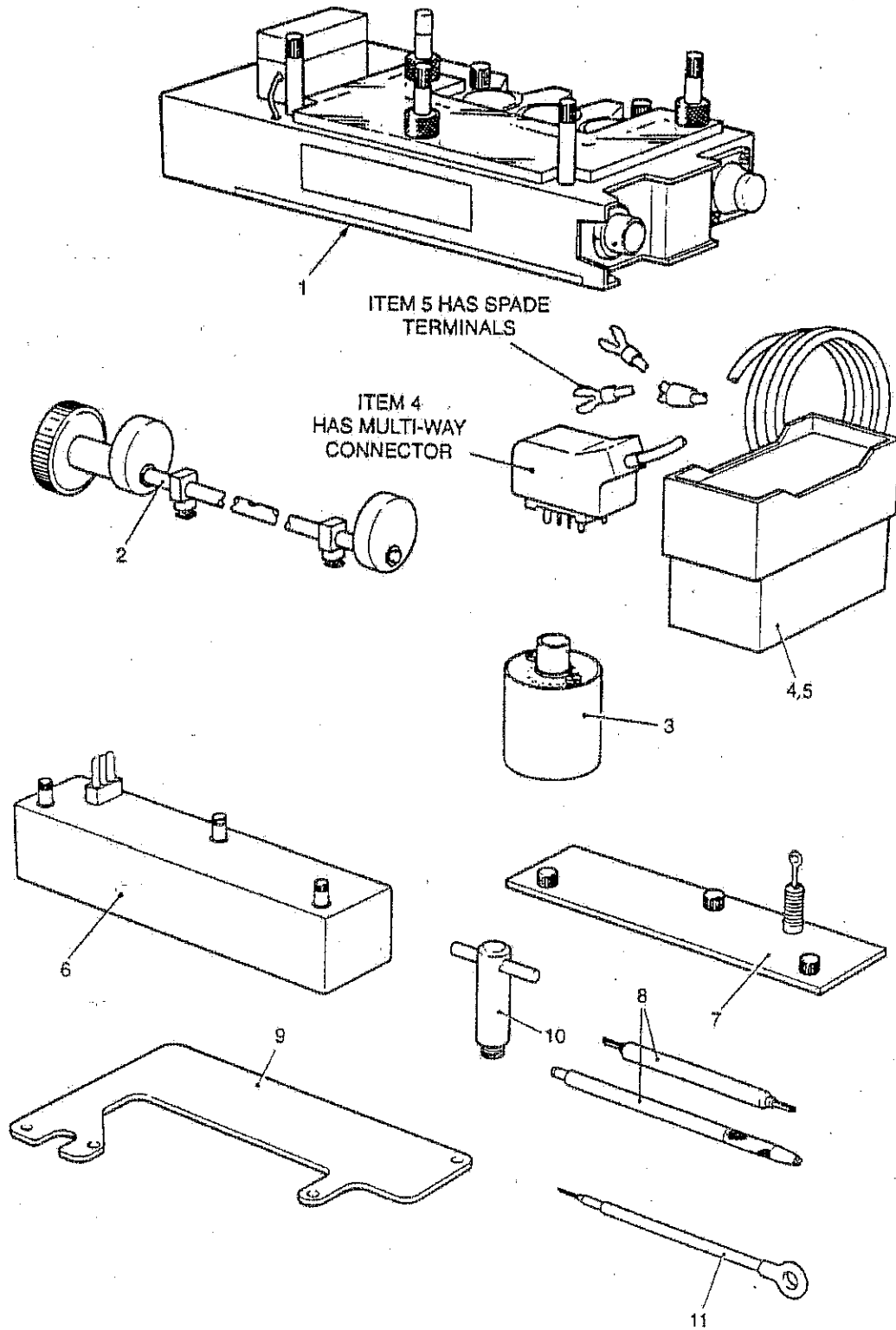


Fig 1 RT-349 Field repair test kit (FRTK)

- 16 When the motherboard (with all assemblies) is fitted into the motherboard assembly test jig (Table 2, Serial 1), the frequency setting switches (FSS) and the system switch (SSW) are controlled by knobs on the test jig in the same manner as the knobs on the RT-349 box assembly. The battery connections (1PL4/5), the audio socket (1SK1) and the antenna socket (1SK2) directly replace those on the RT-349 box assembly and are given the same designations.
- 17 The extractor tool (Table 2, Serial 2) is used to withdraw motherboard sub-assemblies 4 to 9 when the motherboard assembly (assembly 3) is fitted into either the RT-349 box or the test jig.
- 18 The antenna adaptor (Table 2, Serial 3) screws into the antenna socket on either the RT-349 radio or the motherboard assembly test jig; it is used to provide the Equipment Under Test (EUT) with a 50 ohm BNC connection for test equipment.
- 19 The power lead (Table 2, Serial 4) is used to connect either an RT-349 or a motherboard assemble test jig to the d.c. output on the 8920C Connector Interface Panel (CIP).
- 20 The power lead (Table 2, Serial 5) serves the same purpose as item 4, but connects any permitted d.c. supply where protection is not provided against transients, overvoltage and reverse polarity.
- 21 The dummy synthesizer cover (Table 2, Serial 6) provides access to preset controls and a test point which are required for alignment purposes following repair. When alignment is completed, the dummy cover is removed and the normal cover is re-fitted.
- 22 The synthesizer sub-assembly 10a overlay (Table 2, Serial 7) is fitted over the tracks of sub-assembly 10a to provide access to test points and help prevent accidental short-circuits.
- 23 The synthesizer/motherboard mechanical alignment jig (Table 2, Serial 9) is used when re-fitting a synthesizer (assembly 10) to the motherboard following repair.
- 24 The Mandrel (Table 2, Serial 10) is used to replace the battery fixing insert following removal of a damaged item.
- 25 The trimming tools (Table 2, Serial 8) consist of a metal-tipped, double-ended type, and a clutch pencil with a 'stick' of plastic-tipped screwdriver inserts. The button at one end of the pencil is pressed in order to open the clutch jaws for fitting an insert.

DRYING AND SEALING

26 Upon receipt of an RT-349 for repair, proceed as follows:

26.1 Pressurise the equipment to 5 lbf/in² using dry air.

26.2 Using a leak locator (Table 1, Serial 5), carry out a dip test in a water tank and, if necessary, replace the appropriate seals or gaskets. The addition of a wetting agent will assist in the detection of leaks.

26.3 In the driest possible conditions, open the equipment and carry out all obvious repairs and replacements.

26.4 Place the opened equipment in the dehumidifier (AESP 4440-A{100 or 106}) to dry out for at least one hour at 50°C.

26.5 Following a cooling period, carry out electrical tests, repairs and re-alignment, as necessary.

26.6 As soon as possible, following re-alignment, place the equipment in the oven for 15 minutes at 50°C.

26.7 Fit a new silica-gel sachet (Z1/4440-99-013-9203).

26.8 If necessary, fit new gaskets smeared with grease (XG271).

26.9 Seal the RT-349 in its box.

26.10 Using dry air from the dehumidifier, pressurise the radio to 5 lbf/in².

26.11 Repeat the dip test, using the leak locator, and check that no air bubbles appear.

SOLDERING AND DESOLDERING

27 The following caution should be observed to prevent equipment damage when soldering or desoldering.

CAUTION

EQUIPMENT DAMAGE. To prevent damage to the printed circuit boards when soldering or desoldering by prolonged application of heat, short circuits or electrostatic build-up, the following precautions must be observed:

- a. Use the suction soldering tool for desoldering when dismantling the synthesizer.
- b. Ensure that the soldering iron and suction soldering tool are properly earthed.
- c. Select a soldering bit which is compatible with the size of joint and not greater in diameter than the land between the pins and the track.
- d. The suction soldering tool must be carefully maintained. The hole in the bit must be kept clear and the extracted solder sump must be emptied regularly.
- e. The physical size of the synthesizer (assembly 10) and the close proximity of the adjacent soldered connections require that extreme care must be taken when soldering or desoldering.

REMOVAL AND REPLACEMENT PROCEDURES

REMOVAL

RT-349 box lid

28 To remove the RT-349 box lid, proceed as follows:

28.1 Remove the ten 2.5 mm pan-head screws and crinkle washers that secure the lid to the box, and remove the lid and sealing gasket.

Assemblies 4 to 9

CAUTION

EQUIPMENT DAMAGE. Attempted removal of assemblies without using the extractor tool can cause bending or damage to the assembly connecting pins.

29 Assemblies 4 to 9 have extraction keyhole slots in the screening covers. Spigots on the assembly extractor tool (Table 2, Serial 2) engage with the key-hole slots to withdraw the assemblies. The adjustable cam on the assembly extractor tool is set to one of the two following positions:

29.1 To the extreme end stop for assemblies 5 to 9.

29.2 To the centre stop for assembly 4.

30 To remove assemblies 4 to 9, proceed as follows:

30.1 Turn the two cams on the assembly extractor tool so that the white dot is uppermost.

30.2 With reference to Fig 2, place the assembly extractor tool above the assembly to be withdrawn with each cam in contact with the machined face on the box or the motherboard assembly test jig (Table 2, Serial 1).

30.3 Locate and lock the two spigots into the two keyhole slots.

30.4 Turn the knurled knob until the pins are withdrawn from the motherboard.

Motherboard (with all assemblies)

31 To remove the motherboard (with all assemblies) from the RT-349 box, proceed as follows:

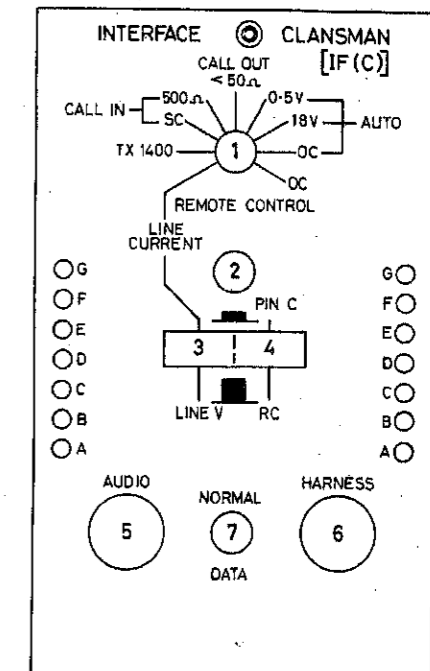
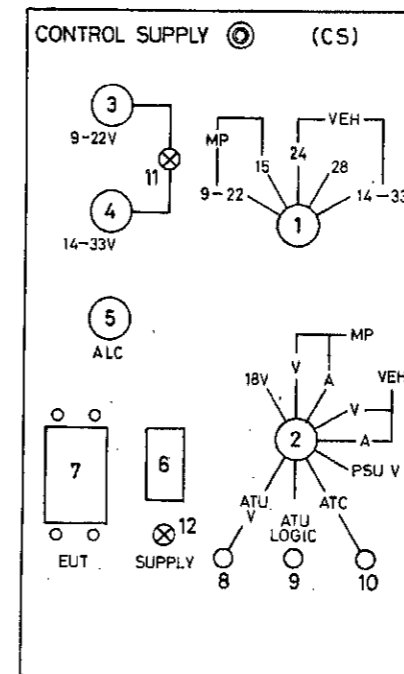
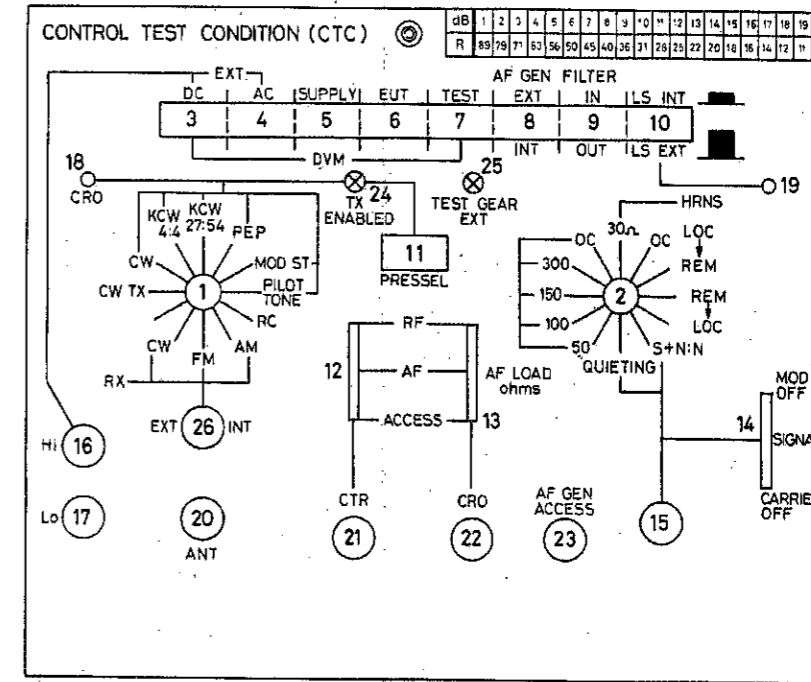
31.1 Set the FSS to 37.000 MHz.

31.2 Holding the motherboard (with all assemblies) in the RT-349 box assembly, remove the four 3.0 mm pan-head screws which are recessed into the exterior of the box.

31.3 Remove the four 3.0 mm socket-head screws and Dowty sealing washers which are located in the four corners of the recess that accommodate the three Frequency Setting Switch knobs.

31.4 Gently ease out the motherboard (with all assemblies) from the box. This will disengage the spring connector on assembly 4 from the antenna socket pin. The motherboard (with all assemblies) can now be completely withdrawn from the box, but remains attached to the box by the cable form.

31.5 Carefully remove the cableform plug from the motherboard assembly.



TEST RIG ELECTRONIC TEST CONTROLLER AS USED IN CLANSMAN.

2581/58

Fig 7 - Test rig electronic controller

4651/Tels

BND

