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TRANSMITTER-RECEIVER RADIO A40

TECHNICAL HANDBOOK - AUTOMATIC TESTING, FIELD AND BASE

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INTRODUCTION

1. The information contained in this regulation applies to the automatic testing of TRA40 types 'A' and 'B', using the Automatic test equipment radio Clansman/Larkspur (a.t.e.).

2. For details of the operation of the a.t.e. reference should be made to EMER Tels M 391.

GENERAL INSTRUCTIONS

3. The TRA40 test programmes will form the first part of a composite test tape comprising the following test programmes:

| <u>Equipment</u> | <u>Test Numbers</u> |
|-------------------|---------------------|
| TRA40 'A' | 0-99 |
| TRA40 'B' | 100-199 |
| TRA41 Nos 1 and 2 | 200-299 |
| TRA42 Nos 1 and 2 | 300-399 |

4. This composite test tape will be identified by the plain language tape leader and will be used to specification test equipments in the hands of troops and equipments received for repair in workshops. The tests contained in this tape are basically those classified as Category A.

E.U.T. to a.t.e. interconnection

13. The e.u.t. is connected to the a.t.e. using the Larkspur interconnecting unit (Larkspur box) together with the appropriate connectors from the Larkspur accessory kit - a.t.e.

Power supplies

14. The e.u.t. receives its power supplies from Power supply, set for bench testing manpack radios (Z4/6625-99-949-5448).

15. Tests are carried out to the e.u.t. with supply voltages adjusted for both normal and low voltage operation:

| | | | |
|------------|-----|---|-------|
| a. Normal: | LT1 | - | 1.25V |
| | LT2 | - | 2.5V |
| | HT1 | - | 90V |
| | HT2 | - | 45V |
| b. Low: | LT1 | - | 1.05V |
| | LT2 | - | 2.5V |
| | HT1 | - | 68V |
| | HT2 | - | 34V |

All testing is carried out with normal supply voltages unless otherwise specified.

16. Testing is carried out on all six channels of the e.u.t. Channel frequencies are:

| | TRA40 'A' | TRA40 'B' |
|-----------|-----------|-----------|
| Channel 1 | 47.0MHz | 47.0MHz |
| Channel 2 | 47.4MHz | 47.4MHz |
| Channel 3 | 47.6MHz | 47.6MHz |
| Channel 4 | 47.2MHz | 47.8MHz |
| Channel 5 | 48.8MHz | 52.6MHz |
| Channel 6 | 54.2MHz | 54.4MHz |

R.F. input voltages

17. All r.f. input voltages are quoted in terms of the open circuit voltage at the signal generator output socket.

A.F. output termination

18. The e.u.t. receiver a.f. output is terminated with 100Ω in all tests (enabled by control word AS0020).

Microphone input voltages

19. Microphone input voltages are required to be derived from a 100Ω source. This is effected by connecting a 150Ω resistance in the Larkspur box in parallel with the 300Ω output resistance of the 3-tone generator AF40S or Signal generator, set, 2-tone 9063.

20. The a.f. voltage level appearing at the e.u.t. microphone input will be modified by the inclusion of the 150Ω resistance, such that the actual voltage will be one third of the programmed level:

$$\text{Voltage at microphone input} = \text{programmed level} \times \frac{150}{150 + 300}$$

Thus if a microphone input of 250mV is required it is necessary to programme a level of 750mV (MA2750).

A.F. waveform monitoring

21. An oscilloscope CT531 or CT436 is to be connected to the AF OUTPUT socket of the a.t.e. Switching unit manual control (s.u.m.c.) so that e.u.t. a.f. waveforms may be monitored.

E.U.T. whisper operation

22. A number of tests are included to test the whisper operation of the e.u.t. and these tests are so designated. All other tests are performed with the control switch at NORMAL.

Variations in test peripherals

23. Two types of signal generator and a.f. generation/modulation packages will be encountered in use with the a.t.e. These are:

- a. The Schlumberger Signal generator, set (automatic) Z4/6625-99-114-6141, which includes the Frequency analyser FAXD120S.
- b. The Racal Synthesiser frequency set CT562 Z4/6625-99-620-6792 together with Signal generator set 2-tone Z4/6625-99-620-7808.

24. The r.f. output level of the Racal signal generator is twice that of the Schlumberger and to ensure compatibility the Racal's associated 6dB attenuator pad must be inserted in the output.

25. It should be noted that below 8MHz, the f.m. deviation law of the Racal Signal generator differs from that above 8MHz.

Manual operation

26. The connection of the e.u.t. to allow monitoring of test socket SKT-F is described in para 12.

27. Prior to the commencement of manual operation of the a.t.e. it is necessary to enable input and output routes of the e.u.t. to the a.t.e. by inserting control word HC1000, any route can then be selected by depressing the appropriate switches on the front panel of the Switching Unit Monitor (s.u.m.). The procedure is:

- a. Depress MANUAL switch on s.u.m.
- b. Select control word HC1000 on thumbwheel switches on s.u.m.
- c. Depress PROG OVERRIDE switch on programmer electronic control (programmer).
- d. Depress MANUAL INSERT switch on programmer.
- e. Routes may now be selected by depressing appropriate switches on s.u.m.

A.T.E. TEST METHODS

General

28. A.T.E. test methods and practices generally are described in EMER Tels M 391. However in the subsequent paragraphs some of the techniques used in the TRA40 test programmes are described to simplify interpretation of results.

Deviation measurement

29. Modulation sensitivity (deviation) is measured using the Frequency analyser FAXD120S. A d.c. output proportional to the deviation is produced by the frequency analyser and measured on the d.v.m. On the 20kHz deviation range, used for all measurements in this programme, the deviation law is:

$$1\text{kHz} = 0.5\text{V d.c. output (f.s.d.} = 10\text{V} = 20\text{kHz)}$$

Transmitter power measurement

30. Transmitter power is measured by applying the e.u.t. power output to a power monitor in the a.t.e. via a 20dB r.f. attenuator (enabled by control word SC2000) and measuring the resultant d.c. voltage output. An r.f. input of 1W will produce a d.c. output of 100mW.

Receiver signal + noise to noise measurement

31. Receiver f.m. signal + noise to noise ratio is tested in two separate tests at each channel frequency. In the first test a $3.2\mu\text{V}$ signal, 15kHz deviation at 1kHz, is applied to the e.u.t. antenna, the resultant a.f. output is attenuated by 20dB of a.f. attenuation, measured on the d.v.m. and the result (A) recorded as the comparator upper limit. In the second test the 20dB a.f. attenuation is reduced to zero and the modulation removed from the antenna signal. The resultant e.u.t. a.f. output (B) shall be less than that recorded in the first test. The specific signal + noise to noise ratio is:

$$(20 \log A/B + 20)\text{dB}$$

Receiver r.f. output measurement

32. The e.u.t. receiver a.f. output is measured on both NORMAL and WHISPER operation. The specification is:

- a. NORMAL. With antenna input of 1mV, 15kHz deviation at 1kHz, e.u.t. a.f. output shall be not less than 2.5mW.
- b. WHISPER. With control switch set to WHISPER, the a.f. output shall reduce by 15dB \pm 3dB.

33. E.U.T. a.f. output is measured in a composite group of tests, MTOO19 to MTOO21. Antenna input is 1mV, 15kHz deviation at 1kHz, in all tests:

- a. MTOO19. This test measures the NORMAL a.f. output of the e.u.t. and also sets the high limit for the subsequent measurement of a.f. output on WHISPER, the measurement being made with an a.f. attenuation of 12dB (15dB - 3dB) in circuit. Thus an e.u.t. a.f. output of 2.5mW is reduced to 0.16mW and a low limit of 0.125V is programmed (0.16mW is equivalent to 0.125V across 100 Ω).
- b. MTOO20. This test sets the low limit for the subsequent measurement of a.f. output on WHISPER, the measurement being made with an a.f. attenuation of 18dB (15dB + 3dB) in circuit.
- c. MTOO21. In this test the control switch is set to WHISPER and the e.u.t. a.f. output is measured via zero a.f. attenuation and compared against the upper and lower limits set in the previous two tests.

SEARCHING INTO TESTS

34. The annotation ■ indicates that the test is one of a composite series of tests eg limiting, and that these tests are not to be searched into, as programmed information, normally inserted at the start of the series of tests, will not be present. All other tests are complete in themselves, but should be searched into with the a.t.e. in the STOP Mode, so that e.u.t. controls can be correctly set before commencement of the test.

OPERATOR ACTION WARNING

35. The operator will receive warning that he is required to intervene in the test sequence in two ways:

- a. The audible warning will 'bleep' for approximately two seconds and the operator action lamp on the Programmer electronic control (programmer) front panel will illuminate.
- b. The tape will stop and the 'continuous encode' lamp on the programmer will illuminate.

Condition a. is indicated in the operating instructions by the annotation @ and condition b. by the annotation *.

INITIAL SETTING UP INSTRUCTIONS

General

36. Dependent upon the type of signal generator and a.f. generation/modulation package employed in the a.t.e., the operator should carry out the relevant parts of these setting up instructions:

- a. Schlumberger package. Para 45 to 47.
- b. Racal package. Para 48 to 50.

Switching unit manual control (s.u.m.c.)

37. Press MAINS ON switch.

Tape reader test

38. Fit TRA40 test tape; set power switch to ON and press RUN.

Programmer electronic control (programmer)

39. Ensure all switches are de-selected.

Switching unit monitor (s.u.m.)

40. Select MANUAL; press RESET and select AUTO.

Line printer

41. Set power switch to ON.

THORN power supply unit

42. Set power switch to ON and LOCAL/REMOTE switch to REMOTE.

Counter electronic CT574

43. Set power switch to OFF; sensitivity control to 0.1V and GATE TIME control to REMOTE.

Frequency analyser FAXD120S

44. Set power switch to ON; attenuator control to 20dB and calibrate switch to OFF. Set control switch to REMOTE and deviation range to 20kHz.

3-tone generator AF40S

45. Set control switch to REMOTE and CARRIER switch to OFF.

Attenuator control unit SBD3S

46. Set attenuator controls to REMOTE.

Synthesiser FSD120S

47. Set power switch to ON and frequency controls to REMOTE.

Signal processor 9062

48. Set power switch to ON, attenuator switch to REMOTE; mode switch to REMOTE and fit 6dB attenuator (Z42/5895-99-525-9818) to the '50Ω' output socket.

Synthesiser frequency 9061

49. Set REMOTE/LOCAL switch to REMOTE.

Signal generator set 2-tone

50. Set power switch to ON and LOCAL/REMOTE switch to REMOTE.

Voltmeter digital CT577 (d.v.m.)

51. Set power switch to ON; sample control to MANUAL and mode switch to REMOTE. Set DC FILTER to OUT and a.c. response time to 1 SECOND.

Converter signal data

52. Press 5V switch.

Oscilloscope CT531 or CT436

53. Connect 'Y' input to AF OUTPUT access coaxial socket on s.u.m.c.

TEST DESCRIPTION AND DETAILED OPERATING INSTRUCTIONS

54. Table 1 lists all the tests in the programme and indicates where operator intervention is required to set e.u.t. and a.t.e. controls:

Table 1 - Test description and detailed operating instructions

| Test No | Test description | Operator action | | | | | | | | |
|----------------|--|--|-----|-------|-----|------|-----|-----|-----|-----|
| 0000 (0100) | <p>Start</p> <p><u>Clear A.T.E. stores</u></p> <p>All stores within the a.t.e. are cleared before testing is commenced.</p> | <p>Press START on programmer</p> <p>@ 1. Search to relevant test number:</p> <p style="padding-left: 40px;">a. TRA40 'A' - 000</p> <p style="padding-left: 40px;">b. TRA40 'B' - 100</p> <p>2. Press STEP.</p> | | | | | | | | |
| 0001 (0101) | <p><u>Tape identification</u></p> <p>This is a false test to print out the identifying code.</p> | | | | | | | | | |
| 0002 (0102) | <p><u>Power monitor zero</u></p> <p>With no r.f. input, the power monitor is adjusted until the d.c. output is $0V \pm 1mV$.</p> | <p>* 1. Adjust power monitor zero controls on the s.u.m. for zero d.v.m. reading. When the d.v.m. reading is $0V \pm 1mV$, the PASS lamp will illuminate and the H1 and LO lamps extinguish.</p> <p>2. Press PASS.</p> | | | | | | | | |
| 0003 (0103) | <p><u>Functional tests</u></p> <p>In this test the e.u.t. is connected to the a.t.e. and p.s.u. and the following functional tests carried out:</p> <p>1. Test of interconnection between audio sockets SKTUa and SKTUb.</p> <p>2. Test of interconnection between antenna sockets SKTW and SKTX.</p> <p>3. Measurement of transmit and receive current consumption.</p> | <p>@ 1. Connect TRA40 PLV (5 pin power plug) to p.s.u. CONTROL MONITOR using 5-way cable assembly (Z4/6625-99-949-8951).</p> <p>2. Adjust p.s.u. supply voltages as follows:</p> <table style="margin-left: 40px;"> <tr> <td>LT1</td> <td>1.25V</td> </tr> <tr> <td>LT2</td> <td>2.5V</td> </tr> <tr> <td>HT1</td> <td>90V</td> </tr> <tr> <td>HT2</td> <td>45V</td> </tr> </table> <p>3. Connect handset to e.u.t. SKTUa (marked OPERATOR).</p> <p>4. Set e.u.t. control switch (SB) to NORMAL and channel switch to 1.</p> | LT1 | 1.25V | LT2 | 2.5V | HT1 | 90V | HT2 | 45V |
| LT1 | 1.25V | | | | | | | | | |
| LT2 | 2.5V | | | | | | | | | |
| HT1 | 90V | | | | | | | | | |
| HT2 | 45V | | | | | | | | | |

Table 1 - (Cont)

| Test No | Test description | Operator action | | | | | | | | | | | | |
|-----------------------------------|---|--|-----|-------|-----|-------|-----|--------|-----|-------|-----|------|-----|------|
| <p>0003 (0103) (Cont)</p> | | <p>5. Measure receiver current consumption on p.s.u. control monitor. Receiver current consumption shall not exceed:</p> <table data-bbox="981 504 1324 604"> <tr> <td>LT1</td> <td>600mA</td> </tr> <tr> <td>HT1</td> <td>3.5mA</td> </tr> <tr> <td>HT2</td> <td>15.5mA</td> </tr> </table> <p>6. Connect CONDITION INDICATOR to e.u.t. rod antenna socket (SKTW), operate handset pressel and ascertain that transmitter power is present.</p> <p>7. With condition indicator still connected, operate pressel and measure transmit current consumption on p.s.u. control monitor. Transmit current consumption shall not exceed:</p> <table data-bbox="981 996 1324 1097"> <tr> <td>LT1</td> <td>975mA</td> </tr> <tr> <td>HT1</td> <td>37mA</td> </tr> <tr> <td>HT2</td> <td>10mA</td> </tr> </table> <p>8. Disconnect handset and using connector No 23 (part of Larkspur accessory kit) connect e.u.t. SKTUa to Larkspur box PLJ1.</p> <p>9. Transfer handset to SKTUb and ascertain that receiver noise is audible in handset earphone.</p> <p>10. Remove handset.</p> <p>11. Connect Larkspur box PLJ2 to a.t.e. AUDIO HARNESS socket (55 way).</p> <p>12. Connect e.u.t. coaxial antenna socket (SKTX) to s.u.m.c. EUT ANTENNA socket.</p> <p>13. Press STEP.</p> | LT1 | 600mA | HT1 | 3.5mA | HT2 | 15.5mA | LT1 | 975mA | HT1 | 37mA | HT2 | 10mA |
| LT1 | 600mA | | | | | | | | | | | | | |
| HT1 | 3.5mA | | | | | | | | | | | | | |
| HT2 | 15.5mA | | | | | | | | | | | | | |
| LT1 | 975mA | | | | | | | | | | | | | |
| HT1 | 37mA | | | | | | | | | | | | | |
| HT2 | 10mA | | | | | | | | | | | | | |
| <p>0004 (0104)</p> | <p><u>Safety test</u></p> <p>The e.u.t. antenna is routed via the 20dB attenuator to the power monitor, with the a.t.e. in the 'receive' mode. The d.c. output of the power monitor shall be a maximum of ± 1mV.</p> | <p>The tape is programmed to stop if this test fails, which will indicate that the e.u.t. is transmitting. DO NOT CONTINUE TESTING.</p> | | | | | | | | | | | | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|------------------|--|-----------------|
| 0010 (0110) | <p><u>Signal + noise to noise ratio, channel 1 (1)</u></p> <p>With antenna input of 3.2μV, 15kHz deviation at 1kHz, at the channel frequency, 47MHz, the e.u.t. a.f. output is measured via 20dB a.f. attenuation and recorded as the comparator high limit.</p> | |
| 0011 (0111) ■ | <p><u>Signal + noise to noise ratio channel 1 (2)</u></p> <p>The antenna signal modulation is removed and the a.f. attenuation is reduced to zero. The resultant e.u.t. a.f. output shall be less than that recorded in the previous test.</p> | |
| 0012 (0112) | <p><u>Limiter operation, channel 1 (1)</u></p> <p>With antenna input of 5μV, 15kHz deviation at 1kHz, the e.u.t. a.f. output is measured via 6dB a.f. attenuation and recorded as the comparator low limit.</p> | |
| 0013 (0113) ■ | <p><u>Limiter operation, channel 1 (2)</u></p> <p>With antenna input as in the previous test, the e.u.t. a.f. output is measured via zero a.f. attenuation and recorded as the comparator high limit.</p> | |
| 0014 (0114) ■ | <p><u>Limiter operation, channel 1 (3)</u></p> <p>The antenna input is increased to 1.0mV and the e.u.t. a.f. output measured via 3dB a.f. attenuation. The measured value shall be between the limits set in the previous two tests.</p> | |
| 0015 (0115) | <p><u>Transmitter power output, channel 1</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output shall be not less than 250mW (25mV).</p> | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|------------------|---|-----------------|
| 0016 (0116) | <u>Modulation sensitivity, channel 1</u> <u>(NORMAL)</u> With a 250mV, 1kHz signal applied to the e.u.t. microphone input, the transmitter output is routed via the 20dB r.f. attenuator to the frequency analyser. The resultant deviation shall be 5-11kHz (2.5-5.5V). | |
| 0017 (0117) | <u>Transmitter sidetone, channel 1</u> With microphone input as in the previous test the e.u.t. sidetone a.f. output shall be not less than 1mW (316mV). | |
| 0018 (0118) | <u>Transmit frequency accuracy, channel 1</u> The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the frequency counter. The frequency of transmission shall be 47.0MHz \pm 9kHz. | |
| 0019 (0119) | <u>Receiver a.f. output, channel 1</u> <u>(NORMAL)</u> With antenna input of 1mV, 15kHz deviation at 1kHz, the e.u.t. a.f. output is measured via 12dB a.f. attenuation and recorded as the comparator high limit. The measured value shall be greater than 0.16mW (125mV). (Which equates to 2.5mW after attenuation of 12dB). | |
| 0020 (0120) ■ | <u>Receiver a.f. output, channel 1</u> <u>(NORMAL)</u> With antenna input as in the previous test, the e.u.t. a.f. output is measured via 18dB a.f. attenuation and recorded as the comparator low limit. | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|------------------|--|---|
| 0021 (0121) ■ | <p><u>Receiver a.f. output, channel 1</u> <u>(WHISPER)</u></p> <p>With antenna input as in the previous test, the control switch is set to WHISPER. The resultant e.u.t. a.f. output shall reduce by 15 ±3dB and thus be within the limits set in the previous two tests.</p> | <p>@ 1. Set control switch to WHISPER. 2. Press STEP.</p> |
| 0022 (0122) | <p><u>Modulation sensitivity, channel 1</u> <u>(WHISPER)</u></p> <p>With a 25mV, 1kHz signal applied to the e.u.t. microphone input, the transmitter output is routed via the 20dB attenuator to the frequency analyser. The resultant deviation shall be 5-11kHz (2.5-5.5V).</p> | |
| 0030 (0130) | <p><u>Signal + noise to noise ratio, channel 2(1)</u></p> <p>With antenna input of 3.2µV, 15kHz deviation at 1kHz, at the channel frequency, 47.4MHz, the e.u.t. a.f. output is measured via 20dB a.f. attenuation and recorded as the comparator high limit.</p> | <p>@ 1. Set control switch to NORMAL. 2. Set channel switch to 2 3. Press STEP.</p> |
| 0031 (0131) ■ | <p><u>Signal + noise to noise ratio, channel 2(2)</u></p> <p>The antenna signal modulation is removed and the a.f. attenuation reduced to zero. The resultant e.u.t. a.f. output shall be less than that recorded in the previous test.</p> | |
| 0032 (0132) | <p><u>Transmitter power output, channel 2</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output shall be not less than 250mW (25mV).</p> | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|------------------|--|--|
| 0033 (0133) | <p><u>Transmitter sidetone, channel 2</u></p> <p>With a 250mV, 1kHz signal applied to the e.u.t. microphone input, the e.u.t. sidetone a.f. output shall be not less than 1mW (316mV).</p> | |
| 0034 (0134) | <p><u>Transmit frequency accuracy channel 2</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the frequency counter. The frequency of transmission shall be 47.4MHz \pm9kHz.</p> | |
| 0040 (0140) | <p><u>Signal + noise to noise ratio, channel 3(1)</u></p> <p>With antenna input of 3.2μV, 15kHz deviation at 1kHz, at the channel frequency, 47.6MHz, the e.u.t. a.f. output is measured via 20dB a.f. attenuation and recorded as the comparator high limit.</p> | <p>@ 1. Set channel switch to 3.</p> <p>2. Press STEP.</p> |
| 0041 (0141) ■ | <p><u>Signal + noise to noise ratio channel 3(2)</u></p> <p>The antenna signal modulation is removed and the a.f. attenuation reduced to zero. The resultant e.u.t. a.f. output shall be less than that recorded in the previous test.</p> | |
| 0042 (0142) | <p><u>Transmitter power output, channel 3</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output shall be not less than 250mW (25mV).</p> | |
| 0043 (0143) | <p><u>Transmitter sidetone, channel 3</u></p> <p>With a 250mV, 1kHz signal applied to the microphone input, the e.u.t. sidetone a.f. output shall be not less than 1mW (316mV).</p> | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|----------------|--|--|
| 0044 (0144) | <p><u>Transmit frequency accuracy, channel 3</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the frequency counter. The frequency of transmission shall be 47.6MHz \pm9kHz.</p> | |
| 0050 (0150) | <p><u>Signal + noise to noise ratio, channel 4(1)</u></p> <p>With antenna input of 3.2μV, 15kHz deviation at 1kHz, at the channel frequency, 47.2MHz (47.8MHz), the e.u.t. a.f. output is measured via 20dB a.f. attenuation and recorded as the comparator high limit.</p> | <p>@ 1. Set channel switch to 4.</p> <p>2. Press STEP.</p> |
| 0051 (0151) | <p><u>Signal + noise to noise ratio, channel 4(2)</u></p> <p>The antenna signal modulation is removed and the a.f. attenuation reduced to zero. The resultant e.u.t. a.f. output shall be less than that recorded in the previous test.</p> | |
| 0052 (0152) | <p><u>Transmitter power output, channel 4</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output shall be not less than 250mW (25.0mV).</p> | |
| 0053 (0153) | <p><u>Transmitter sidetone, channel 4</u></p> <p>With a 250mV, 1kHz signal applied to the microphone input, the e.u.t. sidetone a.f. output shall be not less than 1mW (316mV).</p> | |
| 0054 (0154) | <p><u>Transmit frequency accuracy, channel 4</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the frequency counter. The frequency of transmission shall be 47.2MHz (47.8MHz) \pm9kHz.</p> | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|------------------|---|---|
| 0060 (0160) | <p><u>Signal + noise to noise ratio, channel 5(1)</u></p> <p>With antenna input of 3.2μV, 15kHz deviation at 1kHz, at the channel frequency 48.8MHz (52.6MHz), the e.u.t. a.f. output is measured via 20dB a.f. attenuation and recorded as the comparator high limit.</p> | <p>@ 1. Set the channel switch to 5. 2. Press STEP.</p> |
| 0061 (0161) ■ | <p><u>Signal + noise to noise ratio, channel 5(2)</u></p> <p>The antenna signal modulation is removed and the a.f. attenuation reduced to zero. The resultant e.u.t. a.f. output shall be less than that recorded in the previous test.</p> | |
| 0062 (0162) | <p><u>Transmitter power output, channel 5</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output shall be not less than 250mW (25.0mV).</p> | |
| 0063 (0163) | <p><u>Transmitter sidetone, channel 5</u></p> <p>With a 250mV, 1kHz signal applied to the e.u.t. microphone input, the sidetone a.f. output shall be not less than 1mW (316mV).</p> | |
| 0064 (0164) | <p><u>Transmit frequency accuracy, channel 5</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the frequency counter. The frequency of transmission shall be 48.8MHz (52.6MHz) ±9kHz.</p> | |
| 0070 (0170) | <p><u>Signal + noise to noise ratio, channel 6(1)</u></p> <p>With antenna input of 3.2μV, 15kHz deviation at 1kHz, at the channel frequency, 54.2MHz (54.4MHz), the e.u.t. a.f. output is measured via 20dB a.f. attenuation and recorded as the comparator high limit.</p> | <p>@ 1. Set channel switch to 6. 2. Press STEP.</p> |

Table 1 - (Cont)

| Test No | Test description | Operator action | | | | | | | | |
|------------------|--|---|-----|-------|-----|-------|-----|-----|-----|-----|
| 0071 (0171) ■ | <p><u>Signal + noise to noise ratio, channel 6(2)</u></p> <p>The antenna signal modulation is removed and the a.f. attenuation reduced to zero. The resultant e.u.t. a.f. output shall be less than that recorded in the previous test.</p> | | | | | | | | | |
| 0072 (0172) | <p><u>Transmitter power output, channel 6</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output shall be not less than 250mW (25.0mV).</p> | | | | | | | | | |
| 0073 (0173) | <p><u>Transmitter sidetone, channel 6</u></p> <p>With a 250mV, 1kHz signal applied to the microphone input, the e.u.t. sidetone a.f. output shall be not less than 1mW (316mV).</p> | | | | | | | | | |
| 0074 (0174) | <p><u>Transmit frequency accuracy, channel 6</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the frequency counter. The frequency of transmission shall be 54.2MHz (54.4MHz) ±9kHz.</p> | | | | | | | | | |
| 0080 (0180) | <p><u>Transmitter power output, channel 6</u></p> <p><u>Low Voltage operation</u></p> <p>The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output, low voltage operation, shall be not less than 100mW (10mV).</p> | <p>@ 1. Adjust p.s.u. supply voltages as follows:</p> <table data-bbox="1005 1624 1292 1758"> <tr> <td>LT1</td> <td>1.05V</td> </tr> <tr> <td>LT2</td> <td>-2.5V</td> </tr> <tr> <td>HT1</td> <td>68V</td> </tr> <tr> <td>HT2</td> <td>34V</td> </tr> </table> <p>2. Press STEP</p> | LT1 | 1.05V | LT2 | -2.5V | HT1 | 68V | HT2 | 34V |
| LT1 | 1.05V | | | | | | | | | |
| LT2 | -2.5V | | | | | | | | | |
| HT1 | 68V | | | | | | | | | |
| HT2 | 34V | | | | | | | | | |

Table 1 - (Cont)

| Test No | Test description | Operator action |
|----------------|---|---|
| 0085 (0185) | <u>Transmitter power output, channel 1</u> <u>Low Voltage operation</u> The e.u.t. antenna r.f. output is routed via the 20dB r.f. attenuator to the power monitor. The power output, low voltage operation, shall be not less than 100mW (10mV). | @ 1. Set channel switch to 1. 2. Press STEP. |
| 0090 (0190) | <u>Clear stores and rewind</u> A.T.E. stores are cleared and tape automatically rewinds to start of test programme. | |

The next Page is Page 1001

Table 4701 - Test programme machine instruction code

* TR 440 A. SPECIFICATION TEST. FIELD STANDARD
* REPAIR. ISSUE 1.

MF0000 MI0000 CS0000 IS0000 VS0000 SP0000 *

MF0001 CS0000 HM1401 HL0201 LM0000 LL0000 Cf 6850 *

MF0002 CS0000 DV0001 RS2000 HM0010 HL0000 LM0010 LL0000 *
FD1010 CF1160 *

MF0003 CS0000 SP0000 *

MF0004 CS0000 SG0010 DV0000 AS0020 HC1000 RS2000 SC2000 *
HM0010 HL0000 LM0010 LL0000 FD1020 Cf 2050 *

MF0010 CS0000 DV0012 MA2150 MF4410 MM0500 SA0110 SJ0470 *
SL0000 AA0020 AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 *
LL0000 FD1020 Cf 1072 *

MF0011 MM0100 AA0000 FD1020 Cf 1030 *

MF0012 CS0000 DV0012 MA2150 MF4410 MM0500 SA0106 SJ0470 *
SL0000 AA0006 AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 *
LL0000 FD1020 Cf 1071 *

MF0013 AA0000 FD1020 Cf 1032 *

MF0014 AA0003 SA2050 FD1020 Cf 1070 *

MF0015 CS0000 DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 *
L 40250 LL0000 FD1040 Cf 2010 *

Table 4701 - (Cont)

| | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|---|
| MT0016 | CS0000 | DV0003 | MA2750 | MF4410 | MM0100 | SA3000 | SU0482 | * |
| SL0000 | AS5100 | HC1008 | RS1100 | SC2000 | HM0055 | HL0000 | LM0025 | * |
| LL0000 | TD1030 | CF0070 | * | | | | | |
| MT0017 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | TD1040 | CF1010 | * | | |
| MT0018 | CS0000 | HC1000 | RS5000 | SC2000 | HM4700 | HL9000 | LM4699 | * |
| LL1000 | TD1030 | FC0005 | CF6070 | * | | | | |
| MT0019 | CS0000 | DV0012 | MA2150 | MF4410 | MM0500 | SA2060 | SU0470 | * |
| SL0000 | AA0012 | AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM1250 | * |
| LL0000 | TD1020 | CF1072 | * | | | | | |
| MT0020 | AA0018 | LM0000 | LL0000 | TD1020 | CF1011 | * | | |
| MT0021 | SP0000 | * | | | | | | |
| AA0000 | TD1020 | CF1070 | * | | | | | |
| MT0022 | CS0000 | DV0003 | MA2075 | MF4410 | MM0100 | SA3000 | SU0482 | * |
| SL0000 | AS5100 | HC1008 | RS1100 | SC2000 | HM0055 | HL0000 | LM0025 | * |
| LL0000 | TD1030 | CF0070 | * | | | | | |
| MT0030 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0474 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | TD1020 | * |
| CF1072 | * | | | | | | | |
| MT0031 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0032 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | TD1040 | CF2010 | * | | | | |
| MT0033 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | TD1040 | CF1010 | * | | |
| MT0034 | CS0000 | HC1000 | RS5000 | SC2000 | HM4740 | HL9999 | LM4739 | * |
| LL1000 | TD1030 | FC0005 | CF6070 | * | | | | |
| MT0040 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0476 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | TD1020 | * |
| CF1072 | * | | | | | | | |
| MT0041 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0042 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | TD1040 | CF2010 | * | | | | |
| MT0043 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | TD1040 | CF1010 | * | | |

Table 4701 - (Cont)

MT0044 CS0000 HC1000 RS5000 SC2000 HM4760 HL9000 LM4759 *
LL1000 TD1030 FC0005 CF6070 *

MT0050 CS0000 SP0000 *
DV0012 MA2150 MF4410 MM0500 SA0110 SU0472 SL0000 AA0020 *
AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 LL0000 TD1020 *
CF1072 *

MT0051 MM0100 AA0000 TD1020 CF1030 *

MT0052 CS0000 DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 *
LM0250 LL0000 TD1040 CF2010 *

MT0053 CS0000 DV0012 MA2750 MF4410 AS4120 HC1000 RS1000 *
HM9999 HL9999 LM3160 LL0000 TD1040 CF1010 *

MT0054 CS0000 HC1000 RS5000 SC2000 HM4720 HL9000 LM4719 *
LL1000 TD1030 FC0005 CF6070 *

MT0060 CS0000 SP0000 *
DV0012 MA2150 MF4410 MM0500 SA0110 SU0488 SL0000 AA0020 *
AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 LL0000 TD1020 *
CF1072 *

MT0061 MM0100 AA0000 TD1020 CF1030 *

MT0062 CS0000 DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 *
LM0250 LL0000 TD1040 CF2010 *

MT0063 CS0000 DV0012 MA2750 MF4410 AS4120 HC1000 RS1000 *
HM9999 HL9999 LM3160 LL0000 TD1040 CF1010 *

MT0064 CS0000 HC1000 RS5000 SC2000 HM4880 HL9000 LM4879 *
LL1000 TD1030 FC0005 CF6070 *

MT0070 CS0000 SP0000 *
DV0012 MA2150 MF4410 MM0500 SA0110 SU0542 SL0000 AA0020 *
AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 LL0000 TD1020 *
CF1072 *

MT0071 MM0100 AA0000 TD1020 CF1030 *

MT0072 CS0000 DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 *
LM0250 LL0000 TD1040 CF2010 *

MT0073 CS0000 DV0012 MA2750 MF4410 AS4120 HC1000 RS1000 *
HM9999 HL9999 LM3160 LL0000 TD1040 CF1010 *

MT0074 CS0000 HC1000 RS5000 SC2000 HM5420 HL9000 LM5419 *
LL1000 TD1030 FC0005 CF6070 *

Table 4701 - (Cont)

MF0080 CS0000 SP0000 *
DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 LM0100 LL0000 *
TD1040 CF2010 *

MF0085 CS0000 SP0000 *
DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 LM0100 LL0000 *
TD1040 CF2010 *

MF0090 CS0000 TT0000 TT0000 END OF TESTS

Table 4702 - Test programme machine instruction code

* TR A40 B. SPECIFICATION TEST. FIELD STANDARD
* REPAIR. ISSUE 1.

MT0100 MT0100 CS0000 IS0000 JS0000 SP0000 *

MT0101 CS0000 HM1402 HL0201 LM0000 LL0000 CF6850 *

MT0102 CS0000 DV0001 RS2000 HM0010 HL0000 LM0010 LL0000 *
FD1010 CF1160 *

MT0103 CS0000 SP0000 *

MT0104 CS0000 SG0110 DV0000 AS0020 HC1000 RS2000 SC2000 *
HM0010 HL0000 LM0010 LL0000 FD1020 CF2060 *

MT0110 CS0000 DV0012 MA2150 MF4410 MM0500 SA0110 SU0470 *
SL0000 AA0020 AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 *
LL0000 FD1020 CF1072 *

MT0111 MM0100 AA0000 FD1020 CF1030 *

MT0112 CS0000 DV0012 MA2150 MF4410 MM0500 SA0106 SU0470 *
SL0000 AA0006 AS4020 HC1000 RS0002 HM9999 HL9999 LM0000 *
LL0000 FD1020 CF1071 *

MT0113 AA0000 FD1020 CF1032 *

MT0114 AA0003 SA2060 FD1020 CF1070 *

MT0115 CS0000 DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 *
LM0250 LL0000 FD1040 CF2010 *

Table 4702 - (Cont)

| | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|---|
| MT0116 | CS0000 | DV0003 | MA2750 | MF4410 | MM0100 | SA3000 | SU0482 | * |
| SL0000 | AS5100 | HC1008 | RS1100 | SC2000 | HM0055 | HL0000 | LM0025 | * |
| LL0000 | TD1030 | CF0070 | * | | | | | |
| MT0117 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | TD1040 | CF1010 | * | | |
| MT0118 | CS0000 | HC1000 | RS5000 | SC2000 | HM4700 | HL9000 | LM4699 | * |
| LL1000 | TD1030 | FC0005 | CF6070 | * | | | | |
| MT0119 | CS0000 | DV0012 | MA2150 | MF4410 | MM0500 | SA2060 | SU0470 | * |
| SL0000 | AA0012 | AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM1250 | * |
| LL0000 | TD1020 | CF1072 | * | | | | | |
| MT0120 | AA0018 | LM0000 | LL0000 | TD1020 | CF1011 | * | | |
| MT0121 | SP0000 | * | | | | | | |
| AA0000 | TD1020 | CF1070 | * | | | | | |
| MT0122 | CS0000 | DV0003 | MA2075 | MF4410 | MM0100 | SA3000 | SU0482 | * |
| SL0000 | AS5100 | HC1008 | RS1100 | SC2000 | HM0055 | HL0000 | LM0025 | * |
| LL0000 | TD1030 | CF0070 | * | | | | | |
| MT0130 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0474 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | TD1020 | * |
| CF1072 | * | | | | | | | |
| MT0131 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0132 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | TD1040 | CF2010 | * | | | | |
| MT0133 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | TD1040 | CF1010 | * | | |
| MT0134 | CS0000 | HC1000 | RS5000 | SC2000 | HM4740 | HL9999 | LM4739 | * |
| LL1000 | TD1030 | FC0005 | CF6070 | * | | | | |
| MT0140 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0476 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | TD1020 | * |
| CF1072 | * | | | | | | | |
| MT0141 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0142 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | TD1040 | CF2010 | * | | | | |
| MT0143 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | TD1040 | CF1010 | * | | |

Table 4702 - (Cont)

| | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|---|
| MT0144 | CS0000 | HC1000 | RS5000 | SC2000 | HM4760 | HL9000 | LM4759 | * |
| LL1000 | FD1030 | FC0005 | CF6070 | * | | | | |
| MT0150 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0478 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | FD1020 | * |
| CF1072 | * | | | | | | | |
| MT0151 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0152 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | FD1040 | CF2010 | * | | | | |
| MT0153 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | FD1040 | CF1010 | * | | |
| MT0154 | CS0000 | HC1000 | RS5000 | SC2000 | HM4780 | HL9000 | LM4779 | * |
| LL1000 | FD1030 | FC0005 | CF6070 | * | | | | |
| MT0160 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0526 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | FD1020 | * |
| CF1072 | * | | | | | | | |
| MT0161 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0162 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | FD1040 | CF2010 | * | | | | |
| MT0163 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | FD1040 | CF1010 | * | | |
| MT0164 | CS0000 | HC1000 | RS5000 | SC2000 | HM5260 | HL9000 | LM5259 | * |
| LL1000 | FD1030 | FC0005 | CF6070 | * | | | | |
| MT0170 | CS0000 | SP0000 | * | | | | | |
| DV0012 | MA2150 | MF4410 | MM0500 | SA0110 | SU0544 | SL0000 | AA0020 | * |
| AS4020 | HC1000 | RS0002 | HM9999 | HL9999 | LM0000 | LL0000 | FD1020 | * |
| CF1072 | * | | | | | | | |
| MT0171 | MM0100 | AA0000 | TD1020 | CF1030 | * | | | |
| MT0172 | CS0000 | DV0001 | HC1000 | RS3000 | SC2000 | HM9999 | HL9999 | * |
| LM0250 | LL0000 | FD1040 | CF2010 | * | | | | |
| MT0173 | CS0000 | DV0012 | MA2750 | MF4410 | AS4120 | HC1000 | RS1000 | * |
| HM9999 | HL9999 | LM3160 | LL0000 | FD1040 | CF1010 | * | | |
| MT0174 | CS0000 | HC1000 | RS5000 | SC2000 | HM5440 | HL9000 | LM5439 | * |
| LL1000 | FD1030 | FC0005 | CF6070 | * | | | | |

Table 4702 - (Cont)

MT0180 CS0000 SP0000 *
DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 LM0100 LL0000 *
FD1040 CF2010 *

MT0185 CS0000 SP0000 *
DV0001 HC1000 RS3000 SC2000 HM9999 HL9999 LM0100 LL0000 *
FD1040 CF2010 *

MT0190 CS0000 ††0000 ††0000 END OF TESTS