

| TEST No.  | STEP | UNIT      | RANGE | LIMITS             | INSTRUCTIONS   |
|---|------|-----------|-------|--------------------|--|
| 000   | (a)  | INT. CON. | -     | -                  | Depress "Press to Test" button.  |
|   | (b)  | UUT       | -     | -                  | Set UUT mode switch to CW(W) and frequency to 2.5 MHz.   |
| <u>NOTE:</u> Ensure when selecting frequency that the UUT FREQUENCY RANGE switch is in the correct position for the selected frequency. |      |           |       |                    |  |
|   | (c)  | DVM       | 100V  | -                  | Set DVM to 100 volt range.   |
|   | (d)  | AVO       | 10A   | -                  | Set AVO to 10A dc range.   |
|   | (e)  | RF GEN.   | -     | -                  | Set RF Gen for minimum output.   |
|   | (f)  | RMS VM    | 1V    | -                  | Set RMS VM to 1 volt range.  |
| <u>LINE VOLTAGE</u>   |      |           |       |                    |  |
| 002   | (a)  | INT. CON. | -     | -                  | Depress "Press to Test" button.  |
|   | (b)  | DVM       | 100V  | 23.92V to 24.08V   | Adjust PSU to give a DVM reading of 24V.   |
| <u>Rx CURRENT CONSUMPTION</u>   |      |           |       |                    |  |
| 011   | (a)  | RF GEN.   | -     | 25.0 MHz<br>+ 8 Hz | Set RF Gen to 25.0 MHz and 1 mV emf.   |
|   | (b)  | UUT       | -     | -                  | Set UUT to 25.0 MHz.   |
|   | (c)  | INT. CON. | -     | -                  | Depress "Press to Test" button.  |
|   | (d)  | DVM       | 100V  | 23.92V to 24.08V   | Adjust PSU to give a DVM indication of 24V.  |
|   | (e)  | AVO       | 1A    | NGT 160 mA         | Check the 24 volt line current for the UUT power switch positions HP, LP and ANT.  |
|   | (f)  | UUT       | -     | -                  | Remove Hypertac SIG GEN lead from UUT T/R socket. Connect power meter input to T/R socket, connect power meter to RF load. |
| <u>LINE VOLTAGE</u>   |      |           |       |                    |  |
| 012   | (a)  | INT. CON. | -     | -                  | Depress "Press to Test" button.  |

| TEST No.                             | STEP | UNIT         | RANGE   | LIMITS                                     | INSTRUCTIONS   |
|--------------------------------------|------|--------------|---------|--|--|
| 012<br>(cont)                        | (b)  | DVM          | 100V    | 23.92V to<br>24.08V                        | Adjust PSU to give a DVM indication of 24V.  |
| <u>Tx SIDETONE OUTPUT LEVEL (AM)</u> |      |              |         |  |  |
| 004                                  | (a)  | AF<br>GEN.   | -       | 885 mV emf<br>at 2.0 kHz                   | Set output of AF Gen to 885 mV emf at a frequency of 2.0 kHz (12 mV at UUT).   |
|                                      | (b)  | UUT          | -       | -  | Set UUT mode switch to AM, power switch to LP and frequency to 2.5 MHz.  |
|                                      | (c)  | INT.<br>CON. | -       | -  | Depress "Press to Test" button.  |
|                                      | (d)  | RMS<br>VM.   | 1V      | 300 to<br>440 mV                           | Check the reading on the RMS VM.   |
| <u>Tx SIDETONE OUTPUT LEVEL (CW)</u> |      |              |         |  |  |
| 004                                  | (e)  | UUT          | -       | -  | Set UUT function switch to CW(W).  |
|                                      | (f)  | RMS<br>VM    | 100 mV  | 50 to<br>97 mV                             | Check the reading on the RMS VM.   |
| <u>TRANSMITTER OUTPUT POWER</u>      |      |              |         |  |  |
| 036                                  | (a)  | UUT          | -       | -  | Set UUT mode switch to CW(W), power switch OFF and frequency to 25.0 MHz.  |
|                                      | (b)  | INT.<br>CON. | -       | -  | Depress "Press to Test" button.  |
|                                      | (c)  | PM           | 50W     | 8.4 to<br>13.4W                            | Set UUT power switch to HP and, allowing a 5 second delay, check the power meter reading.                              |
|                                      | (d)  | UUT          | -       | -  | Disconnect power meter assembly from T/R socket. Connect RF mV via 30 dB attenuator to T/R socket.                     |
|                                      | (e)  | RF mV        | 3000 mV | 0 dB REF                                   | Note RF mV reading as 0 dB reference level.  |
|                                      | (f)  | RF mV        | 1000 mV | 9.3 to 12<br>12.7 dB<br>DOWN ON<br>036 (e) | Set UUT power switch to LP and, allowing a 5 sec delay, check the RF mV reading with respect to level noted in 036(e). |
|                                      | (g)  | UUT          | -       | -  | Reconnect power meter assembly to T/R socket in place of RF mV assembly.   |
|                                      | (h)  | -            | -       | -  | Repeat 036(c) only for UUT frequency of 2.5, 4.0, 6.5, 10.0 and 16.0 MHz.  |

| TEST No.   | STEP | UNIT      | RANGE | LIMITS              | INSTRUCTIONS   |
|--|------|-----------|-------|---------------------|--|
| 000  | (a)  | INT. CON. | -     | -                   | Depress "Press to Test" button.  |
|  | (b)  | UUT       | -     | -                   | Set UUT mode switch to CW(W) and frequency to 2.5 MHz.   |
| NOTE: Ensure when selecting frequency that the UUT FREQUENCY RANGE switch is in the correct position for the selected frequency. |      |           |       |                     |  |
|  | (c)  | DVM       | 100V  | -                   | Set DVM to 100 volt range.   |
|  | (d)  | AVO       | 10A   | -                   | Set AVO to 10A dc range.   |
|  | (e)  | RF GEN.   | -     | -                   | Set RF Gen for minimum output.   |
|  | (f)  | RMS VM    | 1V    | -                   | Set RMS VM to 1 volt range.  |
| <u>LINE VOLTAGE</u>  |      |           |       |                     |  |
| 002  | (a)  | INT. CON. | -     | -                   | Depress "Press to Test" button.  |
|  | (b)  | DVM       | 100V  | 23.92V to 24.08V    | Adjust PSU to give a DVM reading of 24V.   |
| <u>Rx CURRENT CONSUMPTION</u>  |      |           |       |                     |  |
| 011  | (a)  | RF GEN.   | -     | 25.0 MHz $\pm$ 8 Hz | Set RF Gen to 25.0 MHz and 1 mV emf.   |
|  | (b)  | UUT       | -     | -                   | Set UUT to 25.0 MHz.   |
|  | (c)  | INT. CON. | -     | -                   | Depress "Press to Test" button.  |
|  | (d)  | DVM       | 100V  | 23.92V to 24.08V    | Adjust PSU to give a DVM indication of 24V.  |
|  | (e)  | AVO       | 1A    | NGT 160 mA          | Check the 24 volt line current for the UUT power switch positions HP, LP and ANT.  |
|  | (f)  | UUT       | -     | -                   | Remove Hypertac SIG GEN lead from UUT T/R socket. Connect power meter input to T/R socket, connect power meter to RF load. |
| <u>LINE VOLTAGE</u>  |      |           |       |                     |  |
| 012  | (a)  | INT. CON. | -     | -                   | Depress "Press to Test" button.  |

| TEST No.                               | STEP | UNIT      | RANGE | LIMITS            | INSTRUCTIONS  |
|--|------|-----------|-------|-------------------|---|
| <u>UUT METER INDICATION (Tx POWER)</u> |      |           |       |                   |   |
| 038                                    | (a)  | INT. CON. | -     | -                 | Depress "Press to Test" button.   |
|  | (b)  | UUT       | -     | -                 | Set UUT to 2 MHz, mode switch to CW(W).   |
|  | (c)  | UUT METER | -     | 30 to 100% of fsd | Set UUT power switch to HP, allow a 5 second delay, and check the reading indicated on the UUT output meter as a percentage of fsd. |
|  | (d)  | UUT METER | -     | 30 to 100% of fsd | Repeat 038(c) but with UUT power switch set to LP.  |
|  | (e)  | UUT METER | -     | 50 to 100% of fsd | Repeat 038(c) but with UUT power switch set to ANT.   |
|  | (f)  | UUT       | -     | -                 | Set UUT power switch OFF and disconnect power meter assy. from UUT T/R socket (i.e. open circuit termination).                      |
|  | (g)  | UUT METER | -     | NGT 20% fsd       | Repeat 038(c) and check the output power meter indication as a percentage of fsd.   |
|  | (h)  | UUT       | -     | -                 | Set UUT power switch OFF. Connect a short circuit BNC connector to the UUT T/R socket.  |
|  | (i)  | UUT       | -     | NGT 20% fsd       | Repeat 038(c) in ANT mode only. Check the output power meter indication as a percentage of fsd.                                     |
|  | (j)  | UUT       | -     | -                 | Set UUT power switch OFF. Reconnect power meter assy. in place of short circuit BNC connector at T/R socket.                        |
| <u>Tx CURRENT CONSUMPTION (HP)</u>     |      |           |       |                   |   |
| 040                                    | (a)  | UUT       | -     | -                 | Set UUT frequency to 2.5 MHz.   |
|  | (b)  | INT. CON. | -     | -                 | Depress "Press to Test" button.   |
|  | (c)  | UUT       | -     | -                 | Set UUT power switch to HP.   |
|  | (d)  | DVM       | 100V  | 23.92V to 24.08V  | Adjust PSU to give a DVM indication of 24V.   |
|  | (e)  | AVO       | 10A   | NGT 2.5A          | After an interval of at least 5 seconds from switch-on.   |
|  | (f)  | UUT       | -     | -                 | Set UUT power switch OFF.   |
|  | (g)  | -         | -     | -                 | <u>REPEAT</u> 040(c) to (f) at UUT frequencies of:-<br>4.0, 6.5, 10.0, 16.0 and 25.0 MHz.   |

| TEST No.  | STEP | UNIT         | RANGE | LIMITS           | INSTRUCTIONS  |
|---|------|--------------|-------|------------------|---|
| <u>Tx CURRENT CONSUMPTION (LP)</u>  |      |              |       |                  |   |
| 042   | (a)  | UUT          | -     | -                | Set UUT frequency to 25.0 MHz.  |
|   | (b)  | INT. CON.    | -     | -                | Depress "Press to Test" button.   |
|   | (c)  | UUT          | -     | -                | Set UUT power switch to LP.   |
|   | (d)  | DVM          | 100V  | 23.92V to 24.08V | Adjust PSU to give a DVM indication of 24V.   |
|   | (e)  | AVO          | 10A   | NGT 1.1A         | After an interval of at least 5 seconds from switch-on, check the 24 volt line current.   |
|   | (f)  | UUT          | -     | -                | Set UUT power switch OFF.   |
| <u>LINE VOLTAGE</u>   |      |              |       |                  |   |
| 044   | (a)  | INT. CON.    | -     | -                | Depress "Press to Test" button.   |
|   | (b)  | DVM          | 100V  | 23.92V to 24.08V | Adjust PSU to give a DVM reading of 24V.  |
| NOTE: In tests 046 to 050 the Tx output is fed via the ATU to a dummy load. |      |              |       |                  |   |
| <u>ATU OPERATION</u>  |      |              |       |                  |   |
| 046   | (a)  | UUT          | -     | -                | Connect the BNC link provided between T/R and INT TUNER sockets at the rear of the UUT. Connect the special 35 pF capacitor box to the top socket on the l.h.s. of the UUT ensuring also that the box earth tag is attached to the UUT at the adjacent earth connection. Terminate the open end of the capacitor box with the 50 ohm load. Set UUT frequency to 2 MHz, LOAD switch to 5 and ATU range to A. |
|   | (b)  | INT. CON.    | -     | -                | Depress "Press to Test" button.   |
|   | (c)  | UUT<br>METER | -     | NLT 60% of fsd   | Switch UUT power switch to ANT and adjust TUNE and load controls for a maximum deflection on the UUT meter. Check meter deflection with reference to full scale deflection  |

| TEST No.                      | STEP | UNIT         | RANGE | UNIT              | INSTRUCTIONS  |
|-------------------------------|------|--------------|-------|-------------------|---|
| 046<br>(cont)                 | (d)  | UUT          | -     | -                 | Set UUT power switch OFF and set frequency to 29.9999 MHz.  |
|                               | (e)  | UUT<br>METER | -     | NLT 60% of<br>fsd | Repeat 046(c) at ATU band E.  |
|                               | (f)  | UUT          | -     | -                 | Set UUT power switch OFF.   |
| 048                           | (a)  | UUT          | -     | -                 | Replace 50 ohm load on 35 pF capacitor box with 10 ohm load.  |
|                               | (b)  | INT.<br>CON. | -     | -                 | Depress "Press to Test" button.   |
|                               | (c)  | UUT<br>METER | -     | NLT 60% of<br>fsd | Switch UUT power switch to ANT and adjust TUNE and load controls for a maximum deflection on the UUT meter. Check meter deflection with reference to full scale deflection. |
|                               | (d)  | UUT          | -     | -                 | Set UUT power switch OFF and set frequency to 2 MHz.  |
|                               | (e)  | UUT<br>METER | -     | NLT 60% of<br>fsd | Repeat 048(c) at ATU band A.  |
|                               | (f)  | UUT          | -     | -                 | Set UUT power switch OFF.   |
| 050                           | (a)  | UUT          | -     | -                 | Replace 10 ohm load on 35 pF capacitor box with 100 ohm load.   |
|                               | (b)  | INT.<br>CON. | -     | -                 | Depress "Press to Test" button.   |
|                               | (c)  | UUT<br>METER | -     | NLT 60% of<br>fsd | Switch UUT power switch to ANT and adjust TUNE control for a maximum deflection on the UUT meter. Check meter deflection with reference to full scale deflection.           |
|                               | (d)  | UUT          | -     | -                 | Set UUT power switch OFF and set frequency to 29.9999 MHz.  |
|                               | (e)  | UUT<br>METER | -     | NLT 60% of<br>fsd | Repeat 050(c) at ATU band E.  |
|                               | (f)  | UUT          | -     | -                 | Set UUT power switch OFF.   |
| <u>VHF FILTER ATTENUATION</u> |      |              |       |                   |   |
| 052                           | (a)  | INT.<br>CON. | -     | -                 | Depress "Press to Test" button.   |

| TEST No.   | STEP | UNIT      | RANGE | LIMITS                   | INSTRUCTIONS  |
|--|------|-----------|-------|--------------------------|---|
| 052<br>(cont)  | (b)  | UUT       | -     | -                        | At the UUT:-<br>1) Remove the coaxial link between T/R and INT TUNER sockets.<br>2) Connect the lead from the hypertac plug at the Test Interface labelled SIG GEN to the UUT INT TUNER socket.<br>3) Remove the 100 ohm load from the 35 pF capacitor box.<br>4) Connect the Power Meter Assembly, via a T-piece to the output of 35 pF capacitor box.<br>5) Connect the Spectrum Analyser directly to the Power Meter Assembly via the T-piece. |
| NOTE: The above connections provide for supply of the RF Gen output to the VERT filter and monitoring the resulting signal after it has passed through the ATU. The remainder of the receiver/transmitter is switched off. |      |           |       |                          |   |
| 054  | (a)  | INT. CON. | -     | -                        | Depress "Press to Test" button.   |
|  | (b)  | RF GEN.   | -     | -                        | Adjust RF Gen O/P to 1V emf at 29.9999 MHz.   |
|  | (c)  | SPEC ANAL | -     | 0 dB REF. LEVEL          | Tune UUT for a peak on the Spectrum Analyser and set to 'Log Ref Level' on screen.  |
|  | (d)  | SPEC ANAL | -     | -                        | Adjust the Spectrum Analyser to sweep from 0 to 110 MHz.  |
|  |      |           |       | NLT 26 dB DOWN ON 054(c) | Maintaining the 1 volt output emf, sweep the RF Gen over the frequency range of 33 to 100 MHz. Check that any output on the Spectrum Analyser over this frequency range is NLT 26 dB down on the reference level set in 054(c).   |
|  | (e)  | UUT       | -     | -                        | Remove SIG GEN lead from UUT INT TUNER socket.<br>Remove Power Meter Assembly from the 35 pF capacitor box. Remove the 35 pF capacitor box from the ATU output. Connect link to T/R socket.   |

| TEST No.                                     | STEP | UNIT           | RANGE | LIMITS                              | INSTRUCTIONS   |
|--|------|----------------|-------|-------------------------------------|--|
| <b>VOLTAGE BREAKDOWN (TRANSMIT)</b>          |      |                |       |                                     |  |
| 058  | (a)  | UUT            | -     | -                                   | Set UUT frequency to 2.8 MHz and ATU range switch to A.  |
|  | (b)  | INT. CON.      | -     | -                                   | Depress "Press to Test" button.  |
|  | (c)  | UUT METER      | -     | MAXIMUM STEADY READING              | Set UUT power switch to AND and adjust TUNE and LOAD controls for a maximum steady reading on UUT meter.   |
|  | (d)  | UUT            | -     | -                                   | Set UUT power switch to HP.  |
|  | (e)  | UUT METER      | -     | MAINTAINS STEADY STATE READING      | Check that the UUT meter maintains a steady state reading.<br>N.B. An intermittent reading on the UUT meter indicates a voltage breakdown.                   |
|  | (f)  | UUT            | -     | -                                   | Set UUT power switch OFF. Remove link from INT TUNER and T/R SOCKETS. Connect lead from hypertac plug at Test Interface marked SIG GEN to T/R socket at UUT. |
| <b>RECEIVER SIGNAL TO NOISE MEASUREMENTS</b> |      |                |       |                                     |  |
| 060  | (a)  | UUT            | -     | -                                   | Set UUT to 2 MHz and SSB.  |
|  | (b)  | INT. CON.      | -     | -                                   | Depress "Press to Test" button.  |
|  | (c)  | RF GEN. & SYNC | -     | 0.8 $\mu$ V at 1.998 MHz $\pm$ 8 Hz | Set RF Gen to give an output emf of 0.8 $\mu$ V at 1.998 MHz $\pm$ 8 Hz. Ensure CARRIER is switched ON.  |
|  | (d)  | RMS VM         | 1V    | 0 dB REF.                           | Set UUT power switch to LP and vary GAIN to set AF output to 320 mV on the RMS VM. Note the dB reading.  |
|  | (e)  | RF GEN.        | -     | -                                   | Switch the carrier of the RF Gen OFF.  |
|  | (f)  | RMS VM         | -     | NLT 10.5 dB DOWN ON 060(d)          | Check the reading of the AF output as indicated on RMS VM is NLT 10.5 dB down on value noted in 060(d).  |
|  | (g)  | UUT            | -     | -                                   | Set UUT power switch to OFF.   |



| TEST No.            | STEP  | UNIT                 | RANGE     | LIMITS                                  | INSTRUCTIONS  |
|---------------------|-------|----------------------|-----------|---|---|
| 060<br>(cont)       | (h)   | -                    | -         | -                                       | REPEAT TEST 060 AT UUT FREQUENCIES:-<br>2.5 AND 3.1 MHz (BAND 1)<br>3.1, 4.0 and 4.9 MHz (BAND 2)<br>4.9, 6.5 AND 7.7 MHz (BAND 3)<br>7.7, 10.0 AND 12.2 MHz (BAND 4)<br>12.2, 16.0 AND 19.1 MHz (BAND 5)<br>19.1, 25.0 AND 29.9 MHz (BAND 6)<br>AND SIGNAL GENERATOR FREQUENCIES:-<br>2.498 AND 3.098 MHz (BAND 1)<br>3.098, 3.998 AND 4.898 MHz (BAND 2)<br>4.898, 6.498 AND 7.698 MHz (BAND 3)<br>7.698; 9.998 AND 12.198 MHz (BAND 4)<br>12.198, 15.998 AND 19.098 MHz (BAND 5)<br>19.098, 24.998 AND 29.898 MHz (BAND 6) |
|                     | (i)   | SIG<br>GEN &<br>SYNC | -         | 1 $\mu$ V at<br>1.998 MHz<br>$\pm$ 8 Hz | Set RF Gen to give an output emf of 1 $\mu$ V at<br>1.998 MHz $\pm$ 8 Hz and Synchroniser at 1.998<br>MHz phase lock.   |
| <u>OVERALL GAIN</u> |       |                      |           |   |   |
| 062                 | (a)   | AF VM                | 3V        | -                                       | Set AF VM to 3V range.  |
|                     | (b)   | UUT                  | -         | -                                       | Set UUT to LP, SSB and 2.0 MHz. Set GAIN<br>control fully clockwise.  |
|                     | (c)   | INT.<br>CON.         | -         | -                                       | Depress "Press to Test" button.   |
|                     | (d)   | AF VM                | 3V        | NLT 0.89V                               | Check the AF output level.  |
|                     | (e)   | SIG<br>GEN           | -         | 1 $\mu$ V at<br>1.999 MHz<br>$\pm$ 8 Hz | Set RF Gen for a phase locked frequency of<br>1.999 MHz $\pm$ 8 Hz.   |
|                     |       | UUT                  | -         | -                                       | Set UUT mode switch to CW(N).   |
|                     | (f)   | AF VM                | 3V        | NLT 0.89V                               | Check the AF output level.  |
|                     | (g)   | UUT                  | -         | -                                       | Set UUT mode switch to AM.  |
|                     | (h)   | RF GEN.<br>& SYNC    | -         | 5 $\mu$ V at<br>2.0 MHz<br>AM 85%       | With RF Gen frequency set to 2.0 MHz set up<br>an AM output emf of 5 $\mu$ V. Set mod. depth<br>to 85% 1 kHz.   |
| (i)                 | AF VM | 3V                   | NLT 0.89V | Check the AF output level.              |   |

| TEST No.                       | STEP | UNIT         | RANGE        | LIMITS                        | INSTRUCTIONS   |
|--------------------------------|------|--------------|--------------|-------------------------------|--|
| 062<br>(cont)                  | (j)  | UUT          | -            | -                             | Switch UUT to FREQ. CHECK, turn GAIN control to minimum. Disconnect lead from T/R socket.  |
|                                | (k)  | AF VM        | 300 mV<br>1V | 115 to<br>400 mV              | Check the reading on the AF VM.  |
|                                | (l)  | UUT          | -            | -                             | Switch UUT to CW(W). Switch the turret to Range 6.   |
|                                | (m)  | AF VM        | 300 mV<br>1V | 115 to<br>400 mV              | Check the reading on the AF VM.  |
| <u>PRESSEL CHARACTERISTICS</u> |      |              |              |                               |  |
| 065                            | (a)  | UUT          | -            | -                             | Switch the turret to Range 1.  |
|                                | (b)  | INT.<br>CON. | -            | -                             | Depress "Press to Test" button.  |
|                                | (c)  | DVM          | 10V          | 1.802V to<br>2.398V           | Check the SK A voltage reading on the DVM.   |
|                                | (d)  | -            | -            | -                             | Disconnect plug from SK A and connect to SK B.   |
| 066                            | (a)  | INT.<br>CON. | -            | -                             | Depress "Press to Test" button.  |
|                                | (b)  | DVM          | 100 mV       | NGT 29 mV<br>(NGT 0.29<br>mA) | Check the voltage reading on the DVM (as current equivalent 0.01 mA/mV).                   |
| 067                            | (a)  | INT.<br>CON. | -            | -                             | Depress "Press to Test" button.  |
|                                | (b)  | DVM          | 100V         | 32V                           | Adjust PSU to obtain an indication of 32 volts on the DVM.                                 |
|                                | (c)  | DVM          | 100V         | 23.92V to<br>24.08V           | Readjust PSU to obtain an indication of 24 volts on the DVM.                               |
|                                | (d)  | DVM          | 100 mV       | NGT 29 mV<br>(NGT 0.29<br>mA) | Reselect Test 066. Check the voltage on the DVM (ensuring 32V input has caused no damage). |
| <u>REMOTE SUPPLY</u>           |      |              |              |                               |  |
| 069                            | (a)  | INT.<br>CON. | -            | -                             | Depress "Press to Test" button.  |

| TEST No.             | STEP | UNIT         | RANGE | LIMITS                     | INSTRUCTIONS   |
|----------------------|------|--------------|-------|----------------------------|--|
| 069<br>(cont)        | (b)  | DVM          | 100V  | NLT 23.52V                 | Check the voltage on the DVM (remote supply at SK B pin C).  |
| 070                  | (a)  | INT.<br>CON. | -     | -                          | Depress "Press to Test" button.<br>(Placing 1 ohm between SK B pins C and E).  |
|                      | (b)  | DVM          | 1V    | NGT 198 mV<br>(NGT 198 mA) | Wait for reading to stabilise and check the voltage reading on the DVM. (Check of current through 1 ohm load across remote supply).  |
| <u>BATTERY CHECK</u> |      |              |       |                            |  |
| 034                  | (a)  | UUT          | -     | -                          | Switch UUT power switch to BATT. CHK.  |
|                      | (b)  | INT.<br>CON. | -     | -                          | Depress "Press to Test" button.  |
|                      | (c)  | DVM          | 100V  | 19.92V to<br>20.08V        | Adjust PSU to give a DVM indication of 20 volts.   |
|                      | (d)  | UUT          | -     | 19 to 21%<br>fsd           | Check the front panel meter reading as a percentage of fsd.  |
|                      | (e)  | DVM          | 100V  | 31.92V to<br>32.08V        | Adjust PSU to give a DVM indication of 32 volts.   |
|                      | (f)  | UUT          | -     | NLT 70%<br>fsd             | Check the front panel meter reading as a percentage of fsd.  |
|                      | (g)  | DVM          | 100V  | 23.92V to<br>24.08V        | Adjust PSU to give a DVM indication of 24 volts.   |
|                      | (h)  | UUT          | -     | 30 to 50%<br>fsd           | Check the front panel meter reading as a percentage of fsd.  |
| 133                  | (a)  | INT.<br>CON. | -     | -                          | Depress "Press to Test" button.  |
|                      | (b)  | UUT          | -     | -                          | Set UUT power switch to OFF. Disconnect UUT from Test Interface.   |
| XXX                  |      | UUT          | -     | -                          | UUT should now be tested for sealing and leakage by raising the internal pressure of the unit to 35 kN/m <sup>2</sup> and checking for any leaks (procedure as given for second line servicing). |

THIRD LINE SERVICING  
OF  
FRONT PANEL & CHASSIS ASSEMBLY 630/1/37601  
(UNIT 1)

CONTENTS

|   | Para. |
|---|-------|
| General ... ..  | 1     |
| Policy ... ..   | 6     |
| Testing   |       |
| Test equipment ... ..   | 10    |
| Preliminary ... ..  | 12    |
| Test procedures ... ..  | 21    |
| Calibration of temperature controlled reference oscillator<br>(Unit 8) ... .. | 22    |
| Components list   |       |

ILLUSTRATIONS

| Fig. |   | Page |
|------|---|------|
| 1    | Front panel and chassis assembly (Unit 1) - circuit diagram ... | 23   |
| 2    | Unit 6, mother panel and Units 6a to 6e - inter-connections ... | 25   |
| 3    | Unit 6 - component layout ... ..                                | 27   |

GENERAL

1. The front panel and chassis assembly (Unit 1) is a component part of the receiver transmitter unit and has the following sub-assemblies located on it:

- |                               |                          |
|-------------------------------|--------------------------|
| (1) Turret assembly           | Unit 3                   |
| (2) Tuner RF (ATU)            | Unit 4                   |
| (3) Power supply              | Unit 5                   |
| (4) Mother panel              | Unit 6                   |
| (5) Screen and can assemblies | (Units 6a, 6b, 6c/d, 6e) |



sine-waveform is effectively removed when pin 3 of the unit is taken from 0V to a positive potential of between +0.6V and +2.0V.

#### POLICY

6. The tests in this section include instructions to adjust internal potentiometers, wire links, etc. These instructions must be used with discretion as follows:

(1) Such an instruction should initially be interpreted as an instruction to check that the required result is obtained without any adjustments.

(2) Such an instruction should be obeyed in full only after a check as in (1) has not provided a result within limits and only if a repair has been carried out on the associated circuits. For example, receiver AGC adjustments are not necessary if the transmitter circuits have been repaired.

7. Within the constraints indicated in para.6, all tests will be carried out after repair.

8. Within the constraint indicated in para.6, the tests can be used as an aid to trouble shooting. Failure to obtain a result within limits must be assumed as due to a fault condition and attempts to rectify this condition by adjustments should not be made.

9. There will be many instances where a fault can be rectified by replacement of a component part of a unit without complete removal of the unit from the Front Panel and Chassis Assembly. This should be done with discretion, the test procedures given in this section only provide for re-alignment adjustments of Units 1a, 6 and 6a to 6e, any other unit which requires re-alignment adjustments should be removed and aligned in accordance with the test procedures given in the section which covers that unit. In any case, a unit which is removed for repair must satisfy all the tests given in the section which covers that unit before it is fitted to the Front Panel and Chassis Assembly.

NOTES: 1. It is preferred that a suspect synthesiser (Unit 9) be removed from Unit 1 before any attempt is made to diagnose which of its sub-assemblies may be at fault.

2. The ATU (Unit 4) is not checked by the procedures given in this section. However the procedures given in the section which covers this unit can be carried out without removing the unit from the Front Panel and Chassis Assembly.

## TESTING

### Test equipment

10. The following items of special-to-purpose test equipment are required:

- (1) Manual Interface Controller. Plessey Type TD4924A.
- (2) Test Interface. Plessey Type TD50562A.
- (3) Test Jig. Plessey Type TJB41A.
- (4) Junction Box (Plessey TD50575A) to switch output of an AF Generator between the test interface and an AF voltmeter.

11. The following items of proprietary test equipment are required:

| <u>Item</u>     | <u>Description</u>  |                 |                 |               |             |          |                  |
|-----------------|---|-----------------|-----------------|---------------|-------------|----------|------------------|
| Avo             | A dc milliammeter for measuring currents in the ranges 100 to 170 mA to an accuracy of $\pm 1\%$ fsd.<br>Suitable instrument: Avo Model 8X  |                 |                 |               |             |          |                  |
| DVM             | A digital voltmeter for measuring voltages in the range 0 to 0.5V, 20 to 33V with an accuracy of $\pm 0.02\%$ of reading or 0.005% fsd.<br>Suitable instrument: Solartron A203/204  |                 |                 |               |             |          |                  |
| RF VM           | An RF millivoltmeter having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Frequency range</td> <td>2 to 30 MHz</td> </tr> <tr> <td>Voltage range</td> <td>10 mV to 1V</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 2\%</math> fsd</td> </tr> </table> Suitable instrument: Marconi TF2604                    | Frequency range | 2 to 30 MHz     | Voltage range | 10 mV to 1V | Accuracy | $\pm 2\%$ fsd    |
| Frequency range | 2 to 30 MHz   |                 |                 |               |             |          |                  |
| Voltage range   | 10 mV to 1V   |                 |                 |               |             |          |                  |
| Accuracy        | $\pm 2\%$ fsd   |                 |                 |               |             |          |                  |
| RMS VM          | A true rms millivoltmeter having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Frequency range</td> <td>100 Hz to 5 kHz</td> </tr> <tr> <td>Voltage range</td> <td>10 mV to 1V</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 1\%</math> of fsd</td> </tr> </table> Suitable instrument: Hewlett Packard 3400A | Frequency range | 100 Hz to 5 kHz | Voltage range | 10 mV to 1V | Accuracy | $\pm 1\%$ of fsd |
| Frequency range | 100 Hz to 5 kHz   |                 |                 |               |             |          |                  |
| Voltage range   | 10 mV to 1V   |                 |                 |               |             |          |                  |
| Accuracy        | $\pm 1\%$ of fsd  |                 |                 |               |             |          |                  |

| <u>Item</u>                | <u>Description</u>  |                 |   |                            |  |                  |  |                         |                              |
|----------------------------|---|-----------------|---|----------------------------|--|------------------|--|-------------------------|------------------------------|
| AF VM                      | An audio frequency millivoltmeter having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Frequency</td> <td>2 kHz</td> </tr> <tr> <td>Voltage range</td> <td>10 to 100 mV</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 1\%</math> of fsd</td> </tr> </table> <p>Suitable instrument: Hewlett Packard 400E</p>  | Frequency       | 2 kHz   | Voltage range              | 10 to 100 mV   | Accuracy         | $\pm 1\%$ of fsd   |                         |                              |
| Frequency                  | 2 kHz   |                 |   |                            |  |                  |  |                         |                              |
| Voltage range              | 10 to 100 mV  |                 |   |                            |  |                  |  |                         |                              |
| Accuracy                   | $\pm 1\%$ of fsd  |                 |   |                            |  |                  |  |                         |                              |
| CRO                        | An oscilloscope having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Voltage range</td> <td>0.1 to 10 V/cm to an accuracy of <math>\pm 5\%</math> of reading</td> </tr> <tr> <td>Timebase range</td> <td>0.1 to 100 mS/cm to an accuracy of <math>\pm 5\%</math> of reading and 0.5 S/cm to an accuracy of <math>\pm 10\%</math> of reading</td> </tr> </table> <p>The oscilloscope must have a long persistence trace and facilities for external triggering.</p> <p>Suitable instrument: Solartron A100</p>   | Voltage range   | 0.1 to 10 V/cm to an accuracy of $\pm 5\%$ of reading | Timebase range             | 0.1 to 100 mS/cm to an accuracy of $\pm 5\%$ of reading and 0.5 S/cm to an accuracy of $\pm 10\%$ of reading |                  |  |                         |                              |
| Voltage range              | 0.1 to 10 V/cm to an accuracy of $\pm 5\%$ of reading   |                 |   |                            |  |                  |  |                         |                              |
| Timebase range             | 0.1 to 100 mS/cm to an accuracy of $\pm 5\%$ of reading and 0.5 S/cm to an accuracy of $\pm 10\%$ of reading  |                 |   |                            |  |                  |  |                         |                              |
| COUNTER                    | A frequency counter for measuring frequencies in the range 2 to 32 MHz to an accuracy of $\pm 1$ count $\pm 1$ part in $10^7$ and having a facility for taking average readings over 10 seconds.  |                 |   |                            |  |                  |  |                         |                              |
|                            | Suitable instrument: Racal 9024 Counter   |                 |   |                            |  |                  |  |                         |                              |
| AF Gen.                    | An AF signal generator having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Frequency</td> <td>2 kHz with a setting accuracy of <math>\pm 2\% \pm 1</math> Hz</td> </tr> <tr> <td>Output voltage</td> <td>50 to 100 mV (setting accuracy as for AF millivoltmeter)</td> </tr> <tr> <td>Outputs</td> <td>600 ohms balanced and 1 ohm unbalanced</td> </tr> </table> <p>Suitable instrument: Advance J3</p>   | Frequency       | 2 kHz with a setting accuracy of $\pm 2\% \pm 1$ Hz   | Output voltage             | 50 to 100 mV (setting accuracy as for AF millivoltmeter)   | Outputs          | 600 ohms balanced and 1 ohm unbalanced                                   |                         |                              |
| Frequency                  | 2 kHz with a setting accuracy of $\pm 2\% \pm 1$ Hz   |                 |   |                            |  |                  |  |                         |                              |
| Output voltage             | 50 to 100 mV (setting accuracy as for AF millivoltmeter)  |                 |   |                            |  |                  |  |                         |                              |
| Outputs                    | 600 ohms balanced and 1 ohm unbalanced  |                 |   |                            |  |                  |  |                         |                              |
| RF Gen.                    | An RF signal generator having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Frequency range</td> <td>2 to 30 MHz with a setting accuracy of <math>\pm 10</math> Hz</td> </tr> <tr> <td>Modulation frequency range</td> <td>70 Hz to 5 kHz with a setting accuracy of <math>\pm 10\%</math></td> </tr> <tr> <td>Modulation depth</td> <td>continuously variable to 100% with a depth setting accuracy of <math>\pm 5\%</math></td> </tr> <tr> <td>Carrier output accuracy</td> <td><math>\pm 1</math> dB with 50 ohms load</td> </tr> </table> <p>Suitable instrument: Marconi TF2002B with Marconi TF2170B synchronizer</p> | Frequency range | 2 to 30 MHz with a setting accuracy of $\pm 10$ Hz    | Modulation frequency range | 70 Hz to 5 kHz with a setting accuracy of $\pm 10\%$   | Modulation depth | continuously variable to 100% with a depth setting accuracy of $\pm 5\%$ | Carrier output accuracy | $\pm 1$ dB with 50 ohms load |
| Frequency range            | 2 to 30 MHz with a setting accuracy of $\pm 10$ Hz  |                 |   |                            |  |                  |  |                         |                              |
| Modulation frequency range | 70 Hz to 5 kHz with a setting accuracy of $\pm 10\%$  |                 |   |                            |  |                  |  |                         |                              |
| Modulation depth           | continuously variable to 100% with a depth setting accuracy of $\pm 5\%$  |                 |   |                            |  |                  |  |                         |                              |
| Carrier output accuracy    | $\pm 1$ dB with 50 ohms load  |                 |   |                            |  |                  |  |                         |                              |
| PSU                        | A power supply unit to give $20 \pm 0.1V$ , $24 \pm 0.1V$ and $33 \pm 0.1V$ with current limiting at 300 mA.  |                 |   |                            |  |                  |  |                         |                              |
|                            | Suitable instrument: Farnell TSV70  |                 |   |                            |  |                  |  |                         |                              |



Preliminary

12. Connect the Test Jig (harness) to the test interface.
13. Connect the test interface to the manual interface controller.
14. At the manual interface controller:
  - (1) Set the DC MONITOR switch to EXT.
  - (2) Set the test selection switches to COO.
  - (3) Connect the AVO to the socket marked Avo.
  - (4) Connect the DVM to the socket marked DVM.
  - (5) Connect the RMS VM to the socket marked RMS V/V.
  - (6) Connect the CRO signal input to the socket marked CRO AMP A.
  - (7) Connect the CRO trigger input to the socket marked CRO AMP TRIG.
  - (8) Connect the COUNTER to the socket marked COUNTER.
  - (9) Connect the junction box 1 ohm emf output to the socket marked AUDIO GEN.
  - (10) Connect the junction box 300 ohm emf balanced outputs to the sockets marked 2 and 5 respectively.
  - (11) Connect the RF GEN to the socket marked SG1.
15. At the junction box inputs, connect the AF GEN outputs to the inputs of the junction box. Connect the AF VM to the junction box socket marked AF V/V.
16. Connect the RF VM to the special socket on the side of the test interface.
17. Connect the PSU to the manual interface controller EXT B connector.

18. At the unit under test (UUT), mount the mother panel in the servicing position (refer to assembly/disassembly procedures). Disconnect the link between TPG and TPH on Unit 6.
19. Load the UUT into the test jig and connect:
  - (1) Harness multiway connectors to 1SK1, 1SK2 and 1SK3 on UUT.
  - (2) Harness probes to TPG, TPH and pin 24, all on UUT Unit 6.
20. Switch on the mains supply to all test instruments where appropriate.

#### Test procedures

21. Carry out the test procedures given on the following pages.

#### Notes relating to test procedures

1. For each test of transmitter circuits, the UUT is set to transmit condition by an interface connection to the UUT pressel line.
2. The test interface includes a circuit which oscillates the speech input from the AF GEN to the transmitter between a high level and a low level. This is to test the VOGAD device; the CRO trigger is taken from the pulsing circuit.
3. The AF GEN output is routed to the transmitter speech input at the UUT 1SK3 pins 4 and 5 when the junction box switch is set to NORMAL OUTPUT. If this switch is set to 300 OHM EMF, the AF VM is connected to the AF GEN output.
4. For the majority of tests, the title of the test, as given in the procedures, together with the UUT switch settings, indicates the nature of the test. Clarifying comments are included at various points and various general comments are given in note 5 below. In respect of particular tests:
  - (1) Test 016/018. This is to check that switch from Rx to Tx mode will not occur if the unit is set to FREQ.CHECK. The DVM is connected to the +6V Tx rail for this test.

- (2) Test 021. This is to check the pressel delay circuit. The +24V Tx rail is displayed at the CRO and the delay between releasing the pressel and switching off this rail is checked on CW mode and or AM mode.
5. The general employment of the test instruments is as follows:
- (1) Avo and DVM. To measure 24V line current and voltage respectively.
  - (2) Counter. To measure VFO output frequency (at pin 24 of Unit 6).
  - (3) RF VM. Is used to measure either:
    - (a) Receiver IF level (at Unit 6 TPh) on receiver tests or
    - (b) Transmitter RF output level (at UUT 1SK2/A1) on transmitter tests.
  - (4) RMS VM. Is used to measure the UUT audio output (at UUT 1SK3 pin 2).
  - (5) RF GEN. Is used to provide the receiver RF input (at UUT 1SK1/A1).
6. All loading units for the UUT and test instruments are built into the test interface.

| TEST No.  | STEP | UNIT      | RANGE         | LIMITS                                       | INSTRUCTIONS  |
|---|------|-----------|---------------|--|---|
| 000   | (a)  | INT. CON. | -             | -  | Depress "Press to Test" button.   |
|   | (b)  | UUT       | -             | -  | Set frequency to 2.2222 MHz (see note below) and mode to AM. Set to LP and turn GAIN fully anticlockwise. |
|   | (c)  | AVO       | 250 mA        | -  | Set AVO to 250 mA dc range.   |
|   | (d)  | DVM       | 100V dc       | -  | Set DVM to 100V dc range.   |
|   | (e)  | RMS VM    | 1V            | -  | Set RMS VM to 1V range.   |
|   | (f)  | COUNTER   | -             | -  | Set counter to take average over 10 sec on MHz range.   |
|   | (g)  | RF VM     | 100 mV        | -  | Set RF VM to 100 mV range.  |
|   | (h)  | CRO       | -             | -  | Set CRO to maximum voltage range.   |
|   | (i)  | AF GEN.   | -             | -  | Set AF Gen to minimum output level.   |
|   | (j)  | PSU       | -             | -  | Set PSU to minimum output.  |
|   | (k)  | RF GEN.   | -             | -  | Set RF Gen to minimum output level.   |
| (l)   | -    | -         | -             | Set switch on junction box to NORMAL OUTPUT. |   |
| <b>NOTE:</b> All instructions to set the UUT frequency must be taken to include setting the FREQUENCY RANGE switch to the appropriate band. |      |           |               |  |   |
| <b>SET SUPPLY VOLTAGE</b>   |      |           |               |  |   |
| 002   | (a)  | INT. CON. | -             | -  | Depress "Press to Test" button.   |
|   | (b)  | PSU       | -             | 23.78V to                                    | Increase PSU output to give 24V on DVM.   |
|   |      | DVM       | 100V          | 24.22V                                       |   |
| (c)   | AVO  | 1A        | 110 to 160 mA | Check 24V line current.                      |   |
| 004   | (a)  | INT. CON. | -             | -  | Depress "Press to Test" button.   |
|   | (b)  | DVM       | -             | 23.78V to 24.22V                             | Readjust PSU for 24V on DVM.  |
| <b>SYNTHESISER LOGIC (VFO OUTPUT)</b>   |      |           |               |  |   |
| 008   | (a)  | INT. CON. | -             | -  | Depress "Press to Test" button.   |

| TEST No.      | STEP | UNIT | RANGE | LIMITS | INSTRUCTIONS  |
|---------------|------|------|-------|--------|---|
| 008<br>(cont) | (b)  | -    | -     | -      | Refer to table 1 and for each of check Nos. 1 to 11:<br>(i) Set UUT frequency, range and mode switches as given.<br>(ii) Check that the counter reading, when averaged over 10 sec, is within the limits given.<br>(iii) Set the gate time on counter to 1 sec and check that the difference between successive readings is $NGT \pm 8$ Hz. |

Table 1

| Check | UUT switch settings |       |       | Counter reading Limits (MHz) |
|-------|---------------------|-------|-------|------------------------------|
|       | Frequency MHz       | Range | Mode  |                              |
| 1     | 02.2222             | 1     | AM    | 3.972202 to 3.972198         |
| 2     | 03.3333             | 2     | AM    | 5.083303 to 5.08329          |
| 3     | 05.5555             | 3     | AM    | 7.305505 to 7.305495         |
| 4     | 10.0000             | 4     | AM    | 11.750010 to 11.749990       |
| 5     | 11.1111             | 4     | AM    | 12.861111 to 12.861089       |
| 6     | 14.4444             | 5     | AM    | 16.194414 to 16.194386       |
| 7     | 26.6666             | 6     | AM    | 28.416626 to 28.41657        |
| 8     | 27.7777             | 6     | AM    | 29.527728 to 29.527672       |
| 9     | 28.8888             | 6     | AM    | 30.638828 to 30.638772       |
| 10    | 29.9999             | 6     | AM    | 31.749929 to 31.749871       |
| 11    | 29.9999             | 6     | CW(W) | 31.749929 to 31.749871       |

|   |        |    |                          |   |
|---|--------|----|--------------------------|---|
| A | UUT    | -  | -                        | Set UUT to SSB, 2.0000 MHz.   |
| B | RMS VM | 1V | -                        | Set RMS VM to 1V range.   |
| C | RFG1   | -  | -                        | Set RFG1 to 2 $\mu$ V emf at 1.998 MHz.                                   |
| D | RMS VM | 1V | 314 to 326 mV (0 dB ref) | Adjust UUT GAIN control to give 320 mV on RMS VM. Note RMS VM dB reading. |

| TEST No.      | STEP | UNIT   | RANGE | LIMITS               | INSTRUCTIONS  |
|---------------|------|--------|-------|----------------------|---|
| 008<br>(cont) | E    | RFG1   | -     | -                    | Increase RFG1 output to 100 mV emf and check that the RMS VM dB reading is NGT 4.8 dB different from that noted in 008D.<br>Set RFG1 output to 5 $\mu$ V emf at 2.0000 MHz modulated at 1 kHz to 85%.<br>Repeat 008D and E. |
|               |      | RMS VM | 10V   | NGT 4.8 dB than 008D |   |
|               | F    | RFG1   | -     | -                    |   |
|               | G    | -      | -     | -                    |   |

**NOTE:** The remainder of test 008 will be carried out only if incorrect results are obtained in 008A-G and only if a repair has been carried out.

AGC PRELIMINARY SETTING UP

|     |         |        |             |   |
|-----|---------|--------|-------------|---|
| (x) | UUT     | -      | -           | Remove links on Unit 6a (see table 2). Set R2 and R4 on Unit 6b both fully anticlockwise. Set UUT to AM and set frequency controls to 2.0000 MHz. Set GAIN control fully clockwise. Connect RF VM to TPH. |
| (y) | RF GEN. | -      | -           | Set RF Gen to 2.0000 MHz at 1.0 $\mu$ V emf.  |
| (z) | UUT     | -      | -           | Adjust L2 and L3 in Unit 6a for maximum output on RF VM. Fit links to Unit 6a (table 2) according to RF VM reading. Then check that reading is within limits of 27 to 48 mV.                              |
|     | RF VM   | 100 mV | 27 to 48 mV |   |

Table 2 - Unit 6a links

| RF VM reading   | Link Unit 6a pins |
|-----------------|-------------------|
| 3.4 to 6.0 mV   | 6 to 7            |
| 6.4 to 8.6 mV   | 6 to 8            |
| 9.4 to 11.4 mV  | 6 to 9            |
| 12.6 to 19.4 mV | 7 to 10           |
| 20.6 to 24.4 mV | 6 to 10           |
| 27 to 48 mV     | None              |

| TEST No.             | STEP | UNIT    | RANGE  | LIMITS                      | INSTRUCTIONS   |  |
|----------------------|------|---------|--------|-----------------------------|--|--|
| <u>AGC LEVEL SSB</u> |      |         |        |                             |  |  |
| 008<br>(cont)        | (aa) | RMS VM  | 1V     | -                           | Set RMS VM to 1V range.  |  |
|                      | (ab) | UUT     | -      | -                           | Set UUT to SSB.  |  |
|                      | (ac) | RF GEN. | -      | -                           | Set RF Gen to 1 $\mu$ V emf at 1.998 MHz.  |  |
|                      | (ad) | RMS VM  | 1V     | 1.00V                       | Adjust R5 on Unit 6b to give 1V on the RMS VM.   |  |
|                      | (ae) | RF GEN. | -      | -                           | Set RF Gen to 2 $\mu$ V emf at 1.998 MHz.  |  |
|                      | (af) | UUT     | -      | 314 to 326 mV<br>(0 dB ref) | Adjust GAIN control on UUT to give 320 mV on RMS VM.   |  |
|                      | (ag) | UUT     | -      | -                           | Adjust R4 on Unit 6b to reduce RMS VM reading by 3 dB. Adjust UUT GAIN control to reset level to 0 dB ref.                                   |  |
|                      | (ah) | RF GEN. | -      | -                           | Increase RF Gen output to 100 mV emf and check the difference between the reading on the dB scale and the reference taken in (af) on RMS VM. |  |
|                      |      |         | RMS VM | 10V                         | NGT 4.8 dB   |  |
|                      |      |         | RMS VM | 1V                          | -3 dB<br>0 dB  |  |
| <u>AGC LEVEL AM</u>  |      |         |        |                             |  |  |
|                      | (ai) | RF GEN. | -      | -                           | Reduce RF Gen output to 5 $\mu$ V emf at 2.0000 MHz modulated at 1 kHz to 85%.   |  |
|                      | (aj) | UUT     | -      | -                           | Switch UUT to AM and set GAIN to maximum.  |  |
|                      | (ak) | RF GEN. | -      | -                           | Increase RF Gen output to 10 $\mu$ V emf.  |  |
|                      | (al) | UUT     | 1V     | 314 to 326 mV<br>(0 dB ref) | Adjust GAIN control on UUT to give 320 mV on RMS VM.   |  |
|                      | (am) | UUT     | -      | -                           | Adjust R2 on Unit 6b to reduce RMS VM reading by 3 dB. Adjust UUT GAIN control to reset level to 0 dB ref.                                   |  |
|                      | (an) | RF GEN. | -      | -                           | Set RF Gen to 10 $\mu$ V emf and 1 kHz modulation depth to 30%.  |  |
|                      | (ao) | UUT     | -      | -                           | Adjust GAIN control on UUT to give 0 dB on RMS VM.   |  |
|                      |      | RMS VM  | 1V     | 0 dB                        |  |  |

| TEST No.                                     | STEP | UNIT          | RANGE   | LIMITS                                 | INSTRUCTIONS   |
|--|------|---------------|---------|--|--|
| 008<br>(cont)                                | (ap) | RF GEN.       | -       | -                                      | Increase RF Gen output to 100 mV.  |
|  | (aq) | RMS VM        | 10V     | NGT 4.8 dB                             | Check the reading on RMS VM is NGT 4.8 dB above 008(ao).   |
| <u>RECEIVER SENSITIVITY AND GAIN CONTROL</u> |      |               |         |  |  |
| 012  | (a)  | RF GEN.       | -       | -                                      | Set RF Gen to 24.998 MHz at 1 $\mu$ V emf.   |
|  | (b)  | UUT           | -       | -                                      | Switch UUT to SSB, frequency to 25 MHz and GAIN to maximum.  |
|  | (c)  | INT. CON.     | -       | -                                      | Depress "Press to Test" button.  |
|  | (d)  | RMS VM        | 1V      | NLT 850 mV<br>(0 dB ref)               | Check reading on RMS VM. Note the reading on the dB scale as a reference.  |
|  | (e)  | UUT<br>RMS VM | -<br>1V | -<br>-                                 | Turn GAIN control on UUT and ensure that it will continuously vary the output as read on the RMS VM. Turn GAIN fully anticlockwise.            |
|  | (f)  | RMS VM        | -       | 42.5 to<br>57.5 dB<br>Below 012<br>(d) | By changing down the range switch of the RMS VM (10 dB steps) check that the reading is between 43 and 57 dB below the reference taken in (d). |
| <u>SIGNAL TO NOISE RATIO CW(W)</u>           |      |               |         |  |  |
|  | (g)  | RF GEN.       | -       | -                                      | Set RF Gen to 24.998 MHz at 0.8 $\mu$ V emf.   |
|  | (h)  | UUT           | -       | -                                      | Set UUT to 25 MHz and CW(W).   |
|  | (i)  | RMS VM        | 1V      | -                                      | Switch RMS VM to 1V range.   |
|  | (j)  | UUT<br>RMS VM | -<br>1V | -<br>314 to<br>326 mV<br>(0 dB ref)    | Adjust GAIN on UUT to set the RMS VM indicator to the nearest dB marker to 320 mV. Note the dB reading.  |
|  | (k)  | RF GEN.       | -       | -                                      | Switch off the carrier on RF Gen.  |
|  | (l)  | RMS VM        | 0.1V    | NLT 10.5 dB<br>Below 012<br>(j)        | Check that the reading on the RMS VM is more than 10.5 dB below the reference taken in (j).  |
| <u>SIGNAL TO NOISE RATIO CW(N)</u>           |      |               |         |  |  |
|  | (m)  | RF GEN.       | -       | -                                      | Switch on carrier at RF Gen (setting 0.8 $\mu$ V emf at 24.999 MHz).   |



| TEST No.                         | STEP | UNIT    | RANGE | LIMITS                          | INSTRUCTIONS   |
|----------------------------------|------|---------|-------|---------------------------------|--|
| 012<br>(cont)                    | (n)  | UUT     | -     | -                               | Switch UUT to CW(N). Adjust GAIN on UUT to set the RMS VM indicator to the nearest dB marker to 320 mV. Note dB reading.                                 |
|                                  |      | RMS VM  | 1V    | 314 to 326 mV<br>(0 dB ref)     |  |
|                                  | (o)  | RF GEN. | -     | -                               |  |
|                                  | (p)  | RMS VM  | 0.1V  | NLT 17.5 dB<br>Below 012<br>(n) | Check that the reading on the RMS VM is more than 17.5 dB below the reference taken in (n). (If necessary change range on RMS VM).                       |
| <b>SIGNAL TO NOISE RATIO AM</b>  |      |         |       |                                 |  |
|                                  | (q)  | RF GEN. | -     | -                               | Switch on carrier at RF Gen (frequency set to 25.000 MHz). Set RF Gen output to 3.3 $\mu$ V emf, modulated at 1 kHz to a depth of 30%.                   |
|                                  | (r)  | UUT     | -     | -                               | Switch UUT to AM mode and frequency to 25 MHz. Adjust UUT GAIN to set the RMS VM indicator to the nearest dB marker to 320 mV.                           |
|                                  |      | RMS VM  | 1V    | 314 to 326 mV<br>(0 dB ref)     |  |
|                                  | (s)  | RF GEN. | -     | -                               | Switch off modulation at RF Gen.   |
|                                  | (t)  | RMS VM  | -     | NLT 10.5 dB<br>Below 012<br>(r) | Check that the reading on the RMS VM is more than 10.5 dB below the reference taken in (r).  |
| <b>FREQUENCY LOCK INDICATION</b> |      |         |       |                                 |  |
|                                  | (u)  | UUT     | -     | -                               | Set GAIN on UUT fully anticlockwise. Switch UUT to a frequency outside the limits of the FREQUENCY RANGE switch. Check that the phase lock alarm sounds. |
|                                  | (v)  | RMS VM  | 1V    | 110 mV to 440 mV                | Check reading on RMS VM.   |
| <b>FREQUENCY CHECK FACILITY</b>  |      |         |       |                                 |  |
|                                  | (w)  | RF GEN. | -     | -                               | Set RF Gen to 1.999 MHz at 25 mV emf.  |
|                                  | (x)  | UUT     | -     | -                               | Switch UUT to FREQ.CHK. Adjust GAIN control fully anticlockwise.   |
|                                  | (y)  | RMS VM  | 1V    | 110 mV to 440 mV                | Note reading on RMS VM. Set UUT to 2.0 MHz and CW(N).  |
|                                  | (z)  | RMS VM  | 1V    | -                               | Adjust GAIN control to give same reading as at 012(v).   |

| TEST No.                          | STEP | UNIT      | RANGE  | LIMITS          | INSTRUCTIONS  |
|-----------------------------------|------|-----------|--------|-----------------|---|
| 012<br>(cont)                     | (aa) | UUT       | -      | -               | Switch UUT to FREQ. CHECK.  |
|                                   | (ab) | RMS VM    | 1V     | -               | Check that there is a low frequency beat note causing the RMS VM needle to fluctuate. Adjust Freq. of RF Gen a small amount if necessary. |
| <b>BATTERY VOLTAGE INDICATION</b> |      |           |        |                 |   |
| 013                               | (a)  | UUT       | -      | -               | Switch UUT to BATTERY CHECK.  |
|                                   | (b)  | INT. CON. | -      | -               | Depress "Press to Test" button.   |
|                                   | (c)  | DVM       | 100V   | 19.92 to 20.08V | Adjust PSU to give 20V on DVM.  |
|                                   | (d)  | UUT       | -      | 20% fsd         | Adjust R4 on mother panel (Unit 6) to set the front panel meter indicator exactly on the first calibration point from zero. (20% fsd).    |
|                                   | (e)  | DVM       | 100V   | 23.92 to 24.08V | Adjust power supply to give 24V on DVM.   |
|                                   | (f)  | UUT       | -      | 30% to 60% fsd  | Check that the front panel meter indicates between 30% and 60% of full scale.   |
|                                   | (g)  | DVM       | 100V   | 31.92 to 32.08V | Adjust power supply to give 32V on DVM.   |
|                                   | (h)  | UUT       | -      | 70% to 100% fsd | Check that the front panel meter indicates between 70 and 100% of full scale.   |
|                                   | (i)  | DVM       | 100V   | 23.78 to 24.22V | Adjust power supply to give 24V on DVM.   |
| <b>SSB DRIVE LEVEL</b>            |      |           |        |                 |   |
| 014                               | (a)  | UUT       | -      | -               | Switch UUT to SSB, LP, 2.000 MHz.   |
|                                   | (b)  | RF VM     | 100 mV | -               | Set RF VM to 100 mV range and refit to side of INTERFACE. Remove probe from pin 24 of UUT Unit 6.   |
|                                   | (c)  | INT. CON. | -      | -               | Depress "Press to Test" button.   |
|                                   | (d)  | -         | -      | -               | Set switch on Junction Box to '300 OHM EMP' position.   |

| TEST No.      | STEP | UNIT            | RANGE  | LIMITS                    | INSTRUCTIONS   |
|---------------|------|-----------------|--------|---------------------------|--|
| 014<br>(cont) | (e)  | AF GEN<br>AF VM | -      | 2.000 kHz                 | Set AF Gen to 2 kHz and level to 29 mV on AF VM.   |
|               | (f)  | -               | -      | -                         | Set switch on Junction Box to NORMAL OUTPUT position.  |
|               | (g)  | RF VM           | 100 mV | 42 to 58 mV<br>(0 dB ref) | If RF VM indication is outside limits, then at Unit 6e, replace links with links to pin 9 to 11 and pin 10 to 12. Note RF VM reading, refer to table 3 and adjust Unit 6 links accordingly. Check and note final reading on RF VM. |

Table 3 - Unit 6e links

| RF VM reading   | Link Unit 6e pins             |
|-----------------|-------------------------------|
| 19.6 to 26.4 mV | 8 to 10 and 10 to 12          |
| 29 to 38 mV     | 9 to 10 and 11 to 13          |
| 42 to 58 mV     | No change                     |
| 62 to 82 mV     | 9 to 11, 8 to 10 and 10 to 12 |
| 86 to 104 mV    | 9 to 11, 8 to 10 and 10 to 12 |

CW (W) DRIVE LEVEL

- (h) UUT - - Switch UUT to CW(W), LP.
- (i) RF VM 100 mV -1.6 to -1.9 dB  
Below 014 (g) -1.6 to -1.9 dB below 014(g).

CW (N) DRIVE LEVEL

- (j) UUT - - Switch UUT to CW(N), LP.
- (k) RF VM 100 mV Within 3.2 dB of 014 (i) Check RF VM reading with respect to result at 014(i).

AM DRIVE LEVEL

- (l) UUT - - Switch UUT to AM. Set h5 on Unit 6d fully anticlockwise.
- (m) CRO - - Set CRO timebase to 1 mS/cm and voltage range to 50 mV/cm. Set to internal trigger, AC.

| TEST No.                            | STEP | UNIT            | RANGE      | LIMITS     | INSTRUCTIONS  |
|-------------------------------------|------|-----------------|------------|------------|---|
| 014<br>(cont)                       | (n)  | UUT             | -          | -          | Adjust R3 on Unit 6d for a modulation depth of 85% by adjusting the Y expansion control on the CRO, so that the waveform covers the full 8 cm of screen height, and setting the trough amplitude using R3 to less than 0.64 cm. (Note that R3 will have two apparent correct settings. The first of these from fully anticlockwise is the correct setting). Set UUT to SSB. |
|                                     | (o)  | CRO             | -          | -          | Set the Y expansion to CAL and note the peak-to-peak amplitude of the waveform.   |
|                                     | (p)  | UUT             | -          | -          | Switch UUT to AM and adjust R8 on Unit 6d to set the peak-to-peak amplitude to the same level as in (o).  |
| <b>FREQUENCY CHECK Tx LOW LEVEL</b> |      |                 |            |            |   |
| 016                                 | (a)  | INT.<br>CON.    | -          | -          | Depress "Press to Test" button.   |
|                                     | (b)  | UUT             | -          | -          | Switch UUT to FREQ. CHK.  |
| 018                                 | (a)  | DVM             | 1V         | -          | Set DVM to 1V range.  |
|                                     | (b)  | UUT             | -          | -          | Set UUT to Transmit.  |
|                                     | (c)  | INT.<br>CON.    | -          | -          | Depress "Press to Test" button.   |
|                                     | (d)  | DVM             | 1V         | NGT 0.499V | Check DVM reading (6V Tx line at Unit 6 pin 11).  |
| <b>SIDETONE LEVEL AM</b>            |      |                 |            |            |   |
| 020                                 | (a)  | -               | -          | -          | Set switch on junction box to 300 ohm EMF position. Switch UUT to AM.   |
|                                     | (b)  | AF GEN<br>AF VM | -<br>30 mV | -          | Set AF Gen to 2 kHz and set output to 17.5 mV as read on the AF VM.   |
|                                     | (c)  | -               | -          | -          | Set switch on junction box to NORMAL OUTPUT position.   |
|                                     | (d)  | RMS<br>VM       | 1V         | -          | Switch RMS VM to 1V range.  |

| TEST No.                    | STEP | UNIT                | RANGE                   | LIMITS              | INSTRUCTIONS  |
|-----------------------------|------|---------------------|-------------------------|---------------------|---|
| 020<br>(cont)               | (e)  | INT.<br>CON.        | -                       | -                   | Depress "Press to Test" button.   |
|                             | (f)  | RMS VM              | 1V                      | 280 mV to<br>460 mV | Check reading on RMS VM.  |
| <u>SIDETONE LEVEL CW(W)</u> |      |                     |                         |                     |   |
|                             | (g)  | UUT                 | -                       | -                   | Switch UUT to CW(W).  |
|                             | (h)  | RMS VM              | 100 mV                  | 48 to 100<br>mV     | Switch RMS VM to 100 mV range and check reading.  |
| <u>CW BREAK IN</u>          |      |                     |                         |                     |   |
| 021                         | (a)  | CRO                 | 100 mS/<br>cm<br>10V/cm | -                   | Set CRO to external trigger, dc, +ve, and set timebase to 100 mS/cm. Set voltage range to 10V/cm dc.  |
|                             | (b)  | UUT                 | -                       | -                   | Switch UUT to CW(W).  |
|                             | (c)  | INT.<br>CON.        | -                       | -                   | Depress "Press to Test" button.   |
|                             | (d)  | CRO                 | -                       | 263 to 712<br>mS    | Check the time taken before the 24V dc level switches off on CRO.   |
|                             | (e)  | INT.<br>CON.<br>CRO | -                       | -<br>c              | Set the Int Controller to TEST 020 and set the CRO timebase to 5 mS/cm.   |
|                             | (f)  | UUT                 | -                       | -                   | Switch UUT to AM.   |
|                             | (g)  | INT.<br>CON.        | -                       | -                   | Set the Int Controller to TEST 021 and press the "Press to Test" button.  |
|                             | (h)  | CRO                 | -                       | NGT 23.7 mS         | Check the time taken before the 24V dc level switches off on CRO.   |
| 022                         | (a)  | INT.<br>CON.        | -                       | -                   | Depress "Press to Test" button.<br><br>Unload UUT from test jig. Replace link between TPG and TPH on Unit 6. Replace Unit 6 in normal operating position. |

Calibration of temperature controlled reference oscillator (Unit 8)

22. It is suggested that calibration of Unit 8 be carried out at specified intervals. The following are recommended:

- (1) Six monthly intervals (Unit 8 assembled into Unit 1).
- (2) Upon assembly into Unit 1 if interval since last calibration exceeds three months.

23. For the calibration, the front panel and chassis assembly should be connected to a 24V supply, be operated in the transmit mode and have a counter connected to monitor the RF output at 1SK2 pin A1. This can be done either by:

- (a) Making the indicated connections, (including pressel switch between 1SK3 pins 3 and 7) or
- (b) By calibrating as part of Unit 1 testing, in which case, it is only necessary to connect the counter to the special socket on the side of the test interface (in place of the RF VM), and, at the manual interface controller, select test number 014 and depress the Press to Test button.

24. Whichever connections are employed, proceed as follows:

- (1) Carry out the calibration at normal room temperature ( $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ).
- (2) Set UUT to CW(W), frequency to 10.00000 MHz and wait at least 20 minutes.
- (3) Set the counter to gating time 10 secs and check that the counter reading is within 10 Hz of 10.00000 MHz, allowing for the calibration information given on Unit 8 and the Front Panel labels (see note).

NOTES: 1. The Unit 8 and Front Panel labels record the last three digits of the counter reading appropriate to three separate temperatures. Hence, the counter reading required at the ambient temperature can be extrapolated.

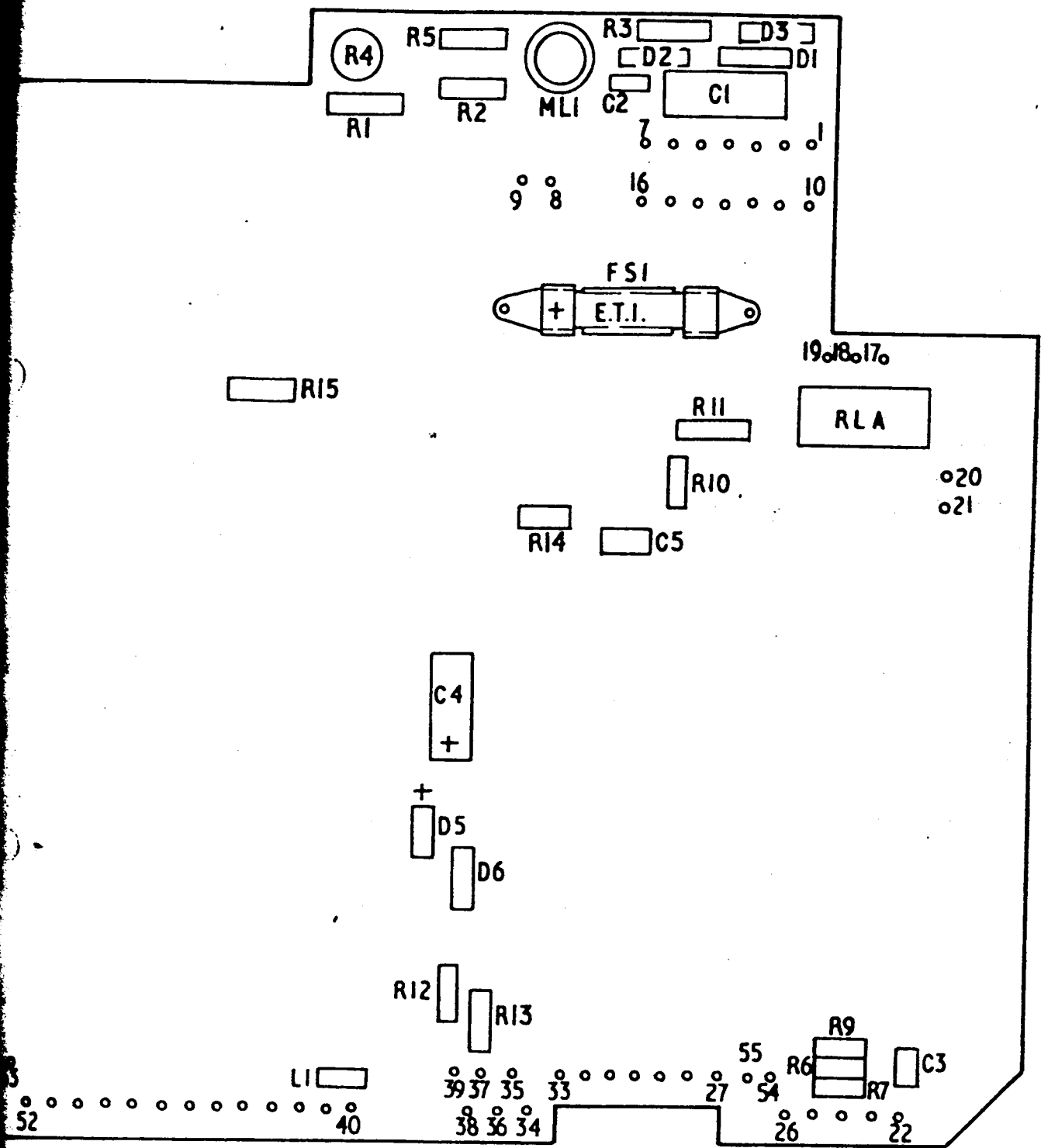
2. When Unit 8 is replaced, the label on the front panel must be changed to agree with the calibration data given on Unit 8 label.

(4) If the counter reading is not within limits, remove the screw plug on Unit 8 and adjust the trimmer resistor to obtain the correct frequency. Replace the screw plug and strike off the appropriate section of the recalibration label on the front panel casting to indicate date of recalibration.

COMPONENTS LIST FOR  
 PANEL, ELECTRONIC CIRCUIT (Unit 6)  
 419/1/24982 (see Figure 3)

| Cct. Ref.                     | Description                      | Reference No.                   |
|-------------------------------|----------------------------------|---------------------------------|
| <u>Resistors</u>              |                                  |                                 |
| R1                            | 10 kohm $\pm$ 5%                 | 403/4/78126/073                 |
| R2                            | 10 kohm $\pm$ 5%                 | 403/4/78126/073                 |
| R3                            | 3.9 kohm $\pm$ 5%                | 403/4/78126/063                 |
| R4                            | 2 kohm $\pm$ 10% variable 0.5w   | 404/9/05032/004                 |
| R5                            | 3.9 kohm $\pm$ 5%                | 403/4/78126/029                 |
| R6                            | 150 ohm $\pm$ 5%                 | 403/4/78126/029                 |
| R7                            | 180 ohm $\pm$ 5%                 | 403/4/78126/031                 |
| R8                            | Not used                         |                                 |
| R9                            | 100 ohm $\pm$ 5%                 | 403/4/78126/025                 |
| R10                           | 1 kohm $\pm$ 5%                  | 403/4/78126/049                 |
| R11                           | 510 kohm $\pm$ 5%                | 403/4/78127/114                 |
| R12                           | 10 kohm $\pm$ 5%                 | 403/4/78126/073                 |
| R13                           | 5.6 kohm $\pm$ 5%                | 403/4/78126/067                 |
| R14                           | 4.7 kohm $\pm$ 5%                | 403/4/78126/065                 |
| R15                           | 1 kohm $\pm$ 5%                  | 403/4/78126/049                 |
| <u>Capacitors</u>             |                                  |                                 |
| C1                            | 180uF $\pm$ 10% 6v               | 402/4/98049/006                 |
| C2, C3                        | 68nF $\pm$ 80% -20% 50v          | 400/9/19084/098                 |
| C4                            | 180uF $\pm$ 10% 6v electrolytic  | 402/4/98049/006                 |
| C5                            | 68nF $\pm$ 80% -20% 50v          | 400/9/19084/098                 |
| <u>Inductors</u>              |                                  |                                 |
| L1                            | Inductor 180uH                   | 406/8/08470/027                 |
| <u>Semi-conductor devices</u> |                                  |                                 |
| D4                            | Not used                         |                                 |
| D1, 2, 3, 5, 6                | Diode, CV7367                    | 990/4/00107/367                 |
| M1                            | Integrated circuit CN497T        | 446/4/00429                     |
| <u>Miscellaneous</u>          |                                  |                                 |
| RLA                           | Relay                            | 507/9/05095<br>(or 507/9/38041) |
| FS1                           | Indicator, elapsed time (E.T.I.) | 434/9/94315                     |





419/1/21940

Fig.3 Unit 6 - component layout

THIRD LINE SERVICING  
OF  
FILTER UNIT 419/1/24970  
(UNIT 1a)

CONTENTS

|                                 | Para. |
|---------------------------------|-------|
| Description ... ..              | 1     |
| Testing                         |       |
| Test equipment ... ..           | 3     |
| 1 k Hz filter ... ..            | 5     |
| Relay protection circuit ... .. | 9     |
| Components list ... ..          | 16    |

ILLUSTRATIONS

| Fig. |   | Page |
|------|---|------|
| 1    | 1 k Hz filter (Unit 1a) - circuit diagram ... ..  | 7    |
| 2    | 1 k Hz filter (Unit 1a) - component layout ... .. | 9    |

DESCRIPTION

1. The Filter Unit (unit 1a) is a panel, electronic circuit (pec), which is a component part of the transmitter receiver and is normally located on the Front Panel and Chassis Assembly (Unit 1).

2. With reference to the circuit diagram in fig.1., Unit 1a provides the following:

- (1) TR4, TR5, TR2 and associated components function as a filter which accepts a 1 k Hz input square wave of 100 mV peak-to-peak and shapes this waveform to provide two 1 k Hz sine wave outputs, one 50 mV peak-to-peak and the other variable up to 50 mV peak-to-peak.

(2) Surge protection of an external relay is provided by transistor TR3 (in parallel with the relay coil) and transistor TR1 (in parallel with the relay contacts). The relay drive signal operates TR3, thereby switching TR1. Since the transistors operate more rapidly than the relay, TR1 takes the initial surge and thereby protects the relay contacts. The maximum surge current is 4.5 mA.

(3) L2/C2 provides decoupling of the +6V supply for the VFO and L1 provides suppression for the +6V supply to certain Rx and Tx circuits.

### TESTING

#### Test equipment

3. The following items of test equipment are required:

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| Sig. Gen    | Square wave generator with frequency output 1 k Hz $\pm 10\%$ , output impedance less than 100 ohm and output emf 100 mV peak-to-peak.<br>Suitable instrument: Advance Type H1 or AF generator with pulse forming network. |
| Avo         | To measure dc current up to 5A with an accuracy of $\pm 5\%$ .<br>Suitable instrument: Avometer Model 8X.  |
| CRO         | Oscilloscope to measure 1 k Hz of amplitude 50 mV p-p<br>Suitable instrument: Solartron A100.  |
| PSU A       | DC supply to provide $+2.9V \pm 0.1V$ up to 10 mA<br>Suitable instrument: Farnell L30B   |
| PSU B       | DC supply to provide $+24V \pm 0.5V$ up to 5A.<br>Suitable instrument: Farnell T5V 70.   |

4. The following components are required:

(1) Resistor 1 k ohm  $\pm 2\%$   $\frac{1}{2}W$  (Qty 2)

- (2) Resistor 1.2 k ohm  $\pm$  2%  $\frac{1}{2}$ W
- (3) Resistor 5.3 ohm  $\pm$  1% 120W
- (4) Capacitor 470 nF  $\pm$  20% (Qty 2)
- (5) Single pole switch (24V, 5A)

NOTE: Filter unit under test is termed UUT

1 k Hz filter

Connect the PSU A across UUT pins 5(+ve) and 7 (-ve)

6. Connect Sig Gen output to UUT pin 6 (cable screen to pin 4 of UUT)
7. Connect 1 k ohm resistor and 470nF capacitor (in series) between UUT pins 3 and 4 (capacitor to pin 3). Similarly connect second 1 k ohm resistor and 470nF capacitor between UUT pins 14 and 4 (capacitor to pin 14).

Switch on supplies to test instruments and

- (1) Set PSU A output to  $2.9V \pm 0.1V$
- (2) Set Sig. Gen output to 1 k Hz  $\pm$  100 Hz at 100 mV p-p.
- (3) Connect CRO to monitor waveform across 1kohm load resistor connected via capacitor to pin 3.
- (4) Check that the displayed waveform is sinusoidal, of frequency 1 k Hz  $\pm$  100 Hz and  $50mV \pm 2mV$  p-p.
- (5) Connect CRO to monitor waveform across 1 k ohm load resistor connected via capacitor to pin 14.
- (6) Repeat (4) but verify that the waveform amplitude is adjustable by R15 on UUT from a maximum of  $50 mV \pm 2 mV$  p-p to approx. 0V.

Relay protection circuit

9. Connect PSU B +ve rail to UUT pins 11 and 13.
10. Connect AVO -ve terminal to PSU B -ve rail.
11. Connect 5.3 ohm resistor between AVO +ve terminal and pin 10 of UUT.
12. Connect pin 12 of UUT via 1.2 k ohm resistor and test switch to PSU B -ve rail. Open the switch.
13. Switch on PSU B and set its output to  $24V \pm 0.5V$  with current limit 5A.
14. Close the test switch and check that the AVO reading is between 4.0A and 4.5A.
15. Open the test switch and check that the AVO reading is less than 1 mA.

COMPONENTS LIST

16. The principal component parts of the 1 k Hz filter are listed below and the component layout is given on Fig.2.

| <u>Cct Ref.</u>  | <u>Description</u>         | <u>Ref. No.</u> |
|------------------|----------------------------|-----------------|
| <u>Resistors</u> |                            |                 |
| R1               | 3.3 kohm $\pm$ 5%          | 403/4/78126/061 |
| R2               | 3.9 kohm $\pm$ 5%          | 403/4/78126/063 |
| R3               | 7.5 kohm $\pm$ 5%          | 403/4/78126/070 |
| R4               | 16 kohm $\pm$ 5%           | 403/4/78126/078 |
| R5               | 10 kohm $\pm$ 5%           | 403/4/78126/073 |
| R6               | 33 kohm $\pm$ 5%           | 403/4/78126/085 |
| R7               | 68 ohm $\pm$ 5%            | 403/4/78126/021 |
| R8               | 2.2 kohm $\pm$ 5%          | 403/4/78126/057 |
| R9               | 10 kohm $\pm$ 5%           | 403/4/78126/073 |
| R10              | 470 ohm $\pm$ 5%           | 403/4/78126/041 |
| R11              | 1 kohm $\pm$ 5%            | 403/4/78126/049 |
| R12              | 3.3 kohm $\pm$ 5%          | 403/4/78126/061 |
| R13, 14          | 10 kohm $\pm$ 5%           | 403/4/78126/073 |
| R15              | 10 kohm $\pm$ 10% variable | 408/9/05033/404 |

| <u>Cct Ref.</u>        | <u>Description</u>                  | <u>Ref. No.</u> |
|------------------------|-------------------------------------|-----------------|
| <u>Capacitors</u>      |                                     |                 |
| C1                     | 82nF $\pm$ 10% 100v                 | 400/9/19083/065 |
| C2                     | 47uF $\pm$ 20% 6v electro-<br>lytic | 402/4/98049/010 |
| C3, C4                 | 39nF $\pm$ 10% 100v                 | 400/9/19083/061 |
| C5                     | 10nF + 80% -20% 100v                | 400/9/19084/078 |
| C6                     | 68nF + 80% -20% 50v                 | 400/9/19084/098 |
| C7                     | 4.7nF $\pm$ 10% 100v                | 400/9/19083/041 |
| <u>Inductors</u>       |                                     |                 |
| L1                     | Inductor R.F.                       | 406/8/11032/004 |
| L2                     | Inductor R.F.                       | 406/9/08490/033 |
| <u>Semi-conductors</u> |                                     |                 |
| TR1                    | Transistor                          | 417/4/00247     |
| TR2                    | Transistor                          | 417/4/02027/003 |
| TR3, TR4               | Transistor                          | 417/4/00240     |
| TR5                    | Transistor CV7648                   | 417/4/98681/000 |
| D1                     | Diode BAX 12                        | 415/4/05451     |

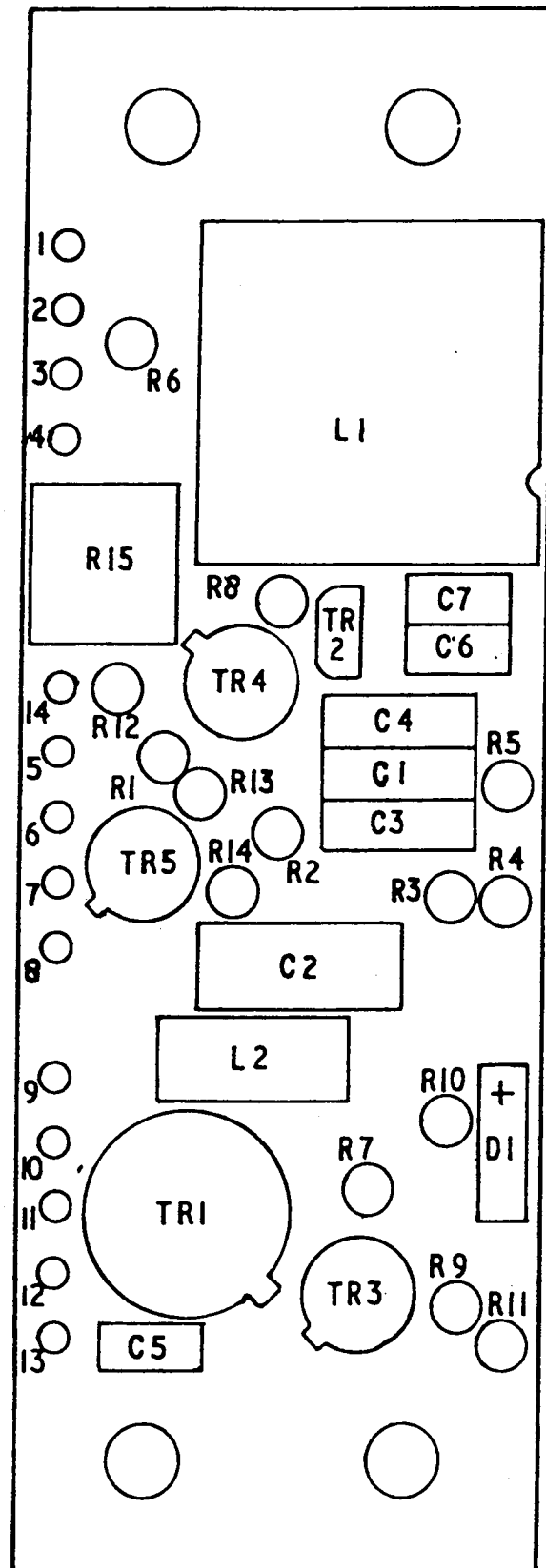


Fig.2 1kHz filter (Unit 1a) - component layout

1

THIRD LINE SERVICING  
OF  
REAR PANEL ASSEMBLY 630/1/37608  
(UNIT 2)

CONTENTS

|                               | Para. |
|-------------------------------|-------|
| Introduction ... ..           | 1     |
| Functional description ... .. | 4     |
| Detailed description          |       |
| General ... ..                | 5     |
| Unit 2a ... ..                | 6     |
| Testing                       |       |
| Test equipment ... ..         | 15    |
| Preliminary ... ..            | 17    |
| Test procedures ... ..        | 25    |
| Repair policy ... ..          | 26    |
| Assembly/disassembly ... ..   | 29    |
| Components list ... ..        | 30    |

ILLUSTRATIONS

| Fig.   | Page |
|--|------|
| 1. Unit 2 - circuit diagram ... ..                         | 25   |
| 2. Power amplifier (Unit 2a) - circuit ... ..              | 27   |
| 3. Power amplifier pec (Unit 2a) - component layout ... .. | 29   |
| 4. Power amplifier - position of heat sinks ... ..         | 31   |



PRODUCTION

The rear panel assembly (Unit 2) is a component part of the transmitter receiver unit and comprises a number of sub-assemblies which are all attached to the rear panel casting.

The principal sub-assemblies of the rear panel assembly are:

- (1) Power Amplifier Unit 2a
- (2) PA Switch and Filter Assembly which contains:
  - (a) Reflectometer Unit 2b
  - (b) PA Filter Assembly Units 2c-2f
- (3) RF Decoupling Unit Unit 2g
- (4) VHF Filter Unit 2h

This section of the manual provides information for the servicing of the third line of the rear panel assembly as a whole. Only Unit 2a is detailed in this section, the remaining sub-assemblies (items 2(a), 2(b), 3 and 4 in a.2 above) can each be independently tested at third line and are each detailed in their own sections in this part of the manual.

FUNCTIONAL DESCRIPTION

The functions of the sub-assemblies are:

(1) Power amplifier (Unit 2a)

Provides power amplification of the transmitter RF signal, with an automatic level control (ALC) which maintains the transmitter output power at the correct level to suit the conditions of load VSWR, battery voltage, operating mode and demanded power. Information concerning load VSWR and output power is provided by the reflectometer.

(2) Reflectometer (Unit 2b)

This contains monitors which provide information concerning load VSWR and output power.

(3) PA filters (Units 2c to 2f)

The filters provide reduction of the harmonic content of the transmitter output to below -40 dB with respect to the wanted signal.

(4) RF decoupling unit (Unit 2g)

This unit is connected in series with the wiring to the two audio sockets. It decouples spurious RF from the audio signal lines.

(5) VHF filter (Unit 2h)

The unit is connected in circuit when the antenna tuning unit (Unit 4) is in use; it provides reduction in the level of broadband noise and spurious outputs in the range 33 MHz to 75 MHz by at least 25 dB.

## DETAILED DESCRIPTION

### General

5. The units, and various plug and socket connectors on the rear panel assembly are interconnected as shown in fig.1. Connectors 2PL1, 2PL2 and 2PL3 engage with corresponding connectors on the Front Panel and Chassis Assembly (Unit 1) and provide all electrical connections between Units 1 and 2. Sockets 2SK5 and 2SK6 are located on the rear of Unit 2 and provide connections to external audio equipment. Sockets 2SK7 and 2SK8 are also located on the rear of the unit, a 50 ohm RF source or load can be connected directly to 2SK7, otherwise the antenna tuning unit (Unit 4) is required and the two sockets are connected by external link.

- NOTES:
1. Refer to figs.1 and 2 in the section for second line servicing of the receiver/transmitter (Part 2 of this manual) for block diagram and interconnection data relating to Unit 2.
  2. Refer to the separate sections in this part of the manual for detailed descriptions of Units 2b-2h.

### Unit 2a

6. The power amplifier sub-assembly consists of a panel, electronic circuit together with a connector (2PL2). Wire leads connect 2PL2 to the panel, which contains RF power amplifiers, ALC generator and bias regulator circuits.

7. With reference to the circuit diagram in figure 2. The power amplifiers consist of a class AB output stage (TR12/13), a class AB driver (TR6/7) and three class A pre-amplifier stages (ML2, TR2 and TR3/4).

8. ML2, the first pre-amplifier stage, is a silicon integrated circuit. The RF input at pin 5 of ML2 is the main signal path and this same input at pin 6 controls the bias level of the internal amplifier. A gain control signal is applied from pin 11 of the ALC generator ML1 to pin 7 of ML2. The amplified RF is taken from pin 3 of ML2 to the second pre-amplifier, TR2.

9. Bias for the driver stage is derived from the +6V supply by a "ring-of-two" regulator circuit (TR5/TR8). The bias level is set by resistor R34. Similarly, bias for the output stage is provided by the regulator TR9, TR10, TR11 and the bias level is set by resistor R43.

NOTE: Transistors TR11, 12 and 13 are located on a heat sink which is attached to the panel, electronic circuit.

10. The ALC generator ML1 compares an ALC control signal, supplied to pin 22 of ML1 from Unit 2b, with a standing reference voltage developed across an internal resistor chain and set by resistor R2. Since the control voltage is derived from the RF output and the ALC generator output controls the gain of the first RF pre-amplifier, a loop is formed which automatically maintains the peak-envelope-power at the appropriate level. The standing reference voltage within ML1 is modified, and the RF power level consequently reduced, when OV is applied either to pin 2 or pin 4 of the panel.

11. The ALC system has a fast attack time constant and a slow decay time constant to provide suitable control of peak-envelope-power without introducing excessive intermodulation. These time constants are provided by various components connected to ML2 and by TR1. The inputs OV LP, OV LP/HP and OV ANT TUNE are normally controlled by the power switch on the front panel of the radio and select the time constants appropriate to the required power level.

12. A delayed mean control limits the power output under single tone conditions to approx. 4 dB below peak-envelope-power to avoid excessive heat dissipation and power consumption.

13. Overload protection is provided by a control voltage applied to pins 16 and 17 of ML1. This voltage is provided by two sources, TR14 emitter in Unit 2a or via the panel pin 15 from Unit 2b. If either source causes the control voltage to exceed a level of 4.5V, a gating circuit within ML1 overrides the normal ALC control and the control voltage applied from ML1 to ML2 renders the first RF pre-amplifier inoperative.

14. The overload sensing circuit within Unit 2a operates as follows. The voltage developed across R45 is the resultant of two anti-phase voltages, one is derived from the RF output current flowing through the primary of current transformer T5 and the other is derived from the RF output voltage at transformer T4. When the load is correctly matched, the two voltages are equal, the resultant across R45 is zero and a minimum output is obtained from the emitter follower TR14. A mismatched load will result in an imbalance of the two voltages, giving a resultant which increases with the degree of mismatch.

### TESTING

#### Test equipment

15. The following items of special-to-purpose test equipment are required:

- (1) Manual Interface Controller. Plessey Type TD4924A.
- (2) Test Interface. Plessey Type TD50563A.
- (3) Test Jig. Plessey Type TJ840A.

16. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| Avo         | A dc milliammeter for measuring currents in the range 10 milliamps to 2 amps to an accuracy of $\pm 1\%$ of fsd.<br>Suitable instrument: Avo Universal Model 8 |
| Counter     | An electronic counter for measuring frequencies in the range 2 to 30 MHz to an accuracy of $\pm 2$ Hz.<br>Suitable instrument: Racal 9024 Counter              |

| <u>Item</u> | <u>Description</u>  |
|-------------|---|
| RF Gen.     | An RF signal generator with the following essential characteristics:<br>Frequency to include            2 MHz to 30 MHz<br>Frequency setting accuracy $\pm 10$ kHz<br>Output voltage                    20 $\mu$ V to 200 mV<br>Output voltage accuracy $\pm 1.2$ dB<br>Output impedance                 50 ohms<br>Suitable instrument: Marconi TF144H/4 |
| DVM         | A digital voltmeter with the following essential characteristics:<br>Range and accuracy              10V, 0.02% reading $\pm$ 0.005% fsd<br>100V, $\pm$ 0.025% reading $\pm$ 0.005% fsd<br>Input impedance                  10 kMohms on 0-10V scale<br>10 Mohms on 0-100V scale<br>Suitable instrument: Solartron A203/204                               |
| PM          | A power meter with the following essential characteristics:<br>Frequency to include              2 MHz to 30 MHz<br>Range                                0-50 watts<br>Accuracy $\pm 5\%$<br>VSWR                                 1.05 maximum<br>Suitable instrument: Bird ThruLine Type 45 with plug-in Type 50H and Load Type 808C                     |
| RF mV       | An RF millivoltmeter having the following essential characteristics:<br>Voltage and dB ranges            1V (+10 dBm)<br>3V (+20 dBm)<br>Frequency range                    to include 2.5 MHz to 30 MHz<br>Accuracy $\pm 1\%$ of reading<br>$\pm 2\%$ of fsd<br>Input impedance                  50 ohms<br>Suitable instrument: Marconi TF2604          |
| Attenuator  | A fixed value attenuator having the following essential characteristics:<br>Attenuation                         30 dB $\pm$ 1.2 dB<br>Power rating                        30 watt<br>Input/output impedance          50 ohms<br>Suitable instrument: Ottawa Electronique OTT.70-1120-14   |
| 24V PSU     | A power supply with the following essential characteristics:<br>Stabilised voltage                 24V $\pm$ 0.1V<br>Current limit                        500 mA to 5A<br>Suitable instrument: Farnell TSV70-Mk2  |

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| 6V PSU      | A power supply with the following essential characteristics: |
|             | Stabilised voltage                      6V $\pm$ 0.1V        |
|             | Current limit                              220 mA            |
|             | Suitable instrument: Farnell L30B:L30DT                      |

Preliminary

17. Connect the test jig to the test interface and connect the test interface to the manual interface controller.
18. At the manual interface controller:
  - (1) Ensure that the DC MONITOR switch is set to EXT and that the test selection switches are set to 000.
  - (2) Connect the Avo to the socket marked AVO.
  - (3) Connect the DVM to the socket marked DVM.
  - (4) Connect the RF Gen to the socket marked SG1.
19. Connect the counter to RF Gen normal output via a 10 dB attenuator.
20. Load the UUT (unit under test) into the jig and secure by means of the clamps. Fit the two multiway connectors to 2PL1 and 2PL2 of the UUT. Connect the power meter to socket T/R of the UUT.
21. At the UUT, remove the reflectometer cover. Adjust R43 and R34 on Unit 2a fully anti-clockwise.
22. Fit the special wheel provided so that it fits over the end of the spindle projecting from the PA Filter casting. The range number selected appears opposite to the connector 2PL1. Select Range 1.
23. At the manual interface controller:
  - (1) Connect the 6V supply to the socket marked EXT A.

(2) Connect the 24V supply to the socket marked EXT B. Connect the sense terminals on the 24V supply unit to the sense leads and remove any shorting links on the power supply terminals.

24. Switch on mains power to all test instruments where applicable.

Notes relating to test connections

The above connections provide the following at the UUT:

24V supply + rail to 2PL1 pins 6, 10, 11

6V supply + rail to 2PL1 pin 7 and 2PL2 pin 10

24V & 6V supply - rail to 2PL1 pins 5, 8

2PL2 pins 2, 3

2PL1 pin 3 (HP modes only)

2PL2 pin 5 (LP modes only)

RF Gen to 2PL2/A1

Avo in series with either 24V + rail or 6V + rail according to test.

Test procedures

CAUTIONS: 1. DAMAGE TO THE POWER AMPLIFIER MAY RESULT IF THE RF GENERATOR OUTPUT IS NOT SET TO LESS THAN 1 mV BEFORE EITHER:

(1) CHANGING PA FILTER RANGE.

(2) CHANGING SIGNAL GENERATOR OUTPUT FREQUENCY.

2. DAMAGE TO THE POWER AMPLIFIERS WILL RESULT IF THE POWER TRANSISTORS ARE NOT KEPT IN PHYSICAL CONTACT WITH THE ASSOCIATED HEAT SINK.

25. Carry out the procedures given on the following pages, in each case strictly observe the indicated sequence.

| TEST No.                           | STEP | UNIT      | RANGE | LIMITS           | INSTRUCTIONS   |
|------------------------------------|------|-----------|-------|------------------|--|
| 000                                | (a)  | INT. CON. | -     | -                | Depress "Press to Test" button.  |
| <u>SET CURRENT LIMIT</u>           |      |           |       |                  |  |
| 001                                | (a)  | PSU       | -     | -                | Set 24V power supply to zero volts output and current limit to a minimum. Set 6V power supply to 6V output.  |
|                                    | (b)  | INT. CON. | -     | -                | Depress "Press to Test" button.  |
|                                    | (c)  | AVO       | 1A    | 485 mA to 515 mA | Increase 24V Power Supply output voltage a small amount and set current limit control to indicate on AVO a reading of 500 mA.  |
|                                    | (d)  | PSU       | -     | -                | Set 6V Power Supply to zero volts output and set current limit to a minimum. Fit a shorting link across 6V Power Supply Terminals. Switch Power Supply to read current on meter. |
|                                    | (e)  | PSU       | 1A    | 245 mA to 255 mA | Increase output voltage a small amount and set current limit control to indicate a reading of 250 mA on meter.<br>Remove shorting link.  |
| 002                                | (a)  | INT. CON. | -     | -                | Depress "Press to Test" button.  |
|                                    | (b)  | DVM       | 10V   | 5.901V to 6.099V | Adjust 6.0V Power Supply to indicate on DVM a reading of 6.0 volts.  |
| 004                                | (a)  | DVM       | 100V  | -                | Set DVM to 100V range.   |
|                                    | (b)  | INT. CON. | -     | -                | Depress "Press to Test" button.  |
|                                    | (c)  | DVM       | 100V  | 23.91V to 24.09V | Adjust 24V Power Supply to indicate on DVM reading of 24.0 volts.  |
| <u>SET PA BIAS AND DRIVER BIAS</u> |      |           |       |                  |  |
| 006                                | (a)  | INT. CON. | -     | -                | Depress "Press to Test" button.  |



Notes relating to tests 000 - 022

The aim of these procedures is to ensure the correct settings of potentiometers in Unit 2a. However, a fault condition in the UUT (e.g. open circuit or short circuit connection etc) could result in damage to the PA transistors if precautions were not taken.

Accordingly, the tests proceed in a sequence commencing at the lowest power condition (2aR43 and 2aR34 set in para.21, and in LP mode) and finishing at the highest power condition; before each adjustment, the PSU current limits are set so that any tendency of the UUT to draw current in excess of that anticipated will trip the PSU before damage will occur. At each step, the actual current drain is checked - if the current is outside limits, or if the PSU trips, abandon the test and repair the fault.

The majority of these test procedures are the current limit setting, the remainder are the actual adjustments thus:

Test 008 2aR43 and 2aR34 bias controls are set to give specified 24V line current levels on LP mode.

Test 016 2aR2 is initially set to give max. PA gain on HP mode and a very low level RF input applied, this level being advanced until a specified mean power output on HP mode is obtained. With this RF input level, 2aR2 is adjusted to reduce the PA gain to an appropriate level - making it safe to proceed.

Test 022 - Final adjustment of 2aR2 to provide the correct peak-emitted-power (PEP) with a 100 mV RF input.

| TEST No.              | STEP | UNIT         | RANGE           | LIMITS                | INSTRUCTIONS  |
|-----------------------|------|--------------|-----------------|-----------------------|---|
| 006<br>(cont)         | (b)  | AVO          | 1A              | 0.18A to<br>0.221A    | Check the 6 volt line current.  |
| 008                   | (a)  | INT.<br>CON. | -               | -                     | Depress "Press to Test" button.   |
|                       | (b)  | AVO          | 100 mA          | 18.4 mA<br>to 32.4 mA | Note the 24 volt line current.  |
|                       | (c)  | AVO          | 100 mA          | 30.4 mA<br>to 48.4 mA | Adjust 2aR34 on UUT to give an increase of<br>14 mA on 008(b). Note the Avo reading.  |
|                       | (d)  | AVO          | 100 mA<br>or 1A | 82 to<br>107 mA       | Adjust 2aR43 on UUT to give an increase of<br>55 mA on 008(c). Check Avo reading is with-<br>in limits.                                     |
| <u>ALC ADJUSTMENT</u> |      |              |                 |                       |   |
| 010                   | (a)  | PSU          | -               | -                     | Set 24V Power Supply to zero volts output<br>and current limit to a minimum.  |
|                       | (b)  | AVO          | 10A             | -                     | Set Avo to 10 amps dc range.  |
|                       | (c)  | INT.<br>CON. | -               | -                     | Depress "Press to Test" button.   |
|                       | (d)  | AVO          | 10A             | 2.5A                  | Increase 24V Power Supply output voltage a<br>small increment and set current limit<br>control to indicate on Avo a reading of<br>2.5 Amps. |
| 012                   | (a)  | INT.<br>CON. | -               | -                     | Depress "Press to Test" button.   |
|                       | (b)  | DVM          | 10V             | 5.901V to<br>6.099V   | Set DVM to 10V range. Adjust 6V Power<br>Supply to indicate on DVM a reading of 6.0<br>volts.   |
| 014                   | (a)  | DVM          | 100V            | -                     | Set DVM to 100V range.  |
|                       | (b)  | INT.<br>CON. | -               | -                     | Depress "Press to Test" button.   |
|                       | (c)  | DVM          | 100V            | 23.91V to<br>24.09V   | Adjust 24V Power Supply to indicate on DVM<br>a reading of 24.0 volts.  |

| TEST No. | STEP | UNIT      | RANGE | LIMITS                   | INSTRUCTIONS   |
|----------|------|-----------|-------|--------------------------|--|
| 016      | (a)  | INT. CON. | -     | -                        | Depress "Press to Test" button.  |
|          | (b)  | COUNTER   | -     | 2.490000 to 2.509998 MHz | Set RF Gen to indicate on Counter a frequency of 2.5 MHz.  |
|          | (c)  | RF GEN.   | -     | Set 20 $\mu$ V           | Set RF Gen output controls to 20 and 20 $\mu$ V output.  |
|          | (d)  | UUT       | -     | -                        | Set 2aR2 on UUT to the fully clockwise position. Set PA Filter to range 1.   |
|          | (e)  | PM        | 10W   | 14.25 to 15.75 watts     | Increase RF Gen output voltage to give an indication on Power Meter of 15 watts.   |
|          | (f)  | AVO       | 10A   | 1.4A to 1.8A             | Check 24 volt line current.  |
|          | (g)  | PM        | 50W   | 9.5 to 10.5 watts        | Adjust 2aR2 on UUT to give PM reading of 10W.  |
| 018      | (a)  | PSU       | -     | -                        | Set 24V Power Supply to zero volts output and current limit to a minimum.  |
|          | (b)  | INT. CON. | -     | -                        | Depress "Press to Test" button.  |
|          | (c)  | AVO       | 10A   | 5A                       | Increase 24V Power Supply output voltage a small increment and set current limit control to indicate on Avo a reading of 5A. |
| 020      | (a)  | INT. CON. | -     | -                        | Depress "Press to Test" button.  |
|          | (b)  | DVM       | 100V  | 23.91 to 24.09V          | Adjust 24V Power Supply to indicate on DVM a reading of 24 volts.  |

| TEST No.   | STEP | UNIT      | RANGE | LIMITS                    | INSTRUCTIONS  |
|--|------|-----------|-------|---------------------------|---|
| 022  | (a)  | INT. CON. | -     | -                         | Depress "Press to Test" button.   |
|  | (b)  | PM        | 50W   | 28.75W to 29.25W          | Set RF Gen output voltage to 100 mV, switch off carrier and wait for at least 10 secs. Switch on carrier and note the 'steady peak value' on the Power Meter. Repeat this operation a number of times and adjust 2aR2 on the UUT each time until the Power Meter reading is 29 watts. |
| <p><u>NOTES:</u> 'Steady peak value'. At carrier switch on the power rapidly rises to the steady peak value in approx. 0.1 to 1 sec. The power then falls to the 'steady rms value'.</p> <p>Tests 022(c)-(j), 024, 026, 028 check the PEP at various frequency levels on HP and LP modes. The reduction of RF Gen output level before changing frequency and PA Filter range is essential if damage to the UUT is to be avoided.</p> |      |           |       |                           |   |
| <u>HP OUTPUT AT 10 MHz</u>   |      |           |       |                           |   |
|  | (c)  | RF GEN.   | -     | -                         | Reduce output voltage of RF Gen to below 1 mV.  |
|  | (d)  | UUT       | -     | -                         | Set PA Filter to range 4.   |
|  | (e)  | COUNTER   | -     | 9.990002 to 10.009998 MHz | Set RF Gen to indicate on Counter a frequency of 10 MHz.  |
|  | (f)  | PM        | 50W   | 22.5W to 30.5W            | Set output voltages of RF Gen to 100 mV, switch off carrier and wait at least 10 secs. Switch on carrier and check the 'steady peak value' as indicated on Power Meter.   |
| <u>HP OUTPUT AT 30 MHz</u>   |      |           |       |                           |   |
|  | (g)  | RF GEN.   | -     | -                         | Reduce output voltage of RF Gen to below 1 mV.  |
|  | (h)  | UUT       | -     | -                         | Change PA Filter to range 6.  |

| TEST No.                   | STEP | UNIT      | RANGE           | LIMITS                              | INSTRUCTIONS  |
|----------------------------|------|-----------|-----------------|-------------------------------------|---|
| 022<br>(cont)              | (i)  | COUNTER   | -               | 29.990002<br>to<br>30.009998<br>MHz | Set RF Gen to indicate on Counter a frequency of 30 MHz.  |
|                            | (j)  | PM        | 50W             | 22.5W to<br>30.5W                   | Repeat 022(f).  |
| <u>LP OUTPUT AT 30 MHz</u> |      |           |                 |                                     |   |
| 024                        | (a)  | RF GEN.   | -               | -                                   | Reduce the output voltage of the RF Gen to below 1 mV.  |
|                            | (b)  | -         | -               | -                                   | Disconnect the Power Meter from the UUT. Connect the RF millivoltmeter via the 30 dB Attenuator to the T/R socket of the UUT.                         |
|                            | (c)  | RF mV     | +20 dBm<br>(3V) | -                                   | Set the RF millivoltmeter to the +20 dBm (3V) range.  |
|                            | (d)  | INT. CON. | -               | -                                   | At the Interface Controller, select TEST 022 and depress the "Press to Test" button.  |
|                            | (e)  | RF mV     | +20 dBm<br>(3V) | REF                                 | Set output of RF Gen to 100 mV and switch carrier off for at least 10 seconds. Switch carrier on and note the dB reading of the RF mV as a reference. |
|                            | (f)  | INT. CON. | -               | -                                   | At the Interface Controller, select TEST 024 and depress the "Press to Test" button.  |
|                            | (g)  | RF mV     | +10 dBm<br>(1V) | -                                   | Subtract the RF mV dB reading from REF ((e) above) and check the difference is between 9.3 dB and 12.7 dB.  |
| <u>LP OUTPUT AT 10 MHz</u> |      |           |                 |                                     |   |
| 026                        | (a)  | RF GEN.   | -               | -                                   | Reduce the output voltage of the RF Gen to below 1 mV.  |
|                            | (b)  | UUT       | -               | -                                   | Set the PA Filter to range 4.   |
|                            | (c)  | COUNTER   | -               | 9.99002 to<br>10.009998<br>MHz      | Set the RF Gen to indicate a frequency of 10 MHz on the Counter.  |
|                            | (d)  | RF mV     | -               | REF                                 | Repeat operation 024(c) to 024(e) inclusive.  |

| TEST No.                           | STEP | UNIT         | RANGE           | LIMITS                         | INSTRUCTIONS  |
|------------------------------------|------|--------------|-----------------|--------------------------------|---|
| 026<br>(cont)                      | (e)  | INT.<br>CON. | -               | -                              | At the Interface Controller, select TEST 026 and depress the "Press to Test" button. Subtract the RF mV dB reading from REF ((d) above) and check the difference is between 9.3 dB and 12.7 dB. |
|                                    | (f)  | RF mV        | +10 dBm<br>(1V) | -                              |   |
| <u>LP OUTPUT AT 2.5 MHz</u>        |      |              |                 |                                |   |
| 028                                | (a)  | RF<br>GEN.   | -               | -                              | Reduce the output voltage of the RF Gen to below 1 mV.  |
|                                    | (b)  | UUT          | -               | -                              | Set the PA Filter to range 1.   |
|                                    | (c)  | COUNTER      | -               | 2.490002 to<br>2.50998 MHz     | Set the RF Gen to indicate a frequency of 2.5 MHz on the Counter.   |
|                                    | (d)  | RF mV        | -               | REF                            | Repeat operations 024(c) to 024(e) inclusive.   |
|                                    | (e)  | INT.<br>CON. | -               | -                              | At the Interface Controller, select TEST 028 and depress the "Press to Test" button.  |
|                                    | (f)  | RF mV        | +10 dBm<br>(1V) | -                              | Subtract the RF mV dB reading from REF ((d) above) and check the difference is between 9.3 dB and 12.7 dB.  |
|                                    | (g)  | RF<br>GEN.   | -               | -                              | Reduce the RF Gen output to less than 1 mV. Disconnect the RF mV and 30 dB attenuator from the RF socket of the UUT. Connect the Power Meter to the T/R socket on UUT.                          |
| <u>ALC CONTROL AND SENSITIVITY</u> |      |              |                 |                                |   |
| 030                                | (a)  | COUNTER      | -               | 1.990002 to<br>2.009998<br>MHz | Set RF Gen to 20 $\mu$ V output voltage and 2 MHz as indicated on Counter.  |
|                                    | (b)  | INT.<br>CON. | -               | -                              | Depress "Press to Test" button.   |
|                                    | (c)  | RF<br>GEN.   | -               | 9.2 mV to<br>28.8 mV           | Note the RF Gen output voltage setting required to indicate on Power Meter a reading of 7.5 watts.  |
|                                    |      | PM           | -               | 7.2W to<br>7.8W                |   |
| (d)                                | AVO  | 10A          | NGT 1.7A        | Check 24V line current.        |   |

Notes relating to tests 030 - 040

These tests check the response of the ALC. Tests 030 - 034 are carried out with a 2 MHz carrier input and tests 036 - 040 are similar tests carried out with a 25 MHz carrier input.

Test 030 (036) Preparatory procedure to determine RF input level required to obtain a specified mean power output on HP mode.

Test 032 (038) Check of response of ALC to the switching on of a carrier input level 10 dB greater than the reference level determined in test 030 (036).

Test 034 (040) Check that, with the carrier input level used in 032 (038), the mean power output, and current drain, on LP mode is within limits.

| TEST No. | STEP | UNIT      | RANGE        | LIMITS         | INSTRUCTIONS  |
|----------|------|-----------|--------------|----------------|---|
| 032      | (a)  | INT. CON. | -            | -              | Remove AVO plug from side of Interface Controller.  |
|          | (b)  | INT. CON. | -            | -              | Depress "Press to Test" button.   |
|          | (c)  | DVM       | 100V         | NGT 14.191V    | With RF Gen output voltage set as 030(c), interrupt the carrier and increase the RF level by 10 dB. Restore carrier and check the maximum DVM reading.  |
|          | (d)  | PM        | 50W          | 8.8W to 13.2W  | With RF Gen output condition as in 032(c), check the Power Meter reading 5 secs after carrier switch-on.  |
|          | (e)  | RF GEN.   | -            | -              | Switch off the RF carrier at the RF Gen (do NOT alter the Sig. Gen. output setting). Disconnect the Power meter from the UUT and connect the RF millivoltmeter via the 30 dB Attenuator to the T/R socket of the UUT. |
|          | (f)  | RF mV     | +20 dBm (3V) | -              | Set the RF mV to the +20 dBm (3V) range.  |
|          | (g)  | RF mV     | -            | REF            | Switch on the RF carrier and note the dB reading of the RF mV after 5 seconds from carrier switch-on.   |
| 034      | (a)  | AVO       | 1A           | -              | Set Avo to dc 1A range.   |
|          | (b)  | INT. CON. | -            | -              | Connect Avo to Interface Controller.  |
|          | (c)  | INT. CON. | -            | -              | Depress "Press to Test" button.   |
|          | (d)  | RF mV     | -            | -              | With RF Gen condition as in 032(c), note RF mV reading 10 secs after carrier switch-on. Check that the value is between 9.5 and 12.3 dB down on noted value of 032(g).  |
|          | (e)  | AVO       | 1A           | 0.31A to 0.79A | Check 24V line current.   |
|          | (f)  | RF GEN.   | -            | -              | Reduce the RF Gen output to less than 1 mV. Disconnect the RF mV and 30 dB attenuator from the T/R socket of UUT. Connect the Power Meter to the T/R socket.  |



| TEST No. | STEP | UNIT          | RANGE        | LIMITS                            | INSTRUCTIONS  |
|----------|------|---------------|--------------|-----------------------------------|---|
| 036      | (a)  | AVO           | 10A          | -                                 | Set AVO to dc 10A range.  |
|          | (b)  | RF GEN.       | -            | Set 20 $\mu$ V                    | Set RF Gen output voltage to 20 $\mu$ V.  |
|          | (c)  | UUT           | -            | -                                 | Set PA Filter to range 6.   |
|          | (d)  | COUNTER       | -            | 24.990002 to 25.009998 MHz        | Set RF Gen to indicate on Counter a frequency of 25 MHz.  |
|          | (e)  | INT. CON.     | -            | -                                 | Depress "Press to Test" button.   |
|          | (f)  | RF GEN.<br>PM | -            | 9.2 mV to 28.8 mV<br>7.2W to 7.8W | Note the RF Gen output voltage setting to give an indication of 7.5 watt on Power Meter.  |
|          | (g)  | AVO           | 10A          | NGT 1.7A                          | Check 24V line current.   |
| 038      | (a)  | INT. CON.     | -            | -                                 | Remove AVO plug from side of Interface Controller.  |
|          | (b)  | INT. CON.     | -            | -                                 | Depress "Press to Test" button.   |
|          | (c)  | DVM           | 100V         | NGT 14.191V                       | With RF Gen output voltage set as 036(f), interrupt the carrier and increase the RF level by 10 dB. Restore carrier and record DVM maximum reading.   |
|          | (d)  | PM            | 50W          | 8.8W to 13.2W                     | With RF Gen output conditions as 038(c), check the Power Meter reading 5 secs after carrier switch-on.  |
|          | (e)  | RF GEN.       | -            | -                                 | Switch off the RF carrier at the RF Gen (do NOT alter the Sig. Gen. output setting). Disconnect the Power Meter from the UUT and connect the RF millivoltmeter via the 30 dB Attenuator to the T/R socket of the UUT. |
|          | (f)  | RF mV         | +20 dBm (3V) | -                                 | Set the RF mV to the +20 dBm (3V) range.  |
|          | (g)  | RF mV         | -            | REF                               | Switch on the RF carrier and note the dB reading of the RF mV after 5 seconds from carrier switch-on.   |

| TEST No.   | STEP  | UNIT      | RANGE | LIMITS         | INSTRUCTIONS   |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|--|-------|-----------|-------|----------------|--|-----------|-------|--------------------------|---|--------------------------|---|---------------------------|---|----------------------------|---|----------------------------|---|
| 040  | (a)   | AVO       | 1A    | -              | Set AVO to dc 1A range.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (b)   | INT. CON. | -     | -              | Connect AVO to Interface Controller.   |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (c)   | INT. CON. | -     | -              | Depress "Press to Test" button.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (d)   | RF mV     | -     | -              | With RF Gen condition as in 038(c) note RF mV dB reading 10 secs after carrier switch-on. Check that the value is between 9.5 and 12.3 dB down on the value noted in 038(g). |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (e)   | AVO       | 1A    | 0.31A to 0.79A | Check 24V line current.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (f)   | RF GEN.   | -     | -              | Set RF Gen output to minimum.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (g)   | -         | -     | -              | Disconnect the RF mV and 30 dB attenuator from the T/R socket. Connect the Power Meter to the T/R socket.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| <p>Repeat tests 036, 038, 040 for each of the following carrier frequencies, in each case setting the PA Filter to the appropriate range thus:</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>3.990002 to 4.009998 MHz</td> <td>2</td> </tr> <tr> <td>6.490002 to 6.509998 MHz</td> <td>3</td> </tr> <tr> <td>9.990002 to 10.010002 MHz</td> <td>4</td> </tr> <tr> <td>15.990002 to 16.010002 MHz</td> <td>5</td> </tr> <tr> <td>29.890002 to 29.909998 MHz</td> <td>6</td> </tr> </tbody> </table> |       |           |       |                |  | Frequency | Range | 3.990002 to 4.009998 MHz | 2 | 6.490002 to 6.509998 MHz | 3 | 9.990002 to 10.010002 MHz | 4 | 15.990002 to 16.010002 MHz | 5 | 29.890002 to 29.909998 MHz | 6 |
| Frequency  | Range |           |       |                |  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| 3.990002 to 4.009998 MHz   | 2     |           |       |                |  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| 6.490002 to 6.509998 MHz   | 3     |           |       |                |  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| 9.990002 to 10.010002 MHz  | 4     |           |       |                |  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| 15.990002 to 16.010002 MHz   | 5     |           |       |                |  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| 29.890002 to 29.909998 MHz   | 6     |           |       |                |  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
| 042  | (a)   | INT. CON. | -     | -              | Depress "Press to Test" button.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |
|  | (b)   | UUT       | -     | -              | Remove Unit Under Test from Test Jig. Replace Reflectometer cover on UUT.  |           |       |                          |   |                          |   |                           |   |                            |   |                            |   |

REPAIR POLICY

26. The tests given in this section must be carried out in full after assembly of any of the power amplifier, reflectometer and PA filters to the rear panel. The tests can also be used as an aid to locating a faulty component on the power amplifier unit; any unit other than the power amplifier can be diagnosed as faulty when testing the complete radio, removed from the rear panel and separately tested as given in the relevant section of this part of the manual.

NOTE: The RF decoupling unit (Unit 2g) can be tested without removal from the rear panel.

27. The tests given in this section do not check either the VHF filter (Unit 2h) or the RF decoupling unit (Unit 2g). They are independent of each other and the other circuits on the rear panel, since they are functionally checked when testing the complete radio and fully checked after repair by the separate test facilities, there is no requirement to perform any test on these items when the rear panel is separated from the radio.

28. Any sub-assembly which can be separately tested should not be removed for a routine check of the sub-assembly.

ASSEMBLY/DISASSEMBLY

29. For assembly/disassembly of the Rear Panel Assembly refer to the Assembly/Disassembly procedures for the Receiver/Transmitter given in Part 2 of this manual.

COMPONENTS LIST

30. For location of the principal sub-assemblies of the Rear Panel Assembly, and the associated components list, refer to the section relating to the second line servicing of the Receiver/Transmitter (Part 2 of this manual).

31. For detailed breakdown of Unit 2a, refer to the following pages. For detailed breakdown of sub-assemblies other than Unit 2a, refer to the relevant sections of this part of the manual.

COMPONENTS LIST FOR  
POWER AMPLIFIER - PEC (Unit 2a)  
419/1/11820 (refer to Fig.3 and 4)

| Cct Ref | Description                    | Reference No.   |
|---------|--------------------------------|-----------------|
|         | <u>Resistors</u>               |                 |
| R1      | 4.7 kohm $\pm$ 5%              | 403/4/78126/065 |
| R2      | 2 kohm $\pm$ 10% 0.5w variable | 404/9/05032/004 |
| R3      | 220 ohm $\pm$ 5%               | 403/4/78126/033 |
| R4      | 100 ohm $\pm$ 5%               | 403/4/78126/025 |
| R5      | 27 kohm $\pm$ 1%               | 403/4/78126/283 |
| R6      | 2.7 kohm $\pm$ 1%              | 403/4/78126/259 |
| R7      | 1 kohm $\pm$ 5%                | 403/4/78126/049 |
| R8      | 47 ohm $\pm$ 5%                | 403/4/78126/017 |
| R9      | 75 ohm $\pm$ 5%                | 403/4/78126/022 |
| R10     | 220 ohm $\pm$ 5%               | 403/4/78126/033 |
| R11     | 2.7 kohm $\pm$ 5%              | 403/4/78126/059 |
| R12     | 680 ohm $\pm$ 5%               | 403/4/78126/045 |
| R13     | 68 ohm $\pm$ 5%                | 403/4/78126/021 |
| R14     | 390 ohm $\pm$ 5%               | 403/4/78126/039 |
| R15     | 33 ohm $\pm$ 5%                | 403/4/78126/013 |
| R16     | 12 ohm $\pm$ 5%                | 403/4/78126/003 |
| R17     | 12 ohm $\pm$ 5%                | 403/4/78126/003 |
| R18     | 6.2 ohm $\pm$ 2%               | 403/9/05026/001 |
| R19     | 18 ohm $\pm$ 5%                | 403/4/78126/007 |
| R20     | 18 ohm $\pm$ 5%                | 403/4/78126/007 |
| R21     | 6.2 ohm $\pm$ 2%               | 403/9/05026/001 |
| R22     | 47 ohm $\pm$ 5%                | 403/4/78126/017 |
| R23     | 47 ohm $\pm$ 5%                | 403/4/78126/017 |
| R24     | 1 kohm $\pm$ 5%                | 403/4/78127/049 |
| R25     | 1.5 kohm $\pm$ 5%              | 403/4/78126/053 |
| R26     | 390 ohm $\pm$ 5%               | 403/4/78126/039 |
| R27     | 68 ohm $\pm$ 5%                | 403/4/78126/021 |
| R28     | 1.8 kohm $\pm$ 5%              | 403/4/78126/055 |
| R29     | 4.7 ohm $\pm$ 5% 0.5w          | 403/9/03540/002 |
| R30     | 4.7 ohm $\pm$ 5% 0.5w          | 403/9/03540/002 |
| R31     | 4.7 kohm $\pm$ 5%              | 403/4/78126/065 |
| R32     | 68 ohm $\pm$ 5%                | 403/4/78126/021 |
| R33     | 3.3 kohm $\pm$ 5%              | 403/4/78126/061 |
| R34     | 2 kohm $\pm$ 10% 0.5w variable | 404/9/05032/004 |
| R35     | 4.7 ohm $\pm$ 5% 0.5w          | 403/9/03540/002 |
| R36     | 1.0 ohm $\pm$ 10% 0.5w         | 403/9/03540/001 |
| R37     | 68 ohm $\pm$ 5% 6w wirewound   | 403/4/78265/029 |
| R38     | 680 ohm $\pm$ 5%               | 403/4/78126/045 |
| R39     | 330 ohm $\pm$ 5%               | 403/4/78126/037 |
| R40     | 2.2 kohm $\pm$ 5%              | 403/4/78126/057 |

| Cct Ref | Description                    | Reference No.   |
|---------|--------------------------------|-----------------|
| R41     | 4.7 kohm $\pm$ 5%              | 403/4/78126/065 |
| R42     | 3.3 kohm $\pm$ 5%              | 403/4/78126/061 |
| R43     | 2 kohm $\pm$ 10% 0.5w variable | 404/9/05032/004 |
| R44     | 220 ohm $\pm$ 5%               | 403/4/78126/033 |
| R45     | 47 ohm $\pm$ 5%                | 403/4/78126/017 |

Capacitors

|                  |                                  |                 |
|------------------|----------------------------------|-----------------|
| C1               | 150uF $\pm$ 10% 6v electrolytic  | 402/4/98049/005 |
| C2               | 100uF $\pm$ 10% 10v electrolytic | 402/4/98049/019 |
| C3               | 150uF $\pm$ 10% 6v electrolytic  | 402/4/98049/005 |
| C4               | 100nF $\pm$ 20% 100v             | 400/9/19083/136 |
| C5               | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C6               | 2.2nF $\pm$ 10% 100v             | 400/9/19083/030 |
| C7               | 10nF $\pm$ 20% 100v              | 400/9/19083/121 |
| C8               | 10nF $\pm$ 20% 100v              | 400/9/19083/121 |
| C9               | 470nF +80% -20% 50v              | 400/9/19084/109 |
| C10              | 4.7nF +80% -20% 100v             | 400/9/19084/070 |
| C11              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C12              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C13              | 4.7nF +80% -20% 100v             | 400/9/19084/070 |
| C14              | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C15              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C16              | 560pF $\pm$ 10% 100v             | 400/9/19082/099 |
| C17 to C20       | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C21, C22         | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C23              | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C24              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C25, C26         | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C27              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C28, C29         | 10nF $\pm$ 20% 100v              | 400/9/19083/121 |
| C30, C31         | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C32              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C33              | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C34, C35         | 47pF $\pm$ 5% 100v               | 400/9/19082/018 |
| C36              | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C37              | not used                         |                 |
| C38, C39         | 470nF +80% -20% 50v              | 400/9/19084/109 |
| C40              | 4.7uF $\pm$ 20% 35v electrolytic | 402/4/98049/088 |
| C41              | 10pF $\pm$ 5% 100v               | 400/9/19082/002 |
| C42              | 56pF $\pm$ 10% 350v silver mica  | 438/9/30100/016 |
| C43              | 4.7nF +80% -20% 100v             | 400/9/19084/070 |
| C44, C45         | 220pF $\pm$ 5% 100v              | 400/9/19082/032 |
| C46, C47         | 68pF $\pm$ 10% 100v              | 400/9/19082/82  |
| <u>Inductors</u> |                                  |                 |
| L1, L2           | Inductor 18uH $\pm$ 10%          | 406/9/08470/027 |
| L3               | Inductor 56uH $\pm$ 10%          | 406/9/08490/030 |
| L4, L5           | Inductor 4.7uH $\pm$ 10%         | 406/9/08470/020 |

| Cct Ref                       | Description                    | Reference       |
|-------------------------------|--------------------------------|-----------------|
| L6, L7                        | Inductor 56uH + 10%            | 406/9/08490/030 |
| L8                            | Inductor 33uH + 10%            | 406/9/26031     |
| L9, L10                       | Inductor 4.7uH + 10%           | 406/9/08470/020 |
| L11                           | Inductor 6.2uH + 10%           | 406/8/11123     |
| L12                           | Inductor 18uH                  | 406/9/08450/024 |
| <u>Semi-conductor devices</u> |                                |                 |
| TR1                           | Transistor CV 7648             | 990/4/00107/648 |
| TR2 to TR4                    | Transistor CV 7555             | 990/4/00107/555 |
| TR5                           | Transistor CV 7644             | 990/4/00107/644 |
| TR6, TR7                      | Transistor 2N 3553             | 417/4/02078     |
| TR8, TR9                      | Transistor CV 7723             | 990/4/00107/723 |
| TR10, TR11                    | Transistor CV 7644             | 990/4/00107/644 |
| TR12, TR13                    | Transistor 2N 5070             | 417/4/00245     |
| TR14                          | Transistor CV 7648             | 990/4/00107/648 |
| D1 to D4                      | Diode CV 7367                  | 990/4/00107/367 |
| ML1                           | Integrated circuit CN 595 D.P. | 446/4/00452     |
| ML2                           | Integrated circuit CN 599T     | 446/4/00421     |
| <u>Transformers</u>           |                                |                 |
| T1                            | Transformer                    | 406/8/11031/004 |
| T2                            | Transformer                    | 406/8/11031/005 |
| T3                            | Transformer                    | 406/8/11031/006 |
| T4                            | Transformer                    | 406/8/11032/007 |
| T5                            | Transformer                    | 406/8/11099     |
| <u>Miscellaneous</u>          |                                |                 |
| 2PL2                          | Plug, electrical               | 508/9/21629     |
|                               | Heat sink assembly             | 640/1/14919     |
|                               | Heat sink adaptor TO-5         | 418/9/37021/001 |
|                               | Heat sink adaptor TO-18        | 418/9/37022/002 |
|                               | Nut 10-32 UNF st. st.          | 991/4/00474/014 |

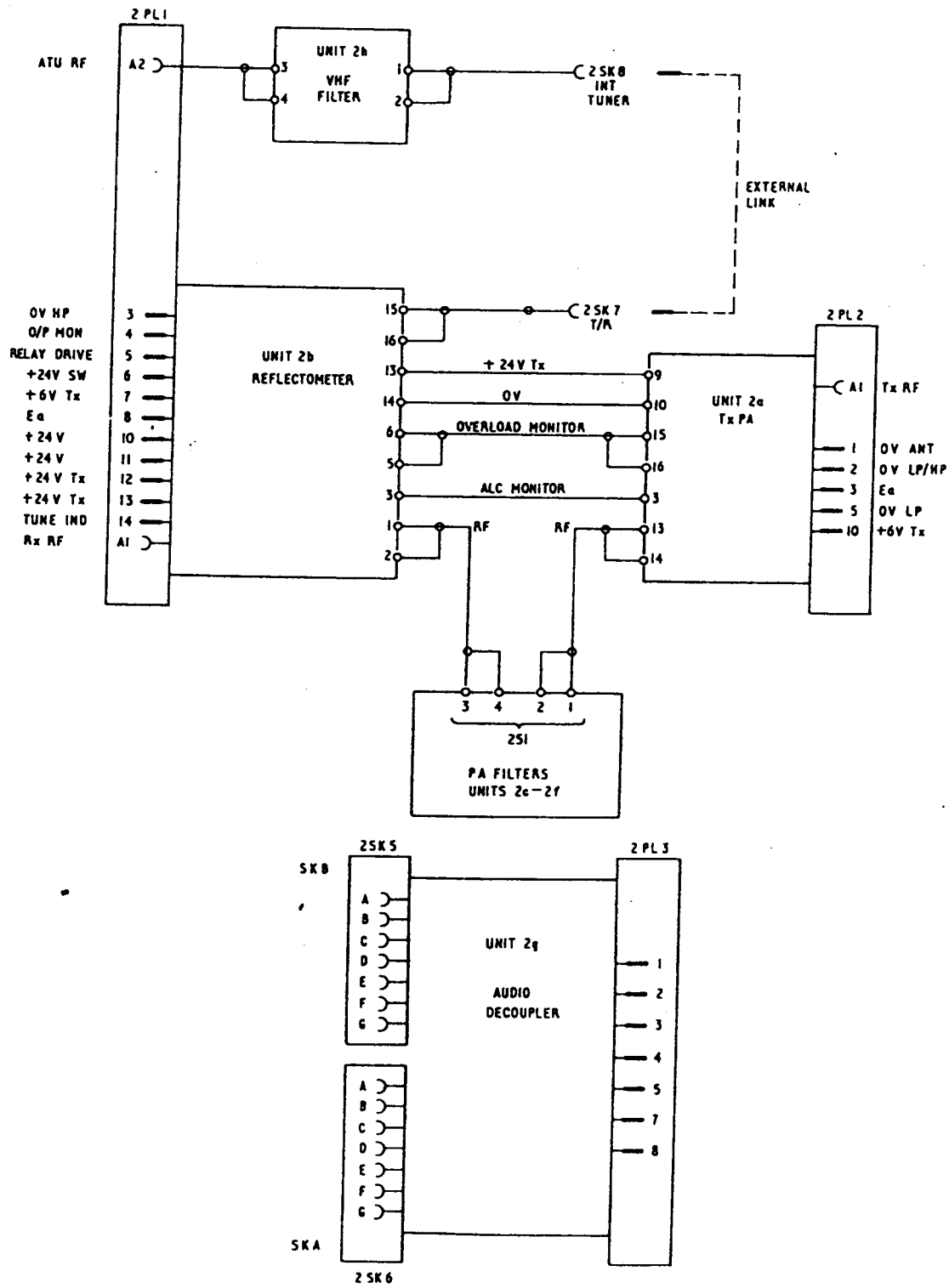


Fig.1 Unit 2 - Circuit diagram

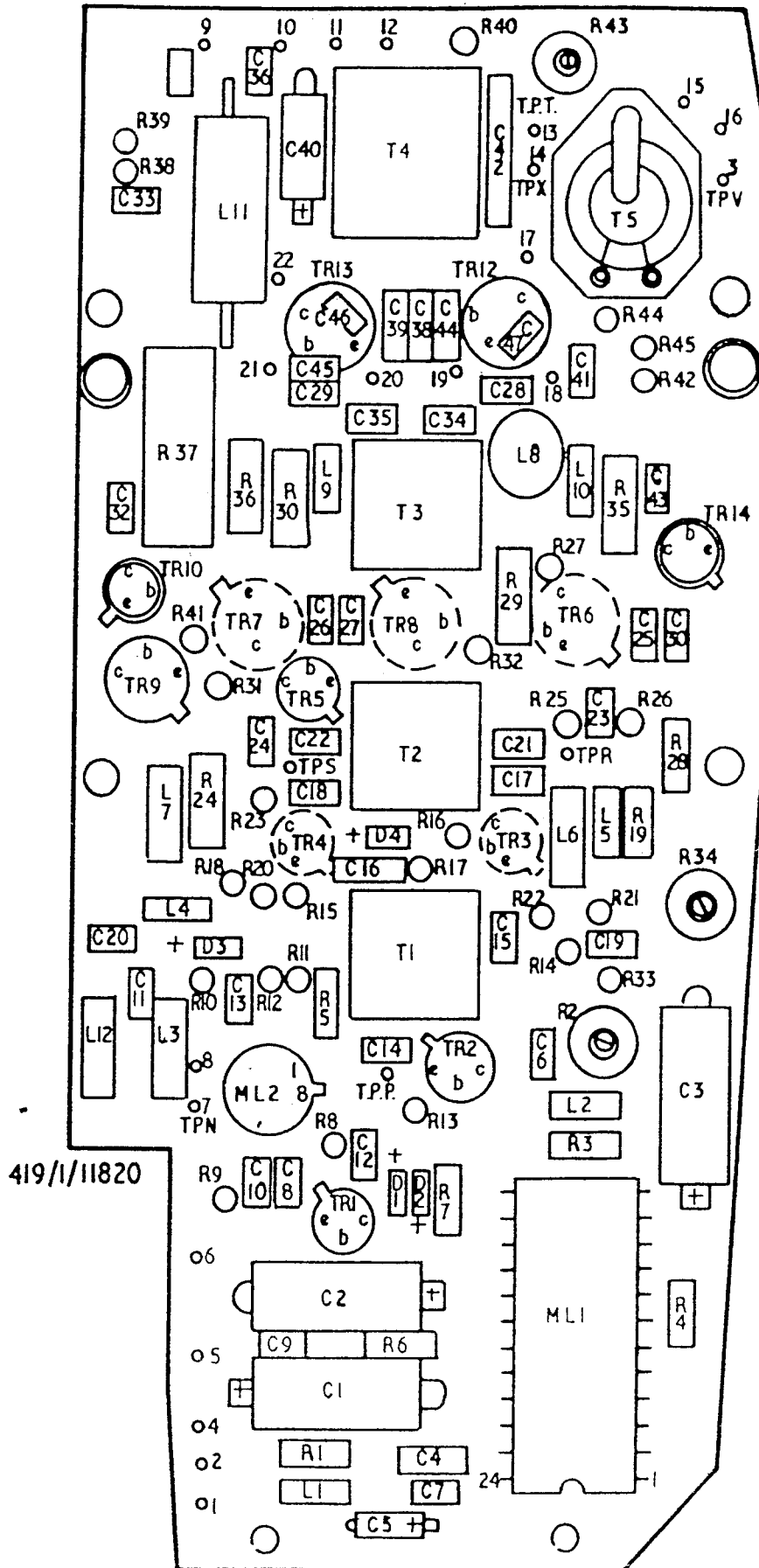


Fig. 3 Power amplifier pec (unit 2a) component layout



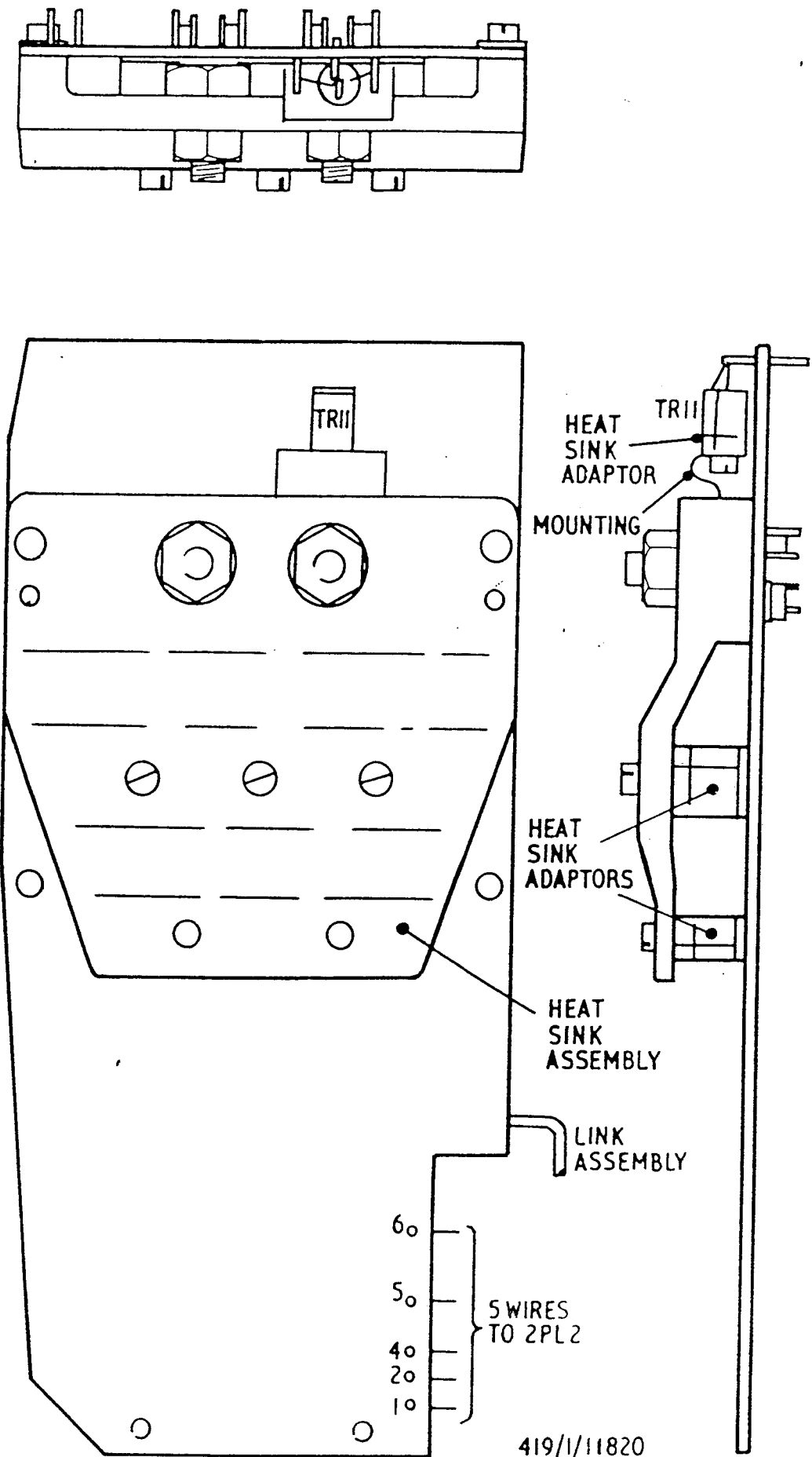


Fig.4 Power amplifier-position of heat sinks

THIRD LINE SERVICING  
OF  
REFLECTOMETER 419/1/11830  
(UNIT 2b)

CONTENTS

|                                | Para. |
|--------------------------------|-------|
| Introduction ... ..            | 1     |
| Detailed description           |       |
| Tx/Rx relay RLA ... ..         | 2     |
| Reflectometer ... ..           | 3     |
| AIC drive ... ..               | 6     |
| Antenna current monitor ... .. | 8     |
| Testing                        |       |
| Test equipment ... ..          | 10    |
| Preliminary ... ..             | 12    |
| Test procedures ... ..         | 19    |
| Components list                |       |

ILLUSTRATIONS

| Fig. |   | Page |
|------|---|------|
| 1    | Reflectometer (Unit 2b) - circuit ... ..              | 15   |
| 2    | Reflectometer pec (Unit 2b) - component layout ... .. | 17   |

INTRODUCTION

1. The reflectometer (Unit 2b) is a component part of the receiver-transmitter and is normally located on the Rear Panel Assembly (Unit 2). It consists of a panel, electronic circuit together with a connector (2PL1). Wire leads connect 2PL1 to the panel, which provides the following circuits:

(1) A reflectometer that produces voltages which indicate whether the transmitter power amplifier is correctly terminated with a 50 ohm impedance or not. Two voltages are produced:

(a) Tune indicator. This is for supply to a small indicating meter and is maximum when the PA is correctly terminated.

(b) Overload monitor. This is for supply to the PA protection circuits and is minimum when the PA is correctly terminated.

(2) An RF output monitor that produced a voltage suitable for supply to a small indicating meter and which is proportional to the transmitter antenna current.

(3) An output monitor (ALC drive) which produces a voltage proportional to the transmitter RF output voltage. Any audio modulation present in the Tx output is reflected to the output of the monitor.

(4) A relay for Tx/Rx switching.

DETAILED DESCRIPTION (refer to fig.1)

Tx/Rx relay RLA

2. The relay is operated from the 24V supply, its contacts provide switching of the +24 Tx supply, and switching of RF path to or from socket 2SK7.

Reflectometer

3. Two opposing voltages developed across resistor R3 are respectively proportional to the RF input voltage and current; these voltages are provided by the auto transformer AUT1 and the secondary of the current transformer CT1. The resultant RF voltage is applied to the rectifier D4 and, reduced in level by auto transformer AUT2, to the rectifier D5. When the

RF load is 50 ohms, the voltages across R3 balance and the resultant (and the rectifier outputs) approaches 0V. A mismatched load will result in an imbalance of the voltages, giving a resultant which increases with the degree of mismatch.

4. The RF rectified by D4 provides a negative bias potential to the base of transistor TR1, the emitter current of which provides the tune indicator output via pin 10 (2PL1/14). When the RF load is 50 ohms, the negative bias applied to TR1 from D4 is minimum (0V nominal) and the resulting output from pin 10 (2PL1/14) is maximum (0.85V dc nominal).

5. The RF rectified by D5 provides a positive potential at the overload monitor output from pin 6; this output is minimum (0V nominal) when the RF load is 50 ohms.

#### ALC drive

6. One transistor in ML1, in conjunction with capacitor C7, provides an RF level detector that produces a dc output at pin 3 which is proportional to the RF input voltage level. This output has a standing level of +2V dc, due to the second transistor in ML1, and is increased by the detector output.

7. There is no audio decoupling in this circuit and any audio modulation in the transmitter output will pass to the output.

#### Antenna current monitor

8. The RF at transformer AUT1 secondary is rectified by diode D1, to provide the output monitor voltage which is taken to an external meter via pin 7 (2PL1/14).

9. The sensitivity of the circuit is reduced when the radio is operating in the high power mode by connecting pin 8 (2PL1/3) to 0V.

#### TESTING

##### Test equipment

10. The following items of special-to-purpose test equipment are required:

- (1) Manual Interface Controller. Plessey Type TD4924A.

(2) Test Interface. Plessey Type TD50564A.

(3) Test Jig. Plessey Type TJ839A.

11. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| AVO         | A dc millivoltmeter with the following essential characteristics:<br>Range 0 to 10 mA<br>Accuracy $\pm 1\%$ of fsd<br>Suitable instrument: Avo Universal Model 8   |
| DVM         | A digital voltmeter with the following essential characteristics:<br>Range 100 mV, 1V and 10V<br>Accuracy $\pm 0.02\%$ reading $\pm 0.005\%$ of fsd on 100 mV, 1V and 10V ranges<br>Input impedance 10 kMohms on the above ranges<br>Suitable instrument: Solartron A203/204   |
| COUNTER     | An electronic counter with the following essential characteristics:<br>Range To include 2 MHz<br>Accuracy $\pm 2$ Hz<br>Suitable instrument: Racal 9024  |
| RF GEN.     | An RF signal generator with the following essential characteristics:<br>Range To include 2 MHz<br>Overall frequency accuracy $\pm 10\%$<br>Output voltage 2 $\mu$ V to 2.0V<br>Output meter accuracy $\pm 0.5$ dB<br>Output impedance 50 ohms with a VSWR of better than 1.25:1<br>Suitable instrument: Marconi TF144H/4 |
| RF VV       | An RF valve voltmeter with the following essential characteristics:<br>Voltage range 1V<br>Frequency range To include 2 MHz<br>Voltage accuracy on 10V range $\pm 2\%$<br>Input impedance 10 Mohms shunted by 25 pF.<br>Suitable instrument: Hewlett Packard 400E  |
| DC PSU      | A power supply with the following essential characteristics:<br>Output voltage 6.0V $\pm 5\%$<br>Current capacity 10 mA<br>Suitable instrument: Farnell L30B:L30DT   |

Preliminary

12. Connect the test jig to the test interface and connect the test interface to the manual interface controller.

13. At the manual interface controller:

(1) Ensure that the DC monitor switch is set to EXT and that the test selection switches are set to 000.

(2) Connect the Avo to the socket marked AVO.

(3) Connect the DVM to the socket marked DVM.

(4) Connect the RF Gen to the socket marked SG1.

14. Connect the counter to the RF Gen normal output via a 10 dB attenuator.

15. Connect the RF voltmeter to the BNC socket on the test interface.

NOTE: Due to attenuation within the interface, the RF voltmeter reading will be a factor of 10:1 lower than the RF output of the UUT.

16. Ensure that any wire leads are removed from the UUT (unit under test) and load it into the jig.

17. At the manual interface controller, connect the PSU output to the socket marked EXT A.

NOTE: A +24V supply to the UUT is provided by the test interface.

18. Switch on mains supplies to all test instruments where applicable.

Notes relating to test connections

The above connections provide the following at the UUT:

24V supply + rail to pin 17

6V supply + rail to pin 9

Supply - rail to pins 17, 20. To pin 8 on test 026

50, 25 or 100 ohm RF load across pins 15/16 according to test

RF VV to pin 16

RF Gen to pin 1 (screen to pin 2)

VV across pins 5/6 (OVERLOAD MONITOR)

or pins 3/20 (ALC MONITOR)

or pins 7/20 (O/P MON)

or pins 10/20 (TUNE INDICATOR)

Avo in series with 6V supply + rail.

Test procedures

19. Carry out the procedures given on the following pages.

| TEST No.                         | STEP | UNIT      | RANGE  | LIMITS                   | INSTRUCTIONS   |
|----------------------------------|------|-----------|--------|--------------------------|--|
| 000                              | (a)  | INT. CON. | -      | -                        | Depress "Press to Test" button.  |
|                                  | (b)  | AVO       | 10 mA  | -                        | Set Avo to 10 mA dc range.   |
|                                  | (c)  | DVM       | 10V    | -                        | Set DVM to 10V dc range.   |
|                                  | (d)  | RF VV     | 10V    | -                        | Set the RF VV to 1V range.   |
| <u>POWER CONSUMPTION</u>         |      |           |        |                          |  |
| 002                              | (a)  | INT. CON. | -      | -                        | Depress "Press to Test" button.  |
|                                  | (b)  | DVM       | 10V    | 5.701V to 6.299V         | Adjust external power supply to indicate on DVM a reading of 6.0 volts.                |
|                                  | (c)  | AVO       | 10 mA  | 2.6 mA to 3.4 mA         | Check the 6V line current.   |
| <u>REFLECTOMETER SENSITIVITY</u> |      |           |        |                          |  |
| 003                              | (a)  | INT. CON. | -      | -                        | Depress "Press to Test" button.  |
|                                  | (b)  | DVM       | 10V    | 5.701V to 6.299V         | Adjust external power supply to indicate on DVM a reading of 6.0 volts.                |
| 004                              | (a)  | RF GEN.   | -      | 2 MHz<br>Min 0/P         | Set RF Gen to a frequency of 2 MHz with minimum output voltage.                        |
|                                  | (b)  | COUNTER   | -      | 1.999902 to 2.000098 MHz | Adjust RF Gen to give a counter indication of 2 MHz.                                   |
|                                  | (c)  | INT. CON. | -      | -                        | Depress "Press to Test" button.  |
|                                  | (d)  | RF VV     | -      | Set 0.7V                 | Adjust RF Gen output level to give an indication on RF VV of 700 mV rms (7.0V at UUT). |
|                                  | (e)  | DVM       | 1V     | 0.7001V to 0.9998V       | Set DVM to 1 volt range. Check DVM reading.  |
| 006                              | (a)  | INT. CON. | -      | -                        | Depress "Press to Test" button.  |
|                                  | (b)  | DVM       | 100 mV | LT 49.99 mV              | Set DVM to 100 mV range. Check DVM reading.  |
| 008                              | (a)  | INT. CON. | -      | -                        | Depress "Press to Test" button.  |



Notes relating to tests 000 - 014

Test 002            Check of 6V line current with no RF input.

Test 003            For setting 6V supply level.

Tests 004 - 014    With an RF input of 2 MHz and input level set to give 7V rms across a load connected across UUT RF output (pins 15/16), the TUNE INDICATOR output (at pin 10) and OVERLOAD MONITOR output (at pin 6) of the UUT is checked at various RF load conditions thus:

50 ohm load : Pin 10 (test 004)  
                 Pin 6 (test 006)

25 ohm load : Pin 10 (test 008)  
                 Pin 6 (test 010)

100 ohm load : Pin 10 (test 012)  
                 Pin 6 (test 014)

NOTE: Failure to obtain an RF output could be due to a faulty relay RLA on the UUT. This relay should be operated by 24V from the test interface and its contact connect the RF to the UUT output (pin 15).

| TEST No.                       | STEP | UNIT         | RANGE  | LIMITS                   | INSTRUCTIONS   |
|--------------------------------|------|--------------|--------|--------------------------|--|
| 008<br>(cont)                  | (b)  | RF VV        | -      | Set 0.7V                 | Adjust RF Gen output level to give an indication on RF VV of 700 mV. |
|                                | (c)  | DVM          | 100 mV | LT<br>199.96 mV          | Check DVM reading.   |
| 010                            | (a)  | DVM          | 1V     | -                        | Set DVM to 1V range.   |
|                                | (b)  | INT.<br>CON. | -      | -                        | Depress "Press to Test" button.                                      |
|                                | (c)  | DVM          | 1V     | 0.7502V<br>to<br>1.1498V | Check DVM reading.   |
| 012                            | (a)  | RF<br>GEN.   | -      | Min. O/P<br>level        | Decrease RF Gen output level to a minimum.                           |
|                                | (b)  | INT.<br>CON. | -      | -                        | Depress "Press to Test" button.                                      |
|                                | (c)  | RF VV        | 1.0V   | Set 0.7V                 | Increase RF Gen output level to give a 700 mV indication on RF VV.   |
|                                | (d)  | DVM          | 1V     | 0.4001V<br>to 0.5999V    | Check DVM reading.   |
| 014                            | (a)  | INT.<br>CON. | -      | -                        | Depress "Press to Test" button.                                      |
|                                | (b)  | DVM          | 1V     | LT<br>0.2499V            | Check DVM reading.   |
| <b>AIC MONITOR SENSITIVITY</b> |      |              |        |                          |  |
| 016                            | (a)  | RF<br>GEN.   | -      | Min. O/P<br>level        | Decrease RF Gen output level to a minimum.                           |
|                                | (b)  | DVM          | 10V    | -                        | Set DVM to 10V range.  |
|                                | (c)  | INT.<br>CON. | -      | -                        | Depress "Press to Test" button.                                      |
|                                | (d)  | DVM          | 10V    | 1.901V to<br>2.099V      | Check DVM reading.   |
| 018                            | (a)  | INT.<br>CON. | -      | -                        | Depress "Press to Test" button.                                      |
|                                | (b)  | RF VV        | 1.0V   | Set 0.7V                 | Increase RF Gen output level to give a 700 mV indication on RF VV.   |

Notes relating to tests 016/018

The ALC MONITOR output (pin 3 of UUT) is checked with a zero RF input (test 016) and with an RF input of 2 MHz at a level set to give 7.0V rms across the UUT RF output (pins 15/16) terminated with a 50 ohm load (test 018).

The output being monitored at the DVM and RF output being monitored at the RF VV.

Notes relating to tests 021 - 026

Tests 022 and 024 check the O/P MON output (pin 7 of UUT) under similar RF input and load conditions to tests 016 and 018 respectively.

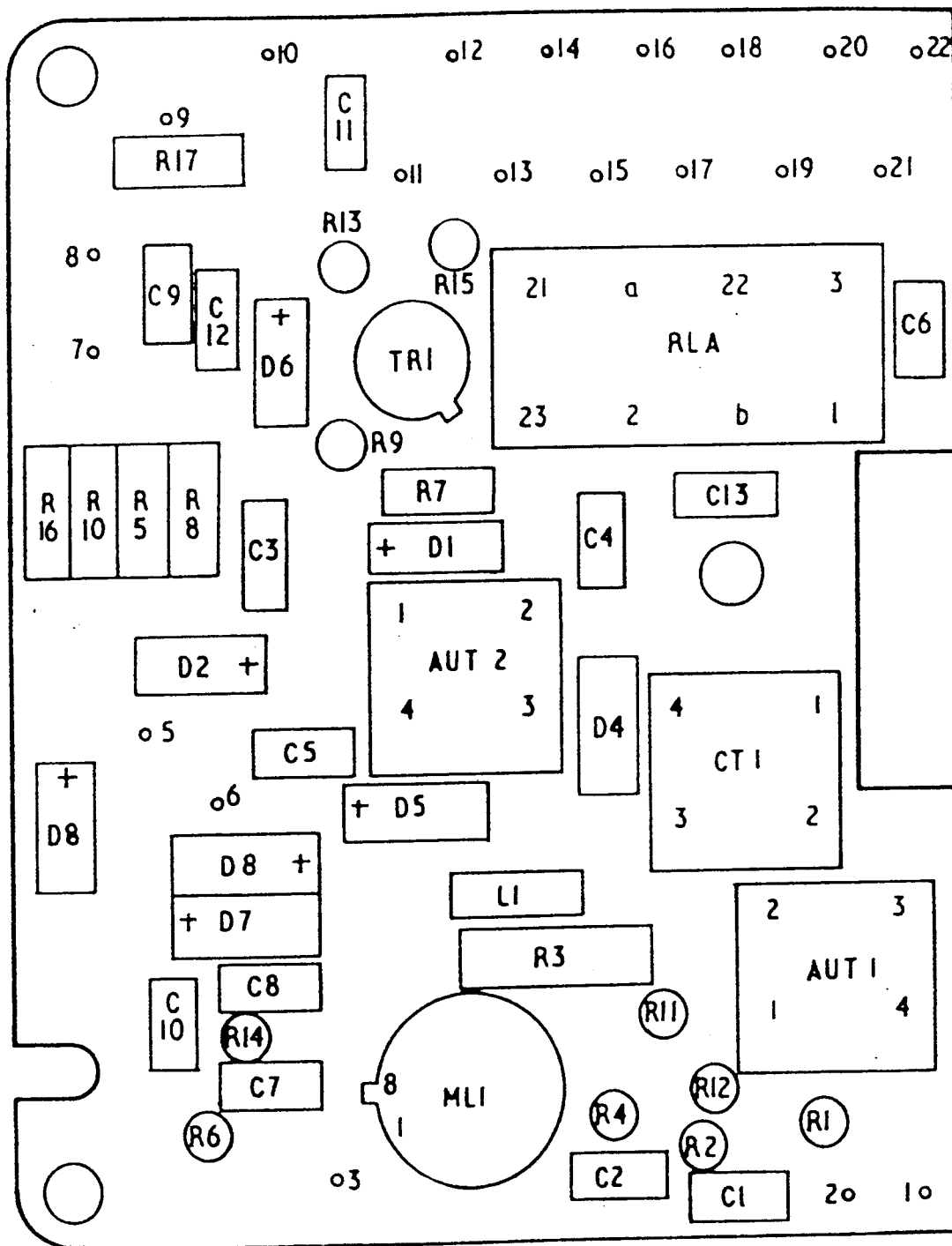
In test 026, the test conditions are similar to those for test 024, but the test checks the effect on the O/P MON output when the OV HP input line (pin 8) is connected to OV.

| TEST No.                | STEP | UNIT         | RANGE | LIMITS                | INSTRUCTIONS   |
|-------------------------|------|--------------|-------|-----------------------|--|
| 018<br>(cont)           | (c)  | DVM          | 10V   | 2.301V to<br>2.399V   | Check DVM reading.   |
| ANTENNA CURRENT MONITOR |      |              |       |                       |  |
| 021                     | (a)  | INT.<br>CON. | -     | -                     | Depress "Press to Test" button.                                    |
|                         | (b)  | DVM          | 10V   | 5.701V to<br>6.299V   | Set external power supply to indicate on DVM a reading of 6 volts. |
| 022                     | (a)  | RF<br>GEN.   | -     | Min. 0/P<br>level     | Decrease RF Gen output level to a minimum.                         |
|                         | (b)  | INT.<br>CON. | -     | -                     | Depress "Press to Test" button.                                    |
|                         | (c)  | DVM          | 1V    | 0 volts               | Set DVM to 1V range. Check DVM reading.                            |
| 024                     | (a)  | INT.<br>CON. | -     | -                     | Depress "Press to Test" button.                                    |
|                         | (b)  | RF VV        | 1.0V  | Set 0.7V              | Increase RF Gen output level to give a 700 mV indication on RF VV. |
|                         | (c)  | DVM          | 1V    | 0.6001V<br>to 0.7998V | Check DVM reading.   |
| 026                     | (a)  | INT.<br>CON. | -     | -                     | Depress "Press to Test" button.                                    |
|                         | (b)  | DVM          | 1V    | 0.4001V<br>to 0.4999V | Check DVM reading.   |
| 028                     | (a)  | INT.<br>CON. | -     | -                     | Depress "Press to Test" button.                                    |
|                         | (b)  | UUT          | -     | -                     | Remove UUT from Test Jig.  |

COMPONENTS LIST FOR  
REFLECTOMETER (Unit 2b)  
419/1/11830 (refer to Fig.2)

| Cct Ref                       | Description                | Reference No.   |
|-------------------------------|----------------------------|-----------------|
| <u>Resistors</u>              |                            |                 |
| R1                            | 3 kohm $\pm$ 1%            | 403/4/78126/260 |
| R2                            | 560 ohm $\pm$ 1%           | 403/4/78126/243 |
| R3                            | 150 ohm $\pm$ 1%           | 403/4/78127/229 |
| R4                            | 150 ohm $\pm$ 5%           | 403/4/78126/029 |
| R5                            | 510 ohm $\pm$ 5%           | 403/4/78126/042 |
| R6                            | 2.7 kohm $\pm$ 5%          | 403/4/78126/059 |
| R7                            | 5.6 kohm $\pm$ 5%          | 403/4/78126/067 |
| R8                            | 30 ohm $\pm$ 5%            | 403/3/78126/012 |
| R9                            | 18 kohm $\pm$ 5%           | 403/4/78126/079 |
| R10                           | 510 ohm $\pm$ 5%           | 403/4/78126/042 |
| R11                           | 2.4 kohm $\pm$ 1%          | 403/4/78126/258 |
| R12                           | 5.6 kohm $\pm$ 1%          | 403/4/78126/267 |
| R13                           | 3.9 kohm $\pm$ 5%          | 403/4/78126/063 |
| R14                           | 1.8 kohm $\pm$ 1%          | 403/4/78126/255 |
| R15                           | 100 ohm $\pm$ 5%           | 403/4/78126/025 |
| R16                           | 10 ohm $\pm$ 5%            | 403/4/78126/001 |
| R17                           | 100 ohm $\pm$ 5%           | 403/4/78126/025 |
| <u>Capacitors</u>             |                            |                 |
| C1                            | 22pF $\pm$ 5% 100v         | 400/9/19082/010 |
| C2                            | 10nF $\pm$ 80% -20% 100v   | 400/9/19084/078 |
| C3                            | 4.7nF $\pm$ 20% 100v       | 400/9/19084/070 |
| C4                            | 68nF $\pm$ 80% -20% 100v   | 400/9/19084/098 |
| C5                            | 10nF $\pm$ 80% -20% 100v   | 400/9/19084/078 |
| C6                            | 10pF $\pm$ 5% 100v         | 400/9/19082/002 |
| C7                            | 10nF $\pm$ 80% -20% 100v   | 400/9/19084/078 |
| C8, C9                        | 4.7nF $\pm$ 20% 100v       | 400/9/19084/070 |
| C10                           | 470nF $\pm$ 80% -20% 50v   | 400/9/19084/109 |
| C11                           | 4.7nF $\pm$ 20% 100v       | 400/9/19084/070 |
| C12, C13                      | 10nF $\pm$ 80% -20% 100v   | 400/9/19084/078 |
| <u>Inductors</u>              |                            |                 |
| L1                            | Inductor, 0.12uH           | 406/9/08470/001 |
| <u>Semi-conductor devices</u> |                            |                 |
| ML1                           | Integrated circuit CN 497T | 446/4/00429     |
| TR1                           | Transistor CV7648          | 990/4/00107/648 |
| D1 to D8                      | Diode CV7367               | 990/4/00107/367 |

| Cct Ref | Description          | Reference No.           |
|---------|----------------------|-------------------------|
|         | <u>Miscellaneous</u> | 507/9/05095             |
| RLA     | Relay                | or 507/9/38041          |
| 2PL1    | Plug, electrical     | 508/9/21630             |
| CT1     | Transformer          | 406/8/11030/003         |
| AUT1    | Transformer          | 406/8/11030/004         |
| AUT2    | Transformer          | 406/8/11030/006         |
|         |                      | 406 <sup>8</sup> /11030 |



419/1/11830

Note: Plug 2PL1 is part of this item and connects to it by flying leads

Fig 2 Reflectometer pec (unit 2b)  
component layout

) )

THIRD LINE SERVICING  
OF  
RF DECOUPLING UNIT 419/1/24973  
(UNIT 2g)

CONTENTS

|                        | Para. |
|------------------------|-------|
| Description ... ..     | 1     |
| Testing                |       |
| Test equipment ... ..  | 4     |
| Test procedures ... .. | 5     |
| Components list        |       |

ILLUSTRATIONS

| Fig. |  | Page |
|------|--|------|
| 1    | Unit 2g, RF decoupler - circuit ... ..               | 5    |
| 2    | RF decoupler pec (Unit 2g) - component layout ... .. | 7    |

DESCRIPTION

1. The RF Decoupling Unit (Unit 2g) is a component part of the transmitter receiver and is normally located on the Rear Panel Assembly (Unit 2). It consists of a panel electronic circuit (pec), two 7-way audio sockets (2SK5, 2SK6) which are connected to the pec by flexible connectors, and a 9-way plug (2PL3) which is connected to the pec by flying leads.

2. The unit provides decoupling of spurious RF signals from the microphone, earphone and pressel lines. It also provides two thermistors which protect the 24V dc supply from the radio to external equipment by limiting the current drain to less than 200 mA when the supply outlet is shorted to ground.

3. A circuit diagram of the unit is given in Fig.1.



TESTINGTest equipment

4. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>  |
|-------------|---|
| AF Gen.     | Audio frequency signal generator which will provide 2 kHz at 100 mV emf.<br>Suitable instrument: Advance J5       |
| AF VM       | AF millivoltmeter to read 2 kHz ac voltages up to 100 mV.<br>Suitable instrument: Hewlett Packard 5400A           |
| Avo         | To read D.C. current 10A with an accuracy of $\pm 1\%$ .<br>Suitable instrument: Avo Model SX                     |
| PSC         | Power supply to provide $24V \pm 0.1V$ dc with a current limit of 1.5A.<br>Suitable instrument: Farnell TSV70-Mk2 |

Test procedures

NOTE: All the following tests can be carried out while the unit is fitted to the Rear Panel Assembly.

5. To test the audio lines, refer to the list of checks given below and for each check:

(1) Connect the AF Gen to the specified pins of 2PL5. Set the AF Gen output to 2 kHz at a level of  $100 \text{ mV} \pm 1 \text{ mV}$ .

(2) Using the AFV, check that the output at the indicated pins of both audio sockets, 2SK5 and 2SK6, is greater than 95 mV.

| <u>Check</u> | <u>AF Gen to<br/>2PL5 pins</u> | <u>RFV to<br/>Audio socket pins</u> |
|--------------|--------------------------------|-------------------------------------|
| 1            | 4/5                            | A/B                                 |
| 2            | 2/7                            | D/E                                 |
| 3            | 2/7                            | G/E                                 |
| 4            | 5/7                            | F/E                                 |

6. To test the 24V supply protection:

(1) Set the 24V supply to  $24V \pm 0.1V$ .

(2) Connect the 24V supply, +ve rail to 2PL3 pin 1, -ve rail to 2PL3 pin 7.

(3) Connect the Avo, set to 10A dc range, between pins C and E of 2SK5.

(4) Switch on the 24V supply, and check that the Avo reading is less than 200 mA after an initial surge.

COMPONENTS LIST FOR  
RF DECOUPLER (Unit 2g)  
419/1/24973 (refer to fig.2)

| Cct Ref              | Description                                | Reference No.   |
|----------------------|--|-----------------|
| <u>Resistors</u>     |  |                 |
| R1, R2               | Thermistors P.T.C.                         | 403/9/03552     |
| <u>Capacitors</u>    |  |                 |
| C1                   | 22uF $\pm$ 20% 35v electrolytic            | 402/4/98049/092 |
| C2, C3               | 10nF +80% -20% 100v                        | 400/9/19084/078 |
| C4 to C6             | 68nF +80% -20% 50v                         | 400/9/19084/098 |
| C7, C8               | 4.7uF $\pm$ 20% electrolytic 35v           | 402/9/98049/088 |
| C9                   | 68nF +80% -20% 50v                         | 400/9/19084/098 |
| C10                  | 10nF +80% -20% 100v                        | 400/9/19084/078 |
| <u>Inductors</u>     |  |                 |
| L1, L2               | Inductor 18uH                              | 406/9/08470/027 |
| <u>Miscellaneous</u> |  |                 |
| 2PL3                 | Plug, electrical, 9-way                    | 508/4/28210/001 |
| 2SK5, 2SK6           | Socket, electrical, fixed                  | 508/9/20411/003 |
|                      | Insulator                                  | 640/2/09855     |
|                      | Spacer                                     | 640/2/09858     |
|                      | Saddle (for securing R1, R2)               | 640/2/14912     |
|                      | Panel, printed circuit flexible to 2SK5    | 419/1/24988     |
|                      | Panel, printed circuit flexible to 2SK6    | 419/1/24977     |
|                      | Bracket (adjacent to L1)                   | 640/2/09853     |
|                      | Bracket assembly (adjacent to C1)          | 640/2/09584     |
|                      | Screw, slotted pan hd., M2.5 x 8mm. st.st. | 991/4/01737/004 |
|                      | Washer, crinkle M2.5 Ber.Cu                | 991/4/02000/036 |
|                      | Nut, hex. M2.5 st.st.                      | 991/4/01495/003 |

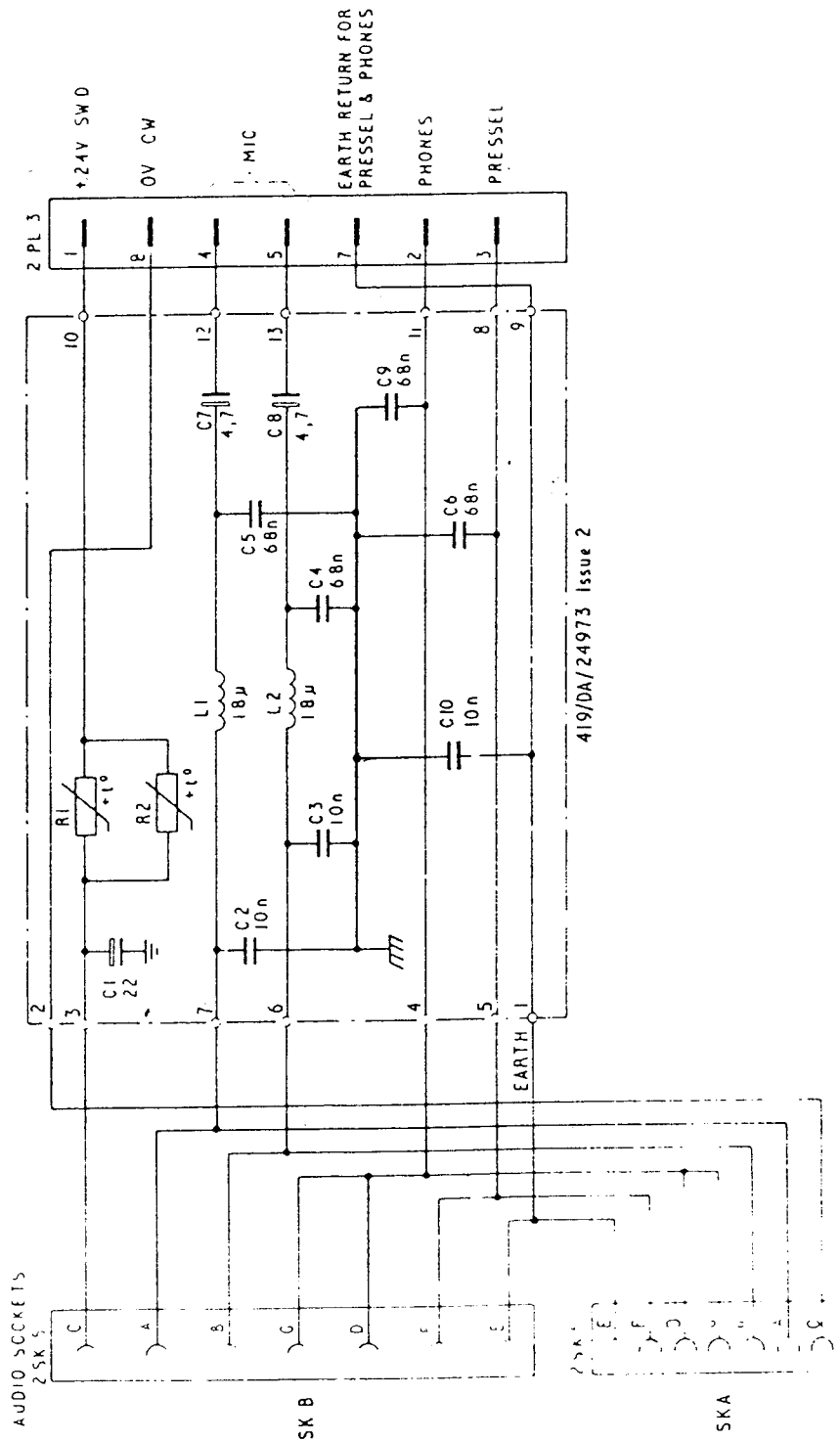


Fig 1 Unit 2g RF decoupler - circuit

SOCKETS  
NOT SHOWN

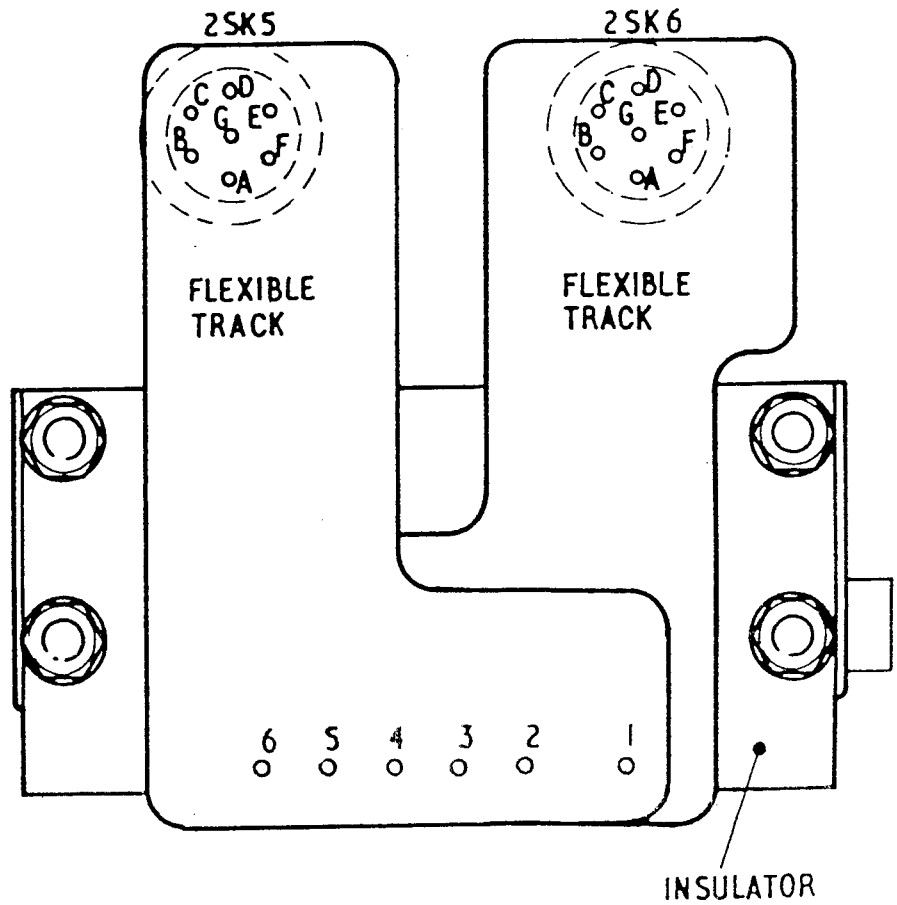
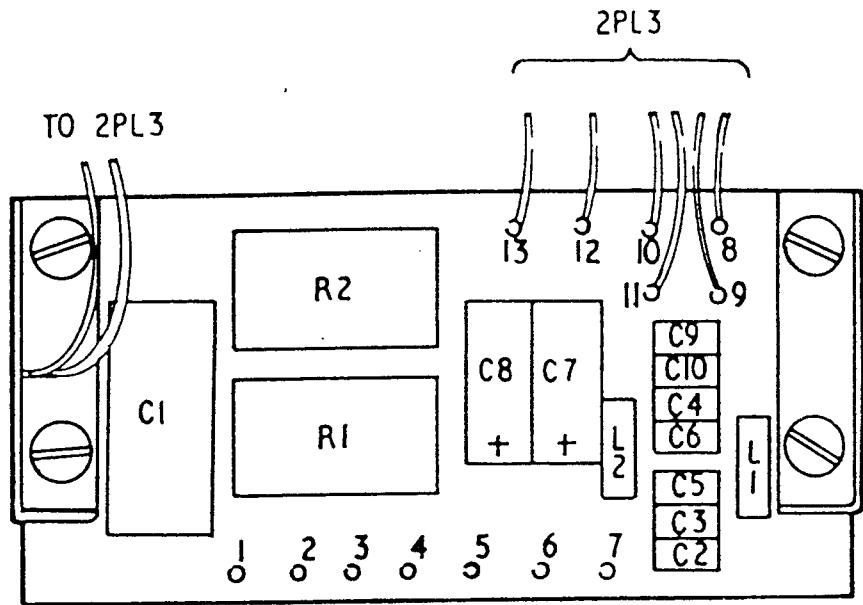
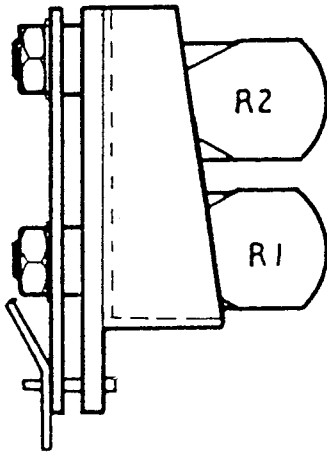


Fig.2 RF decoupler pec (unit 2g) -  
component layout

THIRD LINE SERVICING  
OF  
PA FILTER SUB-ASSEMBLY 640/1/09734  
(UNITS 2c-2f)

CONTENTS

|                             | Para. |
|-----------------------------|-------|
| Introduction ... ..         | 1     |
| Detailed description ... .. | 3     |
| Testing                     |       |
| Test equipment ... ..       | 6     |
| Preliminary ... ..          | 8     |
| Alignment of filters ... .. | 9     |
| Insertion losses ... ..     | 10    |
| Components list             |       |

ILLUSTRATIONS

| Fig. |   | Page |
|------|---|------|
| 1    | PA switch and filter - circuit diagram ... .. | 9    |
| 2    | PA filter - circuit diagram ... ..            | 11   |
| 3    | Units 2c-2f - component layout ... ..         | 13   |

INTRODUCTION

1. The PA filter assembly consists of a switch and four panels, electronic circuit (Units 2c-2f). It is a component part of the receiver transmitter and is normally located on the Rear Panel Assembly (Unit 2).

NOTE: Literally, the PA filter assembly is a component part of the PA switch and filter assembly (630/1/09631). For convenience, a breakdown of this assembly is included in the components list at the rear of this section.

2. The assembly is connected in series with the transmitter output, the harmonic content of which is reduced by one of six filters, selected according to the frequency range.

DETAILED DESCRIPTION

3. The four panels respectively contain one filter on each of Units 2c and 2e and two filters on each of Units 2d and 2f. The panels are fixed in the form of a rectangular block, with six position printed circuit switches placed at the ends. A shaft links the switches. Two coaxial flying leads connect the assembly to the external circuits.

4. A circuit diagram of the assembly is given in fig.1. Each filter (fig.2) is a two-section, low pass, Darlington type configuration. The value of components differ in each filter to provide the following characteristics:

|                | <u>Pass-band</u> | <u>Stop-band edge frequency</u> |
|----------------|------------------|---------------------------------|
| Range 1 filter | 2 - 3.1 MHz      | 4.0 MHz                         |
| Range 2 filter | 3.1 - 4.9 MHz    | 6.2 MHz                         |
| Range 3 filter | 4.9 - 7.7 MHz    | 9.8 MHz                         |
| Range 4 filter | 7.7 - 12.2 MHz   | 15.4 MHz                        |
| Range 5 filter | 12.2 - 19.1 MHz  | 24.4 MHz                        |
| Range 6 filter | 19.1 - 30.0 MHz  | 38.2 MHz                        |

. In each case, the rejection band attenuation is greater than 25 dB with pass-band insertion loss of less than 0.05 dB.

TESTINGTest equipment

. The following item of special-to-purpose test equipment is required:

Test Jig. Plessey Type TJ843A.

. The following items of proprietary test equipment are required:

ItemDescription

RF Gen. An RF Signal Generator capable of supplying an output emf of between 2 microvolts and 2 volts over a frequency range of 2 to 70 MHz with an output impedance of 50 ohms.

Suitable instrument: Marconi RF Signal Generator Type TF144H/4

| <u>Item</u> | <u>Description</u>  |
|-------------|---|
| RF mV       | An RF Voltmeter for measuring between 50 millivolts and 1 volt over a frequency range of 2 to 70 MHz to an accuracy of $\pm 3\%$ of indicated value.<br>Suitable instrument: Marconi RF Millivoltmeter Type TF2603 with adaptors TM7950 and 'N' to 'BNC' connector. |
| Counter     | An Electronic Counter with the facility for measuring frequencies in the range 2 to 70 MHz to an accuracy of $\pm 2$ Hz.<br>Suitable instrument: Racal 9024.  |
| Load        | A resistive load of 50 ohms $\pm 2\%$ . (Suitable 50 ohm pad).  |

### Preliminary

NOTE: Part of the jig is a housing roughly similar to the PA filter housing used in the radio - but with holes drilled to give access to the filter inductor core adjusters.

8. Fit the UUT (unit under test) to the jig as follows:

- (1) Fit the top cover plate to the UUT.
- (2) Hold the UUT by the top of its spindle and position above the jig. Pass the lower flying lead through the side hole inside the base of the jig casting. Pass the upper flying lead into the cut-out in the top of the jig casting and gently lower the UUT until the cover plate locates on the two pins on top of the casting.
- (3) Clamp the cover plate into position.
- (4) Check that all 12 inductor slug slots are accessible through their associated holes in the jig casting.
- (5) Connect the lower flying lead (filter input) into the strip-line connector (side of housing nearest cover clamp lever) so that the inner conductor is in contact with the printed copper strip and the outer conductor is in contact with the ground plane. Tighten the clamp screw to hold both conductors in position.



(6) Connect the upper flying lead (filter output) into the strip-line connector (on opposite side of housing to the first strip-line). Make the connections in a similar manner.

(7) Fit the range selection wheel (number on wheel adjacent to engraved locating line on housing gives range selected). Check that the switch can be turned but do not use force.

#### Alignment of filters

9. Proceed as follows:

(1) Connect the RF Gen output to the filter input at the Test Jig. Connect the counter to the RF Gen normal output via a 10 dB attenuator.

(2) Connect the 50 ohm load to the filter output at the test jig. Connect the RF voltmeter to measure the voltage across the load.

(3) Switch on mains supplies to test instruments.

(4) With reference to the table below, carry out checks 1 to 18 in that order and, for each check:

(a) Set the UUT range as given.

(b) Set RF Gen frequency as indicated, at 2V emf.

(c) Adjust given inductor for minimum reading at RV voltmeter.

NOTE: The location of the inductors is given in terms of upper/lower part of Face A, B, C, D. Face B is the one with the engraved locating line, face C is nearest the cover clamp. Face A is opposite C, face D is opposite B.

| CHECK NO. | RANGE SWITCH 'P' & FILTER NO. | FACE | CORE TO BE ADJUSTED | SIGNAL GENERATOR FREQUENCY (MHz)<br>NOMINAL VALUE AND LIMITS |
|-----------|-------------------------------|------|---------------------|--|
| 1         | 1                             | B    | L2 (TOP)            | 4.21 (4.205002 AND 4.214998)                                 |
| 2         |                               |      | L1 (BOTTOM)         | 5.74 (5.735002 AND 5.744998)                                 |
| 3         |                               |      | L2 (TOP)            | 4.21 (4.205002 AND 4.214998)                                 |
| 4         | 2                             | A    | L3 (TOP)            | 6.40 (6.395002 AND 6.404998)                                 |
| 5         |                               |      | L1 (BOTTOM)         | 9.38 (9.375002 AND 9.384998)                                 |
| 6         |                               |      | L3 (TOP)            | 6.40 (6.395002 AND 6.404998)                                 |
| 7         | 3                             | A    | L4 (TOP)            | 9.94 (9.935002 AND 9.944998)                                 |
| 8         |                               |      | L2 (BOTTOM)         | 15.15 (15.145002 AND 15.154998)                              |
| 9         |                               |      | L4 (TOP)            | 9.94 (9.935002 AND 9.944998)                                 |
| 10        | 4                             | D    | L2 (TOP)            | 15.95 (15.945002 AND 15.954998)                              |
| 11        |                               |      | L1 (BOTTOM)         | 22.50 (22.495002 AND 22.504998)                              |
| 12        |                               |      | L2 (TOP)            | 15.95 (15.945002 AND 15.954998)                              |
| 13        | 5                             | C    | L3 (TOP)            | 25.60 (25.595002 AND 25.604998)                              |
| 14        |                               |      | L1 (BOTTOM)         | 36.24 (36.235002 AND 36.244998)                              |
| 15        |                               |      | L3 (TOP)            | 25.60 (25.595002 AND 25.604998)                              |
| 16        | 6                             | C    | L4 (TOP)            | 39.60 (39.595002 AND 39.604998)                              |
| 17        |                               |      | L2 (BOTTOM)         | 57.25 (57.245002 AND 57.254998)                              |
| 18        |                               |      | L4 (TOP)            | 39.60 (39.595002 AND 39.604998)                              |

Insertion losses

10. With test equipment connected as specified for tests in para.9, carry out each of checks 1 to 18 in the table below and, for each check:

- (1) Set UUT range switch as given.
- (2) Set RF Gen output to indicated frequency at 2V emf.
- (3) Check that RF Voltmeter reading is within the indicated limits.

| CHECK NO. | RANGE SWITCH 'P' & FILTER NO. | SIGNAL GENERATOR FREQUENCY (MHz)<br>NOMINAL VALUE AND LIMITS | OUTPUT LEVEL (mV) |
|-----------|-------------------------------|--|-------------------|
| 1         | 1                             | 2.50 (2.450002 TO 2.549998)                                  | GT 950            |
| 2         |                               | 4.00 (3.995002 TO 4.004998)                                  | LT 56             |
| 3         |                               | 4.73 (4.725002 TO 4.734998)                                  | LT 56             |
| 4         | 2                             | 4.00 (3.950002 TO 4.049998)                                  | GT 950            |
| 5         |                               | 6.20 (6.195002 TO 6.204998)                                  | LT 56             |
| 6         |                               | 7.05 (7.045002 TO 7.054998)                                  | LT 56             |
| 7         | 3                             | 6.30 (6.250002 TO 6.349998)                                  | GT 950            |
| 8         |                               | 9.80 (9.795002 TO 9.804998)                                  | LT 56             |
| 9         |                               | 11.37 (11.365002 TO 11.374998)                               | LT 56             |
| 10        | 4                             | 10.00 (9.950002 TO 10.049998)                                | GT 950            |
| 11        |                               | 15.40 (15.395002 TO 15.404998)                               | LT 56             |
| 12        |                               | 17.82 (17.815002 TO 17.824998)                               | LT 56             |
| 13        | 5                             | 15.70 (15.650002 TO 15.749998)                               | GT 950            |
| 14        |                               | 24.40 (24.395002 TO 24.404998)                               | LT 56             |
| 15        |                               | 28.17 (28.165002 TO 28.174998)                               | LT 56             |
| 16        | 6                             | 24.50 (24.450002 TO 24.549998)                               | GT 950            |
| 17        |                               | 38.20 (38.195002 TO 38.204998)                               | LT 56             |
| 18        |                               | 45.60 (45.550002 TO 45.649998)                               | LT 56             |

COMPONENTS LIST

11. The PA Switch and Filter Assembly 640/1/09631 comprises:

|                                     |                 |
|-------------------------------------|-----------------|
| Panel, electronic circuit (Unit 2b) | 419/1/11830     |
| Housing assembly                    | 640/1/09735     |
| Cover (over Unit 2b)                | 640/1/09733     |
| PA Filter sub-assembly              | 640/1/09734     |
| Cover (over filters)                | 640/2/09729     |
| Shaft                               | 640/2/09845     |
| Circlip                             | 999/4/01348/009 |

12. The Filter sub-assembly 640/1/09734 comprises:

|                                     |             |
|-------------------------------------|-------------|
| Switch 2S1BF                        | 408/8/23235 |
| Switch 2S1AF                        | 408/8/23234 |
| Panel, electronic circuit (Unit 2c) | 419/1/11835 |
| Panel, electronic circuit (Unit 2d) | 419/1/11840 |
| Panel, electronic circuit (Unit 2e) | 419/1/11845 |
| Panel, electronic circuit (Unit 2f) | 419/1/11850 |

Component layout diagrams of Units 2c to 2f are given in fig.3 and associated component lists in paras.13-16 inc.

13. The component parts of Unit 2c, 419/1/11835 are:

| <u>Cct.ref.</u> | <u>Description</u>               | <u>Ref.No.</u>  |
|-----------------|----------------------------------|-----------------|
|                 | <u>Capacitors, silver mica</u>   |                 |
| C1              | 890 pF $\pm \frac{1}{2}\%$ 350V  | 438/9/30100/138 |
| C2              | 264 pF $\pm \frac{1}{2}\%$ 350V  | 438/9/30100/129 |
| C3              | 1497 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/140 |
| C4              | 854 pF $\pm \frac{1}{2}\%$ 350V  | 438/9/30100/137 |
| C5              | 641 pF $\pm \frac{1}{2}\%$ 350V  | 438/9/30100/136 |
|                 | <u>Inductors, r.f.</u>           |                 |
| L1              | 2.04 - 2.38 $\mu$ H min.         | 406/8/11037/001 |
| L2              | 1.37 - 1.61 $\mu$ H min.         | 406/8/11037/002 |

14. The component parts of Unit 2d, 419/1/11840 are:

| <u>Cct.ref.</u> | <u>Description</u>              | <u>Ref.No.</u>  |
|-----------------|---------------------------------|-----------------|
|                 | <u>Capacitors, silver mica</u>  |                 |
| C1              | 614 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/135 |
| C2              | 394 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/132 |
| C3              | 175 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/124 |
| C4              | 106 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/119 |
| C5              | 936 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/139 |
| C6              | 603 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/134 |
| C7              | 573 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/133 |
| C8              | 344 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/130 |
| C9              | 392 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/143 |
| C10             | 258 pF $\pm \frac{1}{2}\%$ 350V | 438/9/30100/128 |

| <u>Cct.ref.</u> | <u>Description</u>       | <u>Ref.No.</u>  |
|-----------------|--------------------------|-----------------|
|                 | <u>Inductors, r.f.</u>   |                 |
| L1              | 1.29 - 1.51 $\mu$ H min. | 406/8/11037/003 |
| L2              | 0.94 - 1.10 $\mu$ H min. | 406/8/11037/004 |
| L3              | 0.80 - 0.94 $\mu$ H min. | 406/8/11037/005 |
| L4              | 0.53 - 0.62 $\mu$ H min. | 406/8/11037/006 |

15. The component parts of Unit 2e, 419/1/11845 are:

| <u>Cct.ref.</u> | <u>Description</u>                | <u>Ref.No.</u>  |
|-----------------|-----------------------------------|-----------------|
|                 | <u>Capacitors, silver mica</u>    |                 |
| C1              | 247 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/127 |
| C2              | 70 pF $\pm \frac{1}{2}\%$ pF 350V | 438/9/30100/116 |
| C3              | 376 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/131 |
| C4              | 230 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/125 |
| C5              | 158 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/123 |
|                 | <u>Inductors, r.f.</u>            |                 |
| L1              | 0.505 - 0.595 $\mu$ H min.        | 406/8/11037/007 |
| L2              | 0.353 - 0.384 $\mu$ H min.        | 406/8/11037/008 |

16. The component parts of Unit 2f, 419/1/11850 are:

| <u>Cct.ref.</u> | <u>Description</u>                | <u>Ref.No.</u>  |
|-----------------|-----------------------------------|-----------------|
|                 | <u>Capacitors, silver mica</u>    |                 |
| C1              | 157 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/122 |
| C2              | 100 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/142 |
| C3              | 45 pF $\pm \frac{1}{2}\%$ pF 350V | 438/9/30100/114 |
| C4              | 29 pF $\pm \frac{1}{2}\%$ pF 350V | 438/9/30100/141 |
| C5              | 240 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/126 |
| C6              | 153 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/121 |
| C7              | 147 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/120 |
| C8              | 94 pF $\pm \frac{1}{2}\%$ pF 350V | 438/9/30100/117 |
| C9              | 101 pF $\pm \frac{1}{2}\%$ 350V   | 438/9/30100/118 |
| C10             | 64 pF $\pm \frac{1}{2}\%$ pF 350V | 438/9/30100/115 |
|                 | <u>Inductors, r.f.</u>            |                 |
| L1              | 0.313 - 0.368 $\mu$ H min.        | 406/8/11037/009 |
| L2              | 0.254 - 0.286 $\mu$ H min.        | 406/8/11037/010 |
| L3              | 0.220 - 0.260 $\mu$ H min.        | 406/8/11037/011 |
| L4              | 0.151 - 0.177 $\mu$ H min.        | 406/8/11037/012 |

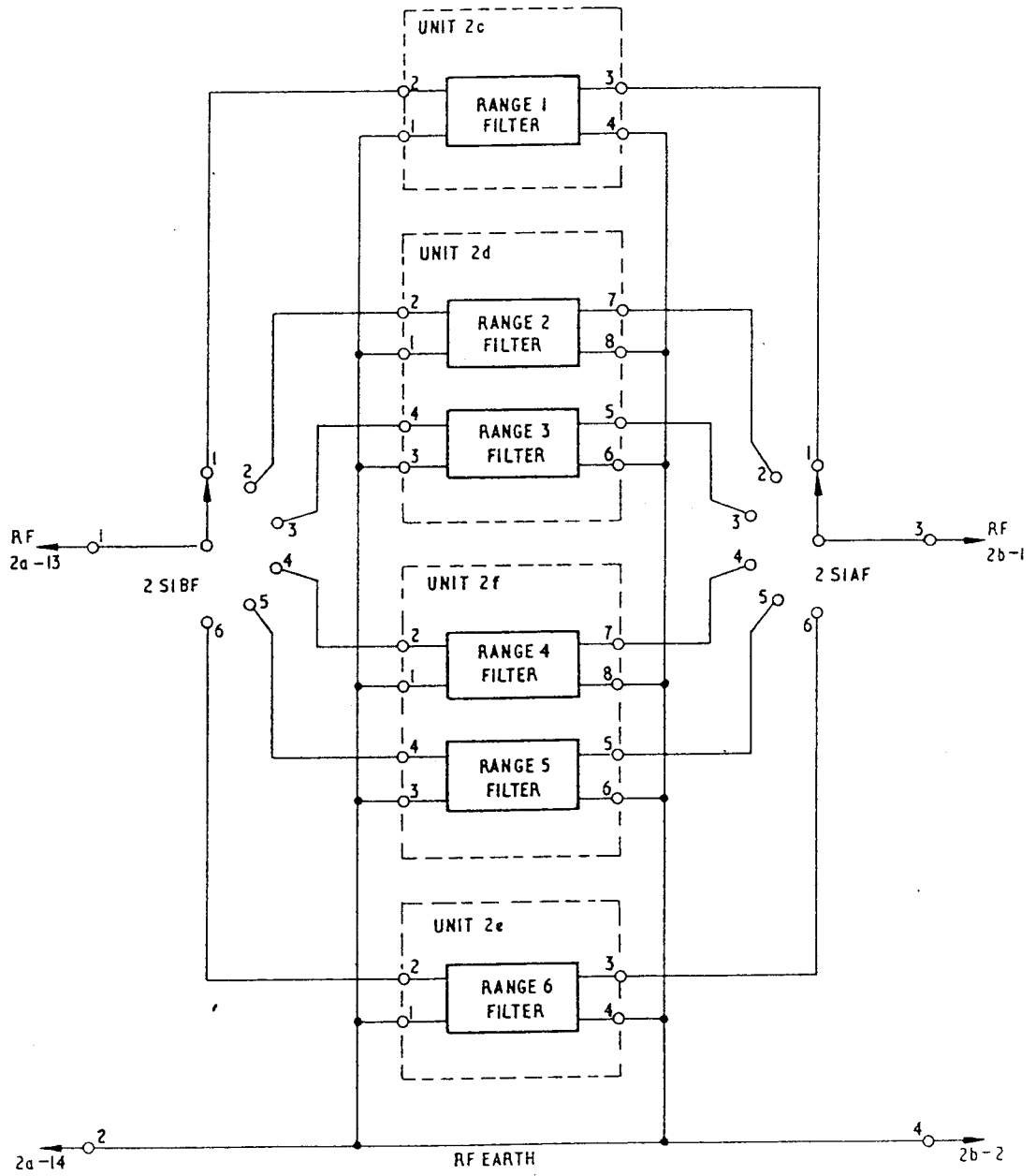
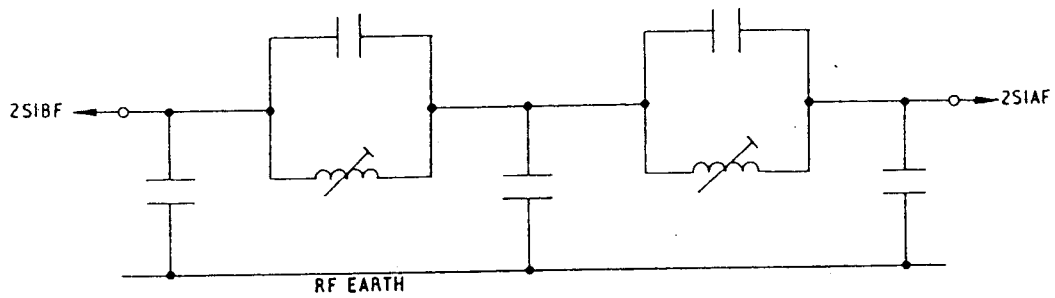


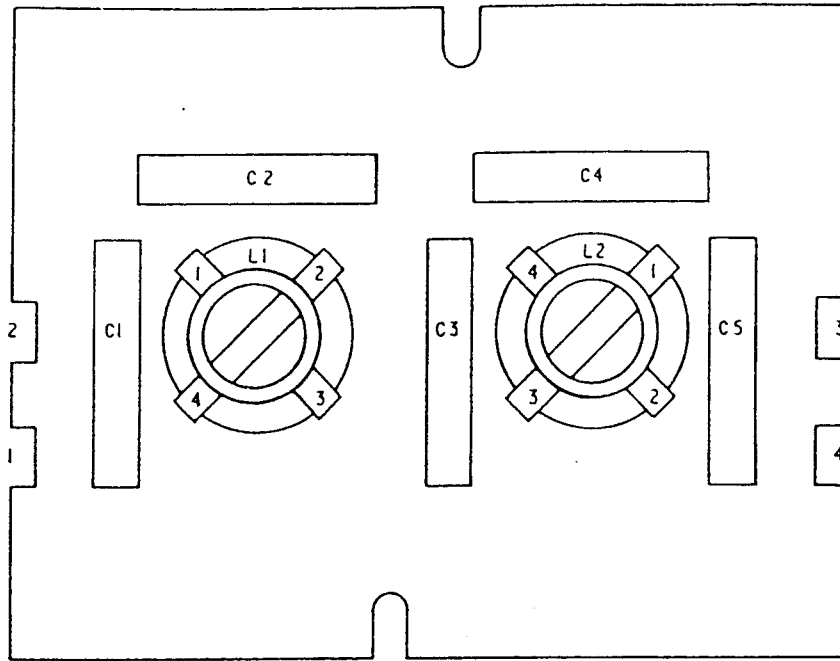
Fig. 1 PA Switch & filter - circuit diagram



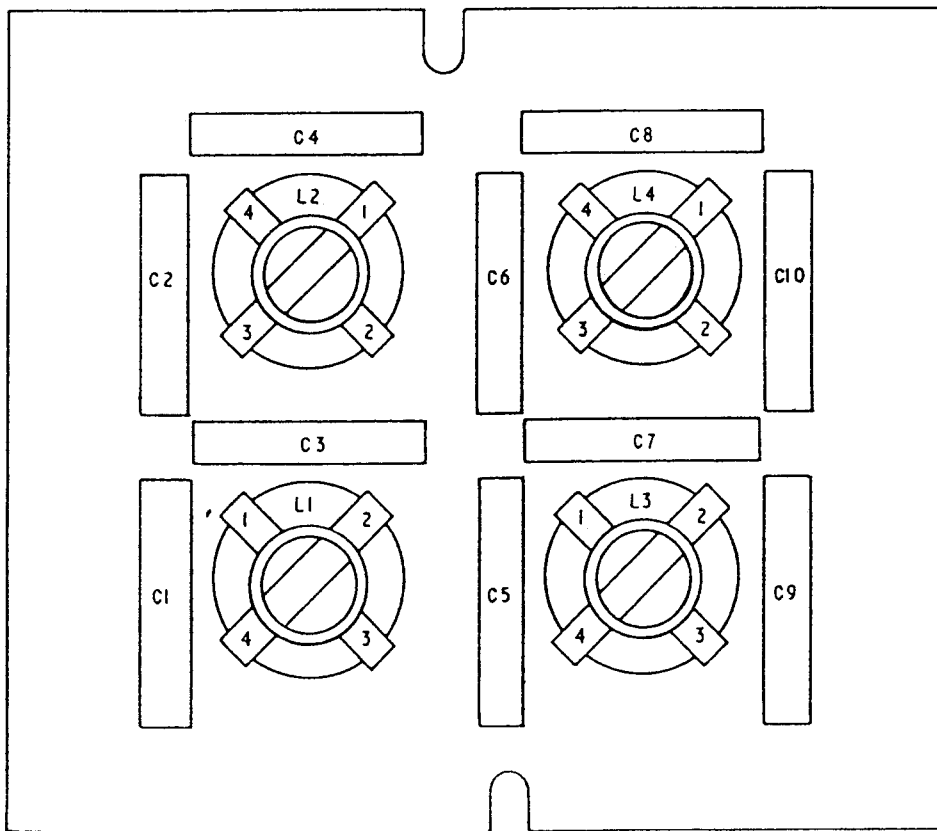
| RANGE | COMPONENT REFERENCES |         |    |         |     | UNIT |
|-------|----------------------|---------|----|---------|-----|------|
|       | C1                   | C2 / L1 | C3 | C4 / L2 | C5  |      |
| 1     | C1                   | C2 / L1 | C3 | C4 / L2 | C5  | 2c   |
| 2     | C1                   | C3 / L1 | C5 | C7 / L3 | C9  | 2d   |
| 3     | C2                   | C4 / L2 | C6 | C8 / L4 | C10 | 2d   |
| 4     | C1                   | C3 / L1 | C5 | C7 / L3 | C9  | 2f   |
| 5     | C2                   | C4 / L2 | C6 | C8 / L3 | C10 | 2f   |
| 6     | C1                   | C2 / L1 | C3 | C4 / L2 | C5  | 2e   |

FOR COMPONENT VALUES REFER TO COMPONENT LISTS

Fig. 2 PA Filter - circuit diagram



UNIT 2c OR 2e



UNIT 2d OR 2f

Fig. 3 Units 2c-2f component layout



THIRD LINE SERVICING  
OF  
VHF FILTER 640/1/09648  
(UNIT 2h)

CONTENTS

|                                   | Para. |
|-----------------------------------|-------|
| Introduction ... ..               | 1     |
| Detailed description ... ..       | 3     |
| Testing                           |       |
| Test equipment ... ..             | 5     |
| Preliminary ... ..                | 7     |
| Alignment procedure ... ..        | 8     |
| Insertion loss measurement ... .. | 9     |
| Components list ... ..            | 10    |

ILLUSTRATIONS

| Fig. |  | Page |
|------|--|------|
| 1    | VHF filter (Unit 2h) - circuit diagram and pec component layout ... .. | 7    |

INTRODUCTION

1. The VHF Filter Assembly (Unit 2h) is a component part of the transmitter receiver and is normally located on the Rear Panel Assembly (Unit 2). It consists of a screening can and a panel electronic circuit. Two coaxial flying leads connect the unit to the associated external circuits.

2. The unit is a low pass filter which reduces the level of broadband noise and spurious outputs at frequencies above 33 MHz by at least 25 dB.

DETAILED DESCRIPTION

3. The filter (refer to fig.1) consists of a three-section, low pass, Darlington-type filter comprising ten fixed capacitors and three variable inductors.

4. The filter has the following characteristics:

|                     |                    |
|---------------------|--------------------|
| Pass-band           | 2 - 30 MHz         |
| Pass-band ripple    | less than 1 dB     |
| Stop-band edge      | 32.8 MHz           |
| Stop-band rejection | greater than 25 dB |

#### TESTING

##### Test equipment

5. The following item of special-to-purpose test equipment is required:

Test Jig. Flessey Type TJS45A.

6. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>  |
|-------------|---|
| RF Gen.     | RF signal generator with the following essential characteristics: |
|             | Range 2 to 100 MHz  |
|             | Overall frequency accuracy $\pm 10\%$                             |
|             | Output voltage $3 \mu\text{V}$ to 3V                              |
|             | Output impedance 50 ohms  |

Suitable instrument: Marconi TF144H/4

RFV An RF millivoltmeter with the following essential characteristics:

|                      |                  |
|----------------------|------------------|
| Frequency to include | 2 to 100 MHz     |
| Range                | 0.3 mV to 3V     |
| Accuracy             | $\pm 3\%$ of fsd |

Suitable instrument: Marconi Type 2605 with adaptor Type TM7950  
with adaptor N to BNC

Counter An electronic counter for measuring frequencies in the range 2 to 100 MHz with an accuracy of 1 part in  $10^4$ .

Suitable instrument: Racal Type 9024

Load A BNC 50 ohm by-pass termination, a suitable one being the Radiall 405 005.

##### Preliminary

7. At the test jig:

(1) Load the UUT (unit under test) onto the jig and clamp it into position.

Insertion loss measurement

Proceed as follows:

- (1) Set the RF Gen output level to 2V emf.
- (2) Set the RF Gen to each of the frequencies listed below and at each step check that the reading of the RFV is as given:

| <u>Check</u> | <u>RF Gen frequency MHz<br/>between</u> | <u>RFV<br/>reading</u> |
|--------------|---|------------------------|
| 1            | 19.91792 and 20.00208                   | GT 930 mV              |
| 2            | 33.79792 and 33.80208                   | LT 53 mV               |
| 3            | 39.99792 and 40.00208                   | LT 53 mV               |
| 4            | 50.0 approx.                            | LT 53 mV               |
| 5            | 60.0 approx.                            | LT 53 mV               |
| 6            | 70.0 approx.                            | LT 53 mV               |
| 7            | 80.0 approx.                            | LT 53 mV               |
| 8            | 90.0 approx.                            | LT 53 mV               |
| 9            | 100.0 approx.                           | LT 53 mV               |

COMPONENTS LIST

The principal component parts of the VHF filter assembly 640/1/09648

are:

|                           |             |
|---------------------------|-------------|
| Panel, electronic circuit | 419/1/11825 |
| Screen can assembly       | 640/1/09620 |

The component parts of the panel, electronic circuit 419/1/11825 (refer fig.1) are:

| <u>Cct.ref.</u> | <u>Description</u>             | <u>Ref.No.</u>  |
|-----------------|--------------------------------|-----------------|
|                 | <u>Capacitors, silver mica</u> |                 |
| C1              | 4.7 pF $\pm$ 0.25 pF 100V      | 400/9/19080/004 |
| C2,3            | 134 pF $\pm$ 0.5% 350V         | 438/9/30100/111 |
| C4              | 135 pF $\pm$ 0.5% 350V         | 438/9/30100/112 |
| C5              | 96 pF $\pm$ 0.5 pF 350V        | 438/9/30100/109 |
| C6,7            | 55 pF $\pm$ 0.5 pF 350V        | 438/9/30100/107 |
| C8              | 132 pF $\pm$ 0.5% 350V         | 438/9/30100/110 |
| C9              | 34 pF $\pm$ 0.5 pF 350V        | 438/9/30100/106 |
| C10             | 92 pF $\pm$ 0.5 pF 350V        | 438/9/30100/108 |

- (2) Fit the coaxial insert on one flying lead into the multi-way connector.
- (3) Connect the other flying lead into the strip-line connector so that the inner conductor is in contact with the printed copper strip and the outer conductor is in contact with the ground plane. Tighten the clamp screw to hold both conductors in position.
- (4) Connect the RF Gen to the input socket on the jig.
- (5) Connect the counter to the RF Gen normal output via a 10 dB attenuator.
- (6) Connect the 50 ohm by-pass termination to the output socket on the jig and connect the termination to the RFV.
- (7) Switch on the test equipment mains supplies where applicable.

#### Alignment procedure

8. Proceed as follows:

- (1) Set the RF Gen output level to 2V emf.
- (2) Set the RF Gen frequency (indicated at counter) as given below for check 1.
- (3) At the UUT, adjust the inductor core given below for check 1 to obtain a minimum reading at the RFV.
- (4) Repeat (2) and (3) for each of checks 2 to 6 inc. in that order.

| <u>Check</u> | <u>RF Gen frequency (MHz)<br/>between</u> | <u>Adjust<br/>core</u> |
|--------------|---|------------------------|
| 1            | 51.49792 and 51.50208                     | L3                     |
| 2            | 35.619792 and 35.620208                   | L2                     |
| 3            | 32.859792 and 32.860208                   | L1                     |
| 4            | 35.619792 and 35.620208                   | L2                     |
| 5            | 32.859792 and 32.860208                   | L1                     |
| 6            | 51.49792 and 51.50208                     | L3                     |

| <u>Cct.ref.</u> | <u>Description</u>          | <u>Ref.No.</u>  |
|-----------------|-----------------------------|-----------------|
|                 | <u>Inductors, r.f.</u>      |                 |
| L1              | 0.056 to 0.060 $\mu$ H min. | 406/8/11037/013 |
| L2              | 0.190 to 0.220 $\mu$ H min. | 406/8/11038     |
| L3              | 0.27 to 0.29 $\mu$ H min.   | 406/8/11037/014 |

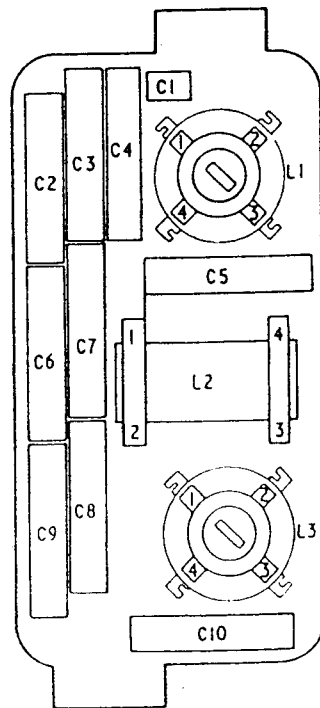
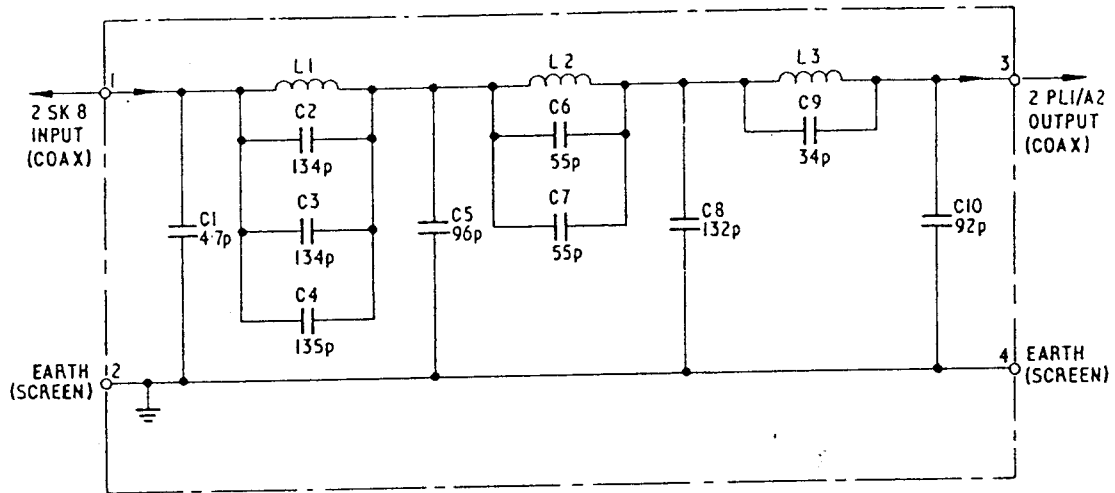


Fig. 1 VHF Filter (unit 2h) - circuit diagram and pec component layout

THIRD LINE SERVICING  
OF  
TURRET ASSEMBLY 640/1/09591  
(UNIT 3)

CONTENTS

|                            | Para. |
|----------------------------|-------|
| Introduction ... ..        | 1     |
| Description ... ..         | 4     |
| Detailed description       |       |
| RF circuits ... ..         | 7     |
| VFO ... ..                 | 12    |
| Testing                    |       |
| Test equipment ... ..      | 14    |
| Preliminary ... ..         | 16    |
| Current consumption check  | 23    |
| Oscillator tracking ... .. | 24    |
| RF tuned circuit alignment | 25    |
| Turret gain ... ..         | 32    |
| Signal + noise/noise ratio | 33    |
| Components list ... ..     | 34    |

ILLUSTRATIONS

| Fig. |   | Page |
|------|---|------|
| 1    | RF circuits ... ..                          | 21   |
| 2    | VFO - circuit ... ..                        | 23   |
| 3    | Turret assembly - component layout ... ..   | 25   |
| 4    | Double tuned circuit static block (Unit 3a) | 27   |
| 5    | Turret coils, RF tuning ... ..              | 29   |
| 6    | Oscillator static block (Unit 3h)           | 31   |
| 7    | Turret coils, oscillator ... ..             | 33   |

INTRODUCTION

1. The turret assembly (Unit 3) is a component part of the transmitter receiver and is normally located on the Front Panel and Chassis Assembly

(Unit 1). It provides the following:

- (1) A variable frequency oscillator (VFO).
- (2) The receiver RF amplifier (single tuned input circuit).
- (3) The receiver RF/IF mixer.
- (4) A receiver IF stage.
- (5) A double tuned filter.

2. Coarse tuning (i.e. frequency range) for items (1), (2) and (5) is selected by a six position switch and, within each range, fine tuning is provided by varactor diodes which respond to a control voltage from a frequency synthesiser (Unit 9).

3. The double tuned filter is employed in either the transmit path or the receive path, selection being made by a relay.

#### DESCRIPTION

4. The turret is a six position manually controlled switch. Each position utilises a different pair of plug-in panels, electronic circuit (pec), which rotate with the switch mechanism. A small plate on the turret casting covers a port that gives access to whichever pair of pec has been selected.

5. Six of the pec (Units 3b, 3g inc.) provide the single/double circuit tuning for ranges 1 to 6 respectively, the other six pec (Units 3j-3p inc.) provide the VFO tuning for ranges 1 to 6 respectively.

6. Two other pec (Units 3a and 3h) are mounted in the turret casting, beneath a large cover plate. Unit 3h contains the VFO circuits and Unit 3a contains the remainder of the RF circuits listed in para.1.

#### DETAILED DESCRIPTION

##### RF circuits (see fig.1)

7. The RF signal applied to pin 11 is fed to a single tuned circuit selected by the range switch and then to ML2. The integrated circuit ML2 is a



variable gain broadband RF amplifier controlled by the receiver AGC voltage fed to pin 9 of Unit 3a.

8. When relay RL1/2 is not operated, its contacts connect ML2 output to ML1 via the double tuned circuit selected by the range switch.

9. Both the single and double tuned circuits are tuned by varactor diodes controlled by a dc voltage in the range 5 to 80V supplied to pin 12 of Unit 3a. The control voltage is used to set the centre of the response curve of the tuned circuits at the frequency of operation.

10. The integrated circuit ML1 is a double balanced modulator. The output at ML1 pin 5 is a complex waveform containing the sum and difference frequencies of the inputs to ML1 pins 7 and 3 (RF from ML2 and RF from the VFO), the original frequencies are effectively suppressed. Ignoring any audio component in the receiver RF signal, the difference between the two frequencies is normally 1.75 MHz. The circuit L2/C4/C5 is tuned to 1.75 MHz and has a bandwidth covering the upper and lower sideband components (i.e. audio components). Thus, the difference frequency is selected and is amplified by TR1/TR2 before being passed to the Rx IF output at pin 7 of Unit 3a.

11. Relay RL1/2 is operated when +24V is applied to pin 1 of Unit 3a; its contacts disconnect the double tuned circuit from the receiver RF path and connect the circuit in the transmitter RF path (between pins 13 and 12 of Unit 3a).

VFO (see fig.2)

12. ML1 on Unit 3h is an oscillator, the frequency of which is determined by the tuned circuit connected between pins 2 and 10 of ML1. This tuned circuit is selected by the range switch and is tuned by varactor diodes controlled by a dc voltage in the range 5 to 80V supplied to pin 8 of Unit 3h. (In practice, this and the similar input to Unit 3a, are connected to a common source, the synthesiser).

13. ML1 provides three sine-wave outputs, two of these outputs are used to supply the transmitter and receiver modulators respectively and are between 200 and 400 mV peak-to-peak. The third output is between 1000 and 1700 mV peak-to-peak and is used to supply the synthesiser control loop.

TESTINGTest equipment

14. The following items of special-to-purpose test equipment are required:

- (1) HF Turret Test Set. Plessey Type TD50572B.
- (2) Test Jig. Plessey Type TJ844B.

15. The following items of proprietary test equipment are required:-

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| RF Gen.     | A RF signal generator capable of providing spot frequencies in the range 2 - 30 MHz to an accuracy of $\pm 2$ Hz. The output emf should be adjustable between 6 $\mu$ V and 500 mV $\pm 1.2$ dB from an output impedance of 50 ohms.<br>Suitable instrument: Marconi TF2002B with TF2170B synchroniser |
| RF VM       | A selective RF millivoltmeter capable of measuring voltages in the range 50 $\mu$ V to 50 mV with an accuracy of $\pm 1.75$ MHz.<br>Suitable instrument: Bruel & Kjoer Type 2006.  |
| DVM         | Digital voltmeter to measure dc voltages in the range 0V to 62V with an accuracy of $\pm 5$ mV. Input impedance 10 Mohm or better.<br>Suitable instrument: Solartron A203/204  |
| Counter     | To measure frequency in the range 2 to 30 MHz with an accuracy of $\pm 2$ MHz.<br>Suitable instrument: Racal 9024  |
| Pad         | A 20 dB 75 ohm pad.  |
| Tool        | A trimming tool such as the Siemens 9 mm tool. (The tool blade dimensions must be correct in order to protect pot cores from damage).  |

NOTE: The test set TD50572 contains a reference oscillator and synthesiser that, in conjunction with the turret, provide a "phase locked loop". A lamp on the test set is extinguished when the phase lock condition is present.

Preliminary

16. Connect the turret test set to the jig, using the 6-way Plessey and BNC connectors.
17. Connect the DVM to the VARICAP connections on the jig, observing the correct polarity.
18. On the UUT (unit under test) remove the two cover plates. Lift the UUT onto the jig, ensure that it is seated correctly and, without using undue force, secure it in position by means of the clamp.
19. By means of the lever on the jig, carefully slide the plunger carriage in until the lever attains its maximum amount of movement - this will cause the plungers on the carriage to locate against the UUT test points.
20. Fit the selection switch wheel to the turret mechanism. Three locating pins, one on UUT and two on wheel ensure that the engraved marker on the wheel correctly indicates the range selected (i.e. the pec requiring alignment is accessible through the access port).
21. On the plunger carriage, set the damping switch (top of carriage) to off.
22. Connect and switch on the mains supplies to the Turret test set and DVM. Set the 6V switch to ON.

Current consumption check

23. Check that the meter on the turret test set indicates that the UUT drain on the 6V supply is between 36 and 62.5 mA.

Oscillator tracking

24. Set the turret to each of the range 1 to 6 in turn, and at each step, refer to the list below and carry out the following procedure.

(1) Set the test set frequency to the upper tracking frequency given and adjust the indicated capacitor for the specified varicap voltage (displayed at DVM). The phase lock lamp on the test set should go out.

(2) Set the test set frequency to the lower tracking frequency and adjust the indicated inductor for the specified varicap voltage. The phase lock lamp on the test set should go out.

(3) Using the counter connected to pin 4 of Unit 3a (VFO output) of the UUT, check that the counter indicates a frequency 1.75 MHz above the tracking frequency.

| RANGE | TRACKING<br>FREQUENCY<br>MHz | ADJUST       | VARICAP DIODE VOLTAGE                    |
|-------|------------------------------|--------------|--|
| 1     | 2.99<br>2.11                 | 3jC1<br>3jL1 | 61.30V $\pm$ 500 mV<br>9.67V $\pm$ 50 mV |
| 2     | 4.72<br>3.28                 | 3kC1<br>3kL1 | 60.80V $\pm$ 500 mV<br>8.86V $\pm$ 50 mV |
| 3     | 7.42<br>5.18                 | 3lC1<br>3lL1 | 61.00V $\pm$ 500 mV<br>9.10V $\pm$ 50 mV |
| 4     | 11.75<br>8.15                | 3mC1<br>3mL1 | 60.80V $\pm$ 500 mV<br>8.77V $\pm$ 50 mV |
| 5     | 18.41<br>12.89               | 3nC1<br>3nL1 | 61.00V $\pm$ 500 mV<br>9.25V $\pm$ 50 mV |
| 6     | 28.91<br>20.19               | 3pC1<br>3pL1 | 61.00V $\pm$ 500 mV<br>9.12V $\pm$ 50 mV |

#### RF tuned circuit alignment

25. Retain the test connections used in the preceding tests.

26. Connect the RF VM probe to the mV MET socket on the test jig. Connect the 20 dB 75 ohm pad between the RF VM and its probe. Calibrate the RF VM to the reference level of 2.5 mV at 30 MHz as described in the manufacturers handbook. Set the RF VM to 1.75 MHz.

27. Set the AGC and 24V switches on the test set to OFF. Set the damping switch on the jig to ON.

28. Connect the RF Gen output to the SG1 terminal on the test jig. Switch on the RF Gen and set its output level to 1 mV.

NOTE: UUT is operated in Rx mode with RF Gen supplying signal and RF VM showing RF output at pin 7 of panel 3a of UUT.

29. Set the turret to each of ranges 1 to 6 in turn and, at each step, refer to the list below and carry out the following procedure:

(1) Set the test set and RF Gen frequency to the upper tracking frequency given.

(2) At the given unit, adjust C3, C2, C1 in that order, for maximum reading at the RF VM.

(3) Set the test set and RF Gen frequency to the lower tracking frequency given.

(4) At the given unit, adjust L3, L2, L1 in that order, for maximum reading at the RF VM.

| RANGE | TRACKING<br>FREQUENCY<br>MHz | ADJUST<br>AT UNIT |
|-------|------------------------------|-------------------|
| 1     | 2.99<br>2.11                 | 3b                |
| 2     | 4.72<br>3.28                 | 3c                |
| 3     | 7.42<br>5.18                 | 3d                |
| 4     | 11.75<br>8.15                | 3e                |
| 5     | 18.41<br>12.89               | 3f                |
| 6     | 28.91<br>20.19               | 3g                |

30. Select 28.91 MHz at test set and RF Gen. Adjust 3aL2 for maximum reading at the RF VM.

31. At the jig, set the damping resistor switch to OFF.

Turret gain

32. Retain the test connections used in the RF tuned circuit alignment and proceed as follows:

- (1) Set UUT range switch to 1.
- (2) Set test set AGC and 24V switches to OFF, set frequency to 2 MHz.
- (3) Set RF Gen to 2 MHz at 1 mV emf.
- (4) Adjust RF VM frequency control for maximum response in region of 1.75 MHz.
- (5) Check that RF VM reading is between 1.9 mV and 9.8 mV (19 mV and 98 mV at UUT).
- (6) Set test set frequency to 2.5 MHz.
- (7) Set RF Gen to 2.5 MHz at 50  $\mu$ V emf.
- (8) Adjust RF VM frequency for maximum response in region of 1.75 MHz with narrow bandwidth selected. Note the reading.
- (9) Set the test set AGC switch to ON and check that the RF VM reading is more than 40 dB down on the reading obtained in (8).

Signal + noise/noise ratio

33. Retain the test connections used in the turret gain test and proceed as follows:

- (1) At the test set, set the AGC and 24V switches to off.
- (2) With reference to the list given below, carry out checks 1 to 12 and for each check:
  - (a) Set UUT range switch as given.
  - (b) Set test set frequency as given. Switch on RF Gen carrier and set to same frequency at 0.8 mV emf.

(c) Adjust RF VM frequency control for max. response in region of 1.75 MHz with narrow band selected. Note RF VM reading in dB.

(d) Switch off RF Gen carrier. Check that the RF VM reading is greater than 16 dB below that noted in (c).

| <u>Check</u> | <u>Range</u> | <u>Frequency (MHz)</u> |
|--------------|--------------|------------------------|
| 1            | 1            | 2.11                   |
| 2            | 1            | 22.99                  |
| 3            | 2            | 3.28                   |
| 4            | 2            | 4.72                   |
| 5            | 3            | 5.18                   |
| 6            | 3            | 7.42                   |
| 7            | 4            | 8.15                   |
| 8            | 4            | 11.75                  |
| 9            | 5            | 12.89                  |
| 10           | 5            | 18.41                  |
| 11           | 6            | 20.19                  |
| 12           | 6            | 28.41                  |

#### COMPONENTS LIST

34. For details of the component parts of Unit 3, refer to table 1. For detailed breakdown of these parts, refer to tables 2 to 15.

Table 1

TURRET ASSEMBLY (UNIT 3)  
640/1/09591 (see Figure 3)

| Unit | Description   | Reference No.   |
|------|---|-----------------|
|      | Filter, low pass                                    | 422/9/07510     |
|      | Screen  | 640/2/09664     |
|      | Housing and rotor assembly, consists of:-           | 640/1/09661     |
|      | Housing assembly                                    | 640/1/09762     |
|      | Rotor, D.T.C.T. assembly, including:-               | 640/1/09765     |
|      | Cheek assembly (right hand)                         | 640/1/09860     |
|      | Cheek assembly (left hand)                          | 640/1/09861     |
|      | Clip retaining                                      | 640/2/09862     |
|      | Screen  | 640/2/09684     |
|      | Rotor, oscillator assembly, including:-             | 640/1/09764     |
|      | Cheek assembly (right hand)                         | 640/1/09860     |
|      | Cheek assembly (left hand)                          | 640/1/09861     |
|      | Clip retaining                                      | 640/2/09862     |
|      | Back plate assembly                                 | 640/1/09766     |
|      | End plate, front assembly                           | 640/1/09767     |
|      | Coupling assembly                                   | 640/1/09768     |
|      | Shaft assembly                                      | 640/1/09856     |
|      | Spring  | 640/1/14902     |
|      | Spring  | 640/1/14904     |
|      | Ring, retaining clip, external 4.8mm.               | 999/4/01303/003 |
|      | Circlip, external, 6mm. shaft                       | 999/4/00451/008 |
| 3a   | Panel, electronic circuit, D.T.C.T. static block    | See table 2     |
| 3b   | R.F. tuning coil, range 1                           | See table 3     |
| 3c   | R.F. tuning coil, range 2                           | See table 4     |
| 3d   | R.F. tuning coil, range 3                           | See table 5     |
| 3e   | R.F. tuning coil, range 4                           | See table 6     |
| 3f   | R.F. tuning coil, range 5                           | See table 7     |
| 3g   | R.F. tuning coil, range 6                           | See table 8     |
| 3h   | Panel, electronic circuit, oscillator, static block | See table 9     |
| 3j   | Oscillator coil, range 1                            | See table 10    |
| 3k   | Oscillator coil, range 2                            | See table 11    |
| 3l   | Oscillator coil, range 3                            | See table 12    |
| 3m   | Oscillator coil, range 4                            | See table 13    |
| 3n   | Oscillator coil, range 5                            | See table 14    |
| 3p   | Oscillator coil, range 6                            | See table 15    |



Table 2

DOUBLE TUNED CIRCUIT (STATIC BLOCK) WITH RECEIVER RF AMPLIFIER AND MODULATOR  
 PEC (UNIT 3a)  
 419/1/11860 (See Figure 4)

| Cct Ref                       | Description                      | Reference No.   |
|-------------------------------|----------------------------------|-----------------|
| <u>Resistors</u>              |                                  |                 |
| R1                            | 620 ohm $\pm$ 5%                 | 403/4/78126/044 |
| R2                            | 10 kohm $\pm$ 5%                 | 403/4/78126/073 |
| R3                            | 150 ohm $\pm$ 5%                 | 403/4/78126/029 |
| R4                            | 1.2 kohm $\pm$ 5%                | 403/4/78126/051 |
| R5                            | 200 ohm $\pm$ 5%                 | 403/4/78126/032 |
| R6                            | 75 ohm $\pm$ 5%                  | 403/4/78126/022 |
| R7                            | 10 kohm $\pm$ 5%                 | 403/4/78126/073 |
| R8                            | 100 ohm $\pm$ 5%                 | 403/4/78126/025 |
| R9                            | 100 kohm $\pm$ 5%                | 403/4/78126/097 |
| R10                           | 100 kohm $\pm$ 5%                | 403/4/78126/097 |
| R11                           | 75 ohm $\pm$ 5%                  | 403/4/78126/022 |
| R12                           | 1 kohm $\pm$ 5%                  | 403/4/78126/049 |
| R13                           | 100 kohm $\pm$ 5%                | 403/4/78126/097 |
| <u>Capacitors</u>             |                                  |                 |
| C1                            | 68nF + 80% - 20% 50v             | 400/9/19084/098 |
| C2                            | 68nF + 80% - 20% 50v             | 400/9/19084/098 |
| C3                            | 10nF + 80% - 20% 50v             | 400/9/19084/078 |
| C4                            | 100pF $\pm$ 5% 100v              | 400/9/19081/085 |
| C5                            | 300pF $\pm$ 1% 350v, silver mica | 438/9/30100/105 |
| C6                            | 10nF + 80% - 20% 50v             | 400/9/19084/078 |
| C7                            | 6.8uF $\pm$ 20% 6v, electrolytic | 402/4/98049/009 |
| C8                            | 68nF + 80% - 20% 50v             | 400/9/19084/098 |
| C9                            | 10nF + 80% - 20% 50v             | 400/9/19084/078 |
| C10                           | 68nF + 80% - 20% 50v             | 400/9/19084/098 |
| C11                           | 10nF + 80% - 20% 50v             | 400/9/19084/078 |
| C12                           | 6.8uF $\pm$ 20% 6v, electrolytic | 402/4/98049/009 |
| C13                           | 10nF + 80% - 20% 50v             | 400/9/19084/078 |
| <u>Inductors</u>              |                                  |                 |
| L1                            | Inductor 18uH                    | 406/8/08470/027 |
| L2                            | Inductor                         | 406/8/11030/002 |
| <u>Semi-conductor devices</u> |                                  |                 |
| TR1                           | Transistor CV7648                | 990/4/00107/648 |
| TR2                           | Transistor CV7648                | 990/4/00107/648 |
| D1 to D4                      | Diode, varactor, DB 4299         | 415/4/05441     |
| D5, D6                        | Diode CV7367                     | 990/4/00107/367 |
| D7, D8                        | Diode, varactor, DB 4299         | 415/4/05441     |
| ML1                           | Integrated circuit CN 615T       | 446/4/00427     |
| ML2                           | Integrated circuit CN 599T       | 446/4/00421     |

Cct Ref

Description

Reference No.

RL1

Miscellaneous  
Relay  
Contact block assembly  
Screw, ch.hd. slotted M2 x 5mm st.st.

507/9/05095  
(or 507/9/38041)  
640/1/09668  
991/4/02030/054



Table 3

R.F. TUNING COIL, RANGE 1 (UNIT 3b)  
406/8/11102/001 (see Figure 5a)

| Cct Ref              | Description            | Reference No.   |
|----------------------|------------------------|-----------------|
| <u>Capacitors</u>    |                        |                 |
| C1 to C3             | 5.5 to 18pF variable   | 401/9/32185     |
| C4                   | 1.6pF $\pm$ 0.1pF 500v | 400/9/18825/004 |
| C5                   | 10nF $\pm$ 10% 100v    | 400/9/19083/051 |
| <u>Miscellaneous</u> |                        |                 |
|                      | Contact block          | 640/2/09670     |
|                      | Spring                 | 640/2/09778     |
| <u>Inductors</u>     |                        |                 |
| L1                   | Printed spiral coil    | 419/2/11876     |
| L2,L3                | Printed spiral coil    | 419/2/11871     |

Table 4

R.F. TUNING COIL, RANGE 2 (UNIT 3c)  
406/8/11102/002 (see Figure 5a)

| Cct Ref              | Description            | Reference No.   |
|----------------------|------------------------|-----------------|
| <u>Capacitors</u>    |                        |                 |
| C1 to C3             | 5.5 to 18pF variable   | 401/9/32185     |
| C4                   | 1.8pF $\pm$ 0.1pF 500v | 400/9/18825/005 |
| C5                   | 10nF $\pm$ 10% 100v    | 400/9/19083/051 |
| <u>Miscellaneous</u> |                        |                 |
|                      | Contact block          | 640/2/09670     |
|                      | Spring                 | 640/2/09778     |
| <u>Inductors</u>     |                        |                 |
| L1                   | Printed spiral coil    | 419/2/11891     |
| L2,L3                | Printed spiral coil    | 419/2/11886     |

Table 5

R.F. TUNING COIL, RANGE 3 (UNIT 3d)  
406/8/11102/003 (see Figure 5a)

| Cct Ref              | Description            | Reference No.   |
|----------------------|------------------------|-----------------|
| <u>Capacitors</u>    |                        |                 |
| C1 to C3             | 5.5 to 18pF variable   | 401/9/32185     |
| C4                   | 1.0pF $\pm$ 0.1pF 500v | 400/9/18825/001 |
| C5                   | 10nF $\pm$ 10% 100v    | 400/9/19083/051 |
| <u>Miscellaneous</u> |                        |                 |
|                      | Contact block          | 640/2/09670     |
|                      | Spring                 | 640/2/09778     |
| <u>Inductors</u>     |                        |                 |
| L1                   | Printed spiral coil    | 419/2/11906     |
| L2,L3                | Printed spiral coil    | 419/2/11901     |

Table 6

R.F. TUNING COIL, RANGE 4 (UNIT 3e)  
406/8/11102/004 (see Figure 5a)

| Cct Ref              | Description            | Reference No.   |
|----------------------|------------------------|-----------------|
| <u>Capacitors</u>    |                        |                 |
| C1 to C3             | 5.5 to 18pF variable   | 401/9/32185     |
| C4                   | 2.0pF $\pm$ 0.1pF 500v | 400/9/18825/006 |
| C5                   | 10nF $\pm$ 10%         | 400/9/19083/051 |
| <u>Miscellaneous</u> |                        |                 |
|                      | Contact block          | 640/2/09670     |
|                      | Spring                 | 640/2/09778     |
| <u>Inductors</u>     |                        |                 |
| L1                   | Printed spiral coil    | 419/2/11921     |
| L2,L3                | Printed spiral coil    | 419/2/11916     |

Table 7

R.F. TUNING COIL, RANGE 5 (UNIT 3f)  
406/8/11102/005 (see Figure 5b)

| Cct Ref  | Description                                     | Reference No.   |
|----------|---|-----------------|
|          | <u>Resistors</u>                                |                 |
| R1       | 10 kohm $\pm$ 5%                                | 403/9/03547/001 |
|          | <u>Capacitors</u>                               |                 |
| C1 to C3 | 5.5 to 18pF variable                            | 401/9/32185     |
| C4       | 2.0pF $\pm$ 0.1pF 500v                          | 400/9/18825/006 |
| C5       | 6.8nF $\pm$ 10% 100v                            | 400/9/29033/047 |
|          | <u>Miscellaneous</u>                            |                 |
|          | Contact block                                   | 640/2/09670     |
|          | Spring  | 640/2/09778     |
|          | Note ... L1, L2, L3 are printed<br>spiral coils |                 |

Table 8

R.F. TUNING COIL, RANGE 6 (UNIT 3g)  
406/8/11102/006 (see Figure 5c)

| Cct Ref  | Description          | Reference No    |
|----------|----------------------|-----------------|
|          | <u>Resistors</u>     |                 |
| R1       | 10 kohm $\pm$ 5%     | 403/9/03547/001 |
|          | <u>Capacitors</u>    |                 |
| C1 to C3 | 5.5 to 18pF variable | 401/9/32185     |
|          | <u>Inductors</u>     |                 |
| L1 to L3 | Printed spiral coils |                 |
| L4       | Inductor             | 406/8/11108/001 |
|          | <u>Miscellaneous</u> |                 |
|          | Contact block        | 640/2/09670     |
|          | Spring               | 640/2/09778     |

Table 9

OSCILLATOR STATIC BLOCK P.E.C. (UNIT 3h)  
419/1/11960 (see Figure 6)

| Cct Ref                       | Description                                 | Reference No.   |
|-------------------------------|---|-----------------|
| <u>Resistors</u>              |   |                 |
| R1                            | 47 kohm $\pm$ 5%                            | 403/4/78126/089 |
| R2                            | 47 kohm $\pm$ 5%                            | 403/4/78126/089 |
| R3                            | 39 kohm $\pm$ 5%                            | 403/4/78126/087 |
| R4                            | 39 kohm $\pm$ 5%                            | 403/4/78126/087 |
| <u>Capacitors</u>             |   |                 |
| C1, C2                        | 10nF +80% -20% 100v                         | 400/9/19084/078 |
| C3                            | 470nF $\pm$ 20% 50v                         | 400/9/19084/049 |
| C4                            | 3pF $\pm$ $\frac{1}{2}$ pF 500v             | 400/9/18825/009 |
| C5, C6                        | 10nF +80% -20% 100v                         | 400/9/19084/078 |
| C7                            | 10nF $\pm$ 20% 100v                         | 400/9/19083/121 |
| C8 to C10                     | 10nF +80% -20% 100v                         | 400/9/19084/078 |
| C11, C12                      | 100nF $\pm$ 10% 100v                        | 400/9/19083/066 |
| C13                           | 68nF +80% -20% 50v                          | 400/9/19084/098 |
| C14, C15                      | 100nF $\pm$ 10% 100v                        | 400/9/19083/066 |
| C16                           | 68nF +80% -20% 50v                          | 400/9/19084/098 |
| <u>Semi-conductor devices</u> |   |                 |
| D1, D2                        | Diode, varactor DB 4299                     | 415/4/05441     |
| D3                            | Diode, BAX-16 High conductance 150v. P.I.V. | 415/4/05449     |
| ML1                           | Integrated circuit CN 597T                  | 446/4/00420     |
| <u>Miscellaneous</u>          |   |                 |
|                               | Block assembly, oscillator                  | 640/1/09671     |
|                               | Earth connection                            | 640/1/09672     |
|                               | Screw, cM.hd. slotted, M2 x 5mm. st.st.     | 991/4/02030/054 |

Table 10

OSCILLATOR COIL, RANGE 1 (UNIT 3j)  
406/8/11101/001 (see Figure 7a)

| Cct Ref              | Description                       | Reference No.   |
|----------------------|-----------------------------------|-----------------|
| <u>Capacitors</u>    |                                   |                 |
| C1                   | 5.5 to 18pF variable              | 401/9/32185     |
| C2                   | 200pF $\pm$ 10% 350v, silver mica | 438/9/30100/083 |
| C3                   | 10pF $\pm$ 5% 100v                | 400/9/19080/075 |
| <u>Inductors</u>     |                                   |                 |
| L1                   | Printed spiral coil               | 419/2/11971     |
| L2                   | Inductor 100uH                    | 406/9/08490/033 |
| <u>Miscellaneous</u> |                                   |                 |
|                      | Spring                            | 640/2/09778     |
|                      | Contact block                     | 640/2/09673     |

Table 11

OSCILLATOR COIL, RANGE 2 (UNIT 3k)  
406/8/11101/002 (see Figure 7a)

| Cct Ref              | Description                      | Reference No.   |
|----------------------|----------------------------------|-----------------|
| <u>Capacitors</u>    |                                  |                 |
| C1                   | 5.5 to 18pF variable             | 401/9/32185     |
| C2                   | 308pF $\pm$ 1% 350v, silver mica | 438/9/30100/099 |
| C3                   | 10pF $\pm$ 5% 100v               | 400/9/19080/075 |
| <u>Inductors</u>     |                                  |                 |
| L1                   | Printed spiral coil              | 419/2/11981     |
| L2                   | Inductor 47uH                    | 406/9/08490/029 |
| <u>Miscellaneous</u> |                                  |                 |
|                      | Spring                           | 640/2/09778     |
|                      | Contact block                    | 640/2/09673     |

Table 12

OSCILLATOR COIL, RANGE 3 (UNIT 31)  
406/8/11101/003 (see Figure 7a)

| Cct Ref              | Description                      | Reference No.   |
|----------------------|----------------------------------|-----------------|
| <u>Capacitors</u>    |                                  |                 |
| C1                   | 5.5 to 18pF variable             | 401/9/32185     |
| C2                   | 470pF $\pm$ 1% 350v, silver mica | 438/9/30100/055 |
| C3                   | 6.8pF $\pm$ 5% 100v              | 400/9/19080/072 |
| <u>Inductors</u>     |                                  |                 |
| L1                   | Printed spiral coil              | 419/2/11991     |
| L2                   | Inductor 33uH                    | 406/9/08390/027 |
| <u>Miscellaneous</u> |                                  |                 |
|                      | Spring                           | 640/2/09778     |
|                      | Contact block                    | 640/2/09673     |

Table 13

OSCILLATOR COIL, RANGE 4 (UNIT 3m)  
406/8/11101/004 (see Figure 7a)

| Cct Ref              | Description                      | Reference No.   |
|----------------------|----------------------------------|-----------------|
| <u>Capacitors</u>    |                                  |                 |
| C1                   | 5.5 to 18pF variable             | 401/9/32185     |
| C2                   | 732pF $\pm$ 1% 350v, silver mica | 438/9/30100/098 |
| C3                   | 6.8pF $\pm$ 5% 100v              | 400/9/19080/072 |
| <u>Inductors</u>     |                                  |                 |
| L1                   | Printed spiral coil              | 419/1/12001     |
| L2                   | Inductor 12uH                    | 406/9/08470/025 |
| <u>Miscellaneous</u> |                                  |                 |
|                      | Spring                           | 640/2/09778     |
|                      | Contact block                    | 640/2/09673     |



Table 14

OSCILLATOR COIL, RANGE 5 (UNIT 3n)  
406/8/11101/005 (see Figure 7b)

| Cct Ref              | Description                       | Reference No.   |
|----------------------|-----------------------------------|-----------------|
| <u>Capacitors</u>    |                                   |                 |
| C1                   | 5.5 to 18uF variable              | 401/9/32185     |
| C2                   | 1124pF $\pm$ 1% 350v, silver mica | 438/9/30100/104 |
| C3                   | 6.8pF $\pm$ 5% 100v               | 400/9/19080/072 |
| C4                   | 6.8pF $\pm$ 5% 100v               | 400/9/18799/102 |
| <u>Inductors</u>     |                                   |                 |
| L1                   | Printed spiral coil               | 419/2/12011     |
| L2                   | Inductor, 5.6uH                   | 406/9/08470/021 |
| <u>Miscellaneous</u> |                                   |                 |
|                      | Spring                            | 640/2/09778     |
|                      | Contact block                     | 640/2/09673     |

Table 15

OSCILLATOR COIL, RANGE 6 (UNIT 3p)  
406/8/11101/006 (see Figure 7c)

| Cct Ref              | Description                     | Reference No.   |
|----------------------|---------------------------------|-----------------|
| <u>Capacitors</u>    |                                 |                 |
| C1                   | 5.5 to 18uF variable            | 401/9/32185     |
| C2                   | 1750pF $\pm$ 1% 200v d.c., mica | 400/9/19295/001 |
| C3                   | 10uF $\pm$ 5% 100v              | 400/9/19080/075 |
| C4                   | 15pF $\pm$ 5% 100v              | 400/9/19080/077 |
| <u>Miscellaneous</u> |                                 |                 |
|                      | Spring                          | 640/2/09778     |
|                      | Contact block                   | 640/2/09673     |
| L1                   | Printed spiral coil             | 419/2/12021     |

PHASE CONTROL  
800V 1V

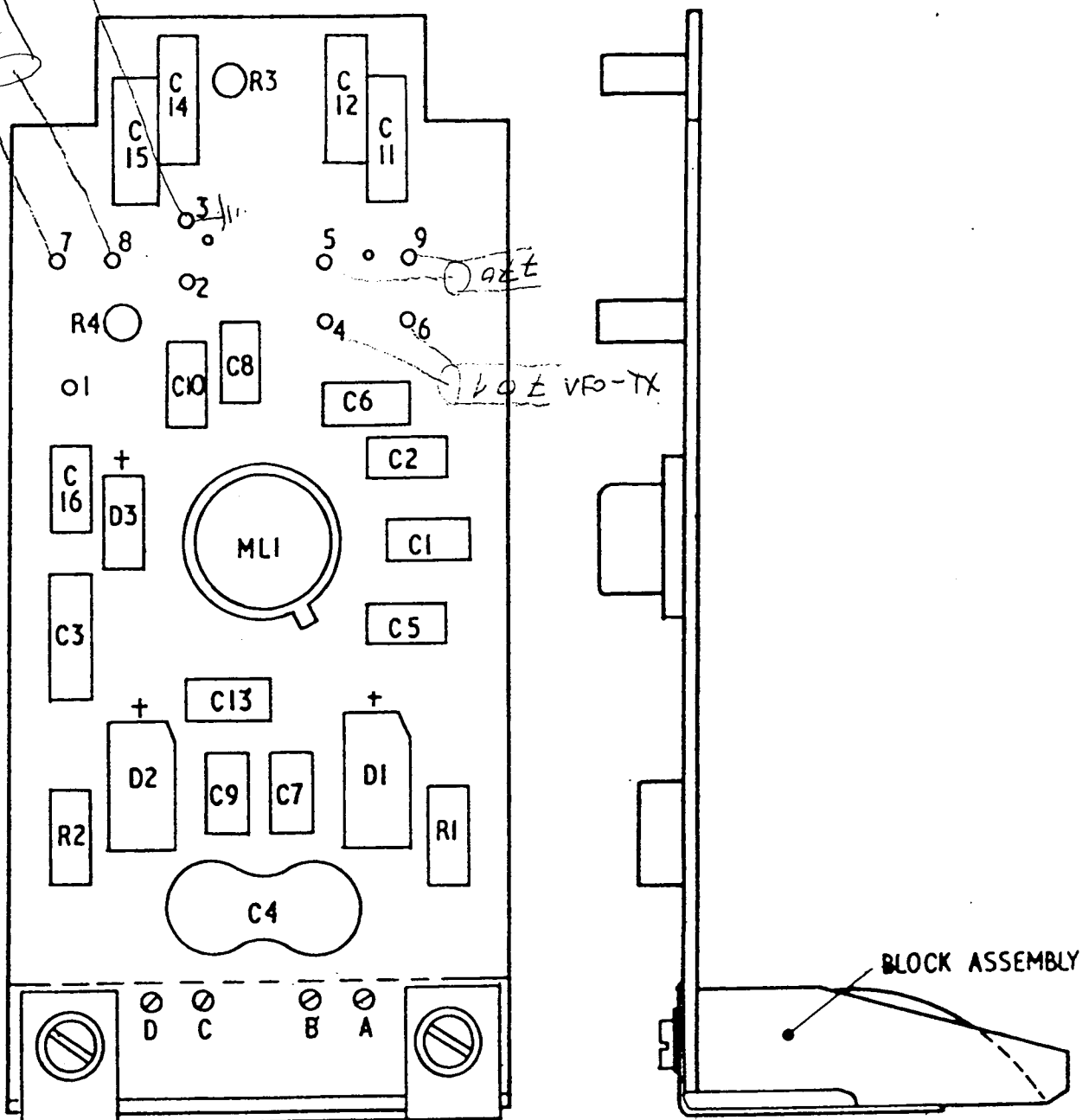
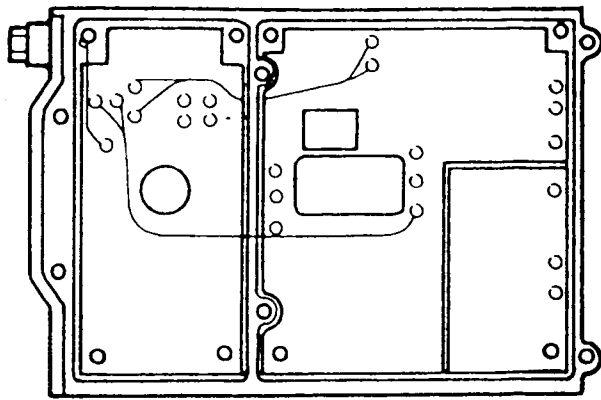
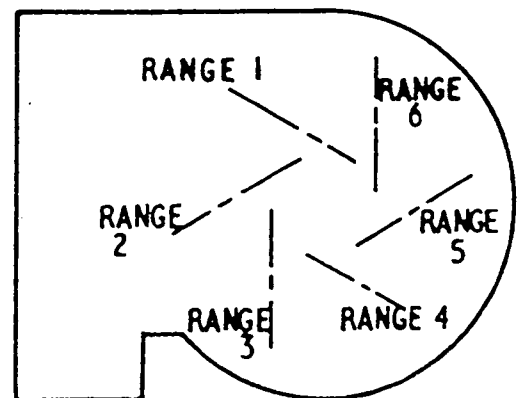
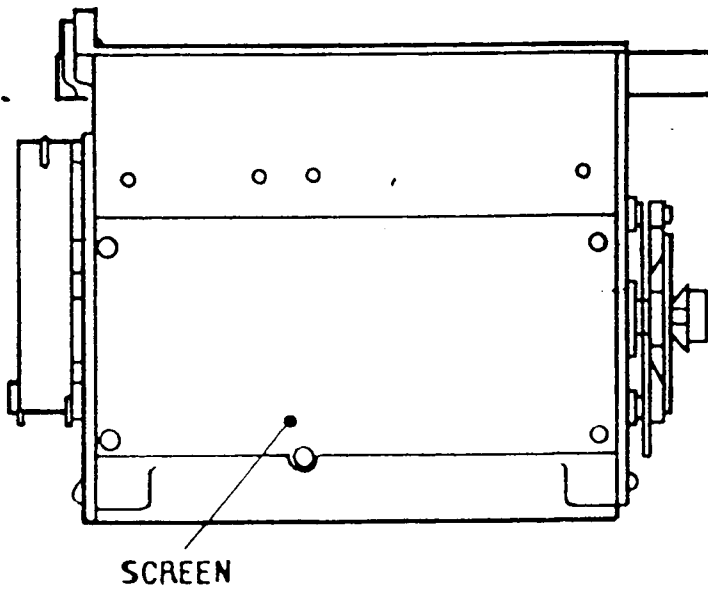
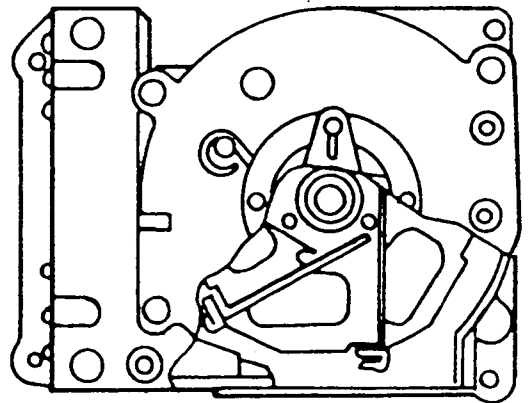
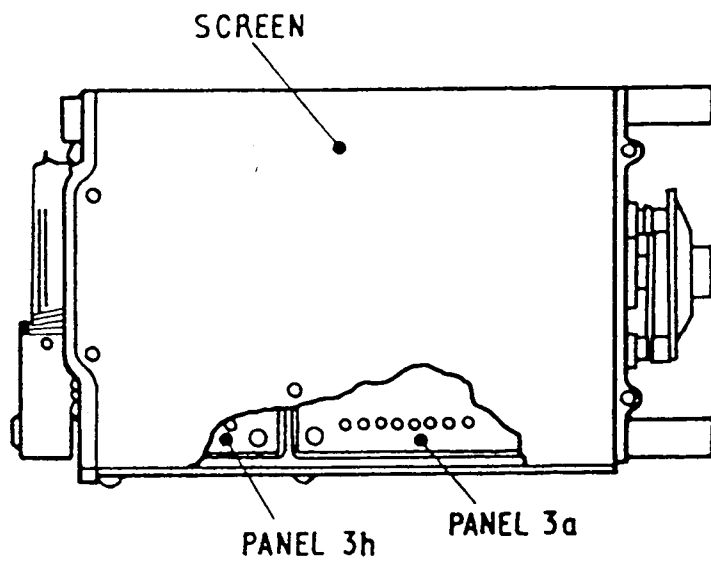


Fig.6 Oscillator static block  
(unit 3h)



VIEW SHOWING PANEL WIRING

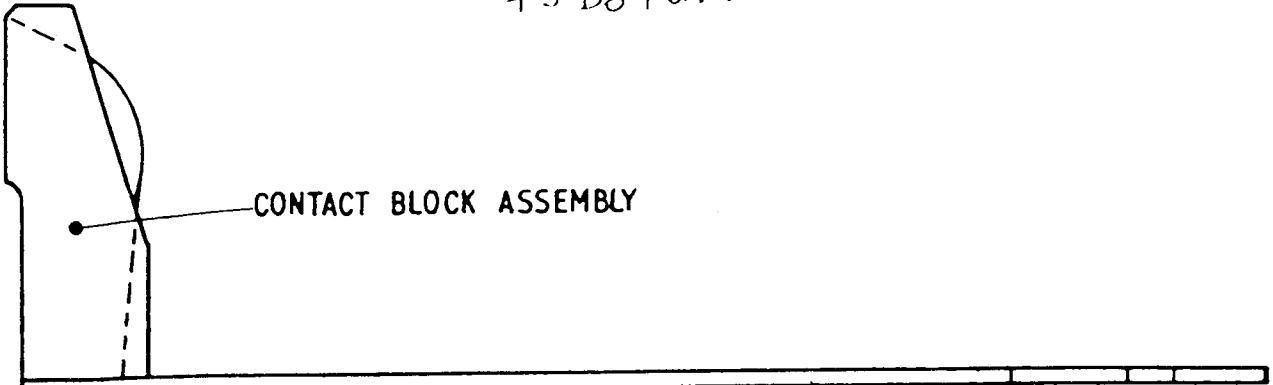


VIEW FROM FRONT SHOWING POSITION OF COILS

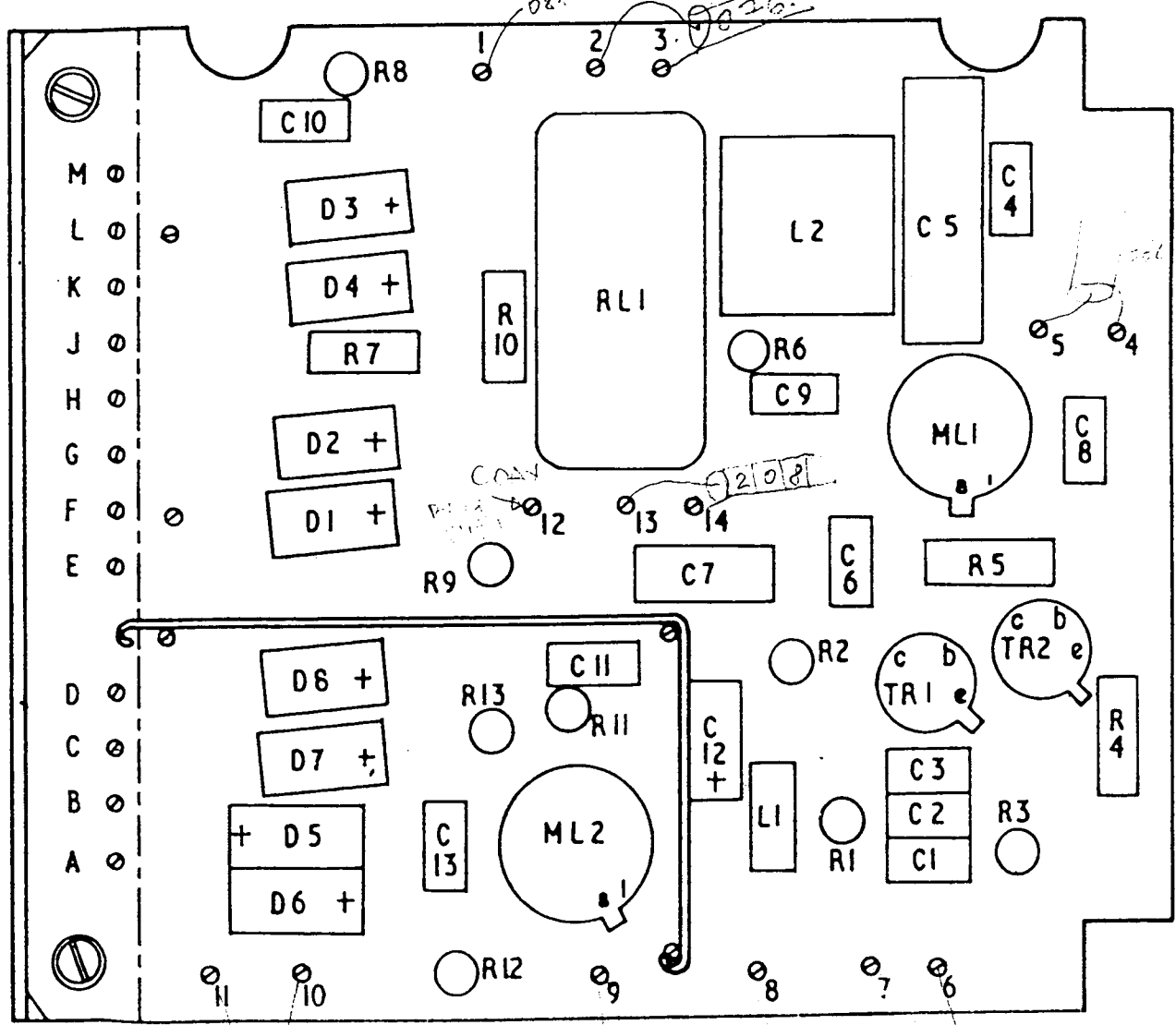
Fig.3 Turret assembly — component layout

12VOD 12" = PHASE CONTROL  
 " +9 D0 +61V

640/HA/09591



COMPONENT SIDE OF PEC



419/1/11860

RX INPUT ANTENNA  
 +6V RX  
 MF-RX-a 1.75MHz

Fig. 4 Double tuned circuit static block (unit 3a)

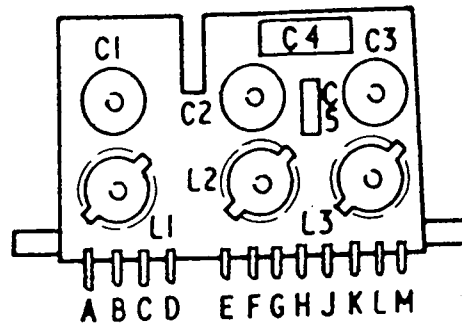


Fig.5a R.F. TUNING COIL  
RANGES 1 TO 4

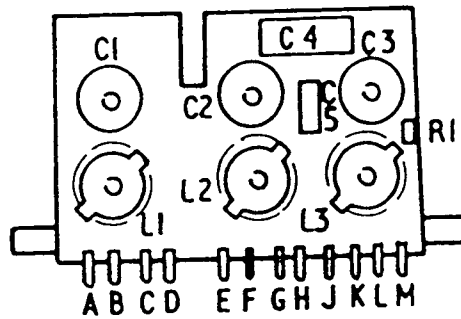


Fig.5b R.F. TUNING COIL  
RANGE 5

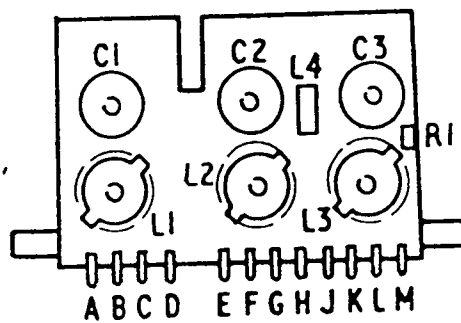


Fig.5c R.F. TUNING COIL  
RANGE 6

Fig.5 Turret coils, R F tuning

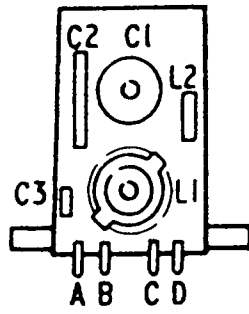


Fig.7a OSCILLATOR COIL,  
RANGES 1 TO 4

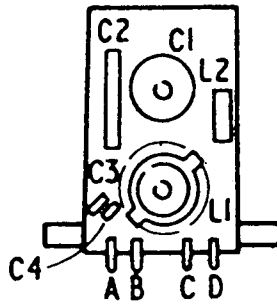


Fig.7 b OSCILLATOR COIL,  
RANGE 5

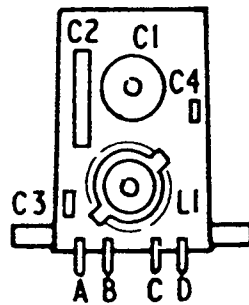


Fig.7c OSCILLATOR COIL  
RANGE 6

Fig.7 Turret coils, oscillator

)
   
THIRD LINE SERVICING
   
OF
   
FILTER UNIT 419/1/24970
   
(UNIT 1a)

CONTENTS

|                          | Para. |
|--------------------------|-------|
| Description ... ..       | 1     |
| Testing                  | 3     |
| Test equipment ... ..    | 5     |
| 1 k Hz filter ... ..     | 9     |
| Relay protection circuit | 16    |
| Components list ... ..   |       |

ILLUSTRATIONS

|      |   | Page |
|------|---|------|
| Fig. |   |      |
| 1    | 1 k Hz filter (Unit 1a) - circuit diagram ... ..  | 7    |
| 2    | 1 k Hz filter (Unit 1a) - component layout ... .. | 9    |

DESCRIPTION

1. The Filter Unit (unit 1a) is a panel, electronic circuit (pec), which is a component part of the transmitter receiver and is normally located on the Front Panel and Chassis Assembly (Unit 1).

2. With reference to the circuit diagram in fig.1., Unit 1a provides the following:

(1) TR4, TR5, TR2 and associated components function as a filter which accepts a 1 k Hz input square wave of 100 mV peak-to-peak and shapes this waveform to provide two 1 k Hz sine wave outputs, one 50 mV peak-to-peak and the other variable up to 50 mV peak-to-peak.

TESTINGTest equipment

4. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| RF Gen.     | An RF signal generator with the following essential characteristics: |
|             | Frequency range 1.8 MHz to 30 MHz                                    |
|             | Output emf 2V  |
|             | Source impedance 50 ohms   |
|             | Suitable instrument: Marconi TF144H                                  |
| RF VM       | An RF millivoltmeter with the following essential characteristics:   |
|             | Voltage range 0-1000 mV  |
|             | Frequency range 1.8 MHz to 30 MHz                                    |
|             | Impedance GT 10 Mohm   |
|             | Suitable instrument: Marconi TF2604                                  |

5. The following loading components are required:

## (1) Resistors:

- (a) 50 ohms  $\pm$  2%  $\frac{1}{4}$ W
- (b) 10 ohms  $\pm$  2%  $\frac{1}{4}$ W
- (c) 100 ohms  $\pm$  2%  $\frac{1}{4}$ W

## (2) Capacitors:

- (a) 35 pF  $\pm$  10% 6V
- (b) 150 pF  $\pm$  10% 6V

Preliminary

6. Connect a 50 ohm load to the ATU ground. Connect a 35 pF capacitor to terminal 8 on the ATU front drive assembly. Join the free ends of the capacitor and resistor, and connect the RF millivoltmeter to this junction (using screened cable with screen linked to unit earth).

6. At the ATU, connect RF Gen output to pin 6 of S1AB, using screened cable with screen linked to transformer T1 earth.



Test procedures

7. Set the ATU RANGE switch to each of positions A to E in turn. At each step:

- (1) Set the RF Gen to the lower frequency given, at 2V emf.
- (2) Adjust the ATU TUNE and LOAD controls for peak reading on the RF VM, check that this peak is GT 590 mV.
- (3) Repeat at the upper frequency given.

| <u>Range</u><br><u>Range</u> | <u>Lower frequency</u><br><u>MHz</u> | <u>Upper frequency</u><br><u>MHz</u> |
|------------------------------|--------------------------------------|--------------------------------------|
| A                            | 1.8                                  | 3.0                                  |
| B                            | 2.8                                  | 9.0                                  |
| C                            | 8.0                                  | 20.0                                 |
| D                            | 18.5                                 | 30.0                                 |
| E                            | 18.5                                 | 30.0                                 |

8. Fit 100 ohm load resistor in place of the 50 ohm load and:

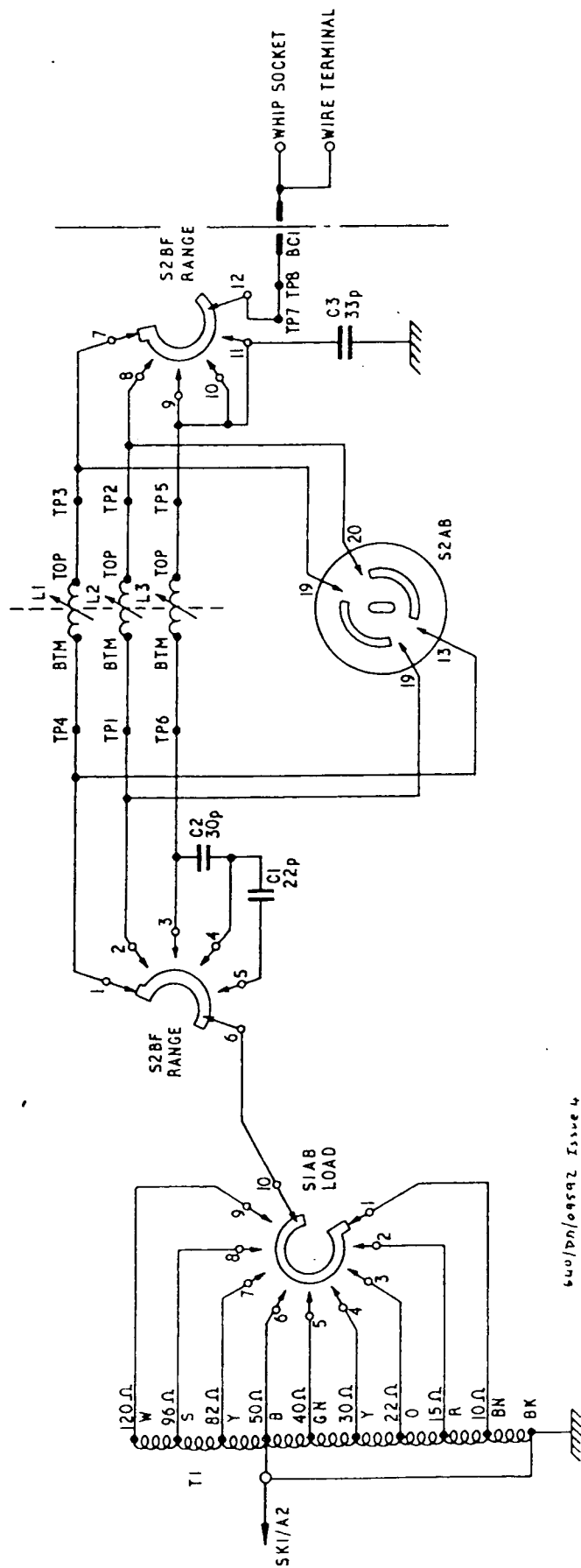
- (1) Set RF Gen to 2 MHz at 2V emf.
- (2) Set RANGE A at ATU.
- (3) Repeat para.6(2).
- (4) Set RF Gen to 30 MHz at 2V emf.
- (5) Set RANGE E at UUT.
- (6) Repeat para.7(2).

9. Fit 10 ohm load resistor in place of 100 ohm load and repeat para.8.

10. Replace 50 ohm load resistor. Fit 150 pF capacitor in place of 35 pF and repeat para.8(4), (5) and (6).

COMPONENTS LIST FOR  
TUNER UNIT RF  
640/1/09592

| Cct Ref. | Description                           | Reference No.   |
|----------|---------------------------------------|-----------------|
|          | Drive plate assembly                  | 640/1/09676     |
|          | including:                            |                 |
|          | HF core (short) (for L1, L2)          | 640/1/09799     |
|          | HF core (for L3)                      | 905/9/02366     |
|          | Plate and bush assembly               | 640/1/09797     |
|          | Rear mounting assembly                | 640/1/09677     |
|          | including:                            |                 |
|          | Plunger contact                       | 640/2/09806     |
|          | Spring                                | 640/2/09807     |
|          | Front drive assembly                  | 640/1/09675     |
|          | including:                            |                 |
| L1       | ATU tuning inductor coil              | 406/8/11035/001 |
| L2       | ATU tuning inductor coil              | 406/8/11035/002 |
| L3       | ATU tuning inductor coil              | 406/8/11035/003 |
| C1       | Capacitor 22pF + 10% 750v             | 400/9/19076/001 |
| C2       | Capacitor 30pF + 10% 750v             |                 |
| C3       | Capacitor 33pF + 2% 750v              |                 |
|          | Gear assembly                         | 640/1/14819     |
| T1+S1    | ATU Loading transformer (with switch) | 406/8/11032/007 |
| S2       | Switch rotary wafer                   | 408/9/00036/193 |
|          | Bracket                               | 640/2/09698     |



640/HA/09592 Issue 4

Fig. 1 IATU Circuit

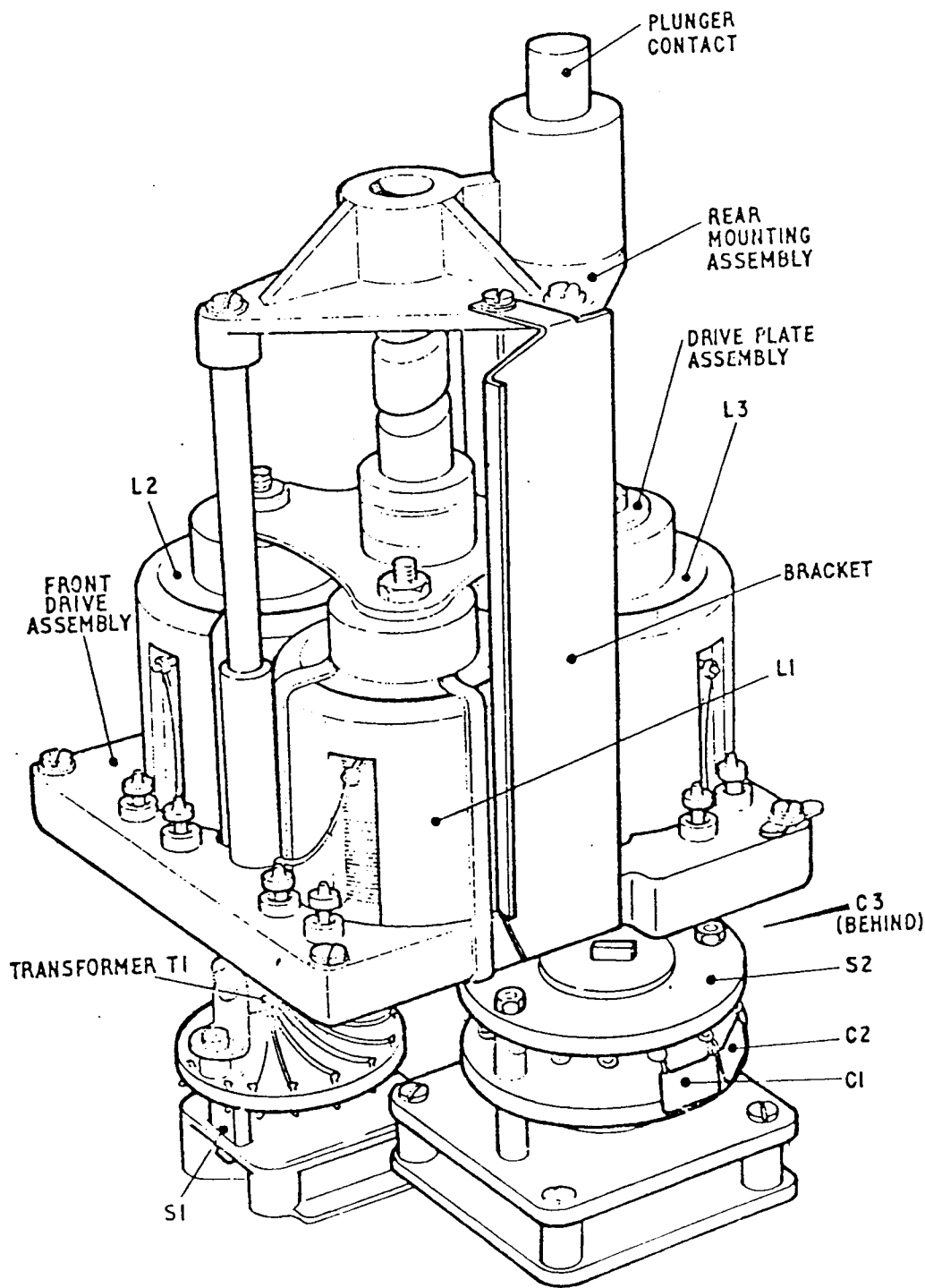


Fig. 2 ATU Assembly

THIRD LINE SERVICING  
OF  
POWER SUPPLY UNIT 640/1/09593  
(UNIT 5)

CONTENTS

|                        | Para. |
|------------------------|-------|
| Introduction ... ..    | 1     |
| Description ... ..     |       |
| General ... ..         | 2     |
| +12V regulator ... ..  | 3     |
| +3V regulator ... ..   | 7     |
| +6V regulator ... ..   | 8     |
| +110V regulator ... .. | 10    |
| Testing                |       |
| Test equipment ... ..  | 13    |
| Preliminary ... ..     | 15    |
| Test procedures ... .. | 16    |
| Components list ... .. | 17    |

ILLUSTRATIONS

|        |   | Page |
|--------|---|------|
| Fig. 1 | Unit 5a, power supply +12V & +3V - circuit ... ..             | 17   |
| 2      | Unit 5b, power supply +6V & +110V - circuit ... ..            | 19   |
| 3      | Power supply unit assembly (Unit 5) ... ..                    | 21   |
| 4      | Panel, electronic circuit (Unit 5b) - component layout ... .. | 23   |
| 5      | Panel, electronic circuit (Unit 5a) - component layout ... .. | 23   |

INTRODUCTION

1. The Power Supply Unit (Unit 5) is a component part of the transmitter/receiver and is normally located on the Front Panel and Chassis Assembly (Unit 1). It provides five regulated dc outputs with nominal values of +3V, +6V, +6V compensated (for VFO), +12V, and +110V all derived from a nominal supply of 24V dc (limits 20 to 32V).

DESCRIPTIONGeneral

2. The unit consists of an assembly of pec (panel, electronic circuit), a base plate and a cover. The pec assembly consists of two pec, one (Unit 5b) is secured by circlips to pillars located on the other (Unit 5a). Connections to external equipment are provided by a multi-way socket on Unit 5a.

-12V regulator

3. At Unit 5a, TR1/TR2, ML1 and auto-transformer T1 provide a switching regulator.

4. ML1 provides a 40 kHz astable multivibrator; the mark-to-space ratio of the output is determined by comparison, within ML1, of a reference voltage derived from the 24V supply voltage at pin 6 and a control voltage at pin 1. The control voltage is obtained from a potentiometer chain connected to the regulator output. Thus, a change in output potential adjusts the multivibrator mark-to-space ratio to oppose the output change. The output mean level is set by resistor R3.

5. Capacitor C2 produces a ramp at ML1 pin 8 at initial switch on. This affects the reference voltage and thereby affects to mark-to-space ratio so that the regulator output gradually rises to the correct level over the first 100 ms after switch on.

6. Overload protection is provided by D3. A short circuit at the regulator output will pull down ML1 reference level far enough to switch off the multivibrator and thereby switch off TR1/TR2.

+3V regulator

7. The switching regulator TR3/TR4, ML2 and T2 at Unit 5a functions in a similar manner to the 12V regulator and derives a +3V regulated supply from the +12V regulator output. The following particular differences exist:

- (1) The reference voltage circuits within ML2 are temperature compensated.
- (2) Part of the control voltage potentiometer chain is within ML2.

(3) There is no overload protection diode because adequate protection is provided in the +12V regulator.

+6V regulator (see fig.2)

8. The +6V regulator, ML1, TR1/TR2, T1, in Unit 5b, functions in a similar manner to the +3V regulator and derives a +6V supply from the +12V regulator output.

9. Since the VFO frequency is sensitive to supply voltage variation and since switching transmit mode to receive or vice versa causes a slight change in the +6V level at pin 4 of Unit 5a, a second +6V output is provided for the VFO at pin 3 of Unit 5b and separated from the first by resistor R5. This resistor is in the control voltage potentiometer chain and provides a compensating variation in the control voltage level to maintain the VFO supply at a constant level.

+110V regulator (see fig.2)

10. The primary of transformer T1 is the output choke of the 6V regulator. Hence, a switching voltage will be applied to TR3; this will be at a low current level and has little effect on the 6V regulator.

11. The switching of TR3 base causes 40 kHz pulses of current to be drawn through T2 primary from the +12V supply rail. T2 is a 10:1 step up transformer which supplies a full wave rectifier (D3-6). A dc voltage of approximately 120V is applied from the rectifier to the 110V regulator

12. In the regulator, TR6 is the series element controlled by the drive transistor TR7. A reference voltage to TR7 is derived using one transistor in ML2 as a reverse biased diode having a breakdown voltage of approximately 5.6V at a low current level through R9. TR4 and TR5 provide a constant current supply source to TR7. The second transistor in ML2 provides a measure of temperature compensation to the control voltage taken to TR7 base from the slider of R11.

TESTING

Test equipment

13. The following items of special-to-purpose test equipment are required:

- (1) Manual Interface Controller. Plessey Type TD4924A.
- (2) Test Interface. Plessey Type TD50566A.
- (3) Test Jig. Plessey Type TJ838A.

14. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| DVM         | A digital voltmeter for measuring voltages in the range 100 mV to 125V with an accuracy of 0.05% and having an input impedance greater than 100 kohms. Two are required.<br>Suitable instrument: Solartron A203/A204 |
| CRO         | An oscilloscope to display ac signals in the amplitude range 10 to 100 mV peak-to-peak at 2.0 MHz.<br>Suitable instrument: Solartron A100  |
| PSU         | To supply 20V $\pm$ 0.02V, 24V $\pm$ 0.02V and 30V $\pm$ 0.02V with current limiting at 400 mA.<br>Suitable instrument: Farnell TSV70  |

Preliminary

15. Proceed as follows:

- (1) Connect the Test Jig to the Test Interface.
- (2) Connect the Test Interface to the Manual Interface Controller.
- (3) At the Interface Controller set:
  - (a) Test selection switches to 000.
  - (b) DC monitor switch to EXT.



- (4) At the Interface Controller connect:
  - (a) DVM (DVM1) to socket marked DVM.
  - (b) DVM (DVM2) to socket marked AVO.
  - (c) CRO to socket marked CRO & AMP.
  - (d) PSU to terminals marked EXT B.
- (5) Switch on the mains supply to all instruments where applicable.
- (6) Adjust PSU voltage and current controls for zero output. Set meter switch to read current. Connect an external short circuit directly across the PSU output terminals. Increase output voltage a small amount and adjust current control until meter reads 400 mA. Remove short circuit.

#### Test procedures

16. Carry out the tests given in the following pages.

#### Notes relating to tests

1. Unit under test is referred to as UUT.
2. Tests 000 - 030 are normally performed with the screening can of the UUT removed. This can must be fitted for tests 031 - 070.
3. DVM2 monitors the voltage developed across a load connected in series with the supply current to the UUT. The DVM reading multiplied by 10 gives current level.
4. DVM1 is connected to measure input voltage or selected output voltage as appropriate.
5. Each output rail is connected to a suitable load, the +6V supply load is switched from simulated receive mode to simulated transmit mode on indicated tests.
6. The CRO is connected to monitor ripple on selected output rail.

7. Tests 000 - 016 set or check the various output voltage levels at the nominal supply voltage level.
8. Tests 018 - 028 check, under transmit mode load conditions, the current drain for various supply voltage levels.
9. Tests 031 - 036 check the output ripple.
10. Tests 038 - 070 check the regulation by monitoring the change of each output for a change of input level from 20 to 24V and from 24V to 30V. DVM2 is used to monitor supply voltage on these tests.

| TEST No.                  | STEP | UNIT | RANGE   | LIMITS             | INSTRUCTIONS  |
|---------------------------|------|------|---------|--------------------|---|
| 000                       | (a)  | -    | -       | -                  | Depress "Press to Test" button.   |
|                           | (b)  | UUT  | -       | -                  | Load UUT in test jig. Connect miniature socket to UUT and connect probe to TP2 on UUT. Turn all four pots fully anti-clockwise. |
|                           | (c)  | DVM2 | 1V      | -                  | Set DVM2 to 1V range.   |
|                           | (d)  | DVM1 | 100V    | -                  | Set DVM1 to 100V range.   |
|                           | (e)  | CRO  | 5 mV/cm | -                  | Set CRO to 5 mV/cm range.   |
|                           | (f)  | PSU  | -       | -                  | Set PSU to minimum output.  |
| <u>SET SUPPLY VOLTAGE</u> |      |      |         |                    |   |
| 002                       | (a)  | -    | -       | -                  | Depress "Press to Test" button.   |
|                           | (b)  | DVM1 | 100V    | 23.95V to 24.05V   | Increase PSU output to give 24V on DVM1.  |
| <u>SET 121V OUTPUT</u>    |      |      |         |                    |   |
| 004                       | (a)  | -    | -       | -                  | Depress "Press to Test" button.   |
|                           | (b)  | DVM1 | 100V    | 121.37V to 120.63V | Adjust 5aR3 to give 121V on DVM1. (Reading at TP2).   |
| <u>12 VOLTS OUTPUT</u>    |      |      |         |                    |   |
| 006                       | (a)  | -    | -       | -                  | Depress "Press to Test" button.   |
|                           | (b)  | DVM1 | 100V    | 13.13V to 12.07V   | Check DVM1 reading.   |
| <u>SET 6V OUTPUT</u>      |      |      |         |                    |   |
| 008                       | (a)  | DVM1 | 10V     | -                  | Set DVM1 to 10V range.  |
|                           | (b)  | -    | -       | -                  | Depress "Press to Test" button.   |
|                           | (c)  | DVM1 | 10V     | 6.019V to 5.981V   | Adjust 5bR4 to give 6V on DVM1.   |
| <u>6V OSC. OUTPUT</u>     |      |      |         |                    |   |
| 009                       | (a)  | -    | -       | WITHIN             | Depress "Press to Test" button.   |
|                           | (b)  | DVM1 | 10V     | $\pm 0.01V$ of 008 | Check reading on DVM1.  |

| TEST No.                              | STEP | UNIT | RANGE  | LIMITS             | INSTRUCTIONS  |
|---------------------------------------|------|------|--------|--------------------|---|
| <u>SET 2.9V OUTPUT</u>                |      |      |        |                    |   |
| 010                                   | (a)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (b)  | DVM1 | 10V    | 2.901V to 2.898V   | Adjust 5aR7 to give 2.9V on DVM1.                   |
| <u>SET 110V OUTPUT</u>                |      |      |        |                    |   |
| 012                                   | (a)  | DVM1 | 200V   | -                  | Set DVM1 to 200V range.                             |
|                                       | (b)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (c)  | DVM1 | 200V   | 110.17V to 109.83V | Adjust 5bR11 to give 110V on DVM1.                  |
| <u>RE-SET 121V OUTPUT</u>             |      |      |        |                    |   |
| 014                                   | (a)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (b)  | DVM1 | 200V   | 121.37V to 120.63V | Adjust 5aR3 to give 121V on DVM1. (Reading at TP2). |
| <u>121V OUTPUT (6V LOADED FOR TX)</u> |      |      |        |                    |   |
| 016                                   | (a)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (b)  | DVM1 | 200V   | 122.93V to 120.56  | Check reading on DVM1.                              |
| <u>SET SUPPLY VOLTAGE (Lo)</u>        |      |      |        |                    |   |
| 018                                   | (a)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (b)  | DVM1 | 100V   | 19.95V to 20.05V   | Adjust PSU to give 20V on DVM1.                     |
| <u>LOAD CURRENT (SUPPLY V Lo)</u>     |      |      |        |                    |   |
| 020                                   | (a)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (b)  | DVM2 | 100 mV | 24.9 mV to 26.1 mV | Check DVM2 reading.                                 |
| <u>SET SUPPLY VOLTAGE</u>             |      |      |        |                    |   |
| 022                                   | (a)  | -    | -      | -                  | Depress "Press to Test" button.                     |
|                                       | (b)  | DVM1 | 100V   | 23.95V to 24.05V   | Adjust PSU to give 24V on DVM1.                     |

| TEST No.                          | STEP | UNIT | RANGE   | LIMITS             | INSTRUCTIONS                                      |
|-----------------------------------|------|------|---------|--------------------|---|
| <u>LOAD CURRENT</u>               |      |      |         |                    |   |
| 024                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | DVM2 | 100 mV  | 21.1 mV to 22.1 mV | Check DVM2 reading.                               |
| <u>SET SUPPLY VOLTAGE (Hi)</u>    |      |      |         |                    |   |
| 026                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | DVM1 | 100V    | 29.95V to 30.05V   | Adjust PSU to give 30V on DVM1.                   |
| <u>LOAD CURRENT (SUPPLY V Hi)</u> |      |      |         |                    |   |
| 028                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | DVM2 | 100 mV  | 17.1 mV to 17.9 mV | Check DVM2 reading.                               |
| <u>RESET SUPPLY VOLTAGE</u>       |      |      |         |                    |   |
| 029                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | DVM1 | 100V    | 23.95V to 24.05V   | Adjust PSU to give 24V on DVM1.                   |
| 030                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | TJ.  | -       | -                  | Disconnect probe from UUT. Replace screening can. |
| <u>12V OUTPUT RIPPLE</u>          |      |      |         |                    |   |
| 031                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | CRO  | 5 mV/cm | NGT 19 mV          | Check the peak-to-peak ripple voltage on CRO.     |
| <u>6V OUTPUT RIPPLE</u>           |      |      |         |                    |   |
| 032                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |
|                                   | (b)  | CRO  | 5 mV/cm | NGT 28.5 mV        | Check the peak-to-peak ripple voltage on CRO.     |
| <u>3V OUTPUT RIPPLE</u>           |      |      |         |                    |   |
| 034                               | (a)  | -    | -       | -                  | Depress "Press to Test" button.                   |

| TEST No.                  | STEP | UNIT | RANGE       | LIMITS              | INSTRUCTIONS   |
|---------------------------|------|------|-------------|---------------------|--|
| 034<br>(cont)             | (b)  | CRO  | 5 mV/<br>cm | NGT 19 mV           | Check the peak-to-peak ripple voltage on CRO.                                      |
| <u>110V OUTPUT RIPPLE</u> |      |      |             |                     |  |
| 036                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.  |
|                           | (b)  | CRO  | 5 mV/<br>cm | NGT 47.5 mV         | Check the peak-to-peak ripple voltage on CRO.                                      |
| <u>12V REGULATION</u>     |      |      |             |                     |  |
| 038                       | (a)  | -    | -           | -                   | Depress "Press-to-Test" button.  |
|                           | (b)  | DVM2 | 100V        | 19.95V to<br>20.05V | Adjust PSU to give 20V on DVM2.  |
| 040                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.  |
|                           | (b)  | DVM1 | 10V         | 12.52V to<br>12.98V | Note reading on DVM1.  |
| 042                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.  |
|                           | (b)  | DVM2 | 100V        | 23.95V to<br>24.05V | Adjust PSU to give 24V on DVM2; then,<br>within 30 seconds, note reading on DVM1.  |
|                           |      | DVM1 | 10V         | NGT 040<br>+ 0.08V  | This must not exceed Result 040 by more<br>than 0.08V.                             |
| 044                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.  |
|                           | (b)  | DVM2 | 100V        | 29.95V to<br>30.05V | Adjust PSU to give 30V on DVM2; then,<br>within 30 seconds, check reading on DVM1. |
|                           |      | DVM1 | 10V         | NGT 042<br>+ 0.12V  | This must not exceed Result 042 by more<br>than 0.12V.                             |
| <u>6V REGULATION</u>      |      |      |             |                     |  |
| 046                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.  |
|                           | (b)  | DVM2 | 100V        | 19.95V to<br>20.05V | Adjust PSU to give 20V on DVM2.  |
| 048                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.  |

| TEST No.             | STEP | UNIT | RANGE | LIMITS              | INSTRUCTIONS   |
|----------------------|------|------|-------|---------------------|--|
| 048<br>(cont)        | (b)  | DVM1 | 10V   | 5.980V to<br>6.019V | Note reading on DVM1.  |
| 050                  | (a)  | -    | -     | -                   | Depress "Press to Test" button.  |
|                      | (b)  | DVM2 | 100V  | 23.95V to<br>24.05V | Adjust PSU to give 24V on DVM2; then,<br>within 30 seconds, note reading on DVM1.  |
|                      |      | DVM1 | 10V   | NGT 048<br>+ 0.002V | This must not exceed Result 048 by more<br>than 0.002V.                            |
| 052                  | (a)  | -    | -     | -                   | Depress "Press to Test" button.  |
|                      | (b)  | DVM2 | 100V  | 29.95V to<br>30.05V | Adjust PSU to give 30V on DVM2; then,<br>within 30 seconds, check reading on DVM1. |
|                      |      | DVM1 | 10V   | NGT 050<br>+ 0.002V | This must not exceed Result 050 by more<br>than 0.002V.                            |
| <u>3V REGULATION</u> |      |      |       |                     |  |
| 054                  | (a)  | -    | -     | -                   | Depress "Press to Test" button.  |
|                      | (b)  | DVM2 | 100V  | 19.95V to<br>20.05V | Adjust PSU to give 20V on DVM2.  |
| 056                  | (a)  | -    | -     | -                   | Depress "Press to Test" button.  |
|                      | (b)  | DVM1 | 10V   | 2.881V to<br>2.919V | Note reading on DVM1.  |
| 058                  | (a)  | -    | -     | -                   | Depress "Press to Test" button.  |
|                      | (b)  | DVM2 | 100V  | 23.95V to<br>24.05V | Adjust PSU to give 24V on DVM2; then,<br>within 30 seconds, note reading on DVM1.  |
|                      |      | DVM1 | 10V   | NGT 056<br>+ 0.002V | This must not exceed Result 056 by more<br>than 0.002V.                            |
| 060                  | (a)  | -    | -     | -                   | Depress "Press to Test" button.  |
|                      | (b)  | DVM2 | 100V  | 29.95V to<br>30.05V | Adjust PSU to give 30V on DVM2; then,<br>within 30 seconds, check reading on DVM1. |
|                      |      | DVM1 | 10V   | NGT 058<br>+ 0.002V | This must not exceed Result 058 by more<br>than 0.002V.                            |

| TEST No.                  | STEP | UNIT | RANGE       | LIMITS              | INSTRUCTIONS  |
|---------------------------|------|------|-------------|---------------------|---|
| 034<br>(cont)             | (b)  | CRO  | 5 mV/<br>cm | NGT 19 mV           | Check the peak-to-peak ripple voltage on CRO.                                   |
| <u>110V OUTPUT RIPPLE</u> |      |      |             |                     |   |
| 036                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.   |
|                           | (b)  | CRO  | 5 mV/<br>cm | NGT 47.5 mV         | Check the peak-to-peak ripple voltage on CRO.                                   |
| <u>12V REGULATION</u>     |      |      |             |                     |   |
| 038                       | (a)  | -    | -           | -                   | Depress "Press-to-Test" button.   |
|                           | (b)  | DVM2 | 100V        | 19.95V to<br>20.05V | Adjust PSU to give 20V on DVM2.   |
| 040                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.   |
|                           | (b)  | DVM1 | 10V         | 12.52V to<br>12.98V | Note reading on DVM1.   |
| 042                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.   |
|                           | (b)  | DVM2 | 100V        | 23.95V to<br>24.05V | Adjust PSU to give 24V on DVM2; then, within 30 seconds, note reading on DVM1.  |
|                           |      | DVM1 | 10V         | NGT 040<br>+ 0.08V  | This must not exceed Result 040 by more than 0.08V.                             |
| 044                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.   |
|                           | (b)  | DVM2 | 100V        | 29.95V to<br>30.05V | Adjust PSU to give 30V on DVM2; then, within 30 seconds, check reading on DVM1. |
|                           |      | DVM1 | 10V         | NGT 042<br>+ 0.12V  | This must not exceed Result 042 by more than 0.12V.                             |
| <u>6V REGULATION</u>      |      |      |             |                     |   |
| 046                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.   |
|                           | (b)  | DVM2 | 100V        | 19.95V to<br>20.05V | Adjust PSU to give 20V on DVM2.   |
| 048                       | (a)  | -    | -           | -                   | Depress "Press to Test" button.   |



| TEST No.               | STEP | UNIT | RANGE | LIMITS                | INSTRUCTIONS   |
|------------------------|------|------|-------|-----------------------|--|
| <u>110V REGULATION</u> |      |      |       |                       |  |
| 062                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM2 | 100V  | 19.95V to<br>20.05V   | Adjust PSU to give 20V on DVM2.  |
| 064                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM1 | 100V  | 109.83V to<br>110.17V | Note reading on DVM1.  |
| 066                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM2 | 100V  | 23.95V to<br>24.05V   | Adjust PSU to give 24V on DVM2; then,<br>within 30 seconds, note reading on DVM1.  |
|                        |      | DVM1 | 100V  | NGT 064<br>+ 0.01V    | This must not exceed Result 064 by more<br>than 0.01V.                             |
| 068                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM2 | 100V  | 29.95V to<br>30.05V   | Adjust PSU to give 30V on DVM2: then,<br>within 30 seconds, check reading on DVM1. |
|                        |      | DVM1 | 100V  | NGT 066<br>+ 0.01V    | This must not exceed Result 066 by more<br>than 0.01V.                             |
| 070                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | -    | -     | -                     | Remove module from test jig.   |

COMPONENTS LIST

17. The principal component parts of the Power Supply Unit 640/1/09593 (see fig.3) are:

|                 |             |
|-----------------|-------------|
| Base            | 640/1/09701 |
| Cover assembly  | 640/1/10088 |
| Assembly of PEC | 640/1/14895 |

18. The principal component parts of the Assembly of PEC 640/1/14895 (see fig.3) are:

|                                     |                 |
|-------------------------------------|-----------------|
| Panel, Electronic Circuit (Unit 5a) | 419/1/12025     |
| Panel, Electronic Circuit (Unit 5b) | 419/1/12030     |
| Ring retaining                      | 994/4/00467/002 |

A detailed breakdown of Units 5a and 5b are given on the following pages.

COMPONENTS LIST

17. The principal component parts of the Power Supply Unit 640/1/09593 (see fig.3) are:

|                 |             |
|-----------------|-------------|
| Base            | 640/1/09701 |
| Cover assembly  | 640/1/10088 |
| Assembly of PEC | 640/1/14895 |

18. The principal component parts of the Assembly of PEC 640/1/14895 (see fig.3) are:

|                                     |                 |
|-------------------------------------|-----------------|
| Panel, Electronic Circuit (Unit 5a) | 419/1/12025     |
| Panel, Electronic Circuit (Unit 5b) | 419/1/12030     |
| Ring retaining                      | 994/4/00467/002 |

A detailed breakdown of Units 5a and 5b are given on the following pages.

| TEST No.               | STEP | UNIT | RANGE | LIMITS                | INSTRUCTIONS   |
|------------------------|------|------|-------|-----------------------|--|
| <u>110V REGULATION</u> |      |      |       |                       |  |
| 062                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM2 | 100V  | 19.95V to<br>20.05V   | Adjust PSU to give 20V on DVM2.  |
| 064                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM1 | 100V  | 109.83V to<br>110.17V | Note reading on DVM1.  |
| 066                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM2 | 100V  | 23.95V to<br>24.05V   | Adjust PSU to give 24V on DVM2; then,<br>within 30 seconds, note reading on DVM1.  |
|                        |      | DVM1 | 100V  | NGT 064<br>+ 0.01V    | This must not exceed Result 064 by more<br>than 0.01V.                             |
| 068                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | DVM2 | 100V  | 29.95V to<br>30.05V   | Adjust PSU to give 30V on DVM2; then,<br>within 30 seconds, check reading on DVM1. |
|                        |      | DVM1 | 100V  | NGT 066<br>+ 0.01V    | This must not exceed Result 066 by more<br>than 0.01V.                             |
| 070                    | (a)  | -    | -     | -                     | Depress "Press to Test" button.  |
|                        | (b)  | -    | -     | -                     | Remove module from test jig.   |

COMPONENTS LIST

17. The principal component parts of the Power Supply Unit 640/1/09593 (see fig.3) are:

|                 |             |
|-----------------|-------------|
| Base            | 640/1/09701 |
| Cover assembly  | 640/1/10088 |
| Assembly of PEC | 640/1/14895 |

18. The principal component parts of the Assembly of PEC 640/1/14895 (see fig.3) are:

|                                     |                 |
|-------------------------------------|-----------------|
| Panel, Electronic Circuit (Unit 5a) | 419/1/12025     |
| Panel, Electronic Circuit (Unit 5b) | 419/1/12030     |
| Ring retaining                      | 994/4/00467/002 |

A detailed breakdown of Units 5a and 5b are given on the following pages.

| Cct Ref   | Description                     | Reference No.   |
|---|---------------------------------|-----------------|
| 19. The principal component parts of the Panel, electronic circuit 419/1/12025 (Unit 5a) (see fig.5) are: |                                 |                 |
| <u>Resistors</u>  |                                 |                 |
| R1  | 620 ohm $\pm$ 5%                | 403/4/78126/044 |
| R2  | 2 kohm $\pm$ 5%                 | 403/4/78126/056 |
| R3  | 500 ohm $\pm$ 10% 0.5w variable | 404/9/05033/001 |
| R4  | 82 ohm $\pm$ 5%                 | 403/4/78126/023 |
| R5  | 2.7 kohm $\pm$ 5%               | 403/4/78126/059 |
| R6  | 620 ohm $\pm$ 5%                | 403/4/78126/044 |
| R7  | 2 kohm $\pm$ 10% 0.5w variable  | 404/9/05033/003 |
| R8  | 100 ohm $\pm$ 5%                | 403/4/78126/025 |
| <u>Capacitors</u>   |                                 |                 |
| C1  | 22uF $\pm$ 20% 35v electrolytic | 402/4/98049/092 |
| C2  | 56uF $\pm$ 10% 6v electrolytic  | 402/4/98049/004 |
| C3  | 1uF $\pm$ 20% 35v electrolytic  | 402/4/98049/085 |
| C4  | 4.7nF $\pm$ 10% 100v            | 400/9/19083/041 |
| C5  | 68uF $\pm$ 20% 15v electrolytic | 402/4/98049/037 |
| C6  | 22uF $\pm$ 20% 15v electrolytic | 402/4/98049/036 |
| C7  | 22uF $\pm$ 20% 15v electrolytic | 402/4/98049/036 |
| C8  | 1uF $\pm$ 20% 35v electrolytic  | 402/4/98049/085 |
| C9  | 4.7nF $\pm$ 10% 100v            | 400/9/19083/041 |
| C10   | 330uF $\pm$ 20% 6v electrolytic | 402/4/98049/012 |
| C11   | 47uF $\pm$ 20% 6v electrolytic  | 402/4/98049/010 |
| <u>Inductors</u>  |                                 |                 |
| L1 to L4  | Inductor 150uH                  | 406/8/11040     |
| <u>Semi-conductor devices</u>   |                                 |                 |
| TR1   | Transistor 2N3720               | 417/4/00241     |
| TR2   | Transistor BCY70                | 417/4/00240     |
| TR3   | Transistor BFS97K               | 417/4/00256     |
| TR4   | Transistor BCY72                | 417/4/00254     |
| D1  | Diode BAX12                     | 415/4/05451     |
| D2  | Diode BAX12                     | 415/4/05451     |

| Cct Ref              | Description                                   | Reference No.   |
|----------------------|---|-----------------|
| D3                   | Diode CV7367                                  | 990/4/00107/367 |
| D4                   | Diode BAX12                                   | 415/4/05451     |
| ML1                  | Integrated circuit CN 587T                    | 446/4/00416     |
| ML2                  | Integrated circuit CN 585T                    | 446/4/00415     |
| <u>Miscellaneous</u> |   |                 |
| T1                   | Transformer                                   | 406/8/11033/001 |
| T2                   | Transformer                                   | 406/8/11033/003 |
| SK                   | Socket, receptacle, electrical                | 508/9/21650     |
|                      | Screw, slotted ch.hd. M2 x 10mm.cad plate st. | 991/4/01547/059 |
|                      | Washer, crinkle. 8BA, Ber.Cu.                 | 991/4/01269/020 |
|                      | Washer, bright, small, 8BA.cad plate. st.     | 991/4/00413/001 |
|                      | Nut, hex, M2, st.st.                          | 991/4/01495/002 |

20. The principal component parts of the Panel, electronic circuit 419/1/12030 (Unit 5b) (see fig.4) are:

| <u>Resistors</u>  |                                   |                 |
|-------------------|-----------------------------------|-----------------|
| R1                | 620 ohm $\pm$ 5%                  | 403/4/78126/044 |
| R2                | 91 ohm $\pm$ 5%                   | 403/4/78126/024 |
| R3                | 1 kohm $\pm$ 5%                   | 403/4/78126/049 |
| R4                | 1 kohm $\pm$ 5% 0.5w variable     | 404/9/05033/002 |
| R5                | Part of printed circuit           |                 |
| R6                | 82 ohm $\pm$ 5%                   | 403/4/78126/023 |
| R7                | 470 kohm $\pm$ 5%                 | 403/4/78127/113 |
| R8                | 22 kohm $\pm$ 5%                  | 403/4/78126/081 |
| R9                | 470 kohm $\pm$ 5%                 | 403/4/78127/113 |
| R10               | 1 Mohm $\pm$ 2%                   | 403/4/78127/521 |
| R11               | 20 kohm $\pm$ 10% 0.5w variable   | 404/9/05033/005 |
| R12               | 43 kohm $\pm$ 5%                  | 403/4/78126/088 |
| <u>Capacitors</u> |                                   |                 |
| C1                | 22uF $\pm$ 20% 15v electrolytic   | 402/4/98049/036 |
| C2                | 4.7uF $\pm$ 20% 10v electrolytic  | 402/4/98049/023 |
| C3                | 1uF $\pm$ 20% 35v electrolytic    | 402/4/98049/085 |
| C4                | 4.7nF $\pm$ 10% 100v              | 400/9/19083/041 |
| C5                | 330uF $\pm$ 20% 6v electrolytic   | 402/4/98049/012 |
| C6                | 3.6uF $\pm$ 20% 125v electrolytic | 402/9/98190/075 |
| C7                | 47nF $\pm$ 80% -20% 50v           | 400/9/19084/094 |
| C8                | 1.7uF $\pm$ 20% 125v electrolytic | 402/9/98190/074 |
| C9                | 220nF $\pm$ 20% 250v              | 435/4/90410/220 |
| <u>Inductors</u>  |                                   |                 |
| L1                | Inductor 150uH                    | 406/8/11040     |

| Cct Ref  | Description                                 | Reference No.   |
|----------|---|-----------------|
|          | <u>Semi-conductor devices</u>               |                 |
| TR1      | Transistor BFS 97K                          | 417/4/00256     |
| TR2      | Transistor BCY 72                           | 417/4/00254     |
| TR3      | Transistor CV 7644                          | 990/4/00107/644 |
| TR4      | Transistor CV 7648                          | 990/4/00107/648 |
| TR5      | Transistor U14906/4                         | 417/4/05089     |
| TR6      | Transistor FRB 700                          | 417/4/00255     |
| TR7      | Transistor FRB 700                          | 417/4/00255     |
| D1       | Diode CV 7367                               | 990/4/00107/367 |
| D2       | Diode BAX 12, controlled avalanche          | 415/4/05451     |
| D3 to D6 | Diode BAX 16, high conductance, 150v P.I.V. | 415/4/05449     |
| D7       | Diode BAX 12, controlled avalanche          | 415/4/05451     |
| ML1      | Integrated circuit CN 587T                  | 446/4/00416     |
| ML2      | Integrated circuit CN 497T                  | 446/4/00429     |
|          | <u>Transformers</u>                         |                 |
| T1       | Transformers                                | 406/8/11033/002 |
| T2       | Transformer                                 | 406/8/11032/003 |



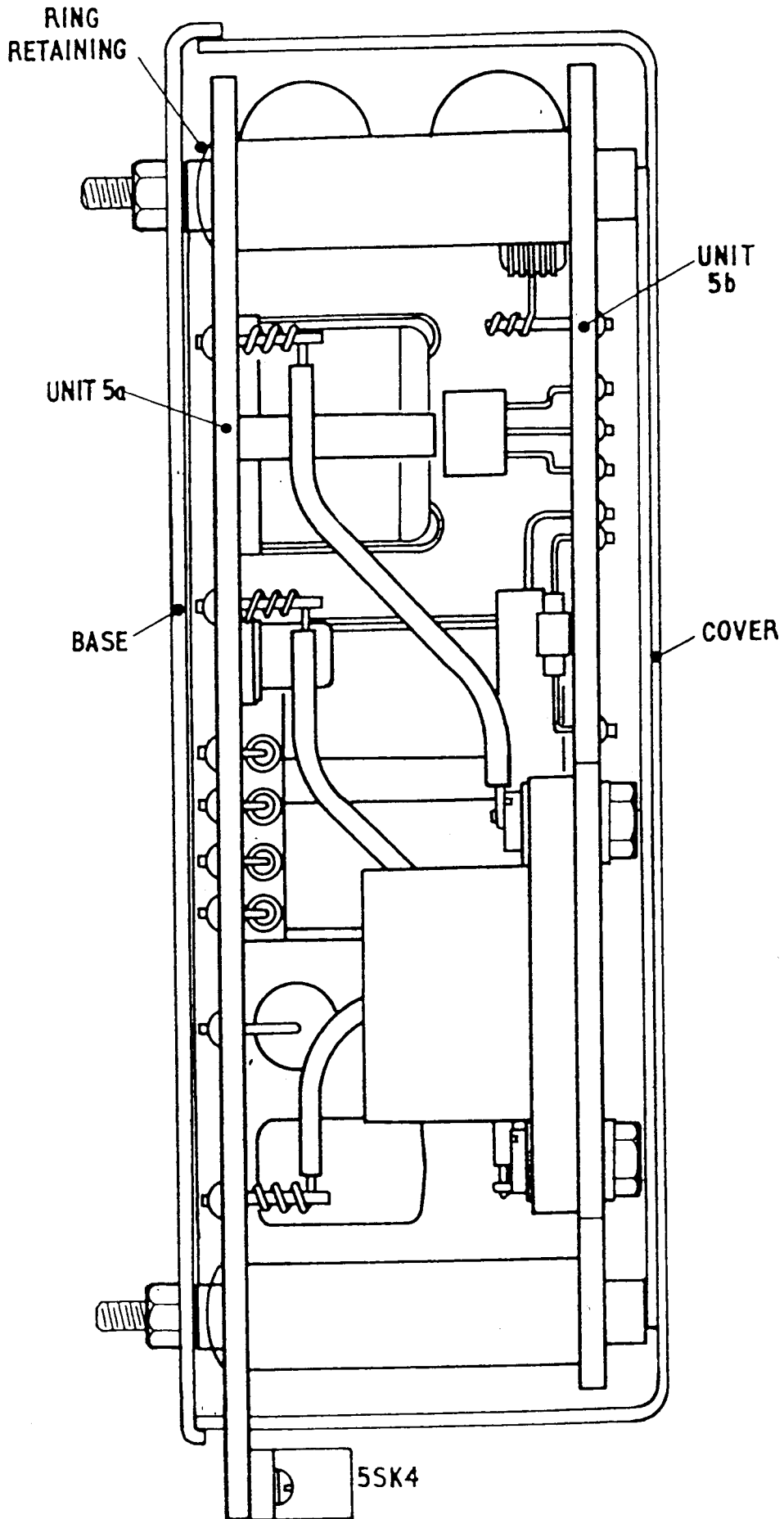


Fig. 3 Power supply unit assembly (unit 5)

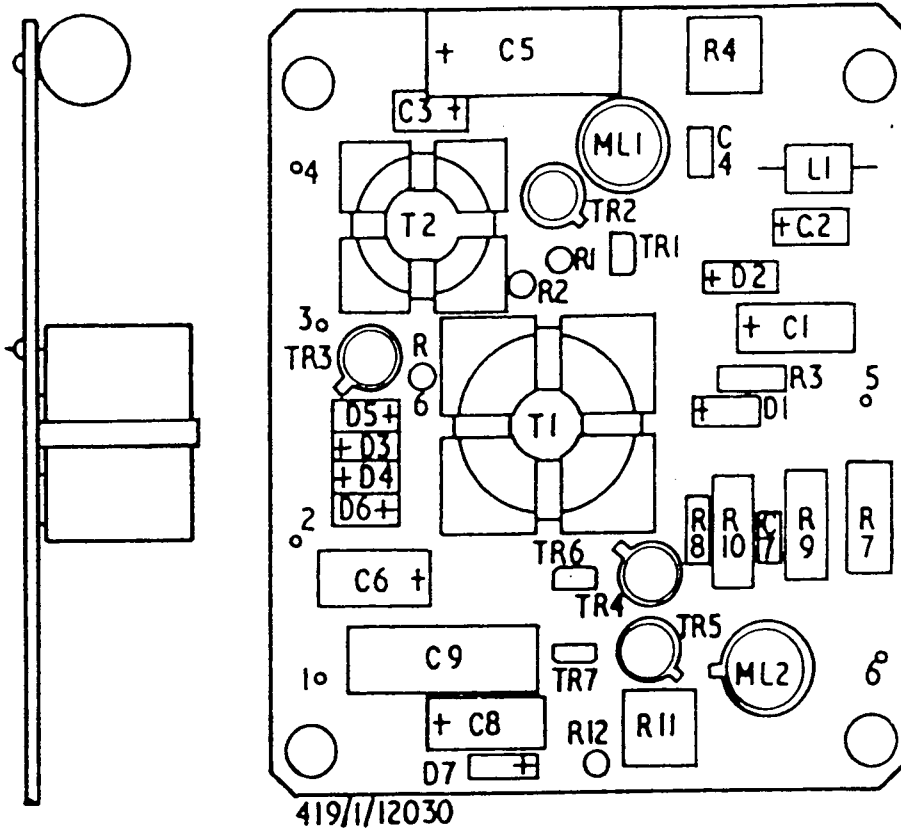


Fig. 4 Panel, electronic circuit, ( unit 5b) - component layout

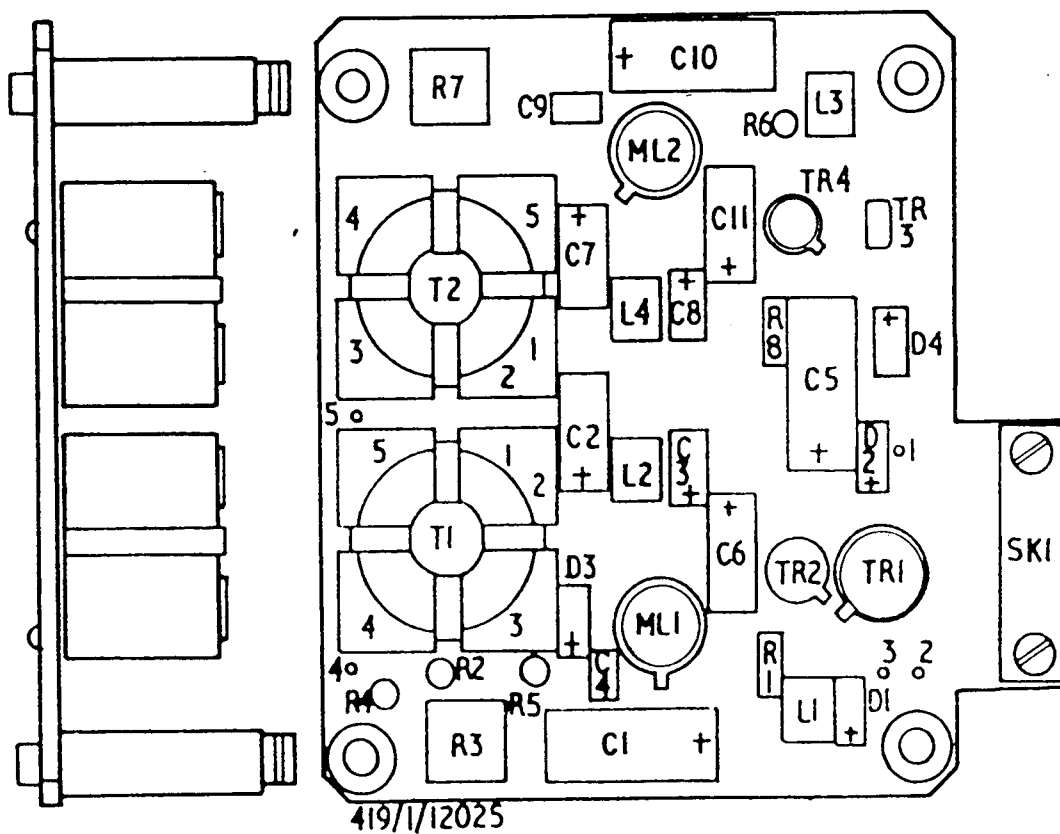


Fig. 5 Panel, electronic circuit, ( unit 5a) - component layout

THIRD LINE SERVICING  
OF  
SCREEN & CAN ASSEMBLY 640/1/09705  
(UNIT 6a)

|                         | CONTENTS | Para. |
|-------------------------|----------|-------|
| Description ... ..      |          | 1     |
| Testing                 |          |       |
| Test equipment ... ..   |          | 6     |
| Preliminary ... ..      |          | 8     |
| Test procedures ... ..  |          | 9     |
| Components lists ... .. |          | 10    |

|  | ILLUSTRATIONS | Page |
|--|---------------|------|
| Fig. 1    Unit 6a, receiver IF stages - circuit ... ..   |               | 9    |
| 2    Receiver IF pec (unit 6a) - component layout ... .. |               | 11   |

#### DESCRIPTION

1. The screen and can assembly (unit 6a) is a component part of the transmitter receiver and provides receiver IF stages. The unit is normally located on a mother panel (unit 6).

The unit consists of a screening can and a panel, electronic circuit (pec). All the circuit components are located on the pec. Holes are drilled in the screening can to allow access for adjustment of tuning.

3. A circuit diagram of the unit is given in Fig.1. A pre-amplifier TR1 and two integrated circuit amplifiers, ML1, ML2, are connected in cascade. ML1 and ML2 are each followed by a tuned circuit. Provision is made for AGC, the control voltage being routed to ML2 pin 7.

4. The gain of TR1 is set by means of a wire link connection to select the appropriate emitter load; this selection is carried out when setting up the complete receiver.

5. The IF is 1.75 MHz with an effective bandwidth of 23 kHz. The maximum gain (AGC input 0V) is greater than 70 dB.

### TESTING

#### Test equipment

6. The following items of special-to-purpose test equipment are required:

- (1) Manual Interface Controller. Plessey Type TD4924A.
- (2) Test Interface. Plessey Type TD50567A.
- (3) Test Jig. Plessey Type TJ834A.

7. The following items of proprietary test equipment are required:

| <u>Item</u>      | <u>Description</u>  |                  |                    |                |  |                  |  |           |                                   |
|------------------|---|------------------|--------------------|----------------|--|------------------|--|-----------|-----------------------------------|
| Avo              | A dc milliammeter capable of reading currents in the range 0 - 10 mA with an accuracy of $\pm 1\%$ of f.s.d.<br>Suitable instrument: Avo Model 8X.  |                  |                    |                |  |                  |  |           |                                   |
| DVM              | A digital voltmeter having the following essential characteristics: <table border="0" style="margin-left: 2em;"> <tr> <td>Range</td> <td>0 - 10V</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 0.015\%</math> of reading<br/><math>\pm 0.005\%</math> of f.s.d</td> </tr> </table> Suitable instrument: Solartron A203/204  | Range            | 0 - 10V            | Accuracy       | $\pm 0.015\%$ of reading<br>$\pm 0.005\%$ of f.s.d |                  |  |           |                                   |
| Range            | 0 - 10V   |                  |                    |                |  |                  |  |           |                                   |
| Accuracy         | $\pm 0.015\%$ of reading<br>$\pm 0.005\%$ of f.s.d  |                  |                    |                |  |                  |  |           |                                   |
| RFVM             | An RF millivoltmeter having the following essential characteristics: <table border="0" style="margin-left: 2em;"> <tr> <td>Frequency range:</td> <td>1.6 MHz to 1.8 MHz</td> </tr> <tr> <td>Voltage range:</td> <td>1V and 100 mV.</td> </tr> <tr> <td>Input impedance:</td> <td>GT 150 kohms at 1 MHz, LT<br/>2.5 pF at 1 MHz</td> </tr> <tr> <td>Accuracy:</td> <td><math>\pm 3\%</math> of f.s.d on 10 mV range</td> </tr> </table> Suitable instrument: Marconi TF 2603 with coaxial adaptor TM 795C and N to BNC adaptor | Frequency range: | 1.6 MHz to 1.8 MHz | Voltage range: | 1V and 100 mV.                                     | Input impedance: | GT 150 kohms at 1 MHz, LT<br>2.5 pF at 1 MHz | Accuracy: | $\pm 3\%$ of f.s.d on 10 mV range |
| Frequency range: | 1.6 MHz to 1.8 MHz  |                  |                    |                |  |                  |  |           |                                   |
| Voltage range:   | 1V and 100 mV.  |                  |                    |                |  |                  |  |           |                                   |
| Input impedance: | GT 150 kohms at 1 MHz, LT<br>2.5 pF at 1 MHz  |                  |                    |                |  |                  |  |           |                                   |
| Accuracy:        | $\pm 3\%$ of f.s.d on 10 mV range   |                  |                    |                |  |                  |  |           |                                   |

Description

- Counter      An electronic counter capable of measuring frequency 1.75 MHz  
with accuracy of  $\pm 2$ Hz  
Suitable instrument:      Racal 9024
- Gen.          An RF signal generator having the following essential  
characteristics:  
                 Frequency range:              1.4 MHz to 2.1 MHz  
                 Frequency accuracy:           $\pm 2$  kHz  
                 Output emf:                      40 $\mu$ V to 50 mV  
                 Source impedance:            50 ohms  
 Suitable instrument:      Marconi TF 144H/4
- PSU          A power supply capable of supplying 6V  $\pm 3\%$ .  
Suitable instrument:      Farnell L30B

Preliminary

Proceed as follows:

- (1) Connect the Test Interface to the Manual Interface Controller and to the Test Jig.
- (2) At the Manual Interface Controller
  - (a) Ensure that the DC monitor switch is set to EXT
  - (b) Set the test selection switches to 000
  - (c) Connect AVO to socket marked AVO
  - (d) Connect DVM to socket marked DVM
  - (e) Connect RF Gen. to socket marked SG1
  - (f) Connect the PSU output to the EXT A connector
- (3) At the test interface, connect RFVM to socket marked RFVM.
- (4) Connect counter to RF Gen. normal output via a 10 dB attenuator.

- (5) Switch on mains power to all test instruments where applicable.
- (6) Ensure that all links are removed from pins 6, 7, 8, 9 and 10 of the UUT (unit under test).

Test procedures

9. Carry out the procedures given on the following pages.

NOTES RELATING TO TESTS

1. The unit under test is referred to as UUT.
2. For the majority of tests, the RF Gen. output is injected into pin 11 of the UUT and the resulting output at pin 3 is displayed at the RFVM. In tests 008/010, + 4.65V is applied to the AGC line of the UUT, for all other tests, AGC is not applied.

| TEST No. | STEP                            | UNIT         | RANGE | LIMITS                     | INSTRUCTIONS  |
|----------|---------------------------------|--------------|-------|----------------------------|---|
| 000      | (a)                             | INT<br>CON   | -     | -                          | Depress "PRESS TO TEST" button.   |
|          | (b)                             | UUT          | -     | -                          | Locate UUT in test jig. Ensure that links are not fitted to any of pins 6 to 10 of the UUT. |
|          | (c)                             | AVO          | 10mA  | -                          | Set Avo to 10 mA dc range.  |
|          | (d)                             | DVM          | 10V   | -                          | Set DVM to 10V range.   |
|          | (e)                             | RF<br>VM     | 1V    | -                          | Set RFVM to the 1V range.   |
| 6.0V     | <u>SUPPLY LINE ADJUSTMENT</u>   |              |       |                            |   |
| 002      | (a)                             | INT<br>CON   | -     | -                          | Depress "PRESS TO TEST" button.   |
|          | (b)                             | DVM          | 10V   | 5.902V to<br>6.098V        | Adjust PSU to indicate on DVM a value of 6.0 Volts.   |
| 6.0V     | <u>LINE CURRENT MEASUREMENT</u> |              |       |                            |   |
| 004      | (a)                             | INT<br>CON   | -     | -                          | Depress "PRESS TO TEST" button.   |
|          | (b)                             | AVO          | 10mA  | NGT 9.0mA                  | Ensure that the 6V line current is not greater than 9.0 mA.                                 |
| 6.0V     | <u>SUPPLY LINE ADJUSTMENT</u>   |              |       |                            |   |
| 005      | (a)                             | INT<br>CON   | -     | -                          | Depress "PRESS TO TEST" button.   |
|          | (b)                             | DVM          | 10V   | 5.902V to<br>6.098V        | Adjust PSU to indicate on DVM a value of 6.0 Volts.   |
|          | <u>IF ALIGNMENT AND GAIN</u>    |              |       |                            |   |
| 006      | (a)                             | INT<br>CON   | -     | -                          | Depress "PRESS TO TEST" button.   |
|          | (b)                             | COUN-<br>TER |       | 1.748002 to<br>1.751998MHz | Set RF Gen. frequency to indicate on Counter 1.75 MHz.                                      |
|          | (c)                             | RF<br>GEN    | -     | Set 500 $\mu$ V            | Set RF Gen. output level to 500 $\mu$ V.  |

| TEST No.                           | STEP | UNIT       | RANGE | LIMITS                    | INSTRUCTIONS  |
|------------------------------------|------|------------|-------|---------------------------|---|
| 006<br>cont'd                      | (d)  | RF<br>VM   | 1V    | MAX. OUTPUT<br>LEVEL      | Adjust L1, L2 on the UUT for a maximum indication on the RFVM Voltmeter.  |
|                                    | (e)  | RF<br>VM   | 1V    | 169V to<br>470mV          | Check the reading indicated on the RFVM.  |
|                                    | (f)  | RF<br>GEN  |       | ZERO<br>OUTPUT            | Set output signal of RF Gen. to zero.   |
|                                    | (g)  | RF<br>VM   | 100mV | 55 mV to<br>65 mV         | Set RFVM to 100 vM scale. Increase output level of RF Gen. to indicate on RFVM a reading of 60 mV.<br>Note the setting of the output level dial on the RF Gen. in dB's. |
| <u>AGC VOLTS</u>                   |      |            |       |                           |   |
| 008                                | (a)  | INT<br>CON | -     | -                         | Depress "PRESS TO TEST" button.   |
|                                    | (b)  | DVM        | 10V   | 4.601V to<br>4.699V       | Check AGC line voltage.   |
| <u>I/P LEVEL INCREASE WITH AGC</u> |      |            |       |                           |   |
| 010                                | (a)  | INT<br>CON | -     | -                         | Depress "PRESS TO TEST" button.   |
|                                    | (b)  | RF<br>GEN  |       |                           | Increase RF Gen. output level to indicate on RFVM a reading of 60 mV. Note the setting of the output dial on the RF Gen. in dB's.                                       |
|                                    | (c)  |            |       | NLT<br>61.2 dB<br>greater | Check that reading noted in 010 b is NLT 61.2 dB above that noted in 006 g.   |
| 012                                | (a)  | INT<br>CON | -     | -                         | Depress "PRESS TO TEST" button.   |
|                                    | (b)  | UUT        |       |                           | Remove UUT.   |



COMPONENTS LIST

10. The component parts of the screen and can assembly (unit 6a)  
640/1/09705 are:

|                          |             |
|--------------------------|-------------|
| Screen can               | 640/1/09824 |
| Panel electronic circuit | 419/1/12035 |
| Spacer                   | 640/2/15412 |

11. A detailed breakdown of the panel electronic circuit 419/1/12035  
is given on the following page.

COMPONENTS LIST FOR  
RECEIVER IF PEC (Unit 6a)  
419/1/12035

| Cct Ref | Description                   | Reference No.                      |
|---------|-------------------------------|------------------------------------|
|         | <u>Resistors</u>              |                                    |
| R1      | 13 kohm $\pm$ 5%              |                                    |
| R2      | 4.3 kohm $\pm$ 5%             | 403/4/78126/076                    |
| R3,R9   | 1 kohm $\pm$ 5%               | 403/4/78126/064                    |
| R4      | 130 ohm $\pm$ 5%              | 403/4/78126/049                    |
| R5      | 75 ohm $\pm$ 5%               | 403/4/78126/028                    |
| R6      | 110 ohm $\pm$ 5%              | 403/4/78126/022                    |
| R7      | 470 kohm $\pm$ 5%             | 403/4/78126/026                    |
| R8      | 390 ohm $\pm$ 5%              | 403/4/78126/041<br>403/4/78126/039 |
|         | <u>Capacitors</u>             |                                    |
| C1      | 10nF +80% -20% 100v           |                                    |
| C2      | 68nF +80% -20% 50v            | 400/9/19084/078                    |
| C3      | 68nF +80% -20% 50v            | 400/9/19084/098                    |
| C4      | 10nF +80% -20% 100v           | 400/9/19084/098                    |
| C5      | 68nF +80% -20% 50v            | 400/9/19084/078                    |
| C6      | 27pF $\pm$ 5% 100v            | 400/9/19084/098                    |
| C7      | 100pF $\pm$ 5% 100v           | 400/9/19080/080                    |
| C8      | 330pF $\pm$ 1% 350v           | 400/9/19081/085                    |
| C9      | 10nF +80% -20% 100v           | 438/9/30100/105                    |
| C10     | Not used                      | 400/9/19084/078                    |
| C11     | 27pF $\pm$ 5% 100v            |                                    |
| C12     | 100pF $\pm$ 5% 100v           | 400/9/19080/080                    |
| C13     | 330pF $\pm$ 1% 350v           | 400/9/19081/085                    |
| C14     | 10nF +80% -20% 100v           | 438/9/30100/105                    |
| C15     | 6.8uF $\pm$ 20% 6v CET 30A    | 400/9/19084/078<br>402/4/98049/009 |
|         | <u>Inductors</u>              |                                    |
| L1      | Inductor, R.F.                |                                    |
| L2      | Inductor, R.F.                | 406/9/08470/027                    |
| L3      | Inductor, R.F.                | 406/8/11030/001<br>406/8/11030/001 |
|         | <u>Semi-conductor devices</u> |                                    |
| TR1     | Transistor ZTX109L            |                                    |
| ML1     | Integrated circuit CN603T     | 990/4/02027/003                    |
| ML2     | Integrated circuit CN603T     | 446/4/00423<br>446/4/00423         |

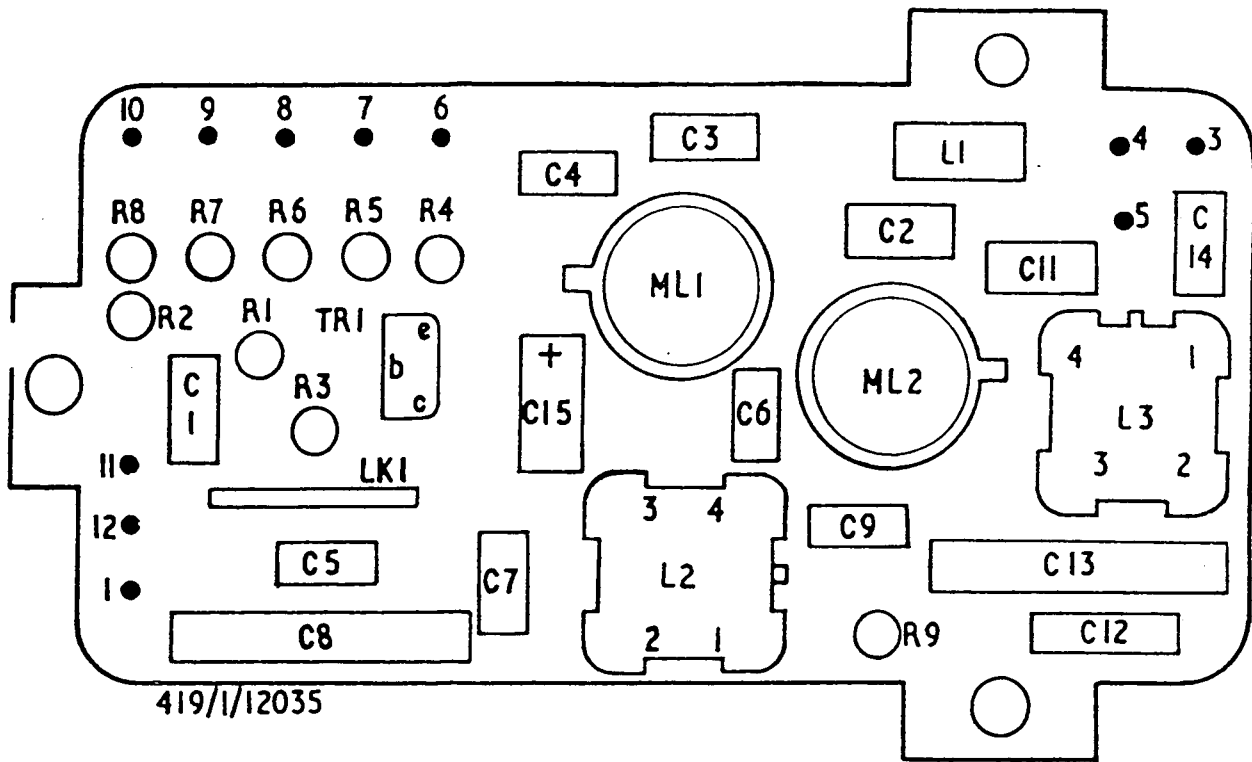


Fig.2 Receiver IF pec (unit 6a)-component layout

13

THIRD LINE SERVICING  
OF  
SCREEN & CAN ASSEMBLY 640/HA/09706  
(UNIT 6b)

CONTENTS

| Description                            | Para. |
|--|-------|
| Introduction ... ..                    | 1     |
| Demodulation and AGC generation ... .. | 4     |
| AF amplifiers ... ..                   | 7     |
| Tone gate ... ..                       | 13    |
| <br>Testing                            |       |
| Test equipment ... ..                  | 16    |
| Preliminary ... ..                     | 18    |
| Test procedures ... ..                 | 22    |
| Components list ... ..                 | 23    |

ILLUSTRATIONS

| Fig.  | Page |
|---|------|
| 1. Unit 6b, receiver AF and AGC - circuit ... ..            | 15   |
| 2. Receiver AF and AGC pec (unit 6b) - component layout ... | 17   |

DESCRIPTION

Introduction

1. The screen and can assembly (unit 6b) is a component part of the transmitter receiver and provides the receiver AF and AGC unit. The unit is normally located on a mother panel (unit 6).

2. The unit consists of a screening can and a panel, electronic circuit (pec). All the circuit components are located on the pec. The circuit diagram is given in Fig. 1.

3. The unit provides the following functions:

- (1) SSB demodulation and AGC generation.
- (2) AM demodulation and AGC generation.
- (3) Amplification of selected demodulator AF output.
- (4) Injection of a tone to audio amplifier input under external control.
- (5) Injection of audio (Tx sidetone) into audio amplifier input.

#### Demodulation and AGC generation

4. SSB demodulation is provided by integrated circuit, ML1, which also provides AM demodulation and AM AGC generation. A second integrated circuit, ML2, provides SSB AGC generation.

5. SSB IF signals applied to ML1 pin 6 beat with a 1.75 MHz carrier reinsertion signal applied to ML1 pin 9. The difference frequency at ML1 pin 8 is the AF component of the SSB signal and is routed via the emitter follower TR1 to:

(1) Integrated circuit ML2, which produces the SSB AGC voltage at ML2 pin 2. The SSB AGC threshold level, is set by R4.

(2) gate TR3 (see para. 8)

6. AM IF signals applied to ML1 pin 6 are rectified to provide an AF output at ML1 pin 1. This output is routed via the emitter follower TR2 to the gate TR4 (see para. 8). The AM AGC voltage is produced at ML1 pin 4 and is derived from the AM AF. The AM AGC threshold level is set by resistor R2, connected between ML1 pins 2 and 5.

#### AF amplifiers

7. Either the demodulated SSB or the demodulated AM, as selected by a gate circuit, is routed via preamplifier to the external gain control and

thence to a class AB audio amplifier. Other signals to this amplifier are provided by a tone gate and the sidetone input.

8. TR3/TR4 form a gate to select either the demodulated SSB applied to TR3 base or the demodulated AM applied to TR4 base. When the +6V(AM) input to pin 6 of unit 6b is open circuit, the bias conditions are such that TR3 passes the demodulated SSB to TR5 and TR4 is switched off. If the +6V(AM) input is at +6V, TR4 is switched on to pass the demodulated AM to TR5 and TR4 emitter current causes TR3 to be biased beyond cut-off. Resistors R5 and R11 provide independent adjustment of the AF input levels to TR3 and TR4.

9. The +6V at the +6V (AM) input is taken via the isolating diode D3 to pin 16 of the unit where it is externally used to inhibit the carrier insertion signal (i.e. SSB demodulation is inhibited when the AM demodulator output is selected).

10. The AF signal selected by TR3/TR4 is amplified by TR5 and TR6 and passed via an external gain control to TR8. Other AF inputs to TR8 are provided by the tone gate TR7 and the sidetone input to pin 4 of unit 6b.

11. TR8/TR9 are driver stages for the class AB audio amplifier TR10/TR11.

12. The amplitude of sidetone input at TR8 base is reduced when the 0V CW input to pin 3 of unit 6b is connected to 0V.

#### Tone gate

13. The tone gate is provided to facilitate the transmitter-receiver frequency check and loss of phase lock warning functions. The gate passes a tone to the audio amplifier input when either one of two control signals is applied.

14. The tone (normally 1 kHz or 2 kHz) applied to pin 15 of unit 6b is passed to the base of TR7 which is normally biased beyond cut-off. If +6V is applied either to pin 6 (Rx Freq Check) or to pin 2 (Phase Lock) of unit 6b, TR7 is switched on and the tone is passed to the audio amplifier input.

15. +6V applied to the phase lock input is routed via the isolating diode D4 to pin 16 of unit 6b where it is externally used to inhibit the Tx and Rx IF carrier.

### TESTING

#### Test equipment

16. The following items of special-to-purpose test equipment are required:

- |     |                              |                       |
|-----|------------------------------|-----------------------|
| (1) | Manual interface controller. | Plessey Type TD4924A  |
| (2) | Test interface.              | Plessey Type TD50568A |
| (3) | Test jig.                    | Plessey Type TJ835A   |

17. The following items of proprietary test equipment are required:

| <u>Item</u>          | <u>Description</u>   |                     |               |               |                          |                      |                                      |                 |          |
|----------------------|--|---------------------|---------------|---------------|--------------------------|----------------------|--------------------------------------|-----------------|----------|
| Avo                  | <p>A dc milliammeter having the following essential characteristics:</p> <table border="0" style="margin-left: 20px;"> <tr> <td>Range</td> <td>100 mA</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 1\%</math> of fsd</td> </tr> </table> <p>Suitable instrument: Avo Universal Model 8</p>  | Range               | 100 mA        | Accuracy      | $\pm 1\%$ of fsd         |                      |                                      |                 |          |
| Range                | 100 mA   |                     |               |               |                          |                      |                                      |                 |          |
| Accuracy             | $\pm 1\%$ of fsd   |                     |               |               |                          |                      |                                      |                 |          |
| DVM                  | <p>A digital voltmeter having the following essential characteristics:</p> <table border="0" style="margin-left: 20px;"> <tr> <td>Range</td> <td>10V and 1V</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 0.015\%</math> of reading</td> </tr> <tr> <td></td> <td><math>\pm 0.005\%</math> of fsd</td> </tr> </table> <p>Suitable instrument: Solartron A203<br/>or Solartron LM 1619<br/>or Fluke 8100A</p>   | Range               | 10V and 1V    | Accuracy      | $\pm 0.015\%$ of reading |                      | $\pm 0.005\%$ of fsd                 |                 |          |
| Range                | 10V and 1V   |                     |               |               |                          |                      |                                      |                 |          |
| Accuracy             | $\pm 0.015\%$ of reading   |                     |               |               |                          |                      |                                      |                 |          |
|                      | $\pm 0.005\%$ of fsd   |                     |               |               |                          |                      |                                      |                 |          |
| AF VM                | <p>An AF voltmeter having the following essential characteristics:</p> <table border="0" style="margin-left: 20px;"> <tr> <td>Operating Frequency</td> <td>100Hz to 5KHz</td> </tr> <tr> <td>Voltage range</td> <td>0.5mV to 1V</td> </tr> <tr> <td>Measurement Accuracy</td> <td><math>\pm 1\%</math> over above frequency range</td> </tr> <tr> <td>Input Impedance</td> <td>150 ohms</td> </tr> </table> <p>Suitable instrument: Hewlett Packard 400E</p> | Operating Frequency | 100Hz to 5KHz | Voltage range | 0.5mV to 1V              | Measurement Accuracy | $\pm 1\%$ over above frequency range | Input Impedance | 150 ohms |
| Operating Frequency  | 100Hz to 5KHz  |                     |               |               |                          |                      |                                      |                 |          |
| Voltage range        | 0.5mV to 1V  |                     |               |               |                          |                      |                                      |                 |          |
| Measurement Accuracy | $\pm 1\%$ over above frequency range   |                     |               |               |                          |                      |                                      |                 |          |
| Input Impedance      | 150 ohms   |                     |               |               |                          |                      |                                      |                 |          |

| <u>Item</u>  | <u>Description</u>  |
|--------------|---|
| RF Gen.<br>A | An RF signal generator with the following essential characteristics:  |
|              | Operating frequency 1.75 MHz  |
|              | CW output emf 200 mV, 125 mV, 45 mV, 25 mV, and 4.5 mV.   |
|              | Output emf accuracy $\pm 1$ dB at 1.75 MHz  |
|              | Source Impedance 50 ohms  |
|              | Amplitude Modulation level 85% at 1 KHz, emf of 125 mV $\pm 2\%$  |
|              | Suitable instrument: Marconi Type 2002B with Synchroniser Type 2170B  |
| RF Gen.<br>B | An RF signal generator with the following essential characteristics:  |
|              | Operating frequency Different from RF Gen. A by 100 Hz $\pm 10$ Hz, or 1 kHz $\pm 10$ Hz or 5 kHz $\pm 10$ Hz |
|              | CW output emf 100 mV  |
|              | Output emf accuracy $\pm 1$ dB at 1.75 MHz  |
|              | Source impedance 50 ohms  |
|              | Accuracy of difference frequencies $\pm 10$ Hz  |
|              | Suitable instrument: Marconi Type 2002B with Synchroniser Type 2170B  |
| AF Gen.      | An AF signal generator with the following essential characteristics:  |
|              | Operating frequency 1 KHz and 2 KHz   |
|              | Frequency accuracy $\pm 2\%$ of indicated value   |
|              | Output emf 250 mV and 50 mV   |
|              | Output accuracy $\pm 1$ dB  |
|              | Source impedance less than 100 ohms   |
|              | Suitable instrument: Advance J3   |
| PSU          | A power supply capable of supplying 6.0V $\pm 2\%$ at 100 mA maximum.   |
|              | Suitable power supply: Farnell L30B   |



Preliminary

18. Connect the test interface to the test jig and to the manual interface controller.
19. At the manual interface controller:
  - (1) Set the DC monitor switch to EXT
  - (2) Set the test selection switches to 000
  - (3) Connect DVM to socket marked DVM
  - (4) Connect RF Gen. A to socket marked SG1
  - (5) Connect RF Gen. B to socket marked SG2
  - (6) Connect AF Gen. to socket marked AUDIO GEN
  - (7) Connect AF VM to socket marked AF V/V
  - (8) Connect PSU to socket marked EXT A
20. Connect a synchroniser to each RF Gen.
21. Switch on the mains supplies to all test instruments where applicable.

Test procedures

22. Carry out the test procedures given on the following pages.

NOTES RELATING TO TESTS

- (1) The unit under test is referred to as JUT.
- (2) Potentiometers R2, R4, R5 and R11 on JUT are adjusted to the requisite operational settings after unit 6b is fitted to the radio. The resistors are set to give maximum gain and AGC voltages for the purposes of the tests herein.

(3) For all tests the load normally presented by the external gain control is synthesised by a suitable resistor connected between pins 17 and 18 of the UUT, pin 17 is linked to pin 13 (max gain).

(4) Tests 000 - 005 are to set the 6V supply and check the 6V line current.

(5) For the AM circuit checks (tests 006 and 008) the UUT is set to AM mode by applying +6V to the +6V Rx AM input (pin 6) of the UUT (the resulting carrier inhibit output at pin 16 of the UUT is checked). RF Gen. A is used to supply an amplitude modulated 1.75 MHz carrier to the detector input (pin 10) of the UUT. The resulting AF and AM AGC output voltages are checked.

(6) For the SSB circuit checks (tests 010 and 012) the UUT is set to SSB mode by open circuit of the +6V Rx AM input (pin 6) of UUT. RF Gen. A is used to supply 1.75 MHz CW to the detector input (pin 10) of UUT and RF Gen. B is used to supply 1.75 MHz + 1 kHz to the carrier input (pin 8) of UUT. The resulting 1 kHz AF and SSB AGC outputs are checked.

(7) For tests 014 to 018, a 2 kHz audio signal is applied to the tone gate of the UUT and the effect of the control inputs on the routing of this audio signal to the AF output of the UUT are checked thus:

(a) Phase lock input (pin 2) at +6V - test 014

(b) Phase lock input (pin 2) at 0V - test 016

(c) Phase lock input (pin 2) at 0V and 6V Rx freq. check input (pin 17) at +6V - test 018

| TEST No.                             | STEP | UNIT        | RANGE | LIMITS                                     | INSTRUCTIONS   |
|--------------------------------------|------|-------------|-------|--|--|
| 000                                  | (a)  | INT<br>CON  | -     | -  | Depress "PRESS TO TEST" button.  |
|                                      | (b)  | UUT         | -     | -  | Locate UUT in the Test Jig.  |
|                                      | (c)  | AVO         | 100mA | -  | Set Avo to 100 mA dc range.  |
|                                      | (d)  | DVM         | 10V   | -  | Set DVM to 10V range.  |
|                                      | (e)  | AF<br>VM    | 1V    | -  | Set AF voltmeter to 1V range.  |
|                                      | (f)  | UUT         |       |  | Set R2, R4, R5 and R11 controls on UUT fully clockwise.  |
| <u>6.0V SUPPLY LINE ADJUSTMENT</u>   |      |             |       |  |  |
| 002                                  | (a)  | INT<br>CON  | -     | -  | Depress "PRESS TO TEST" button.  |
|                                      | (b)  | DVM         | 10V   | 5.881V to<br>6.119V                        | Adjust external power supply to indicate on DVM a value of 6.0V.                                 |
| <u>6.0V LINE CURRENT</u>             |      |             |       |  |  |
| 004                                  | (a)  | INT<br>CON  | -     | -  | Depress "PRESS TO TEST" button.  |
|                                      | (b)  | AVO         | 100mA | NGT 34.0mA                                 | Check 6V line current.   |
| <u>6.0V SUPPLY LINE READJUSTMENT</u> |      |             |       |  |  |
| 005                                  | (a)  | INT<br>CON  | -     | -  | Depress "PRESS TO TEST" button.  |
|                                      | (b)  | DVM         | 10V   | 5.881V to<br>6.119V                        | Adjust external power supply to indicate on DVM a value of 6.0V.                                 |
| <u>AF OUTPUT AM CIRCUIT</u>          |      |             |       |  |  |
| 006                                  | (a)  | SYNC<br>'A' |       | 1.74001 to<br>1.75999MHz                   | Set Synchroniser to 1.75000 MHz and tune RF Gen. to 1.75 MHz.                                    |
|                                      |      | RF<br>GEN A |       | Set 125mV<br>MOD. at<br>1K Hz<br>Depth 85% | Set an output level of 125 mV, amp. modulated at 1 K Hz, depth of modulation 85%, on the RF Gen. |
|                                      | (b)  | INT<br>CON  | -     | -  | Depress "PRESS TO TEST" button.  |

| TEST No.                     | STEP | UNIT     | RANGE | LIMITS                | INSTRUCTIONS  |
|------------------------------|------|----------|-------|-----------------------|---|
| 006<br>(contd)               | (c)  | AF VM    | 3V    | NLT 1.03V             | Check the AF output on AF VM.   |
|                              | (d)  | DVM      | 10V   | NLT 4.001V            | Check the carrier inhibit output on DVM.                                    |
| <u>AM AGC CIRCUIT</u>        |      |          |       |                       |   |
| 008                          | (a)  | RF GEN A |       | SET ZERO OUTPUT       | Set RF Gen. output voltage to a minimum.                                    |
|                              | (b)  | INT CON  | -     | -                     | Depress "PRESS TO TEST" button.   |
|                              | (c)  | DVM      | 1V    | NGT 0.999V            | Check AM AGC output on DVM.   |
|                              | (d)  | DVM      | 10V   | -                     | Set DVM to 10V range.   |
|                              | (e)  | RF GEN A |       | Set 220mV             | Set the RF Gen. output voltage to 220 mV.                                   |
|                              | (f)  | DVM      | 10V   | NLT 4.601V            | Check AM AGC output on DVM.   |
| <u>AF OUTPUT SSB CIRCUIT</u> |      |          |       |                       |   |
| 010                          | (a)  | RF GEN A |       | Set 25mV CW           | With frequency as in 006 (a) set a CW output voltage of 25 mV on RF Gen. A. |
|                              | (b)  | SYNC 'B' |       | 1.75097 to 1.75103MHz | Set Synchroniser B to 1.75100 and tune RF Gen. B to 1.751 MHz.              |
|                              |      | RF GEN B |       | Set 100 mV CW         | Set an output level of 100 mV CW, on RF Gen. B.                             |
|                              | (c)  | INT CON  | -     | -                     | Depress "PRESS TO TEST" button.   |
|                              | (d)  | AF VM    | 3V    | NLT 1.03V             | Check the AF output on AF VM.   |
| <u>AGC SSB CIRCUIT</u>       |      |          |       |                       |   |
| 012                          | (a)  | RF GEN A |       | Set 45 mV CW          | Increase CW output voltage to 45 mV on the RF Gen.                          |
|                              | (b)  | INT CON  | -     | -                     | Depress "PRESS TO TEST" button.   |
|                              | (c)  | DVM      | 10V   | NLT 4.601V            | Check the SSB AGC output on DVM.  |
|                              | (d)  | INT CON  | -     | -                     | Remove the two RF Gen. output leads.  |
|                              | (e)  | DVM      | 1V    | NGT 0.999V            | Check the SSB AGC output on DVM.  |

| TEST No.                    | STEP | UNIT    | RANGE | LIMITS                         | INSTRUCTIONS   |
|-----------------------------|------|---------|-------|--------------------------------|--|
| <u>TEST CHARACTERISTICS</u> |      |         |       |                                |  |
| 014                         | (a)  | AF GEN  |       | Set 50 mV<br>Set 2 K Hz        | Set the AF signal generator to a frequency of 2 KHz and output level of 50 mV.<br>Depress "PRESS TO TEST" button.  |
|                             | (b)  | INT CON | -     | -                              |  |
|                             | (c)  | AF VM   | 300mV | 153mV to 297 mV                | Note AF output on AF VM  |
|                             | (d)  | DC VM   | 10V   | NLT 3.001V                     | Check the carrier inhibit output on DVM.   |
| 016                         | (a)  | INT CON | -     | -                              | Depress "PRESS TO TEST" button.  |
|                             | (b)  | AF VM   | 1mV   | NLT 52dB down on 014 (c) value | Check that the AF output on the AF VM is greater than 52 dB down on the indicated value of 014(c).<br><u>NOTE:-</u> AF VM dB range switch reduction facility used. |
| 018                         | (a)  | AF VM   | 300mV | -                              | Set AF VM to 300 mV range.   |
|                             | (b)  | INT CON | -     | -                              | Depress "PRESS TO TEST" button.  |
|                             | (c)  | AF VM   | 300mV | 014(c) recorded value.         | Check that AF output on AF VM is the value noted in 014(c).  |
| <u>CONCLUSION OF TESTS</u>  |      |         |       |                                |  |
| 020                         | (a)  | INT CON | -     | -                              | Depress "PRESS TO TEST" button.  |
|                             | (b)  | UUT     | -     | -                              | Remove UUT from test jig.  |

COMPONENTS LIST

23. The component parts of the screen and can assembly (unit 6b) 640/1/09706 are:

|                          |             |
|--------------------------|-------------|
| Screen can               | 640/1/09825 |
| Panel electronic circuit | 419/1/12040 |
| Spacer                   | 640/2/15412 |

24. A detailed breakdown of the panel electronic circuit 419/1/12040 is given on the following pages.

COMPONENTS LIST FOR  
RECEIVER AF AND AGC PEC (Unit 6b)  
419/1/12040

| Cct Ref | Description                     | Reference No.   |
|---------|---------------------------------|-----------------|
|         | <u>Resistors</u>                |                 |
| R1      | 10 ohm $\pm$ 5%                 |                 |
| R2      | 10 kohm $\pm$ 10% 0.5w variable | 403/4/78126/001 |
| R3      | 1 kohm $\pm$ 5%                 | 404/9/05033/004 |
| R4      | 1 kohm $\pm$ 10% 0.5w variable  | 403/4/78126/049 |
| R5      | 10 kohm $\pm$ 10% 0.5w variable | 404/9/05033/002 |
| R6      | 390 ohm $\pm$ 5%                | 404/9/05033/004 |
| R7      | 10 kohm $\pm$ 5%                | 403/4/78126/039 |
| R8      | 4.7 kohm $\pm$ 5%               | 403/4/78126/073 |
| R9      | 2 kohm $\pm$ 5%                 | 403/4/78126/065 |
| R10     | 47 ohm $\pm$ 5%                 | 403/4/78126/056 |
| R11     | 10 kohm $\pm$ 10% 0.5w variable | 403/4/78126/017 |
| R12     | 47 kohm $\pm$ 5%                | 404/9/05033/004 |
| R13     | 390 ohm $\pm$ 5%                | 403/4/78126/089 |
| R14     | 10 kohm $\pm$ 5%                | 403/4/78126/039 |
| R15     | 1 kohm $\pm$ 5%                 | 403/4/78126/073 |
| R16     | 2 kohm $\pm$ 5%                 | 403/4/78126/049 |
| R17     | 22 kohm $\pm$ 5%                | 403/4/78126/056 |
| R18     | 2 kohm $\pm$ 5%                 | 403/4/78126/081 |
| R19     | 1.5 kohm $\pm$ 5%               | 403/4/78126/056 |
| R20     | 390 ohm $\pm$ 5%                | 403/4/78126/053 |
| R21     | 33 ohm $\pm$ 5%                 | 403/4/78126/039 |
| R22     | 1.2 kohm $\pm$ 5%               | 403/4/78126/013 |
| R23     | 10 ohm $\pm$ 5%                 | 403/4/78126/051 |
| R24     | 910 ohm $\pm$ 5%                | 403/4/78126/001 |
| R25     | 160 ohm $\pm$ 5%                | 403/4/78126/048 |
| R26     | 2.2 kohm $\pm$ 5%               | 403/4/78126/030 |
| R27     | 2.4 kohm $\pm$ 5%               | 403/4/78126/057 |
| R28     | 1 kohm $\pm$ 5%                 | 403/4/78126/058 |
| R29     | 2.7 kohm $\pm$ 5%               | 403/4/78126/049 |
| R30     | 2.2 kohm $\pm$ 5%               | 403/4/78126/059 |
| R31     | 100 kohm $\pm$ 5%               | 403/4/78126/057 |
| R32     | 2.7 kohm $\pm$ 5%               | 403/4/78126/097 |
| R33     | 5.6 kohm $\pm$ 5%               | 403/4/78126/059 |
| R34     | 6.8 kohm $\pm$ 5%               | 403/4/78126/067 |
| R35     | 15 kohm $\pm$ 5%                | 403/4/78126/069 |
| R36     | 7.5 kohm $\pm$ 5%               | 403/4/78126/077 |
| R37     | 10 kohm $\pm$ 5%                | 403/4/78126/070 |
| R38     | 10 ohm $\pm$ 5%                 | 403/4/78126/073 |
| R39     | 10 ohm $\pm$ 5%                 | 403/4/78126/001 |
| R40     | 10 kohm $\pm$ 5%                | 403/4/78126/001 |
| R41     | 10 kohm $\pm$ 5%                | 403/4/78126/073 |

| Cct Ref                       | Description                      | Reference No.   |
|-------------------------------|----------------------------------|-----------------|
| <u>Capacitors</u>             |                                  |                 |
| C1                            | 47uF $\pm$ 20% 6v electrolytic   | 402/4/98049/010 |
| C2                            | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C3                            | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C4                            | 47uF $\pm$ 20% 6v electrolytic   | 402/4/98049/010 |
| C5                            | 1uF $\pm$ 20% 35v electrolytic   | 402/4/98049/085 |
| C6                            | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C7                            | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C8                            | 4.7nF +80% -20% 100v             | 400/9/19083/041 |
| C9                            | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C10                           | 22nF $\pm$ 10% 100v              | 400/9/19083/058 |
| C11                           | 330nF $\pm$ 20% 35v electrolytic | 402/4/98049/082 |
| C12                           | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C13                           | 47uF $\pm$ 20% 6v electrolytic   | 402/4/98049/010 |
| C14                           | 100uF $\pm$ 10% 10v electrolytic | 402/4/98049/019 |
| C15                           | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C16                           | 47uF $\pm$ 10% 6v electrolytic   | 402/4/98049/003 |
| C17                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C18                           | 100uF $\pm$ 10% 10v electrolytic | 402/4/98049/019 |
| C19                           | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C20                           | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C21                           | 1uF $\pm$ 20% 35v electrolytic   | 402/4/98049/085 |
| C22                           | 470nF +80% -20% 50v              | 400/9/19084/109 |
| C23                           | 6.8uF $\pm$ 20% 6v electrolytic  | 402/4/98049/009 |
| C24                           | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C25                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C26                           | 47uF $\pm$ 20% 6v electrolytic   | 402/4/98049/010 |
| C27                           | 47uF $\pm$ 20% 6v electrolytic   | 402/4/98049/010 |
| C28                           | 22uF $\pm$ 20% 35v electrolytic  | 402/4/98049/092 |
| C29                           | 1uF $\pm$ 2% 35v electrolytic    | 402/4/98049/085 |
| C30                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C31                           | 10nF $\pm$ 10% 100v              | 400/9/19083/051 |
| C32, C33                      | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C34                           | 4.7nF +80% -20% 100v             | 400/9/19083/041 |
| <u>Inductors</u>              |                                  |                 |
| L1                            | Inductor 18uH                    | 406/9/08470/027 |
| <u>Semi-conductor devices</u> |                                  |                 |
| TR1 to TR 10                  | Transistor CV 7648               | 990/4/00107/648 |
| TR 11                         | Transistor BCY 70                | 417/4/00240     |
| D1 to D4                      | Diode CV 7367                    | 990/4/00107/367 |
| ML1                           | Integrated circuit CN 589T       | 446/4/00417     |
| ML2                           | Integrated circuit CN 605T       | 446/4/00424     |



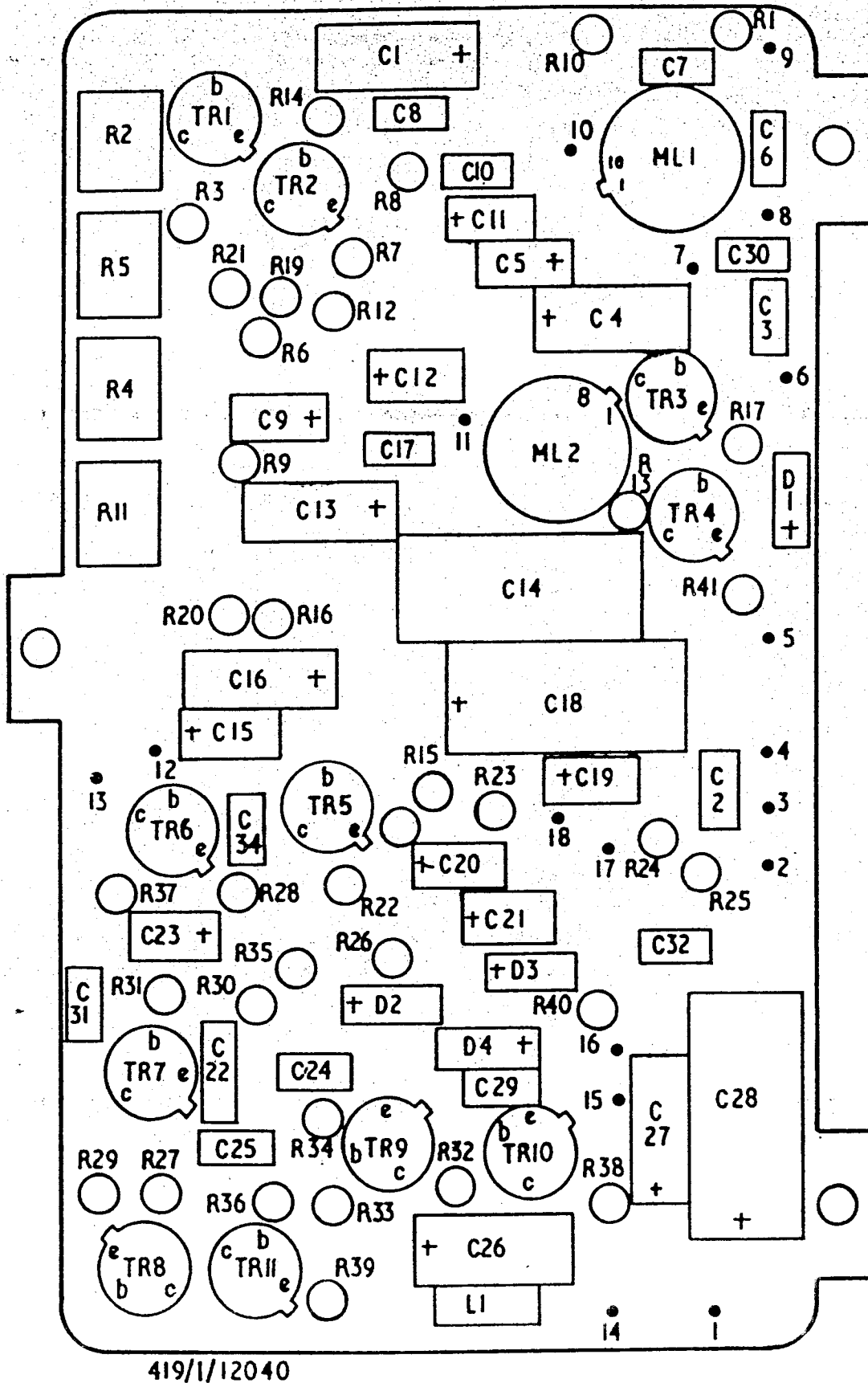


Fig.2 Receiver AF and AGC pec (unit 6b) — component layout

THIRD LINE SERVICING  
OF  
SCREEN & CAN ASSEMBLY 630/1/37605  
(UNITS 6c/d)

CONTENTS

| Description               | Para. |
|---------------------------|-------|
| Introduction ... ..       | 1     |
| Audio circuits ... ..     | 4     |
| Modulator circuits ... .. | 10    |
| Pressel circuits ... ..   | 14    |
| <br>Testing               |       |
| Test equipment ... ..     | 20    |
| Preliminary ... ..        | 22    |
| Test procedures ... ..    | 28    |
| Components lists... ..    | 29    |

ILLUSTRATIONS

| Fig.  | Page |
|---|------|
| 1. Unit 6c, transmitter AF and gating - circuit ... ..        | 17   |
| 2. Unit 6d, transmitter AF to IF and relay drive - circuit... | 19   |
| 3. Transmitter AF and gating pec (unit 6c) - component layout | 21   |
| 4. Transmitter AF to IF pec (unit 6d) - component layout ...  | 21   |

DESCRIPTION

Introduction

1. The screen and can assembly (unit 6c/d) is a component part of the transmitter receiver; it provides the transmitter audio circuits, AF/IF mixer and pressel circuits. The unit is normally located on a mother panel (unit 6).

2. The unit consists of a panel electronic circuit (pec) assembly and screening can. The pec assembly comprises two pec (units 6c and 6d), secured to each other at separating spacers. All external connections

are via unit 6c; connections to unit 6d are by wire leads to terminals on unit 6c.

3. Circuit diagrams of unit 6c and unit 6d are given in Figs 1 and 2 respectively.

Audio circuits (refer to Fig.1.)

4. Unit 6c provides a 300 ohm balanced input impedance for speech signals from a microphone. These signals are applied to an integrated circuit, ML1, which provides two audio amplifiers, one for a main signal path and one for a sidetone path.

5. The sidetone path amplifier in ML1 has a constant gain of approx. 30 dB. The main path amplifier in ML1 incorporates a VOGAD (voice operated gain adjusting device) which provides a constant output level (90 mV rms nominal) for input signals in the range 100  $\mu$ V to 100 mV peak-to-peak.

6. Main path speech signals are routed from ML1 pin 9 to ML3 pin 6. Sidetone path speech is routed from ML1 pin 4 to ML2 pin 6.

7. Integrated circuits ML2 and ML3 are identical controlled gates which incorporate a fixed gain clipping amplifier. ML2 output provides the Tx sidetone (normally passed to Rx audio circuits in unit 6b) and ML3 output provides the audio signal to the modulator circuits in unit 6d. Both gates operate in the following manner:

- (1) ML2 and ML3 will not pass audio signals when there is 0V at pin 12 of unit 6c.
- (2) ML2 and ML3 will pass speech signals from ML1 when pins 12, 15 and 16 of unit 6c are all open circuit.
- (3) ML2 and ML3 will pass an audio tone (normally 1 kHz or 2kHz) applied to pins 17 and 20 of unit 6c when pin 12 of the unit is open circuit and either of pins 15, 16 is at +6V.

8. The control input to pin 12 of unit 6c is provided by unit 6d and is determined by the pressel input to that unit (para. 16); when the pressel is set to transmit, audio is passed by ML2 and ML3. The control of inputs to pins 15 and 16 of unit 6c is from external switches.

9. Two separate tone inputs are provided so that each input can be externally set to a level appropriate to the respective output path, main or sidetone.

#### Modulator circuits (see fig.2)

10. Audio from unit 6c and a 1.7MHz carrier from an external oscillator are applied to a double balanced modulator in ML1 of unit 6d. The output produced at ML1 pin 6 is a complex waveform which contains the sum and difference frequencies of these signals, the original frequencies are effectively suppressed within ML1.

11. The modulator output is routed via a clipping stage and a switched gain amplifier, both in the integrated circuit ML3. The signal is routed out of ML3 at pin 7 and back again at pin 2. At this link, a connection is made to transistor TR4. This transistor is operated by the pressel and provides keying of the transmitter IF signal (para. 17)

12. The clipping of audio signals in ML3 of unit 6c, together with the clipping of peaks of the modulator output signal within ML3 is to ensure that the peak-to-mean ratio of the transmitter IF signal enables the transmitter power amplifiers to give maximum power output. Switching of ML3 gain enables the output signal to be approximately the same on all modes of operation; selection of gain is by external control applying the following to pins of unit 6d:

(1) +6V to pin 2 for SSB modes

(2) +6V to pin 3 and 4 for CW modes (note that clipping will not occur in this instance).

(3) Open circuit at pins 2, 3 and 4 for AM modes.

Fine setting of the gain for AM signals is provided by R8.

13. For reinsertion of 1.75 MHz carrier into the IF signal on AM modes, a gate in ML3 is operated for AM mode and passes the 1.75 MHz carrier from pin 5 to pin 3 of ML3 where, according to the setting of the link, LK, is either inserted into the IF signal at ML3 or is passed out of unit 6d for insertion at a later point in the IF signal path. Potentiometer R9 provides setting of the carrier level and thereby sets the modulation depth of the resulting AM signal.

#### Pressel circuits

14. The pressel circuits, in conjunction with an external pressel switch, provide switching of the radio from transmit to receive and vice versa.

15. The pressel is connected to pin 8 of unit 6d. When this input is open circuit (Rx), transistors TR2 and TR3 conduct. When this input is 0V (Tx), transistors TR2 and TR3 are switched off.

16. The audio outputs from unit 6c are keyed by the control input to pin 12 of that unit (para. 7/8). This control input is provided by TR3 in unit 6d, the control is open circuit when TR3 is switched off (Tx), thereby switching on the audio outputs; the control is at 0V when TR3 is switched on (Rx), thereby switching off the audio output.

17. Keying of transmitter IF signal by TR4 (para. 11) is controlled by the voltage at TR2 emitter. When TR2 is switched on (Rx), its output causes TR4 to switch on, thereby switching off the transmitter IF; when TR2 is switched off (Tx), its output causes TR4 to switch off, thereby switching on the transmitter IF.

18. Changing over of the radio from transmit mode to receive mode and vice versa is provided by external circuits which respond to a relay drive provided by ML3 in unit 6d. This integrated circuit is controlled by the collector voltage at transistor TR2. When TR2 is switched off (Tx), approx. +6V is applied to pin 5 of ML2, causing a heavy current to be supplied by ML2 to any relay circuits connected to pin 10 of unit 6d. This drive is removed when ML2 pin 5 is set to approx. 1V by conduction of TR2 (Rx).

19. Keying of the sidetone and the transmitter IF provides the marks and spaces of the morse message. Reversion of the radio to receive condition on CW modes when the pressel is released for the formation of a space is prevented by a delay (0.25 - 0.75 sec) between release of pressel and removal of drive. This delay is provided by capacitor C2 when pin 12 of unit 6d is connected to OV.

### TESTING

#### Test equipment

20. The following items of special-to-purpose test equipment are required:

- |     |                              |                       |
|-----|------------------------------|-----------------------|
| (1) | Manual interface controller. | Plessey Type TD4924A  |
| (2) | Test interface.              | Plessey Type TD50569A |
| (3) | Test jig.                    | Plessey Type TJ836B   |

21. The following items of proprietary test equipment are required:

#### Item

#### Description

|                 |  |           |          |                 |             |               |  |
|-----------------|--|-----------|----------|-----------------|-------------|---------------|--|
| AVO             | A dc milliammeter for measuring current in the range 50 to 100 mA to an accuracy of $\pm 1\%$ of fsd.<br>Suitable instrument: AVO Universal Model 8 or 9.  |           |          |                 |             |               |  |
| DVM             | A digital voltmeter for measuring 6 volts to an accuracy of $\pm 0.1\% \pm 1$ digit.<br>Suitable instrument: Solartron A203/204  |           |          |                 |             |               |  |
| RF VV           | An RF millivoltmeter having the following essential characteristics:<br><br><table border="0" style="margin-left: 40px;"> <tr> <td style="padding-right: 20px;">Frequency</td> <td>1.75 MHz</td> </tr> <tr> <td>Input impedance</td> <td>NLT 1M ohms</td> </tr> <tr> <td>Voltage range</td> <td>1 mV to 500 mV to an accuracy of <math>\pm 5\%</math></td> </tr> </table> Suitable instrument: Hewlett Packard 400E. | Frequency | 1.75 MHz | Input impedance | NLT 1M ohms | Voltage range | 1 mV to 500 mV to an accuracy of $\pm 5\%$ |
| Frequency       | 1.75 MHz   |           |          |                 |             |               |  |
| Input impedance | NLT 1M ohms  |           |          |                 |             |               |  |
| Voltage range   | 1 mV to 500 mV to an accuracy of $\pm 5\%$   |           |          |                 |             |               |  |

| <u>Item</u> | <u>Description</u>  |
|-------------|---|
| AF VV       | An AF voltmeter having the following essential characteristics:<br>Frequency 2 KHz<br>Input impedance 10M ohms 20 pf.<br>Voltage range 1 mV to 3 volts to an accuracy of $\pm 3\%$ of fsd<br>Suitable instrument: Advance VM 77D              |
| AFG 'A'     | An AF signal generator having the following essential characteristics:<br>Frequency range 2 KHz $\pm 2\%$<br>Output impedance 600 ohms balanced<br>60 to 110 mV $\pm 1$ dB $\pm 1.5\%$ of fsd<br>Suitable instrument: Advance J3.             |
| AFG 'B'     | An AF signal generator having the following essential characteristics:<br>Frequency range 2 KHz $\pm 10\%$<br>Output impedance NGT 50 ohms<br>Output EMF 90 mV to 1.7 volts $\pm 1$ dB $\pm 1.5\%$ of fsd<br>Suitable instrument: Advance J3. |
| RF Gen.     | An RF signal generator having the following essential characteristics:<br>Frequency range 1.75 MHz $\pm 2$ KHz<br>Output impedance 50 ohms<br>Output EMF 100 mV $\pm 5\%$<br>Suitable instrument: Marconi TF 144H/4                           |
| Counter     | A frequency counter for measuring 1.75 MHz to an accuracy of $\pm 1$ count $\pm 1$ part in $10^0$ .<br>Suitable instrument: Racal 9024  |

| <u>Item</u> | <u>Description</u>  |           |                  |           |                               |      |                                 |
|-------------|---|-----------|------------------|-----------|-------------------------------|------|---------------------------------|
| CRO         | An oscilloscope having the following essential characteristics:<br><table><tbody><tr><td>Frequency</td><td>500 Hz to 10 KHz</td></tr><tr><td>Amplitude</td><td>400 mV to 550 mV to <math>\pm 5\%</math></td></tr><tr><td>Time</td><td>1.0 mS to 1.4 sec to <math>\pm 10\%</math></td></tr></tbody></table> Suitable instrument: Solartron A100. (Long persistence trace). | Frequency | 500 Hz to 10 KHz | Amplitude | 400 mV to 550 mV to $\pm 5\%$ | Time | 1.0 mS to 1.4 sec to $\pm 10\%$ |
| Frequency   | 500 Hz to 10 KHz  |           |                  |           |                               |      |                                 |
| Amplitude   | 400 mV to 550 mV to $\pm 5\%$   |           |                  |           |                               |      |                                 |
| Time        | 1.0 mS to 1.4 sec to $\pm 10\%$   |           |                  |           |                               |      |                                 |
| PSU         | A dc power supply to provide $6V \pm 0.1V$ with limiting above 150 mA.<br>Suitable instrument: Farnell L30B   |           |                  |           |                               |      |                                 |

### Preliminary

22. Connect the test interface to the test jig and to the manual interface controller.
23. At the manual interface controller:
  - (1) Set the DC MONITOR switch to EXT
  - (2) Set the test selection switches to 000
  - (3) Connect the AVO to the socket marked AVO
  - (4) Connect the DVM to the socket marked DVM
  - (5) Connect the AF Gen. A (600 ohms balanced output), one side to socket marked INPUT 2 and other side to socket marked INPUT 5 using coaxial cables.
  - (6) Connect AF Gen. B (low level output) to socket marked AUDIO GEN
  - (7) Connect RF Gen. to socket marked SG1
  - (8) Connect CRO input to socket marked CRO AMP A



- (9) Connect CRO sync input to socket marked CRO AMP TRIG
  - (10) Connect AF VV to socket marked AF VV
  - (11) Connect PSU to terminals marked EXT A
24. Connect counter to monitor the output of the RF Gen.
  25. Set switch on test jig to 320L
  26. Connect the RF VV to socket on side of interface.
  27. Switch on the mains power supply to all instruments where applicable.

#### Test procedures

28. Carry out the test procedures given on the following pages.

#### NOTES RELATING TO TESTS

1. Unit under test is referred to as UUT
2. For the majority of tests, the UUT:
  - (1) Is set to the Tx mode (all tests other than 020).
  - (2) Is set to the CW, AM or SSB mode by application of relevant control signals to the UUT (mode is indicated in sub-headings within test procedures).
  - (3) Carrier input is supplied by RF Gen.
  - (4) Tone input is supplied by AFG 'B'.
  - (5) Speech input is supplied by AFG 'A' (see notes 3 and 4).

The resulting output, sidetone or IF, is measured.

- (9) Connect CRO sync input to socket marked CRO AMP TRIG
- (10) Connect AF VV to socket marked AF VV
- (11) Connect PSU to terminals marked EXT A
24. Connect counter to monitor the output of the RF Gen.
25. Set switch on test jig to 320L
26. Connect the RF VV to socket on side of interface.
27. Switch on the mains power supply to all instruments where applicable.

#### Test procedures

28. Carry out the test procedures given on the following pages.

#### NOTES RELATING TO TESTS

1. Unit under test is referred to as UUT
2. For the majority of tests, the UUT:
  - (1) Is set to the Tx mode (all tests other than 020).
  - (2) Is set to the CW, AM or SSB mode by application of relevant control signals to the UUT (mode is indicated in sub-headings within test procedures).
  - (3) Carrier input is supplied by RF Gen.
  - (4) Tone input is supplied by AFG 'B'.
  - (5) Speech input is supplied by AFG 'A' (see notes 3 and 4).

The resulting output, sidetone or IF, is measured.

3. The test interface includes a circuit which pulses the speech signal input to the UUT. This is to test the VOGAD device; the CRO Trigger is taken from the pulsing circuit.

4. For adjustment of 6cR6, a variable level of AF is required at TPH. The action of the VOGAD would prevent this. The link between TPG and TPH is broken before the tests and maintained via the interface for the tests in which AF is to be fed via the VOGAD. For tests 032/034, this connection is broken and AF is fed to TPH.

| TEST No.                         | STEP | UNIT       | RANGE | LIMITS                       | INSTRUCTIONS  |
|----------------------------------|------|------------|-------|------------------------------|---|
| 000                              | (a)  |            |       |                              | Depress "Press-to-test" button.                                 |
|                                  | (b)  |            |       |                              | Load UUT into test jig.   |
|                                  | (c)  | AVO        | 100mA |                              | Set AVO to 100mA d.c. range.                                    |
|                                  | (d)  | DVM        | 20V   |                              | Set DVM to 20 V   |
|                                  | (e)  | PSU        |       |                              | Set PSU to min. O/P voltage.                                    |
|                                  | (f)  | AFG 'A'    |       |                              | Set AFG 'A' to min. O/P level.                                  |
|                                  | (g)  | AFG 'B'    |       |                              | Set AFG 'B' to min. O/P level.                                  |
|                                  | (h)  | RF Gen     |       |                              | Set RF Gen. to min. O/P level.                                  |
|                                  | (j)  | RFVV       |       |                              | Set RFVV to max. range.   |
|                                  | (k)  | AFVV       |       |                              | Set AFVV to max. range.   |
|                                  | (l)  | CRO        |       |                              | Set CRO volts/CM to max. range.                                 |
|                                  | (m)  | PSU        |       |                              | Set PSU current limit for 150 mA.                               |
|                                  | (n)  | UUT        |       |                              | Remove link between TPG and TPH on Unit 6c.                     |
|                                  | (p)  | UUT        |       |                              | Ensure that a link is fitted between pins 17 and 18 of unit 6d. |
| <u>SET SUPPLY VOLTAGE</u>        |      |            |       |                              |   |
| 002                              | (a)  |            |       |                              | Depress "Press-to-test" button.                                 |
|                                  | (b)  | PSU<br>DVM | 20V   | 5.907 to<br>6.094V           | Increase PSU O/P to give 6 volts on DVM.                        |
| <u>SET AF AND RF GEN OUTPUTS</u> |      |            |       |                              |   |
| 004                              | (a)  |            |       |                              | Depress "Press-to-test" button.                                 |
|                                  | (b)  | AFG 'A'    |       | 1.837 KHz<br>to<br>2.155 KHz | Set AFG 'A' to 2 kHz.   |
|                                  | (c)  | AFVV       | 30mV  | 17.5 mV                      | Adjust AFG 'A' O/P level until AFVV indicates 17.5 mV.          |
| 006                              | (a)  |            |       |                              | Depress "Press-to-test" button.                                 |
|                                  | (b)  | AFG 'B'    |       | 1.837 KHz<br>to<br>2.155 KHz | Set AFG 'B' to a frequency of 2 KHz.                            |
|                                  | (c)  | AFVV       | 100mV | 50mV                         | Adjust AFG 'B' O/P level until AFVV indicates 50 mV.            |

| TEST No.                          | STEP | UNIT    | RANGE        | LIMITS                           | INSTRUCTIONS   |
|-----------------------------------|------|---------|--------------|----------------------------------|--|
| 006<br>(cont'd)                   | (d)  | RFGen   |              | 1.748011MHz<br>to<br>1.751989MHz | Set RFGen. to a frequency of 1.75 MHz indicated by the frequency counter.      |
|                                   | (e)  | RFGen   |              | 95mV to<br>104mV                 | Set RF Gen. O/P level to 100 mV.   |
| <u>SIDETONE OUTPUT LEVEL (AM)</u> |      |         |              |                                  |  |
| 08                                | (a)  | CRO     | 0.1v/<br>/cm |                                  | Set CRO to 0.1v/cm range.  |
|                                   | (b)  |         |              |                                  | Depress "Press-to-test" button.  |
|                                   | (c)  | CRO     | 0.1v/<br>/cm | 430 mV to<br>500 mV<br>pk-pk     | Check amplitude of the non-sinusoidal waveform.                                |
| <u>SIDETONE OUTPUT LEVEL (CW)</u> |      |         |              |                                  |  |
| 010                               | (a)  |         |              |                                  | Depress "Press-to-test" button.  |
|                                   | (b)  | CRO     | 0.1v/<br>/cm | 430 mV to<br>500 mV<br>pk-pk     | Check amplitude of the non-sinusoidal waveform.                                |
| <u>IF OUTPUT LEVEL (SSB)</u>      |      |         |              |                                  |  |
| 012                               | (a)  | AFVV    | 30mV         |                                  | Set AFVV to 30 mV range.   |
|                                   | (b)  |         |              |                                  | Depress "Press-to-test" button.  |
|                                   | (c)  | AFG 'A' |              |                                  | Adjust AFG 'A' O/P level until AFVV indicates 17.5 mV at a frequency of 2 kHz. |
| 014                               | (a)  | CRO     | 0.2v/<br>/cm |                                  | Set CRO to 0.2v/cm range.  |
|                                   | (b)  |         |              |                                  | Depress "Press-to-test" button.  |
|                                   | (c)  | CRO     | 0.2V/<br>/cm | 368mV to<br>807mV<br>pk-pk       | Check amplitude of the displayed waveform.<br>Note result.                     |

| TEST No.                                | STEP | UNIT    | RANGE   | LIMITS              | INSTRUCTIONS  |
|---|------|---------|---------|---------------------|---|
| <u>IF OUTPUT LEVEL (CW)</u>             |      |         |         |                     |   |
| 016                                     | (a)  |         |         |                     | Depress "Press-to-test" button.                                 |
|   | (b)  | CRO     | 0.5V/cm | 1.03 to 2.28V pk-pk | Check amplitude of the displayed waveform.                      |
| <u>RELAY DRIVE</u>                      |      |         |         |                     |   |
| 018                                     | (a)  |         |         |                     | Depress "Press-to-test" button.                                 |
|   | (b)  | DVM     | 20V     | NGT 2.496V          | Check the DVM indication (relay drive with pressel on).         |
| 020                                     | (a)  |         |         |                     | Depress "Press-to-test" button.                                 |
|   | (b)  | DVM     | 20V     | 5.887V to 6.112V    | Check the DVM indication (relay drive with pressel off).        |
| <u>CURRENT CONSUMPTION (PRESSEL ON)</u> |      |         |         |                     |   |
| 022                                     | (a)  |         |         |                     | Depress "Press-to-test" button.                                 |
|   | (b)  | DVM     | 20V     | 5.887V to 6.112V    | Adjust PSU O/P voltage until DVM indicates 6V.                  |
|   | (c)  | AVO     | 100mA   | 51mA to 89mA        | Check 6V line current.  |
| 024                                     | (a)  |         |         |                     | Depress "Press-to-test" button.                                 |
|   | (b)  | DVM     | 20V     | 5.887V to 6.112V    | Adjust PSU O/P voltage until DVM indicates 6V.                  |
| <u>SPEECH CLIPPING THRESHOLD (SSB)</u>  |      |         |         |                     |   |
| 026                                     | (a)  | AFVV    | 30mV    |                     | Set AFVV to the 30 mV range.                                    |
|   | (b)  |         |         |                     | Depress "Press-to-test" button.                                 |
|   | (c)  | AFG 'A' |         |                     | Adjust AFG 'A' O/P level until AFVV indicates 17.5 mV at 2 kHz. |
| 028                                     | (a)  | UUT     |         |                     | Adjust 6cR6 fully counter clockwise.                            |

| TEST No.        | STEP              | UNIT            | RANGE | LIMITS     | INSTRUCTIONS   |
|-----------------|-------------------|-----------------|-------|------------|--|
| 028<br>(cont'd) | (b)<br>(c)        | CRO             |       | 5 cm       | Depress "Press-to-test" button.<br>Adjust the CRO variable amp. control until the peak to peak displayed waveform is 5 cm high.  |
| 030             | (a)<br>(b)<br>(c) | RFVV            | 300mV | 50 - 150mV | Set RFVV to the 300 mV range.<br>Depress "Press-to-test" button.<br>Note output level at the RF VV.  |
| 032             | (a)<br>(b)<br>(c) | AFG 'B'<br>AFVV | 30mV  | 2 KHz      | Set AFG 'B' to min O/P level.<br>Depress "Press-to-test" button.<br>Adjust AFG 'B' O/P level for an indication of 20 dB down on the level measured in test 030 (c).  |
| 034             | (a)<br>(b)        | UUT             |       |            | Depress "Press-to-test" button.<br>Adjust 6cR6 until the displayed waveform on the CRO is 3.5 cm, Pk - Pk in amplitude, using the unaltered display set in test 028 (c).<br><u>NB</u> The setting of 3.5 cm represents a 3 dB reduction of level from the reference set in test 028 (c). |
| 036             | (a)<br>(b)        |                 |       |            | Depress "Press-to-test" button.<br>Remove UUT. Replace link between TPG and TPH on Unit 6c.  |

COMPONENTS LISTS

29. The principal component parts of the screen and can assembly 630/1/37605 (unit 6c/d) are:

|              |             |
|--------------|-------------|
| Pec assembly | 630/1/37606 |
| Spacer       | 640/2/15412 |
| Screen can   | 630/1/37607 |

30. The principal component parts of the pec assembly 630/1/37606 are:

|                                    |             |
|------------------------------------|-------------|
| Panel electronic circuit (unit 6c) | 419/1/24978 |
| Panel electronic circuit (unit 6d) | 419/1/24981 |
| Spacer                             | 640/2/09898 |

A breakdown of the two pec is given on the following pages.

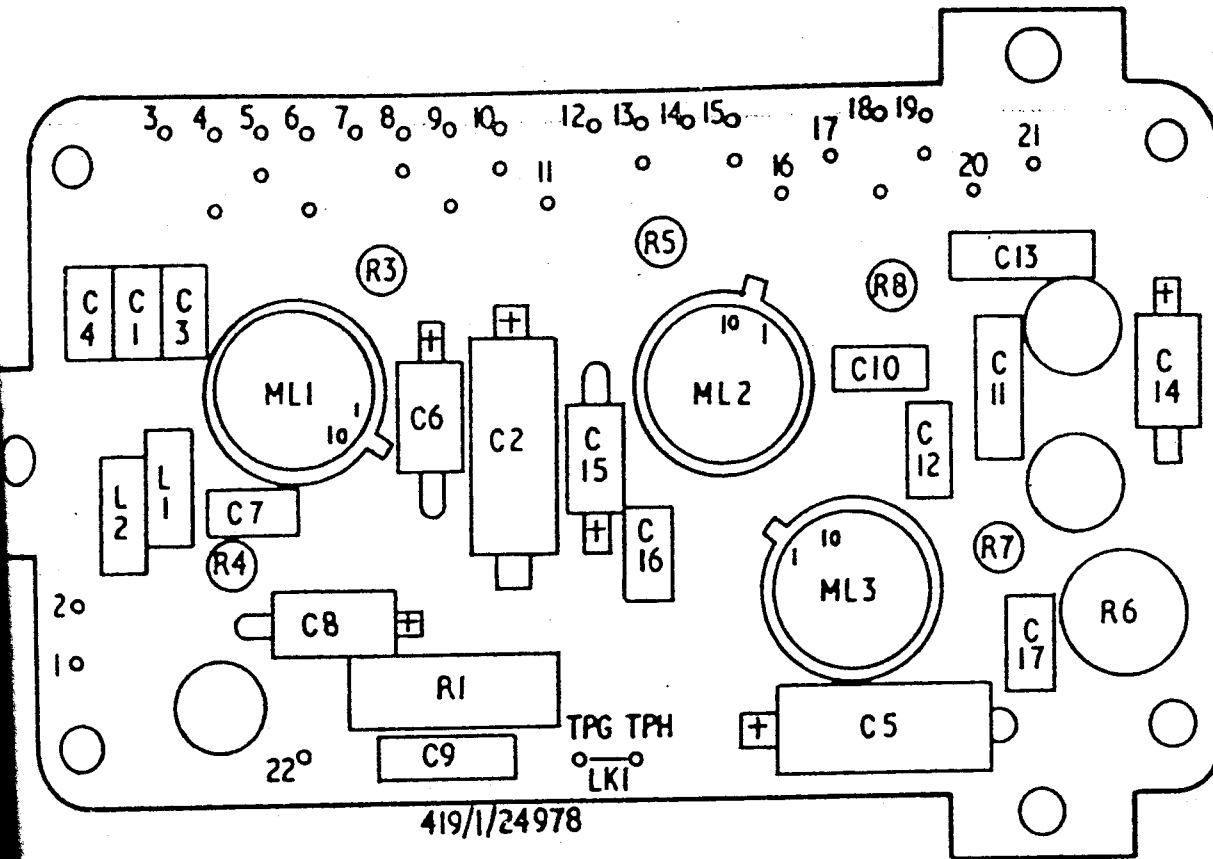


COMPONENTS LIST FOR  
TRANSMITTER AF & GATING PEC (Unit 6c)  
419/1/24978

| Cct Ref                       | Description                      | Reference No.   |
|-------------------------------|----------------------------------|-----------------|
| <u>Resistors</u>              |                                  |                 |
| R1                            | 1 Mohm $\pm$ 5%                  | 403/4/78127/121 |
| R2                            | not used                         |                 |
| R3 to R5                      | 4.7 kohm $\pm$ 5%                | 403/4/78126/065 |
| R7, R8                        | 1 kohm $\pm$ 5%                  | 403/4/78126/049 |
| R6                            | 5 kohm $\pm$ 10% 0.5w variable   | 404/9/05032/005 |
| <u>Capacitors</u>             |                                  |                 |
| C1                            | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C2                            | 47uF $\pm$ 10% 6v electrolytic   | 402/4/98049/003 |
| C3                            | 68nF +80% -20% 50v               | 400/9/19084/098 |
| C4                            | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C5                            | 47uF $\pm$ 10% 6v electrolytic   | 402/4/98049/003 |
| C6                            | 330nF $\pm$ 20% 35v electrolytic | 402/4/98049/082 |
| C7                            | 4.7nF $\pm$ 10% 100v             | 400/9/19083/041 |
| C8                            | 2.2uF $\pm$ 20% 20v electrolytic | 402/4/98049/053 |
| C9                            | 680nF $\pm$ 20% 50v              | 400/9/19296/001 |
| C10                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C11                           | 470nF +80% -20% 50v              | 400/9/19084/109 |
| C12                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C13                           | 470nF +80% -20% 50v              | 400/9/19084/109 |
| C14                           | 4.7uF $\pm$ 20% 10v electrolytic | 402/4/98049/023 |
| C15                           | 4.7uF $\pm$ 20% 10v electrolytic | 402/4/98049/023 |
| C16                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| C17                           | 10nF +80% -20% 100v              | 400/9/19084/078 |
| <u>Inductors</u>              |                                  |                 |
| L1                            | Inductor 18uH                    | 406/9/08470/027 |
| L2                            | Inductor 18uH                    | 406/9/08470/027 |
| <u>Semi-conductor devices</u> |                                  |                 |
| ML1                           | Integrated circuit CN 617T       | 446/4/00428     |
| ML2                           | Integrated circuit CN 591T       | 446/4/00418     |
| ML3                           | Integrated circuit CN 591T       | 446/4/00418     |

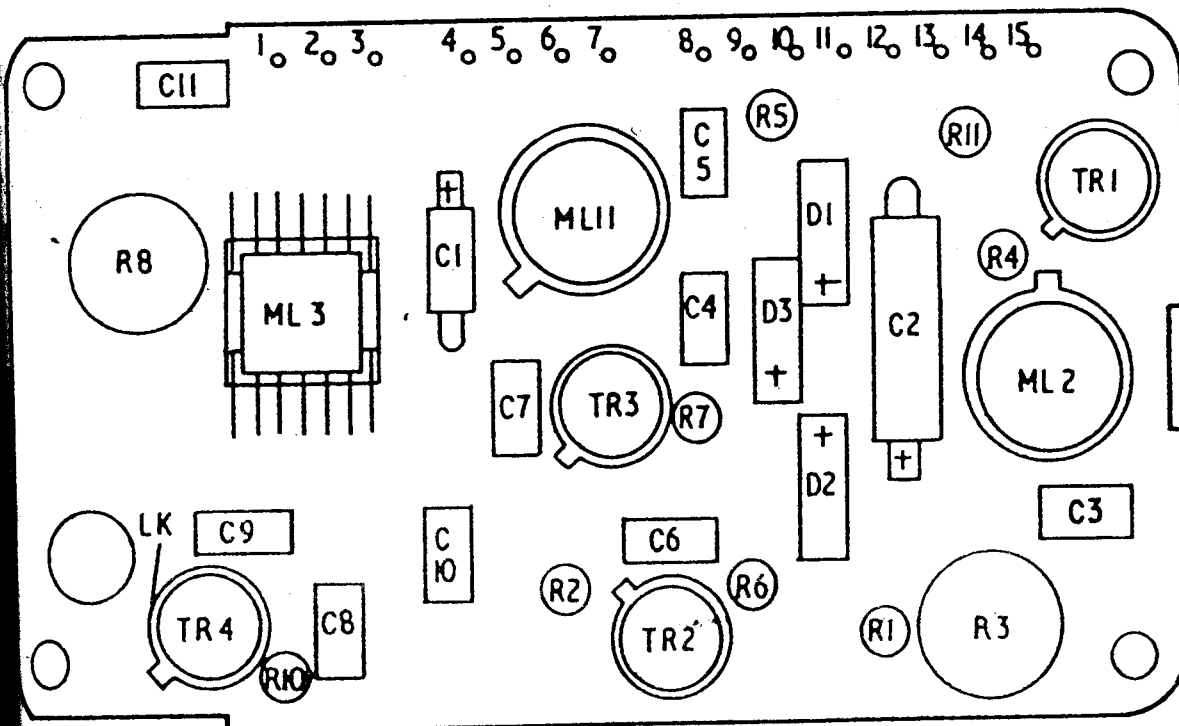
COMPONENTS LIST FOR  
TRANSMITTER AF TO IF PEC (Unit 6d)  
419/1/24981

| Cct Ref                | Description                      | Reference No.   |
|------------------------|----------------------------------|-----------------|
| <u>Resistors</u>       |                                  |                 |
| R1                     | 15 kohm $\pm$ 5%                 | 403/4/78126/077 |
| R2                     | 10 kohm $\pm$ 5%                 | 403/4/78126/073 |
| R3                     | 5 kohm $\pm$ 10% 0.5w variable   | 404/9/05032/005 |
| R4                     | 4.7 kohm $\pm$ 5%                | 403/4/78126/065 |
| R5                     | 22 kohm $\pm$ 5%                 | 403/4/78126/081 |
| R6                     | 1.5 kohm $\pm$ 5%                | 403/4/78126/053 |
| R7                     | 10 kohm $\pm$ 5%                 | 403/4/78126/073 |
| R8                     | 1 kohm $\pm$ 10% 0.5w variable   | 404/9/05032/003 |
| R9                     | Not used                         |                 |
| R10                    | 750 ohm $\pm$ 5%                 | 403/4/78126/046 |
| R11                    | 22 kohm $\pm$ 5%                 | 403/4/78126/081 |
| <u>Capacitors</u>      |                                  |                 |
| C1                     | 4.7uF $\pm$ 20% 10v electrolytic | 402/4/98049/023 |
| C2                     | 47uF $\pm$ 10% 6v electrolytic   | 402/4/98049/003 |
| C3                     | 10nF $\pm$ 80% -20% 100v         | 400/9/19084/078 |
| C4 to C6               | 68nF $\pm$ 80% -20% 50v          | 400/9/19084/098 |
| C7 to C10              | 10nF $\pm$ 80% -20% 100v         | 400/9/19084/078 |
| C11                    | 68nF $\pm$ 80% -20% 50v          | 400/9/19084/098 |
| <u>Semi-conductors</u> |                                  |                 |
| TR1 to TR4             | Transistor CV 7648               | 990/4/00107/648 |
| D1                     | Diode CV 7367                    | 990/4/00107/367 |
| D2                     | Diode LR 360C, zener 33v         | 415/4/05442     |
| D3                     | Diode CV 7367                    | 990/4/00107/367 |
| ML1                    | Integrated circuit CN 609T       | 446/4/00426     |
| ML2                    | Integrated circuit CN 581T       | 446/4/00413     |
| ML3                    | Integrated circuit CN 593F       | 446/4/00412     |



419/1/24978

Fig.3 Transmitter AF and gating pec (unit 6c)- component layout



419/1/24981

Fig.4 Transmitter AF to IF pec (unit 6d)- component layout

THIRD LINE SERVICING  
OF  
SCREEN & CAN ASSEMBLY 640/1/09708  
(UNIT 6e)

CONTENTS

|                        | Para. |
|------------------------|-------|
| Description ... ..     | 1     |
| ing                    |       |
| Test equipment ... ..  | 7     |
| Preliminary ... ..     | 9     |
| Test procedures ... .. | 15    |
| Components list ... .. | 17    |

ILLUSTRATIONS

|  | Page |
|--|------|
| Transmitter IF/RF mixer - circuit                        | 9    |
| Transmitter IF/RF mixer pec (unit 6e) - component layout | 11   |

DESCRIPTION

The screen and can assembly (unit 6e) is a component part of the transmitter receiver and provides the transmitter IF/RF mixer. The unit is normally located on a mother panel (unit 6).

The unit consists of a screening can and a panel, electronic circuit. All the circuit components are located on the pec. The circuit diagram is given in Fig. 1.

The input to pin 7 is an IF signal which can be one or other of:

- (1) Amplitude modulated 1.75 MHz carrier.
- (2) One or both sidebands of a suppressed 1.75 MHz carrier.

The input to pin 5 provides for reinsertion of carrier when required.

4. The IF signal is amplified by TR1 and routed to integrated circuit ML1 via emitter follower TR2. The gain of TR1 is set by means of a wire link connection to select the amount of negative feedback between TR2 emitter and TR1 base; this selection is carried out when setting up the complete transmitter.

5. The integrated circuit ML1 is a double balanced modulator which performs the function of IF/RF mixer. The IF from TR2 is mixed in ML1 with an RF in the range 3.75 MHz to 31.75 MHz supplied to pin 3 of the unit.

6. ML1 output is taken from the unit via TR5. This output is a complex waveform which contains the sum and difference frequencies of the inputs; the original frequencies are suppressed in ML1. Only the difference frequency component of the output is significant, the sum frequencies are rejected at later stages of the transmitter.

### TESTING

#### Test equipment

7. The following items of special-to-purpose test equipment are required:

- (1) Manual interface controller. Plessey Type TD4924A.
- (2) Test interface. Plessey Type TD50565A.
- (3) Test jig. Plessey Type TJ837A.

8. The following items of proprietary test equipment are required:

| <u>Item</u> | <u>Description</u>   |
|-------------|--|
| Avo         | A dc milliammeter for measuring current in the range 28 to 48 mA with an accuracy of $\pm 1\%$ fsd.<br>Suitable instrument: Avo Model 8X   |
| RF Gen.     | An RF signal generator to supply an output of 31.75 MHz at 100 mV emf $\pm 2\%$ and an output impedance of not greater than 100 ohms.<br>Suitable instrument: Marconi TF2002B with TF2170B.<br>Synchronising unit. |

- RF VM A selective RF millivoltmeter with the following essential characteristics:
- |                 |   |
|-----------------|---|
| Voltage range   | 5 mV to 500 mV to accuracy of 5%                    |
| Frequency range | Spot frequencies of 1.75 MHz, 30 MHz and 31.75 MHz. |
| Bandwidth       | + 200 kHz at -3dB and<br>+ 1.75 MHz at -60dB        |
| Input impedance | 75 ohms $\pm$ 5%                                    |
- Suitable instrument: Bruel and Kjoer Type 2006 with high Z probe fitted with 50 ohm input load.
- DVM A digital voltmeter for measuring 6V to an accuracy of  $\pm$  2%
- Suitable instrument: Solartron A203/204
- PSU Power supply unit to provide 6.0V  $\pm$  20% at 50 mA.
- Suitable supply: Farnell L30B
- Pad A 20dB 75 ohm pad.

### Preliminary

9. Connect the test interface to the test jig and the manual interface controller.
10. At the manual interface controller:
  - (1) Set the DC monitor switch to EXT.
  - (2) Set the test selection switches to 000.
  - (3) Connect the Avo to the socket marked AVO.
  - (4) Connect the RF Gen. to the socket marked SG2.
  - (5) Connect the DVM to the socket marked DVM.
11. Connect synchronising unit to the RF Gen.
12. Connect the RF VM to the manual interface controller socket marked SEL V/M via the 20dB 75 ohm pad in series with the high impedance probe fitted with a 50 ohm load.

13. Connect the PSU to the manual interface controller sockets marked EXT A.

14. Switch on the mains power to all units where applicable.

Test procedures

15. Before proceeding with the tests, calibrate the RF VM to the reference level of 2.5 mV at 30 MHz as described in the manufacturers handbook.

16. Carry out the procedures given on the following pages.

NOTES RELATING TO TESTS

(1) Unit under test is referred to as UUT.

(2) The RF Gen is connected to supply the RF input (pin 3) of the UUT (unit under test). A 1.75 MHz oscillator within the test interface supplies the IF input (pin 7) of the UUT.

(3) The mixer output (pin 1) of the UUT is measured at the RF VM.

(4) Tests 000 to 006 set the supply voltage and check the current drain on the supply.

(5) Test 008 checks the conversion gain by ensuring that particular levels of inputs at 31.75 MHz and 1.75 MHz result in a specific level of output at the difference frequency (30 MHz).

| TEST No.                   | STEP | UNIT          | RANGE | LIMITS                           | INSTRUCTIONS   |
|----------------------------|------|---------------|-------|----------------------------------|--|
| 000                        | (a)  | INT.<br>CONT. | -     | -                                | Depress "Press to Test" button.<br>Load UUT into jig.                          |
|                            | (b)  | AVO           | 100mA | -                                | Set AVO to 100mA d.c. range.   |
|                            | (c)  | DVM           | 10V   | -                                | Set DVM to 10V range.  |
|                            | (d)  | RF<br>GEN     |       | -                                | Set the RF GEN. to minimum output level.                                       |
|                            | (e)  | PSU           |       | -                                | Set the PSU to minimum output voltage.   |
|                            | (f)  | RF<br>VM      | 50mV  | -                                | Set RF VM to maximum voltage range (check Ref. level).                         |
|                            | (g)  | UUT           |       |                                  | Ensure that links are fitted between pins 9 and 11 and between pins 10 and 12. |
| <u>D.C. SUPPLY CURRENT</u> |      |               |       |                                  |  |
| 002                        | (a)  |               | -     | -                                | Depress "Press to Test" button.  |
|                            | (b)  | DVM           | 10V   | 5.882V to<br>6.118V              | Increase power supply voltage to give 6V on DVM.                               |
| 004                        | (a)  |               | -     | -                                | Depress "Press to Test" button.  |
|                            | (b)  | AVO           | 100mA | 29 to 47mA                       | Check supply current.  |
| 006                        | (a)  | -             | -     | -                                | Depress "Press to Test" button.  |
|                            | (b)  | DVM           | 10V   | 5.882V to<br>6.118V              | Adjust PSU for 6V on DVM.  |
| <u>CONVERSION GAIN</u>     |      |               |       |                                  |  |
| 008                        | (a)  | RF<br>GEN     | G     | -                                | Set RF Gen. to 31.75 MHz.  |
|                            | (b)  | SYNC          |       | 31.75100MHz<br>to<br>31.74900MHz | Set Synchronizer to 31.75 MHz.   |
|                            | (c)  | RF<br>GEN     | -     | 100mV                            | Set RF Gen. output level to 100mV.<br>EMF (50mV on dial).                      |
|                            | (d)  | -             | -     |                                  | Depress "Press to Test" button.  |
|                            | (e)  | RF<br>VM      | 50mV  |                                  | Set RF VM to the 50mV range, and tune to a peak response at 30 MHz.            |



| TEST No. | STEP       | UNIT     | RANGE | LIMITS            | INSTRUCTIONS                                   |
|----------|------------|----------|-------|-------------------|--|
| 008      | (f)        | RF<br>VM | 50mV  | 56.4 to<br>104 mV | Check mixer output at RF VM.                   |
| 010      | (a)<br>(b) | -        | -     | -                 | Depress "Press to Test" button.<br>Unload UUT. |

COMPONENTS LISTS

17. The principal component parts of the Screen and Can Assembly (Unit 6e) 640/1/09708 are:

|                          |             |
|--------------------------|-------------|
| Screen can               | 640/1/09826 |
| Panel electronic circuit | 419/1/12055 |
| Spacer                   | 640/2/15412 |

18. The component parts of the panel electronic circuit 419/1/12055 are detailed on the following page.

## COMPONENTS LIST

FOR

TRANSMITTER IF/RF MIXER PEC (unit 6e)

419/1/12055

| Cct Ref                       | Description                | Reference No.   |
|-------------------------------|----------------------------|-----------------|
| <u>Resistors</u>              |                            |                 |
| R1                            | 910 ohm $\pm$ 5%           | 403/4/78126/048 |
| R2                            | 1.8 kohm $\pm$ 5%          | 403/4/78126/055 |
| R3                            | 4.7 kohm $\pm$ 5%          | 403/4/78126/065 |
| R4                            | 3.3 kohm $\pm$ 5%          | 403/4/78126/061 |
| R5                            | 1.6 kohm $\pm$ 5%          | 403/4/78126/054 |
| R6                            | 750 ohm $\pm$ 5%           | 403/4/78126/046 |
| R7                            | 470 ohm $\pm$ 5%           | 403/4/78126/041 |
| R8                            | 1.8 kohm $\pm$ 5%          | 403/4/78126/055 |
| R9                            | 12 ohm $\pm$ 5%            | 403/4/78126/003 |
| R10                           | 22 ohm $\pm$ 5%            | 403/4/78126/009 |
| R11                           | 75 ohm $\pm$ 5%            | 403/4/78126/022 |
| <u>Capacitors</u>             |                            |                 |
| C1                            | 10nF +80% -20% 100v        | 400/9/19084/078 |
| C2                            | 10nF +80% -20% 100v        | 400/9/19084/078 |
| C3                            | 68nF +80% -20% 100v        | 400/9/19084/098 |
| C4                            | 10nF +80% -20% 100v        | 400/9/19084/078 |
| C5                            | 10nF +80% -20% 100v        | 400/9/19084/078 |
| C6                            | 68nF +80% -20% 100v        | 400/9/19084/098 |
| C7                            | 220nF +80% -20% 50v        | 400/9/19084/105 |
| C8                            | 68nF +80% -20% 100v        | 400/9/19084/098 |
| <u>Inductors</u>              |                            |                 |
| L1                            | Inductor 18uH              | 406/9/08470/027 |
| <u>Semi-conductor devices</u> |                            |                 |
| TR1                           | Transistor CV 7648         | 990/4/00107/648 |
| TR2                           | Transistor CV 7648         | 990/4/00107/648 |
| TR3                           | Transistor BCY 70          | 417/4/00240     |
| ML1                           | Integrated circuit CN 609T | 446/4/00426     |

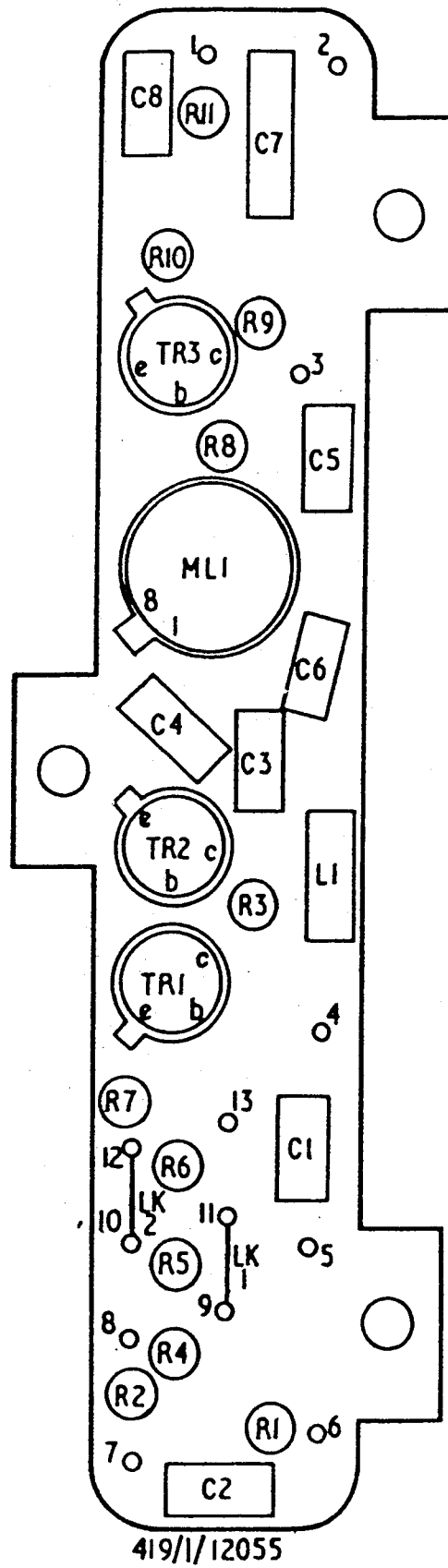


Fig.2 Transmitter IF/RF mixer pec(unit 6e)—  
component layout

THIRD LINE SERVICING  
OF  
SYNTHESISER 682/1/01775  
(UNIT 9)

CONTENTS

|                               | Para. |
|-------------------------------|-------|
| Introduction ... ..           | 1     |
| Description                   |       |
| General ... ..                | 4     |
| Unit 9a ... ..                | 6     |
| Unit 9b ... ..                | 7     |
| Unit 9c ... ..                | 11    |
| Unit 9d ... ..                | 19    |
| Unit 9e ... ..                | 22    |
| Unit 9f ... ..                | 27    |
| Testing                       |       |
| Test equipment ... ..         | 30    |
| Preliminary ... ..            | 32    |
| Test procedures ... ..        | 37    |
| Repair policy ... ..          | 38    |
| Assembly/disassembly          |       |
| Cover ... ..                  | 41    |
| Units 9c to 9f ... ..         | 42    |
| Unit 9a ... ..                | 45    |
| Unit 9b and upper base ... .. | 46    |
| Components list ... ..        | 48    |

ILLUSTRATIONS

| Fig. |   | Page |
|------|---|------|
| 1    | Unit 9, synthesiser inputs and connections to internal units ... .. | 31   |
| 2    | Unit 9a - circuit ... ..  | 32   |
| 3    | Unit 9b - circuit ... ..  | 33   |
| 4    | Unit 9c - circuit ... ..  | 37   |
| 5    | Unit 9d - circuit ... ..  | 39   |
| 6    | Unit 9e - circuit ... ..  | 41   |
| 7    | Unit 9f - circuit ... ..  | 43   |
| 8    | Synthesiser assembly ... ..   | 45   |

## ILLUSTRATIONS

| Fig. |                              |     |     |     |     | Page |
|------|------------------------------|-----|-----|-----|-----|------|
| 9    | Synthesiser wire link layout | ... | ... | ... | ... | 47   |
| 10   | Unit 9a - component layout   | ... | ... | ... | ... | 49   |
| 11   | Unit 9b - component layout   | ... | ... | ... | ... | 49   |
| 12   | Unit 9c - component layout   | ... | ... | ... | ... | 51   |
| 13   | Unit 9d - component layout   | ... | ... | ... | ... | 53   |
| 14   | Unit 9e - component layout   | ... | ... | ... | ... | 55   |
| 15   | Unit 9f - component layout   | ... | ... | ... | ... | 57   |

INTRODUCTION

1. The Synthesiser (Unit 9) is a component part of the receiver transmitter and is normally located on the Front Panel and Chassis Assembly (Unit 1).

2. Unit 9 is a module which, together with a voltage controlled variable frequency oscillator (VFO), a reference oscillator and decade switches, forms a loop that automatically sets and maintains the VFO output to any frequency in the range 3.75 MHz to 31.7499 MHz in 100 Hz increments. A facility is provided whereby the VFO output frequency can be sidestepped by -2 kHz.

3. The module consists of six panels, electronic circuit (pec), termed units 9a to 9f, together with an upper baseplate, lower baseplate and a cover. These items are mounted in a stack on four studs attached to the upper base and sealed by a gasket. Unit 9a is located between the upper and lower baseplates and is thereby fully screened. Pins and filter connectors in the lower baseplate provide terminals for external connections. Apart from printed wiring on the pec, all internal interconnections are by soldered wire leads.

DESCRIPTIONGeneral

4. A functional description of the synthesiser unit, together with supporting block and interconnection diagram is given in Part 2 of this manual (section covering second line servicing of the transmitter receiver). This

information, together with that given in Table 2 (pp 19/20) in this section will normally be sufficient to facilitate location of a faulty p.e.c.

5. The following description is intended to supplement the functional description given in Part 2 of this manual; each pec' is covered separately.

Unit 9a (see fig.2)

6. The VFO output signal is applied via buffer amplifier ML1 to a divide-by-four circuit in ML2. The resulting output is a square waveform, at  $\frac{1}{4}$  the input frequency, for supply to the variable divider in Unit 9b.

Unit 9b (see fig.3)

7. Unit 9b contains two divider chains, one fixed and one variable.

8. The fixed divider provided by ML1 ( $\div 5$ ), ML2 ( $\div 5$ ), and ML3 ( $\div 7$ ), has an overall division factor of 175. The input to ML1 is a 1.75 MHz square waveform from the reference oscillator and the resulting output is a 10 kHz square waveform for supply to Unit 9c.

9. The variable divider is provided by ML4 to ML8 inc. The overall division factor is determined by binary coded signals from external decade switches (refer to Table 1). The input signal at Unit 9c pin 45 is a variable frequency square waveform derived from the VFO output by Unit 9a; the output signal, at Unit 9b pin 41, comprises positive going pulses with an average prf of 250 Hz when the VFO is operating at the correct frequency.

10. The overall operation of the synthesiser is such that if the decade switches are set to indicate a frequency  $f_i$  MHz, the VFO output will be:

(1) 1.75 MHz above  $f_i$  if the command sidestep input (Unit 9b pin 2) is at a potential of between +1.1 and +3V.

(2) 1.7498 MHz above  $f_i$  if the command sidestep input is open circuit.

NOTE: If the command sidestep facility is not required, the command input line is externally linked to the +3V rail.

Table 1  
Frequency setting switch code

| Unit 9b<br>Pin             | Signals applied in Switch Position       |        |                  |        |        |        |        |        |        |        | Switch |        |
|----------------------------|--|--------|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                            | 0  | 1      | 2                | 3      | 4      | 5      | 6      | 7      | 8      | 9      |        |        |
| 9<br>23                    | +  | 0      | +                |        |        |        |        |        |        |        |        | 10MHz  |
| 25<br>24<br>7<br>8         | 0<br>0<br>0<br>0                         | +      | 0<br>0<br>0<br>0 | +      | 0<br>+ | +      | 0<br>0 | +      | 0<br>0 | +      | 0<br>+ | 1MHz   |
| 28<br>27<br>5<br>6<br>26   | +  | 0<br>+ | +                | 0<br>0 | +      | 0<br>0 | +      | 0<br>0 | +      | 0<br>0 | +      | 100kHz |
| 31<br>30<br>3<br>4<br>29   | 0<br>+                                   | +      | 0<br>0           | +      | 0<br>+ | +      | 0<br>+ | +      | 0<br>0 | +      | 0<br>+ | 10kHz  |
| 33<br>32<br>37<br>1        | +  | 0<br>0 | +                | 0<br>0 | +      | 0<br>0 | +      | 0<br>0 | +      | 0<br>+ | +      | 1kHz   |
| 22<br>10<br>12<br>21<br>11 | 0<br>0<br>+                              | +      | 0<br>0           | +      | 0<br>+ | +      | 0<br>+ | +      | 0<br>0 | +      | 0<br>+ | 100Hz  |
| 2                          | + (Zero sidestep)<br>0 (-2 kHz sidestep) |        |                  |        |        |        |        |        |        |        |        |        |

+ indicates +3V nominal

0 indicates open circuit

Unit 9c (see fig.4)

11. The 10 kHz square waveform derived by Unit 9b from the reference oscillator output is applied to divider stages ML1 and ML2 in Unit 9c to provide:

(1) A 1 kHz square waveform which is taken via TR1 to provide the 1 kHz output from the synthesiser unit.

(2) A 250 Hz square waveform.

12. ML3 in Unit 9c contains two monostable elements, termed ramp mono and sample mono respectively and each producing a train of 30  $\mu$ s duration pulses. The ramp monostable is triggered by the "250 Hz" output of the variable divider in Unit 9b and the sample monostable is triggered by the 250 Hz output of ML2 in Unit 9c.

13. The outputs of both monostable elements are applied to ML4. The ramp monostable output is also taken to Unit 9f and the sample monostable output is also taken to Unit 9e.

14. ML4 contains two pulse frequency comparator circuits, one produces an output at pin 2 when the ramp mono output frequency is greater than that of the sample mono, the other produces an output at pin 9 when the converse is true; neither output will occur if the two frequencies are within 1 Hz. The outputs consist of a pulse train at the difference frequency and operate the reversible counter in ML5, causing a forward count if a pulse train is applied from ML4 pin 2 and a backwards count if a pulse train is applied from ML4 pin 9. The counter outputs B, C and D are taken to a decoder in Unit 9d.

15. In order to prevent the counter being recycled at the top of the count (i.e. stepping from 15 to 0), the decoder (Unit 9d) output applied to ML4 pin 4, together with the counter output applied to ML4 pin 3, inhibit the forwards count pulse train when the count reaches 15. Similarly, inputs to ML4 pins 10 and 11 inhibit the backwards count pulse train when the count reaches 0, thereby preventing the counter being recycled at the bottom of the count.



16. The output from pin 8 of ML4 is taken via TR2 to provide the phase lock output from the synthesiser, the output at TR2 collector is high when ML4 detects a frequency difference in the two input pulse trains.

NOTE: The collectors of each of TR1 and TR2 must be suitably externally connected to a suitable supply rail via a resistive load. Similarly, for the phase angle output from ML4 pin 1.

17. The phase angle output from ML4 pin 1 is provided for test purposes and is taken to pin 20 of Unit 9, it consists of a pulse train (250 Hz when the VFO is operating at the correct frequency).

18. The LS bit of the counter output, together with the frequency comparator error output pulse trains are taken to Unit 9e.

Unit 9d (see fig.5)

19. The control voltage for supply to the VFO is generated in Unit 9e and taken via the emitter follower TR9 in Unit 9d. The input to the emitter follower contains switched attenuators which are controlled by the decoder ML1.

20. ML1 decodes the 3 most significant bits of the four-bit output of the counter in Unit 9c. The decoder produces a high level at one of its outputs, according to the binary input, and thereby operates one of the transistor switches to select the attenuation at TR9 input.

21. The output from ML1 pins 8 and 3 (decoding a count of 0 or 1, 14 or 15 respectively) are taken to Unit 9c for prevention of counter recycling (para.15).

Unit 9e (see fig.6)

22. The output of a ramp generator in Unit 9f is applied to the emitter of TR1 in Unit 9e.

23. The outputs of the sample mono operate switch TR1 via TR2 and switch TR4 via TR3.

24. Since the negative going ramp is triggered by the ramp mono, that portion of the ramp which is sampled by the switch TR1 will be a function of the difference in phase between the ramp and sample mono outputs. This sample is transferred to capacitor C1. Successive sampling pulses cause C1 to be charged to a mean dc level with a small superimposed ripple. This is passed through the emitter follower TR8/TR9 to a switched attenuator controlled by the least significant bit from the counter in Unit 9c. The level at the attenuator is passed via the emitter follower TR11/12 and Unit 9d to provide the VFO control voltage.

25. Thus, when there is phase lock, a fall in VFO frequency causes the prf of the pulse train from the ramp mono to change such that the ramp occurs later relative to the sample mono pulse. Hence, the voltage level at C1 becomes more positive, increasing the VFO control voltage and thereby increasing the VFO frequency. The reverse will be true if the VFO frequency rises.

26. The control voltage output attenuators in Units 9d and 9e are switched in steps when there is loss of lock. The attenuator switching causes a voltage overlap to occur and, in Unit 6e, either a fast pull up circuit (TR6/TR7) or a fast pull down circuit (TR5) is operated by the appropriate frequency error pulse from Unit 9c to rapidly bring the voltage to an appropriate level.

#### Unit 9f (see fig.7)

27. This unit provides a ramp generator which is triggered by the ramp mono output.

28. Transistor TR1 is normally switched off. At the positive going leading edge of a 30  $\mu$ s pulse from the ramp mono, TR1 switches on, causing TR2 to conduct, thereby rapidly charging C2 towards +102V.

29. At the end of the monostable pulse, TR1 and TR2 switch off and C2 discharges through R6 to provide a ramp which is taken via the emitter follower TR3/TR4 to Unit 9e.

TESTINGTest equipment

30. The following items of special-to-purpose test equipment are required:

- (1) Manual interface controller. Plessey Type TD4924A.
- (2) Test interface. Plessey Type TD50141A.
- (3) Test jig. Plessey Type TJ754A.
- (4) Frequency controller. Plessey Type TD50150A.

31. The following items of proprietary test equipment are required:

| <u>Item</u>                 | <u>Description</u>   |                             |  |                   |   |                     |  |                     |  |
|-----------------------------|--|-----------------------------|--|-------------------|---|---------------------|--|---------------------|--|
| Avo                         | A dc milliammeter for measuring currents in the range 4 to 400 mA to an accuracy of $\pm 1\%$ fsd.<br>Suitable instrument: Avo Universal Model 8X  |                             |  |                   |   |                     |  |                     |  |
| Counter                     | An electronic counter for measuring frequencies in the range 3 MHz to an accuracy of $\pm 2$ Hz.<br>Suitable instrument: Racal Type 9024   |                             |  |                   |   |                     |  |                     |  |
| DVM                         | A digital voltmeter for measuring dc voltages in the range 0 to 115V, having an input impedance of more than 10,000 Megohms and accuracy as follows <table border="0" style="margin-left: 40px;"> <tr> <td>10 mV, 100 mV and 1V ranges</td> <td><math>\pm 0.02\%</math> of reading<br/><math>\pm 0.005\%</math> of full scale</td> </tr> <tr> <td>10V range</td> <td><math>\pm 0.015\%</math> of reading<br/><math>\pm 0.005\%</math> of full scale</td> </tr> <tr> <td>100V range</td> <td><math>\pm 0.03\%</math> of reading<br/><math>\pm 0.005\%</math> of full scale</td> </tr> </table> Suitable instrument: Solartron LM1604/05 | 10 mV, 100 mV and 1V ranges | $\pm 0.02\%$ of reading<br>$\pm 0.005\%$ of full scale | 10V range         | $\pm 0.015\%$ of reading<br>$\pm 0.005\%$ of full scale | 100V range          | $\pm 0.03\%$ of reading<br>$\pm 0.005\%$ of full scale |                     |  |
| 10 mV, 100 mV and 1V ranges | $\pm 0.02\%$ of reading<br>$\pm 0.005\%$ of full scale   |                             |  |                   |   |                     |  |                     |  |
| 10V range                   | $\pm 0.015\%$ of reading<br>$\pm 0.005\%$ of full scale  |                             |  |                   |   |                     |  |                     |  |
| 100V range                  | $\pm 0.03\%$ of reading<br>$\pm 0.005\%$ of full scale   |                             |  |                   |   |                     |  |                     |  |
| CRO                         | Cathode ray oscilloscope having the following essential characteristics: <table border="0" style="margin-left: 40px;"> <tr> <td>Input</td> <td>1 Mohm</td> </tr> <tr> <td>Input capacitance</td> <td>47 pF</td> </tr> <tr> <td>Rise and fall times</td> <td>less than 1 <math>\mu</math>s</td> </tr> <tr> <td>Vertical deflection</td> <td>0.01 V/cm to 10 V/cm to accuracy<br/><math>\pm 3\%</math> of indicated value</td> </tr> </table>  | Input                       | 1 Mohm   | Input capacitance | 47 pF   | Rise and fall times | less than 1 $\mu$ s                                    | Vertical deflection | 0.01 V/cm to 10 V/cm to accuracy<br>$\pm 3\%$ of indicated value |
| Input                       | 1 Mohm   |                             |  |                   |   |                     |  |                     |  |
| Input capacitance           | 47 pF  |                             |  |                   |   |                     |  |                     |  |
| Rise and fall times         | less than 1 $\mu$ s  |                             |  |                   |   |                     |  |                     |  |
| Vertical deflection         | 0.01 V/cm to 10 V/cm to accuracy<br>$\pm 3\%$ of indicated value   |                             |  |                   |   |                     |  |                     |  |

| <u>Item</u>   | <u>Description</u>  |
|---------------|---|
| CRO<br>(cont) | Timebase speed<br>0.5 $\mu$ s/cm to 1 sec/cm to accuracy<br>$\pm$ 3% of indicated value   |
|               | Suitable instrument: Tektronix 561B with Type 3A6 amplifier and<br>Type 3B3 plug-in unit. A probe unit P6012<br>(X10 attenuation) |

Preliminary

32. Connect the test interface to the test jig and to the manual interface controller.

33. At the test interface:

- (1) Set the SLAVE OSCILLATOR RANGE switch to 2.
- (2) Connect frequency controller to the socket provided. Set the controller to 12.2000 MHz, sidestep function off.

34. At the manual interface controller:

- (1) Set the DC MONITOR switch to EXT.
- (2) Set the test selection switches to 000.
- (3) Connect AVO to socket marked AVO.
- (4) Connect DVM Hi to socket marked DVM and DVM Lo to socket marked DVM floating input.
- (5) Connect counter to socket marked COUNTER, set counter for frequency measurement Channel B. 0.01V sensitivity.
- (6) Connect a 50 ohm termination to socket marked CRO AMP A TRIG.

NOTE: If using a CRO other than that recommended in para.31, interpret para.35 accordingly.

35. Fit plug-in unit 3A6 and 3B3 to CRO type 561B. Ensure probe P6012 has been correctly compensated to match input impedance of channel 1 of 3A6

amplifier. Connect probe between Channel 1 input of the 3A6 amplifier and the SCOPE socket on the test interface.

36. Switch on the mains power to all test instruments where applicable.

Test procedures

37. Carry out the test procedures given on the following pages.

Notes relating to test procedures

1. The synthesiser under test is referred to as UUT.
2. +3V, +6V, +12.2V and +106 to 115V (varactor) supplies for the UUT are provided by the test interface and the Manual interface controller (see note 6 below).
3. The UUT is connected to a reference oscillator and a slave oscillator (VFO) within the test interface. The UUT therefore operates in a similar manner to its normal working environment.
4. The slave oscillator frequency ranges are the same as the VFO in the radio but are numbered in reverse sequence (i.e. slave oscillator range 1 is the highest frequency range).
5. The parameters measured by the test instruments are readily determined from the test procedures. The following points should be noted:

Tests 008 - 016      check that the UUT causes the correct slave oscillator output frequency at either end of each of ranges 6 to 2. The 30 sec wait before taking readings is to ensure the UUT has regained lock after the switch operation.

Tests 018 - 020      check that the UUT causes the correct slave oscillator output frequency throughout range 1 and includes exercising the decade switch inputs not already exercised. The final check (test 020) verifies that sidestep command is effective.

Test 022              checks the stability of the UUT output.

- Test 024/026 check the phase control voltage upper and lower limits by verifying that the correct slave oscillator output frequency is achieved when the selected frequency is slightly outside the range (above range on test 024 and below range on test 026).
- Test 027/028 check phase lock output voltage under test conditions which ensure loss of lock (test 027) and lock (test 028).
- Test 030 checks the phase angle output under test conditions which give lock (i.e. ensure a waveform with 250 Hz prf).

| TEST No.   | STEP | UNIT          | RANGE  | LIMITS              | INSTRUCTIONS   |
|--|------|---------------|--------|---------------------|--|
| <b>NOTE:</b> Before commencing tests, ensure that the test interface has been switched on for at least 4 minutes to allow stabilisation of reference oscillator frequency. |      |               |        |                     |  |
| 000  | (a)  | INT.<br>CON.  | -      | -                   | Depress "Press to Test" button.  |
|  | (b)  | AVO           | 1 Amp  | -                   | Set AVO to 1A dc range.  |
|  | (c)  | DVM           | 10V    | -                   | Set DVM to 10V range.  |
|  | (d)  | TEST<br>INT.  | -      | -                   | Load UUT into test jig.  |
|  | (e)  | INT.<br>CON.  | -      | Set 110.0V          | Set varactor supply voltage to 110.0V and set slave oscillator to range 2. |
| <b>+3 VOLT LINE CURRENT (PIN 19)</b>   |      |               |        |                     |  |
| 002  | (a)  | INT.<br>CON.  | -      | -                   | Depress "Press to Test" button.  |
|  | (b)  | AVO           | 1 AMP  | NGT 355 mA          | Check +3V line current.  |
| <b>+6 VOLT LINE CURRENT (PIN 36)</b>   |      |               |        |                     |  |
| 004  | (a)  | AVO           | 100 mA | -                   | Set AVO to 100 mA range.   |
|  | (b)  | INT.<br>CON.  | -      | -                   | Depress "Press to Test" button.  |
|  | (c)  | AVO           | 100 mA | NGT 29.5 mA         | Check +6V line current.  |
| <b>+110 VOLT LINE CURRENT (PIN 15)</b>   |      |               |        |                     |  |
| 006  | (a)  | AVO           | 10 mA  | -                   | Set AVO to 10 mA range.  |
|  | (b)  | INT.<br>CON.  | -      | -                   | Depress "Press to Test" button.  |
|  | (c)  | AVO           | 10 mA  | 5.3 mA to<br>4.2 mA | Check +110V line current.  |
| <b>SLAVE OSCILLATOR FREQUENCY ACCURACY</b>   |      |               |        |                     |  |
| 008  | (a)  | AVO           | 1 AMP  | -                   | Set AVO to 1A dc range.  |
|  | (b)  | INT.<br>CON.  | -      | Set 106.7V          | Set varactor supply voltage to 106.7V. Set slave osc to range 6.           |
|  | (c)  | FREQ.<br>CON. | -      | Set<br>2.0000 MHz   | Set Freq Cont to 2.0000 MHz and set sidestep switch to OFF.                |

| TEST No.      | STEP | UNIT          | RANGE | LIMITS                        | INSTRUCTIONS  |
|---------------|------|---------------|-------|-------------------------------|---|
| 008<br>(cont) | (d)  | INT.<br>CON.  | -     | -                             | Depress "Press to Test" button.                           |
|               | (e)  | COUNTER       | -     | 3.750,003<br>3.749,997<br>MHz | Wait 30 sec and check slave osc freq.                     |
|               | (f)  | FREQ.<br>CON. | -     | Set<br>3.1000 MHz             | Set Freq Cont to 3.1000 MHz (sidestep off).               |
|               | (g)  | COUNTER       | -     | 4.850,004<br>4.849,996<br>MHz | Wait 30 sec and check slave osc freq.                     |
| 010           | (a)  | INT.<br>CON.  | -     | -                             | Depress "Press to Test" button. Set slave osc to range 5. |
|               | (b)  | COUNTER       | -     | 4.850,004<br>4.849,996<br>MHz | Wait 30 sec and check slave osc freq.                     |
|               | (c)  | FREQ.<br>CON. | -     | Set<br>4.9000 MHz             | Set Freq Cont to 4.9000 MHz (sidestep off).               |
|               | (d)  | COUNTER       | -     | 6.650,007<br>6.649,993<br>MHz | Wait 30 sec and check slave osc freq.                     |
| 012           | (a)  | INT.<br>CON.  | -     | -                             | Depress "Press to Test" button. Set slave osc to range 4. |
|               | (b)  | COUNTER       | -     | 6.650,007<br>6.649,993<br>MHz | Wait 30 sec and check slave osc freq.                     |
|               | (c)  | FREQ.<br>CON. | -     | Set<br>7.7000 MHz             | Set Freq Cont to 7.7000 MHz (sidestep off).               |
|               | (d)  | COUNTER       | -     | 9.450,011<br>9.449,989<br>MHz | Wait 30 sec and check slave osc freq.                     |
| 014           | (a)  | INT.<br>CON.  | -     | -                             | Depress "Press to Test" button. Set slave osc to range 3. |
|               | (b)  | COUNTER       | -     | 9.450,011<br>9.449,989<br>MHz | Wait 30 sec and check slave osc freq.                     |
|               | (c)  | FREQ.<br>CON. | -     | Set<br>12.2000 MHz            | Set Freq Cont to 12.2000 MHz (sidestep off).              |



| TEST No.      | STEP | UNIT          | RANGE | LIMITS                          | INSTRUCTIONS  |
|---------------|------|---------------|-------|---------------------------------|---|
| 014<br>(cont) | (d)  | COUNTER       | -     | 13.950,017<br>13.949,983<br>MHz | Wait 30 sec and check slave osc freq.                     |
| 016           | (a)  | INT.<br>CON.  | -     | -                               | Depress "Press to Test" button. Set slave osc to range 2. |
|               | (b)  | COUNTER       | -     | 13.950,017<br>13.949,983<br>MHz | Wait 30 sec and check slave osc freq.                     |
|               | (c)  | FREQ.<br>CON. | -     | Set<br>19.1000 MHz              | Set Freq Cont to 19.1000 MHz (sidestep off)               |
|               | (d)  | COUNTER       | -     | 20.850,027<br>20.849,973<br>MHz | Wait 30 sec and check slave osc freq.                     |
| 018           | (a)  | INT.<br>CON.  | -     | -                               | Depress "Press to Test" button. Set slave osc to range 1. |
|               | (b)  | COUNTER       | -     | 20.850,027<br>20.849,973<br>MHz | Wait 30 sec and check slave osc freq.                     |
|               | (c1) | FREQ.<br>CON. | -     | Set<br>20.1000 MHz              | Set Freq Cont to 20.1000 MHz (sidestep off)               |
|               | (c2) | COUNTER       | -     | 21.850,028<br>21.849,972<br>MHz | Wait 5 sec and check slave osc freq.                      |
|               | (d1) | FREQ.<br>CON. | -     | Set<br>21.1000 MHz              | Set Freq Cont to 21.1000 MHz (sidestep off)               |
|               | (d2) | COUNTER       | -     | 22.850,030<br>22.849,970<br>MHz | Wait 5 sec and check slave osc freq.                      |
|               | (e1) | FREQ.<br>CON. | -     | Set<br>25.1000 MHz              | Set Freq Cont to 25.1000 MHz (sidestep off)               |
|               | (e2) | COUNTER       | -     | 26.850,035<br>26.849,965<br>MHz | Wait 5 sec and check slave osc freq.                      |
|               | (f1) | FREQ.<br>CON. | -     | Set<br>26.1000 MHz              | Set Freq Cont to 26.1000 MHz (sidestep off)               |
|               | (f2) | COUNTER       | -     | 27.850,037<br>27.849,963<br>MHz | Wait 5 sec and check slave osc freq.                      |
|               | (g1) | FREQ.<br>CON. | -     | Set<br>28.1000 MHz              | Set Freq Cont to 28.1000 MHz (sidestep off)               |

| TEST No.      | STEP | UNIT          | RANGE | LIMITS                          | INSTRUCTIONS                                 |
|---------------|------|---------------|-------|---------------------------------|--|
| 018<br>(cont) | (g2) | COUNTER       | -     | 29.850,039<br>29.849,961<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (h1) | FREQ.<br>CON. | -     | Set<br>29.1111 MHz              | Set Freq Cont to 29.1111 MHz (sidestep off). |
|               | (h2) | COUNTER       | -     | 30.861,141<br>30.861,059<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (i1) | FREQ.<br>CON. | -     | Set<br>29.2222 MHz              | Set Freq Cont to 29.2222 MHz (sidestep off). |
|               | (i2) | COUNTER       | -     | 30.972,241<br>30.972,159<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (j1) | FREQ.<br>CON. | -     | Set<br>29.3333 MHz              | Set Freq Cont to 29.3333 MHz (sidestep off). |
|               | (j2) | COUNTER       | -     | 31.083,342<br>31.083,258<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (k1) | FREQ.<br>CON. | -     | Set<br>29.4444 MHz              | Set Freq Cont to 29.4444 MHz (sidestep off). |
|               | (k2) | COUNTER       | -     | 31.194,442<br>31.194,358<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (l1) | FREQ.<br>CON. | -     | Set<br>29.5555 MHz              | Set Freq Cont to 29.5555 MHz (sidestep off). |
|               | (l2) | COUNTER       | -     | 31.305,542<br>31.305,458<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (m1) | FREQ.<br>CON. | -     | Set<br>29.6666 MHz              | Set Freq Cont to 29.6666 MHz (sidestep off). |
|               | (m2) | COUNTER       | -     | 31.416,642<br>31.416,558<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (n1) | FREQ.<br>CON. | -     | Set<br>29.7777 MHz              | Set Freq Cont to 29.7777 MHz (sidestep off). |
|               | (n2) | COUNTER       | -     | 31.527,742<br>31.527,658<br>MHz | Wait 5 sec and check slave osc freq.         |
|               | (o1) | FREQ.<br>CON. | -     | Set<br>29.8888 MHz              | Set Freq Cont to 29.8888 MHz (sidestep off). |
|               | (o2) | COUNTER       | -     | 31.638,842<br>31.638,758<br>MHz | Wait 5 sec and check slave osc freq.         |

| TEST No.                            | STEP | UNIT          | RANGE | LIMITS                          | INSTRUCTIONS   |
|-------------------------------------|------|---------------|-------|---------------------------------|--|
| 018<br>(cont)                       | (p1) | FREQ.<br>CON. | -     | Set<br>29.9999 MHz              | Set Freq Cont to 29.9999 MHz (sidestep off)  |
|                                     | (p2) | COUNTER       | -     | 31.749,942<br>31.749,858<br>MHz | Wait 5 sec and check slave osc freq.   |
| 020                                 | (a)  | INT.<br>CON.  | -     | -                               | Depress "Press to Test" button.  |
|                                     | (b)  | FREQ.<br>CON. | -     | 29.9999 MHz                     | Check that Freq Cont is set to 29.9999 MHz.<br>Set sidestep ON.                    |
|                                     | (c)  | COUNTER       | -     | 31.747,942<br>31.747,958<br>MHz | Wait 5 sec and check slave osc freq.   |
| 022                                 | (a)  | INT.<br>CON.  | -     | Set 113.3V                      | Set varactor supply voltage to 113.3V.   |
|                                     | (b)  | FREQ.<br>CON. | -     | 29.9999 MHz                     | Check that Freq Cont is set to 29.9999 MHz<br>(sidestep on).                       |
|                                     | (c)  | INT.<br>CON.  | -     | -                               | Depress "Press to Test" button.  |
|                                     | (d)  | COUNTER       | -     | 31.747,934<br>31.747,866<br>MHz | Wait 5 sec and not slave osc freq.   |
|                                     | (e)  | COUNTER       | -     | Within<br>+18 Hz                | Check that the frequency drift over a period<br>of 20 secs does not exceed +18 Hz. |
| <u>PHASE CONTROL VOLTAGE LIMITS</u> |      |               |       |                                 |  |
| 024                                 | (a)  | INT.<br>CON.  | -     | Set 106.7V                      | Set varactor supply voltage to 106.7V.   |
|                                     | (b)  | INT.<br>CON.  | -     | -                               | Depress "Press to Test" button. Set slave<br>osc to range 6.                       |
|                                     | (c)  | FREQ.<br>CON. | -     | Set<br>3.17 MHz                 | Set Freq Cont to 3.17 MHz. Set sidestep to<br>OFF.                                 |
|                                     | (d)  | COUNTER       | -     | 4.920,005<br>4.919,995<br>MHz.  | Wait 30 sec and check slave osc freq.  |
| 026                                 | (a)  | INT.<br>CON.  | -     | Set 113.3V                      | Set varactor supply voltage to 106.7V.   |

| TEST No.  | STEP | UNIT          | RANGE                | LIMITS                        | INSTRUCTIONS  |
|---|------|---------------|----------------------|-------------------------------|---|
| 026<br>(cont)   | (b)  | INT.<br>CON.  | -                    | -                             | Depress "Press to Test" button. Set slave osc to range 3.   |
|   | (c)  | FREQ.<br>CON. | -                    | Set<br>7.55 MHz               | Set Freq Cont to 7.55 MHz (sidestep off).   |
|   | (d)  | COUNTER       | -                    | 9.999,910<br>9.999,990<br>MHz | Wait 30 sec and check slave osc freq.   |
| <u>PHASE LOCK OUTPUT (PIN 14)</u>   |      |               |                      |                               |   |
| 027   | (a)  | INT.<br>CON.  | -                    | Set 110.0V                    | Set varactor supply voltage to 110.0V.  |
|   | (b)  | INT.<br>CON.  | -                    | -                             | Depress "Press to Test" button. Set slave osc to range 2.   |
|   | (c)  | FREQ.<br>CON. | -                    | Set<br>22.2000 MHz            | Set Freq Cont to 22.2000 MHz (sidestep off).  |
|   | (d)  | DVM           | 1V                   | NGT 0.3998V                   | Check phase lock output.  |
| 028   | (a)  | INT.<br>CON.  | -                    | -                             | Depress "Press to Test" button. Set slave osc to range 3.   |
|   | (b)  | FREQ.<br>CON. | -                    | Set<br>12.2000 MHz            | Set Freq Cont to 12.2000 MHz (sidestep off).  |
|   | (c)  | DVM           | 1V                   | NGT 0.3998V                   | Check phase lock output.  |
| <u>PHASE ANGLE OUTPUT (PIN 20)</u>  |      |               |                      |                               |   |
| 030   | (a)  | FREQ.<br>CON. | -                    | Set<br>12.2000 MHz            | Ensure Freq Cont is set to 12.2000 MHz (sidestep off).  |
|   | (b)  | INT.<br>CON.  | -                    | -                             | Depress "Press to Test" button. Ensure varactor supply voltage is 110V.   |
|   | (c)  | CRO           | 0.2V/cm<br>0.5mS/cm  | NLT 7.2V                      | Check upper level of displayed waveform, commencing at a point 180 us after leading edge. The real value should be NLT 7.2V wrt 0V. |
| <u>NOTE:</u> Real value is measured value with allowance for probe attenuation. |      |               |                      |                               |   |
|   | (d)  | CRO           | 0.02V/cm<br>0.5mS/cm | NGT 90 mV                     | Check that the real value of the lower level of displayed waveform wrt 0V is NGT 90 mV.   |

| TEST No.                              | STEP | UNIT      | RANGE                    | LIMITS             | INSTRUCTIONS   |
|---------------------------------------|------|-----------|--------------------------|--------------------|--|
| 1 kHz FIXED FREQUENCY OUTPUT (PIN 13) |      |           |                          |                    |  |
| 032                                   | (a)  | INT. CON. | -                        | -                  | Depress "Press to Test" button. Ensure varactor supply voltage is 110V.  |
|                                       | (b)  | COUNTER   | 1.0V                     | 0.999 to 1.001 kHz | Check 1 kHz output frequency.  |
|                                       | (c)  | CRO       | 0.2mS/cm<br>0.2V/cm      | -                  | Examine 1 kHz output waveform.   |
|                                       | (d)  | CRO       | 50 $\mu$ s/cm<br>0.2V/cm | NLT 11.4V          | Check upper level of displayed waveform, commencing at a point 180 $\mu$ s after the positive going edge. The real value should be NLT 11.4V wrt 0V. |
|                                       | (e)  | CRO       | 0.2V/cm<br>50 $\mu$ s/cm | NGT 388 mV         | Check that real value of lower level of displayed waveform is NLT 388 mV wrt 0V.   |
| 034                                   | (a)  | INT. CON. | -                        | -                  | Depress "Press to Test" button. Set varactor voltage to zero.  |
|                                       | (b)  | TEST INT. | -                        | -                  | Remote UUT.  |

Table 2  
Typical signal levels

NOTE: This table is to assist in the location of possible faults and is not to be used for inspection purposes.

| Unit | Pin | Function           | Pulse width                  | Typical Amplitude | Remarks  |
|------|-----|--------------------|------------------------------|-------------------|--|
| 9a   | 38  | RF input           |                              | 1.4V p-p          | 3.748 MHz -<br>31.7499 MHz   |
| 9b   | 45  | Clock              | Variable                     | 0.7V p-p          | 937 kHz - 8 MHz  |
| 9b   | 8   | Ref input          | Mark space<br>2.2:1 to 1:2.2 | 1.1 to 3V<br>p-p  | 1.75 MHz   |
| 9b   | 41  | Count output       | 125 ns to 1.1 $\mu$ s        | 1.1V p-p          | 250 Hz prf<br>nominal  |
| 9b   | 40  | 10 kHz output      | Mark space 4:3               | 1.1V p-p          |  |
| 9c   | 5   | 1 kHz output       | Mark space 2:3               | 11.5V<br>p-p      |  |
| 9c   | 6   | Phase lock         | dc                           | 0-400 mV*         | In lock  |
|      |     |                    | dc                           | 11.5V*            | Out of lock  |
| 9c   | 11  | Phase angle output | Variable                     | 7.5V<br>p-p       | If output<br>connected via<br>8K to +8V<br>supply  |
| 9c   | 12  | Ramp mono          | 30 $\mu$ s                   | 1.1V p-p          | 250 Hz prf<br>nominal  |
| 9c   | 3   | Sample mono        | 30 $\mu$ s                   | 1.1V p-p          | 250 Hz prf<br>nominal  |
| 9c   | 1   | Counter D          | Variable                     | 1.0V p-p          | To see these<br>waveforms the<br>synthesiser<br>must be out of<br>lock with pins<br>4 and 15 of<br>Unit 9c dis-<br>connected |
| 9c   | 2   | Counter C          |                              |                   |  |
| 9c   | 17  | Counter B          |                              |                   |  |
| 9c   | 18  | Counter A          |                              |                   |  |
| 9d   | 12  | Limit state        | dc                           | 1.0V              | VFO at range 1<br>& 3.1 MHz<br>selected  |

\* When output connected via 12K to +12V supply.

Table 2 continued

| Unit | Pin | Function      | Pulse width | Typical Amplitude | Remarks  |
|------|-----|---------------|-------------|-------------------|--|
| 9d   | 2   | Limit state   | dc          | 1.0V              | VFO at range 2<br>3.1 MHz<br>selected                                  |
| 9c   | 8   | Range control | dc          | 6 to 88V          | level depends<br>on channel<br>frequency<br>selected                   |
| 9f   | 2   | Ramp output   | 4 ms        | 22V p-p           | 4 ms period if<br>phase lock<br>(Sweep from<br>+98V to +75V<br>approx) |
| 9e   | 10  | Phase output  | dc          | 50-102V           | level depends<br>on channel<br>frequency<br>selected                   |

REPAIR POLICY

38. It is recommended that repair of the synthesiser at third line be limited to replacement of faulty pec. Replacement of component parts on pec should be carried out only if locally authorised.

39. Following repair and assembly, the tests given in this section must be carried out in full.

40. A faulty unit returned to third line for repair should have the cover removed and be subjected to the test given in this section. If an incorrect result is obtained, maintain the test conditions and, with the aid of the data given in Table 2, attempt to diagnose which pec is at fault.

CAUTION: The synthesiser is employed, and tested, as part of a loop. Hence a fault condition could give rise to incorrect signal conditions at all, or most, points in the loop. The indiscriminate exchanging of pec as a means of locating the faulty pec should be avoided because excessive soldering/unsoldering of wire link interconnections can damage a pec.

ASSEMBLY/DISASSEMBLY

NOTE: Refer to fig.8 for component location and to fig.9 for interconnecting wire link data.

Cover

41. To remove the cover, proceed as follows:

- (1) Remove the four nuts and washers securing the cover.
- (2) Remove the fixing bracket (if still fitted after removal of Unit 9 from Unit 1).
- (3) Remove the cover.
- (4) Discard the exposed gasket.

42. To replace the cover, fit a new gasket (para.43), fit the cover and fixing bracket (if available). Secure with the four nuts and washers, tightening the nuts to a torque of  $2.25 \pm 0.25$  lb. inches.

43. To fit a new gasket, it is necessary to trim the replacement to the required length - the join should be positioned approx. midway along any one side and the ends sealed using a silicone rubber sealant approx. 0.25 in. either side of joint.

Units 9c to 9f

NOTE: All orientation given below assumes that the synthesiser is positioned with its base lower most. The component sides of the pec are then:

Units 9d and 9f - component side facing down

Units 9e and 9c - component side facing up.

44. To replace any one of Units 9c, 9d, 9e or 9f, proceed as follows:

- (1) Remove the cover (para.41).
- (2) Locate and unsolder the wire links connected to the edge slots of the unit to be replaced. Any link that provides a through connection



should also be unsoldered at all units above, or all units below, whichever involves the fewest edge slots.

- (3) If removing Unit 9c, unsolder the fixed pin from terminal 22 on Unit 9c.
- (4) At the top of the synthesiser, remove the four nuts and washers from the studs which pass through the spacer pillars of all units.
- (5) Withdraw, as a block, all units above that which is to be replaced.
- (6) Remove the unit which is to be replaced.
- (7) Position the replacement unit with its pillars over the four fixing studs and with its component side correctly oriented (see note above). In the case of positioning Unit 9c, ensure that the fixed pin locates with, and moves freely into, terminal 22 of the unit.
- (8) Position the block of units (withdrawn in (4) above), with their pillars over the four fixing studs.
- (9) Secure the units in place with four nuts and washers.
- (10) Solder the fixed pin to terminal 22 of Unit 9c (only if this unit replaced).
- (11) Solder all wire links disconnected in (2) above. If necessary, renew links using 22 swg tinned copper wire.
- (12) Fit the cover (para.42).

#### Unit 9a

45. To replace Unit 9a, proceed as follows:

- (1) Remove the cover (para.41).
- (2) At the top of the synthesiser, remove the four nuts and washers from the studs which pass through the spacer pillars on all units.

- (3) At the bottom of the synthesiser, withdraw the lower base and the four studs.
- (4) The printed circuit side of Unit 9a is now exposed. Unsolder the joints at terminals 1, 2, 3 and 4.
- (5) Remove the two screws and washers which secure Unit 9a to the upper base and remove the unit.
- (6) Place the replacement Unit 9a in position, ensuring that the fixed pins locate correctly to terminals 1, 2, 3 and 4 on the unit.
- (7) Secure Unit 9a in position using two screws and washers.
- (8) Solder terminals 1, 2, 3 and 4.
- (9) Replace the lower base and the four studs.
- (10) Secure the units with four nuts and washers.
- (11) Fit the cover (para.42).

#### Unit 9b and upper base

46. Special soldering techniques are employed during construction and no attempt should be made to separate Unit 9b from the upper base or to replace filter connectors on the base. However, discrete components on Unit 9b can be replaced and are accessible after Units 9b - 9f have been removed.

47. To replace Unit 9b/upper base, proceed as follows:

- (1) Remove Units 9b - 9f as a block, employing the procedure given in para.44(1) to (5).
- (2) At the bottom of the synthesiser, withdraw the lower base and the four studs.
- (3) The replacement upper base assembly is supplied complete with Units 9a and 9b. Fit the lower base and the four studs to this

assembly and then fit Units 9b - 9f, employing the procedures given in para.44(7) to (12).

COMPONENTS LIST

48. The principal component parts of the Synthesiser Unit 682/1/01775 are:

| Description                         | Reference No. |
|-------------------------------------|---------------|
| Base lower                          | 682/2/01777   |
| Base, upper assembly including:-    | 682/1/00409   |
| Panel, electronic circuit (Unit 9a) | 682/1/00450   |
| Panel, electronic circuit (Unit 9b) | 682/1/00460   |
| Panel, electronic circuit (Unit 9c) | 419/1/24984   |
| Panel, electronic circuit (Unit 9d) | 682/1/00480   |
| Panel, electronic circuit (Unit 9e) | 682/1/00490   |
| Panel, electronic circuit (Unit 9f) | 682/1/00500   |
| Gasket                              | 682/2/00241   |
| Cover                               | 682/2/01776   |

49. Components list for each of Units 9a to 9f are given on the following pages.

COMPONENTS LIST FOR  
UNIT 9a 682/1/00450

| Cct Ref  | Description                   | Reference No.   |
|----------|-------------------------------|-----------------|
|          | <u>Resistors</u>              |                 |
| R1       | 12 kohm $\pm$ 5%              | 403/4/78126/075 |
| R2       | 39 ohm $\pm$ 5%               | 403/4/78126/015 |
| R3       | 560 ohm $\pm$ 5%              | 403/4/78126/043 |
| R4       | 56 kohm $\pm$ 5%              | 403/4/78126/091 |
|          | <u>Capacitors</u>             |                 |
| C1 to C6 | 4.7nF $\pm$ 10% 100v          | 400/9/18794/036 |
|          | <u>Inductors</u>              |                 |
| L1       | Inductor R.F.                 | 406/9/08470/024 |
|          | <u>Semi-conductor devices</u> |                 |
| ML1      | Integrated circuit CN 295F    | 446/4/00236     |
| ML2      | Integrated circuit CN 303F    | 446/4/00240     |

COMPONENTS LIST FOR  
UNIT 9b 682/1/00460

| Cct Ref | Description                   | Reference No.   |
|---------|-------------------------------|-----------------|
|         | <u>Resistors</u>              |                 |
| R1      | 3.3 kohm $\pm$ 5%             | 403/4/78126/061 |
|         | <u>Capacitors</u>             |                 |
| C1      | 6.8nF $\pm$ 10% 100v          | 400/9/18794/038 |
|         | <u>Inductors</u>              |                 |
| L1      | Inductor, R.F.                | 406/9/08470/016 |
|         | <u>Semi-conductor devices</u> |                 |
| ML1     | Integrated circuit CN 333F    | 446/4/00244     |
| ML2     | Integrated circuit CN 333F    | 446/4/00244     |
| ML3     | Integrated circuit CN 333F    | 446/4/00244     |
| ML4     | Integrated circuit CN 311F    | 446/4/00223     |
| ML5     | Integrated circuit CN 317F    | 446/4/00226     |
| ML6     | Integrated circuit CN 317F    | 446/4/00226     |
| ML7     | Integrated circuit CN 321F    | 446/4/00229     |
| ML8     | Integrated circuit CN 325F    | 446/4/00230     |

COMPONENTS LIST FOR  
UNIT 9c 419/1/24984

| Cct Ref                       | Description                     | Reference NO.   |
|-------------------------------|---------------------------------|-----------------|
| <u>Resistors</u>              |                                 |                 |
| R1                            | 1.5 kohm $\pm$ 5%               | 403/4/78126/053 |
| R2, R3                        | 10 kohm $\pm$ 5%                | 403/4/78126/073 |
| R4 to R7                      | 3.3 kohm $\pm$ 5%               | 403/4/78126/061 |
| R8                            | 33 kohm $\pm$ 5%                | 403/4/78126/085 |
| R9                            | 33 ohm $\pm$ 5%                 | 403/4/78126/013 |
| <u>Capacitors</u>             |                                 |                 |
| C1                            | 6.8nF $\pm$ 10% 100v            | 400/9/18794/038 |
| C2, C3                        | 4.7nF $\pm$ 10% 100v            | 400/9/18794/036 |
| C4                            | 22uF $\pm$ 10% 15v electrolytic | 402/4/98049/030 |
| <u>Inductors</u>              |                                 |                 |
| L1                            | Inductor, R.F.                  | 406/9/08470/020 |
| <u>Semi-conductor devices</u> |                                 |                 |
| TR1, TR2                      | Transistor CV 7555              | 990/4/00107/555 |
| ML1, ML2                      | Integrated circuit CN 333F      | 446/4/00244     |
| ML3                           | Integrated circuit CN 309F      | 446/4/00234     |
| ML4                           | Integrated circuit CN 337F      | 446/4/00247     |
| ML5                           | Integrated circuit CN 339F      | 446/4/00232     |

COMPONENTS LIST FOR  
UNIT 9d 682/1/00480

| Cct Ref                       | Description                  | Reference No.   |
|-------------------------------|------------------------------|-----------------|
| <u>Resistors</u>              |                              |                 |
| R1                            | 115 kohm $\pm$ 1%            | 403/9/03511/008 |
| R2                            | 47.5 kohm $\pm$ 1%           | 403/9/03511/007 |
| R3                            | 26.1 kohm $\pm$ 1%           | 403/9/03511/005 |
| R4                            | 16 kohm $\pm$ 1%             | 403/9/03511/004 |
| R5                            | 10.5 kohm $\pm$ 1%           | 403/9/03511/003 |
| R6                            | 6.98 kohm $\pm$ 1%           | 403/9/03511/002 |
| R7                            | 4.75 kohm $\pm$ 1%           | 403/9/03511/001 |
| R8                            | 680 ohm $\pm$ 5%             | 403/4/78126/045 |
| R9                            | 100 kohm $\pm$ 5%            | 403/4/78126/097 |
| R10                           | 39 kohm $\pm$ 1%             | 403/4/78126/287 |
| <u>Capacitors</u>             |                              |                 |
| C1                            | 220nF $\pm$ 5% 160v plastics | 400/9/18791/028 |
| <u>Semi-conductor devices</u> |                              |                 |
| TR1 to TR7                    | Transistor SGS - U14 909/4   | 417/4/05086     |
| TR8                           | Transistor SGS - U14 906/4   | 417/4/05089     |
| TR9                           | Transistor SGS - U14 908/4   | 417/4/05087     |
| ML1                           | Integrated circuit CN 341F   | 446/4/00233     |

COMPONENTS LIST FOR  
UNIT 9e 682/1/00490

| Cct Ref                       | Description                  | Reference No.   |
|-------------------------------|------------------------------|-----------------|
| <u>Resistors</u>              |                              |                 |
| R1                            | 1.5 kohm $\pm$ 5%            | 403/4/78126/053 |
| R2                            | 33 kohm $\pm$ 5%             | 403/4/78126/085 |
| R3                            | 15 kohm $\pm$ 5%             | 403/4/78126/077 |
| R4                            | 1.5 kohm $\pm$ 5%            | 403/4/78126/053 |
| R5                            | 1.5 kohm $\pm$ 5%            | 403/4/78126/053 |
| R6                            | 4.7 kohm $\pm$ 5%            | 403/4/78127/065 |
| R7                            | 330 ohm $\pm$ 5%             | 403/4/78127/037 |
| R8                            | 1.5 kohm $\pm$ 5%            | 403/4/78126/053 |
| R9                            | 27 kohm $\pm$ 5%             | 403/4/78127/083 |
| R10                           | 1.5 kohm $\pm$ 5%            | 403/4/78126/053 |
| R11                           | 2.2 kohm $\pm$ 5%            | 403/4/78126/057 |
| R12                           | 120 kohm $\pm$ 5%            | 403/4/78126/099 |
| R13                           | 100 kohm $\pm$ 5%            | 403/4/78126/097 |
| R14                           | 47 kohm $\pm$ 1%             | 403/4/78126/289 |
| R15                           | 1.5 kohm $\pm$ 5%            | 403/4/78126/053 |
| R16                           | 261 kohm $\pm$ 1%            | 403/9/03511/009 |
| R17                           | 150 kohm $\pm$ 5%            | 403/4/78126/101 |
| R18                           | 47 kohm $\pm$ 1%             | 403/9/03511/006 |
| <u>Capacitors</u>             |                              |                 |
| C1                            | 470nF $\pm$ 5% 160v plastics | 400/9/18791/029 |
| <u>Semi-conductor devices</u> |                              |                 |
| TR1                           | Transistor SGS -U14 906/4    | 417/4/05089     |
| TR2                           | Transistor SGS -U14 909/4    | 417/4/05086     |
| TR3                           | Transistor CV 7555           | 990/4/00107/555 |
| TR4, 5, 6.                    | Transistor SGS -U14 909/4    | 417/4/05086     |
| TR7                           | Transistor SGS -U14 906/4    | 417/4/05089     |
| TR8, 9.                       | Transistor SGS -U14 908/4    | 417/4/05087     |
| TR10                          | Transistor SGS -U14 909/4    | 417/4/05086     |
| TR11, 12                      | Transistor SGS -U14 908/4    | 417/4/05087     |
| D1                            | Diode 1N3070                 | 415/4/05440     |

COMPONENTS LIST FOR  
UNIT 9F 682/1/00500

| Cct Ref                       | Description                     | Reference No.   |
|-------------------------------|---------------------------------|-----------------|
| <u>Resistors</u>              |                                 |                 |
| R1                            | 1.5 kohm $\pm$ 5%               | 403/4/78126/053 |
| R2                            | 12 kohm $\pm$ 1%                | 403/4/78126/275 |
| R3                            | 150 kohm $\pm$ 1%               | 403/4/78126/301 |
| R4                            | 2.2 kohm $\pm$ 5%               | 403/4/78126/057 |
| R5                            | 27 kohm $\pm$ 5%                | 403/4/78126/083 |
| R6                            | 680 kohm $\pm$ 1%               | 403/9/03511/012 |
| R7                            | 150 kohm $\pm$ 5%               | 403/4/78126/101 |
| R8                            | 220 kohm $\pm$ 5%               | 403/4/78127/105 |
| R9                            | 4.7 kohm $\pm$ 5%               | 403/4/78126/065 |
| R10                           | 100 kohm $\pm$ 5%               | 403/4/78126/097 |
| <u>Capacitors</u>             |                                 |                 |
| C1                            | 9uF $\pm$ 20% 125v electrolytic | 402/4/98190/076 |
| C2                            | 22nF $\pm$ 5% 160v plastic      | 400/9/18791/027 |
| C3                            | 9uF $\pm$ 20% 125v electrolytic | 402/4/98190/076 |
| <u>Semi-conductor devices</u> |                                 |                 |
| TR1                           | Transistor SGS -U14 909/4       | 417/4/05086     |
| TR2                           | Transistor SGS -U14 906/4       | 417/4/05089     |
| TR3                           | Transistor SGS -U14 908/4       | 417/4/05087     |
| TR4                           | Transistor SGS -U14 907/4       | 417/4/05088     |
| D1                            | Diode 1N3070                    | 415/4/05440     |



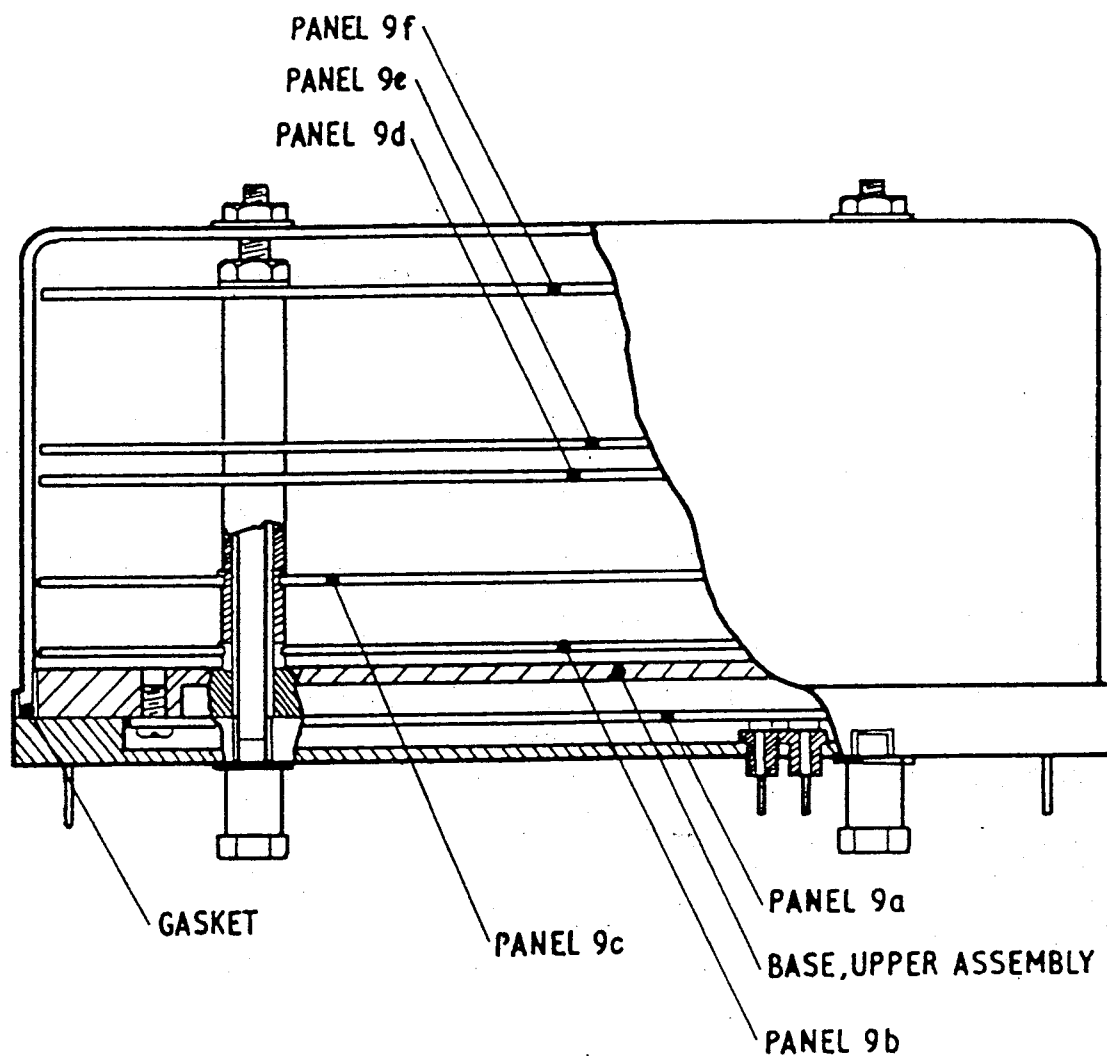


Fig.8 Synthesizer assembly

| TEST No.                   | STEP | UNIT        | RANGE          | LIMITS             | INSTRUCTIONS   |
|----------------------------|------|-------------|----------------|--------------------|--|
| STATE OF CHARGE INDICATION |      |             |                |                    |  |
| 22                         | (a)  | LOAD SWITCH | 27V            | -                  | Switch the load switch to the 27V position.  |
|                            | (b)  | VOLT-METER  | VR1 VOLTS      | -                  | Switch the voltmeter to the VR1 VOLTS mode and range to 199.9 mV.  |
|                            | (c)  | VOLT-METER  | 199.9 mV       | 20.1 mV to 21.9 mV | Adjust VR1 on the test set to obtain a reading of 21 mV.   |
| 23                         | (a)  | UUT         | -              | 1L1 illuminated    | Check the amber lamp 1L1.  |
| 24                         | (a)  | UUT         | -              | 1L2 extinguished   | Check the green lamp 1L2.  |
| 25                         | (a)  | CUR METER   | OUTPUT CURRENT | -                  | Switch the current meter to the OUTPUT CURRENT mode and range to 199.9 mA. (Divide button not selected). |
|                            | (b)  | CUR METER   | 199.9 mA       | NGT 9.98 mA        | Adjust VR1 on test set to obtain a reading of NGT 9.98 mA.   |
| 26                         | (a)  | VOLT-METER  | VR1 VOLTS      | -                  | Switch the voltmeter to the VR1 VOLTS mode and range to 199.9 mV.  |
|                            | (b)  | VOLT-METER  | 199.9 mV       | 22.1 mV to 37.9 mV | Check the reading.   |
| 27                         | (a)  | UUT         | -              | 1L1 extinguished   | Check the amber lamp 1L1.  |
| 28                         | (a)  | UUT         | -              | 1L2 illuminated    | Check the green lamp 1L2.  |
| 29                         | (a)  | VOLT-METER  | VR1 VOLTS      | -                  | Switch the voltmeter to the VR1 VOLTS mode and range to 199.9 mV.  |
|                            | (b)  | VOLT-METER  | 199.9 mV       | 40 mV              | Adjust VR1 on test set to obtain a reading of 40 mV.   |

| TEST No.   | STEP | UNIT        | RANGE          | LIMITS             | INSTRUCTIONS   |
|--|------|-------------|----------------|--------------------|--|
| 30   | (a)  | CUR METER   | OUTPUT CURRENT | -                  | Switch the current meter to the OUTPUT CURRENT mode and range to 1.999A.     |
|  | (b)  | CUR METER   | 1.999A         | 0.904A to 1.288A   | Adjust VR1 on test set to set the current meter reading.                     |
| 31   | (a)  | VOLT-METER  | 199.9 mV       | 15.1 mV to 31.9 mV | Check the reading.   |
| 32   | (a)  | UUT         | -              | 1L1 illuminated    | Check the amber lamp 1L1.  |
| 33   | (a)  | UUT         | -              | 1L2 extinguished   | Check the green lamp 1L2.  |
| 34   | (a)  | VOLT-METER  | 199.9 mV       | NGT 0.45 mV        | Operate VR1 S/C switch on test set to obtain a reading of NGT 0.45 mV.       |
| <b>OVERVOLTAGE PROTECTION</b>  |      |             |                |                    |  |
| 35   | (a)  | VOLT-METER  | INPUT VOLTS    | -                  | Switch the voltmeter to the INPUT VOLTS mode and range to 199.9V.            |
|  | (b)  | VOLT-METER  | 199.9V         | 19.5V to 20.5V     | Adjust the external power supply output voltages to obtain a reading of 20V. |
| 36   | (a)  | CUR METER   | OUTPUT CURRENT | -                  | Switch the current meter to the OUTPUT CURRENT mode and range to 199.9 mA.   |
|  | (b)  | CUR METER   | 199.9 mA       | NGT 9.98 mA        | Check the reading.   |
|  | (c)  | UUT         | -              | -                  | Disconnect UUT from test set.  |
| <b>NOTE:</b> Test the UUT for sealing and leakage as in Part 3, para.38. |      |             |                |                    |  |
| <b>HIGH INPUT VOLTAGE</b>  |      |             |                |                    |  |
| 37   | (a)  | LOAD SWITCH | 330 ohm        | -                  | Switch the load switch to the 330 ohm position.                              |
|  | (b)  | UUT         | -              | -                  | Switch S1 and S2 to ON.  |
|  | (c)  | VOLT-METER  | INPUT VOLTS    | -                  | Switch the voltmeter to the INPUT VOLTS mode and range to 199.9V.            |

| TEST No.   | STEP | UNIT        | RANGE          | LIMITS                        | INSTRUCTIONS   |
|--|------|-------------|----------------|-------------------------------|--|
| 37<br>(cont)   | (d)  | VOLT-METER  | 199.9V         | 15.5V to 16.5V                | Adjust the external power supply output voltage to obtain a reading of 16V on the voltmeter.                   |
| 38   | (a)  | VOLT-METER  | VR1 VOLTS      | -                             | Switch the voltmeter to the VR1 VOLTS mode and range to 199.9 mV.  |
|  | (b)  | VOLT-METER  | 199.9 mV       | LT 0.45 mV                    | Operate VR1 S/C on test set to obtain a reading of not less than 0.45 mV on the voltmeter.                     |
| <b>CURRENT REGULATION CHECK (HIGH INPUT VOLTAGE)</b> |      |             |                |                               |  |
| 39   | (a)  | LOAD SWITCH | 27V            | -                             | Switch the load switch to the 27V position.  |
|  | (b)  | UUT         | -              | Amber lamp only illuminated   | Check the lamps.   |
| 40   | (a)  | UUT         | -              | Amber lamp extinguished by S1 | Check the amber lamp when switch S1 is operated.   |
| 41   | (a)  | CUR METER   | OUTPUT CURRENT | -                             | Switch the current meter to the OUTPUT CURRENT mode and range to 1.999A only i.e. divide buttons not selected. |
|  | (b)  | CUR METER   | 1.999A         | 0.902A to 1.288A              | Check the reading.   |
| 42   | (a)  | LOAD SWITCH | S/C            | -                             | Switch the load switch to the S/C position.  |
|  | (b)  | CUR METER   | OUTPUT CURRENT | -                             | Switch the current meter to the OUTPUT CURRENT ÷ 2 mode and range to 1.999A.                                   |
|  | (c)  | CUR METER   | 1.999A         | 0.402A to 0.748A              | Check the reading.<br>(Actual current is twice reading).   |
| <b>STATE OF CHARGE INDICATION (HIGH I/P VOLTAGE)</b> |      |             |                |                               |  |
| 43   | (a)  | LOAD SWITCH | 27V            | -                             | Set the load switch to the 27V position.   |

| TEST No.     | STEP | UNIT       | RANGE             | LIMITS                | INSTRUCTIONS  |
|--------------|------|------------|-------------------|-----------------------|---|
| 43<br>(cont) | (b)  | VOLT-METER | VR1<br>VOLTS      | -                     | Switch the voltmeter to the VR1 VOLTS mode and range to 199.9 mV. |
|              | (c)  | VOLT-METER | 199.9<br>mV       | 20.1 mV<br>21.9 mV    | Adjust VR1 on the test set to obtain a reading of 21 mV.          |
| 44           | (a)  | UUT        | -                 | 1L1 illuminated       | Check the amber lamp 1L1.   |
| 45           | (a)  | UUT        | -                 | 1L2 extinguished      | Check the green lamp 1L2.   |
| 46           | (a)  | CUR METER  | 199.9<br>mA       | NGT 9.98 mA           | Adjust VR1 on test set to obtain a reading of NGT 9.98 mA.        |
| 47           | (a)  | VOLT-METER | VR1<br>VOLTS      | -                     | Switch voltmeter to VR1 VOLTS mode and range to 199.9 mV.         |
|              | (b)  | VOLT-METER | 199.9<br>mV       | 22.1 mV to<br>37.9 mV | Check the reading.  |
| 48           | (a)  | UUT        | -                 | 1L1 extinguished      | Check the amber lamp 1L1.   |
| 49           | (a)  | UUT        | -                 | 1L2 illuminated       | Check the green lamp 1L2.   |
| 50           | (a)  | VOLT-METER | VR1<br>VOLTS      | -                     | Switch the voltmeter to VR1 VOLTS mode and range to 199.9 mV.     |
|              | (b)  | VOLT-METER | 199.9<br>mV       | 40 mV                 | Adjust VR1 on test set to obtain a reading of 40 mV.              |
| 51           | (a)  | CUR METER  | OUTPUT<br>CURRENT | -                     | Switch current meter to OUTPUT CURRENT mode and range to 1.999A.  |
|              | (b)  | CUR METER  | 1.999A            | 0.904A to<br>1.288A   | Adjust VR1 on test set to set the current meter reading.          |
| 52           | (a)  | VOLT-METER | 199.9<br>mV       | 15.1 mV to<br>31.9 mV | Check the reading.  |

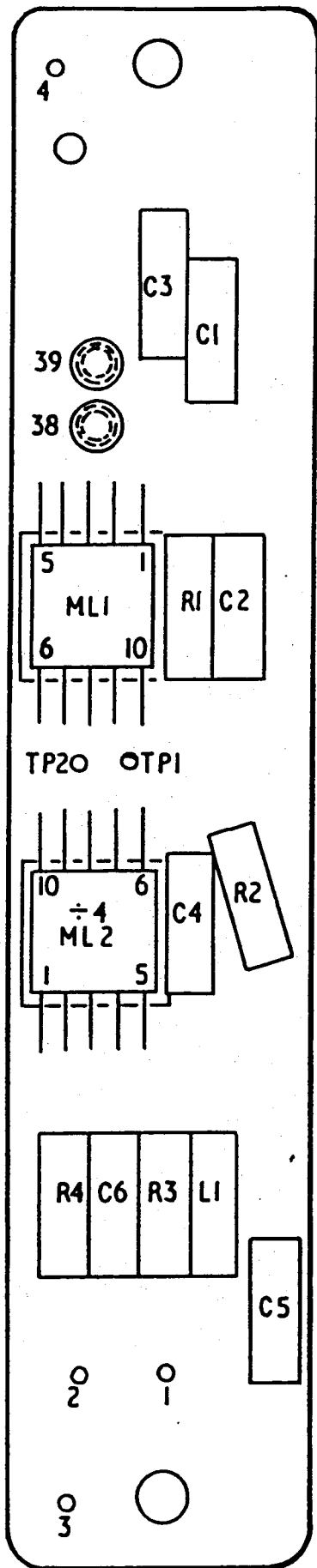
| TEST No.  | STEP | UNIT        | RANGE          | LIMITS                        | INSTRUCTIONS   |
|---|------|-------------|----------------|-------------------------------|--|
| 53  | (a)  | UUT         | -              | 1L1 illuminated               | Check the amber lamp 1L1.  |
| 54  | (a)  | UUT         | -              | 1L2 extinguished              | Check the green lamp 1L2.  |
| 55  | (a)  | VOLT-METER  | 199.9 mV       | NGT 0.45 mV                   | Operate VR1 S/C switch to obtain NGT 0.45 mV.  |
| <u>LOW INPUT VOLTAGE</u>                            |      |             |                |                               |  |
| 56  | (a)  | LOAD SWITCH | 330 ohm        | -                             | Switch the load switch to the 330 ohm position.  |
|   | (b)  | UUT         | -              | -                             | Switch S1 and S2 on UUT to ON.   |
|   | (c)  | VOLT-METER  | 199.9V         | 9.5V to 10.5V                 | Adjust the external power supply output voltage to obtain a reading of 10V.                            |
| 57  | (a)  | VOLT-METER  | VR1 VOLTS      | -                             | Switch the voltmeter to VR1 VOLTS mode and range to 199.9 mV.  |
|   | (b)  | VOLT-METER  | 199.9 mV       | NGT 0.45 mV                   | Operate VR1 S/C switch to obtain a reading of NGT 0.45 mV.   |
| <u>CURRENT REGULATION CHECK (LOW INPUT VOLTAGE)</u> |      |             |                |                               |  |
| 58  | (a)  | LOAD SWITCH | 27V            | -                             | Set load switch to 27V position.   |
|   | (b)  | UUT         | -              | Amber lamp only illuminated   | Check the amber lamp.  |
| 59  | (a)  | UUT         | -              | Amber lamp extinguished by S1 | Operate switch S1.   |
| 60  | (a)  | CUR METER   | OUTPUT CURRENT | -                             | Switch the current meter to the OUTPUT CURRENT mode and range to 1.999A. divide buttons not operating. |
|   | (b)  | CUR METER   | 1.999A         | 0.902A to 1.288A              | Check the reading.   |

| TEST No.                                     | STEP | UNIT        | RANGE           | LIMITS             | INSTRUCTIONS  |
|--|------|-------------|-----------------|--------------------|---|
| 61   | (a)  | LOAD SWITCH | S/C             | -                  | Set the load switch to the S/C position.  |
|  | (b)  | CUR METER   | OUTPUT CURRENT  | -                  | Switch the current meter to the OUTPUT CURRENT $\div 2$ mode and range to 1.999A. |
|  | (c)  | CUR METER   | 1.999A $\div 2$ | 0.402A to          | Check the reading.<br>(Actual current is twice reading).                          |
| STATE OF CHARGE INDICATION (LOW I/P VOLTAGE) |      |             |                 |                    |   |
| 62   | (a)  | LOAD SWITCH | 27V             | -                  | Set the load switch to the 27V position.  |
|  | (b)  | VOLT-METER  | VR1 VOLTS       | -                  | Switch voltmeter to VR1 VOLTS mode and range to 199.9 mV.                         |
|  | (c)  | VOLT-METER  | 199.9 mV        | 20.1 mV to 21.9 mV | Adjust VR1 on the test set to obtain a reading of 21 mV.                          |
| 63   | (a)  | UUT         | -               | 1L1 illuminated    | Check the amber lamp 1L1.   |
| 64   | (a)  | UUT         | -               | 1L2 extinguished   | Check the green lamp 1L2.   |
| 65   | (a)  | CUR METER   | 199.9 mA        | NGT 9.98 mA        | Adjust VR1 on test set to obtain a reading of NGT 9.98 mA.                        |
| 66   | (a)  | VOLT-METER  | VR1 VOLTS       | -                  | Switch voltmeter to VR1 VOLTS mode and range to 199.9 mV.                         |
|  | (b)  | VOLT-METER  | 199.9 mV        | 22.1 mV to 37.9 mV | Check the reading.  |
| 67   | (a)  | UUT         | -               | 1L1 extinguished   | Check the amber lamp 1L1.   |
| 68   | (a)  | UUT         | -               | 1L2 illuminated    | Check the green lamp 1L2.   |
| 69   | (a)  | VOLT-METER  | VR1 VOLTS       | -                  | Switch the voltmeter to VR1 VOLTS mode and range to 199.9 mV.                     |

| TEST No.                | STEP | UNIT        | RANGE          | LIMITS             | INSTRUCTIONS  |
|-------------------------|------|-------------|----------------|--------------------|---|
| 69<br>(cont)            | (b)  | VOLT-METER  | 199.9 mV       | 40 mV              | Adjust VR1 on test set to obtain a reading of 40 mV on the voltmeter. |
| 70                      | (a)  | CUR METER   | OUTPUT CURRENT | -                  | Switch current meter to OUTPUT CURRENT mode and range to 1.999A.      |
|                         | (b)  | CUR METER   | 1.999A         | 0.904A to 1.288A   | Adjust VR1 on test set to set the current meter reading.              |
| 71                      | (a)  | VOLT-METER  | 199.9 mV       | 15.5 mV to 31.9 mV | Check the reading.  |
| 72                      | (a)  | UUT         | -              | 1L1 illuminated    | Check the amber lamp 1L1.   |
| 73                      | (a)  | UUT         | -              | 1L2 extinguished   | Check the green lamp 1L2.   |
| 74                      | (a)  | VOLT-METER  | 199.9 mV       | NGT 0.45 mV        | Operate VR1 S/C switch to obtain a reading of NGT 0.45 mV.            |
| <u>REVERSE POLARITY</u> |      |             |                |                    |   |
| 75                      | (a)  | VOLT-METER  | 199.9V         | -                  | Set voltmeter to INPUT VOLT mode 199.9V range.                        |
|                         | (b)  | VOLT-METER  | 199.9V         | 13.5V to 14.5V     | Adjust the external power supply to obtain a reading of 14V.          |
|                         | (c)  | CUR METER   | OFF            | -                  | Set current meter to OFF.   |
|                         | (d)  | LOAD SWITCH | 33 ohm         | -                  | Set to 33 ohm position.   |
|                         | (e)  | -           | -              | -                  | Depress REVERSE VOLTAGE switch.                                       |
| 76                      | (a)  | VOLT-METER  | 199.9 mV       | -                  | Set to OUTPUT VOLTAGE mode 199.9 mV.                                  |
|                         | (b)  | VOLT-METER  | 199.9          | NGT 10 mV          | Check the reading.  |
|                         | (c)  | -           | -              | -                  | Depress REVERSE VOLTAGE switch.                                       |

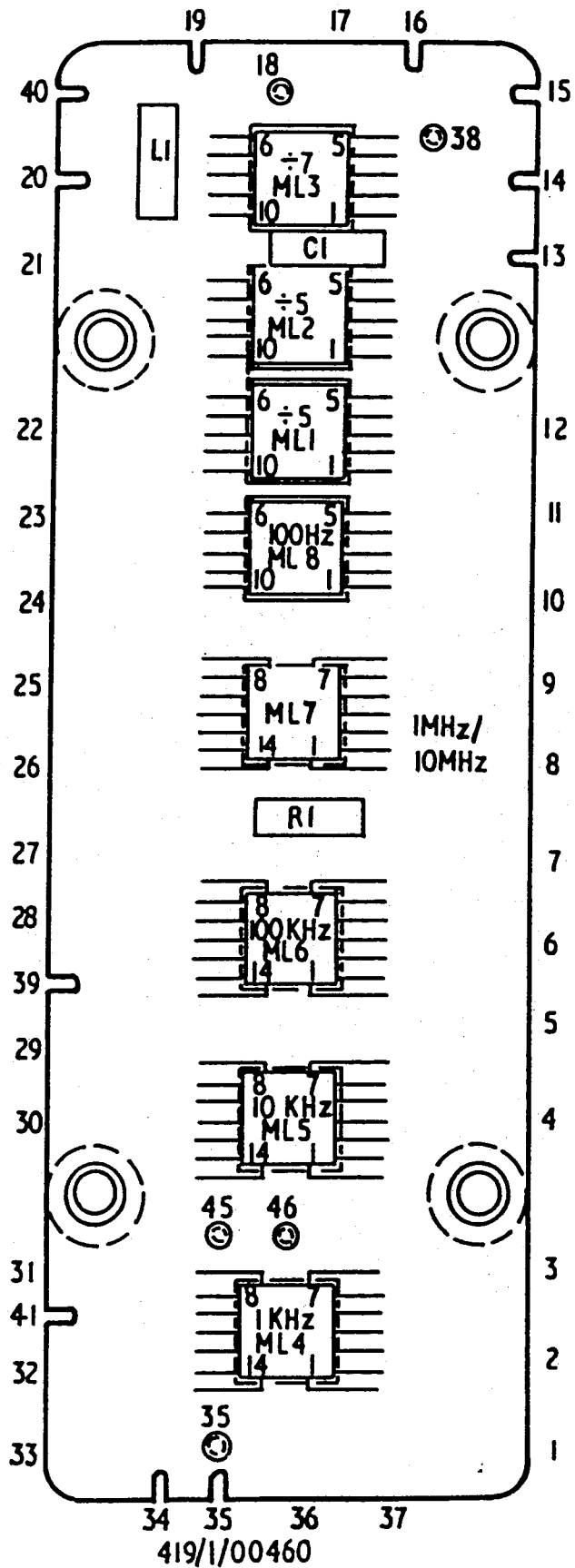


| TEST No.               | STEP | UNIT        | RANGE    | LIMITS         | INSTRUCTIONS  |
|------------------------|------|-------------|----------|----------------|---|
| <u>REVERSE CURRENT</u> |      |             |          |                |   |
| 77                     | (a)  | UUT         | -        | -              | Remove SKT1 from UUT.                                     |
|                        | (b)  | VOLT-METER  | 199.9V   | -              | Set voltmeter switch to INPUT VOLTS mode 199.9V range.    |
|                        | (c)  | VOLT-METER  | 199.9V   | 23.5V to 24.5V | Adjust an external supply connected to UUT output to 24V. |
|                        | (d)  | CUR METER   | 199.9 mA | -              | Set current meter to INPUT CURRENT mode 199.9 mA range.   |
|                        | (e)  | REV CURRENT | -        | -              | Depress REVERSE CURRENT switch.                           |
| 78                     | (a)  | CUR METER   | 199.9 mA | NGT 9.98 mA    | Check the reading.  |



682/1/00450

Fig. 10  
Unit 9a component layout



419/1/00460

Fig. 11  
Unit 9b component layout

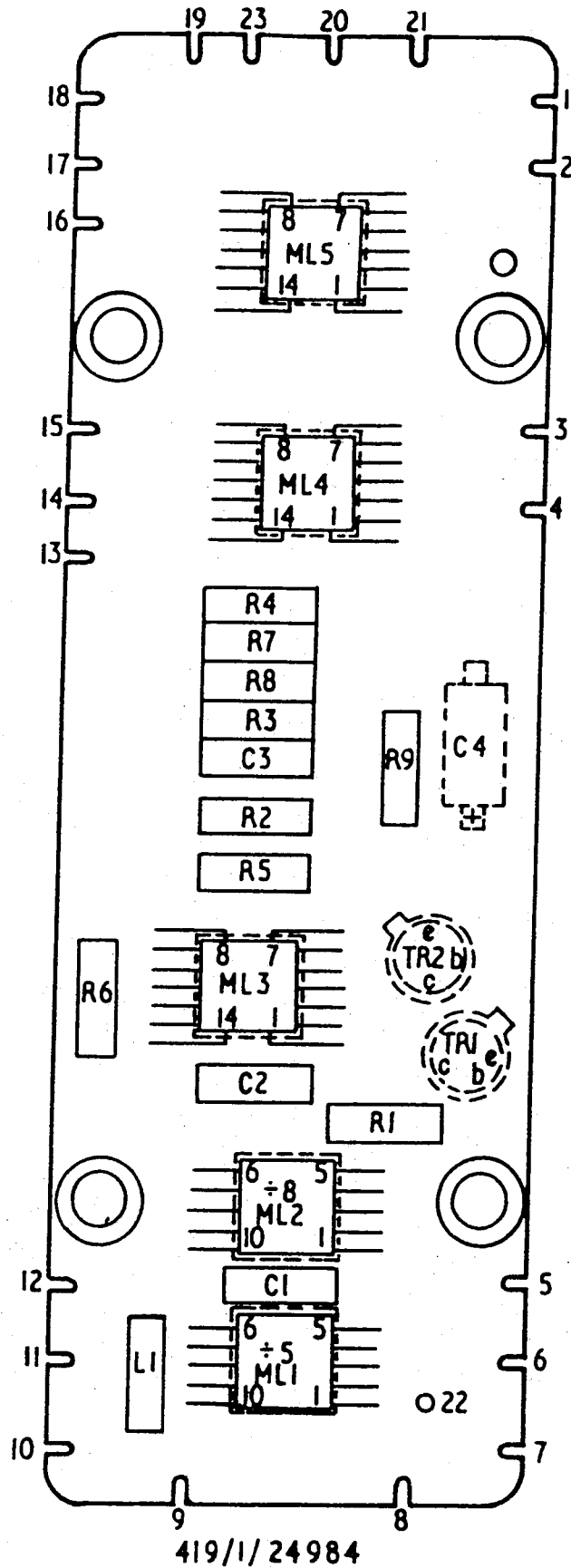


Fig.12 Unit 9c - component layout

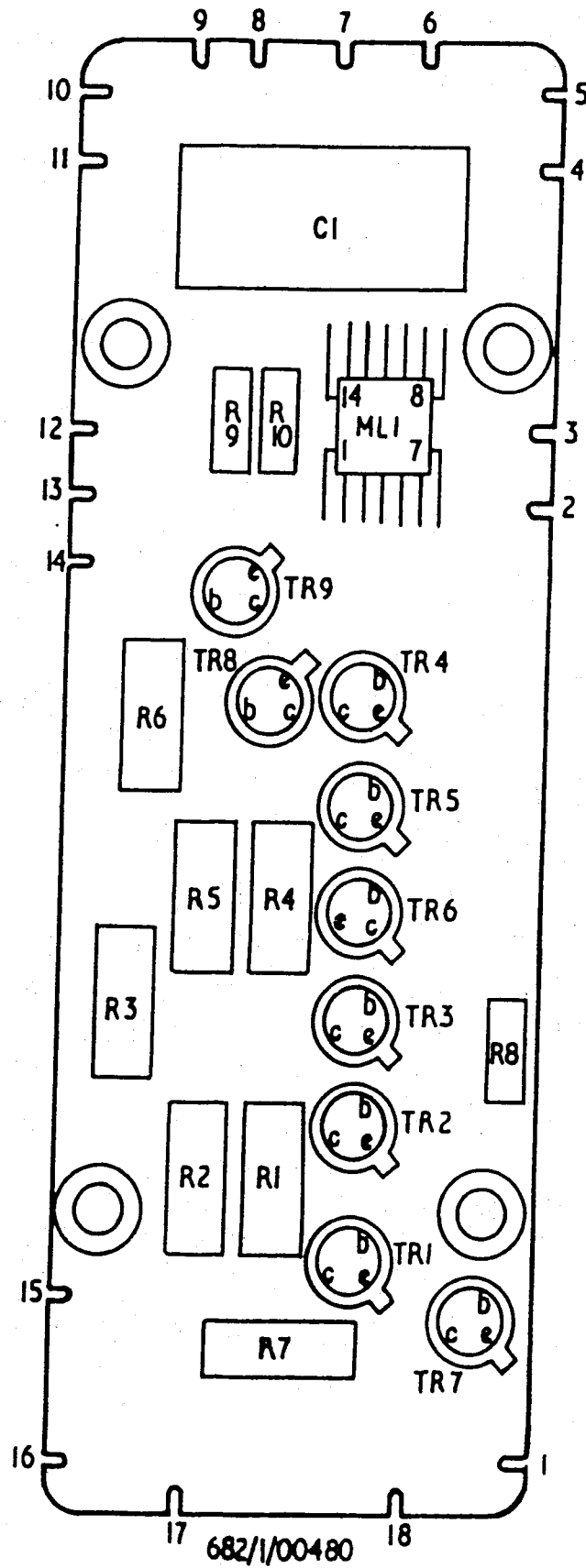


Fig.13 Unit 9d - component layout

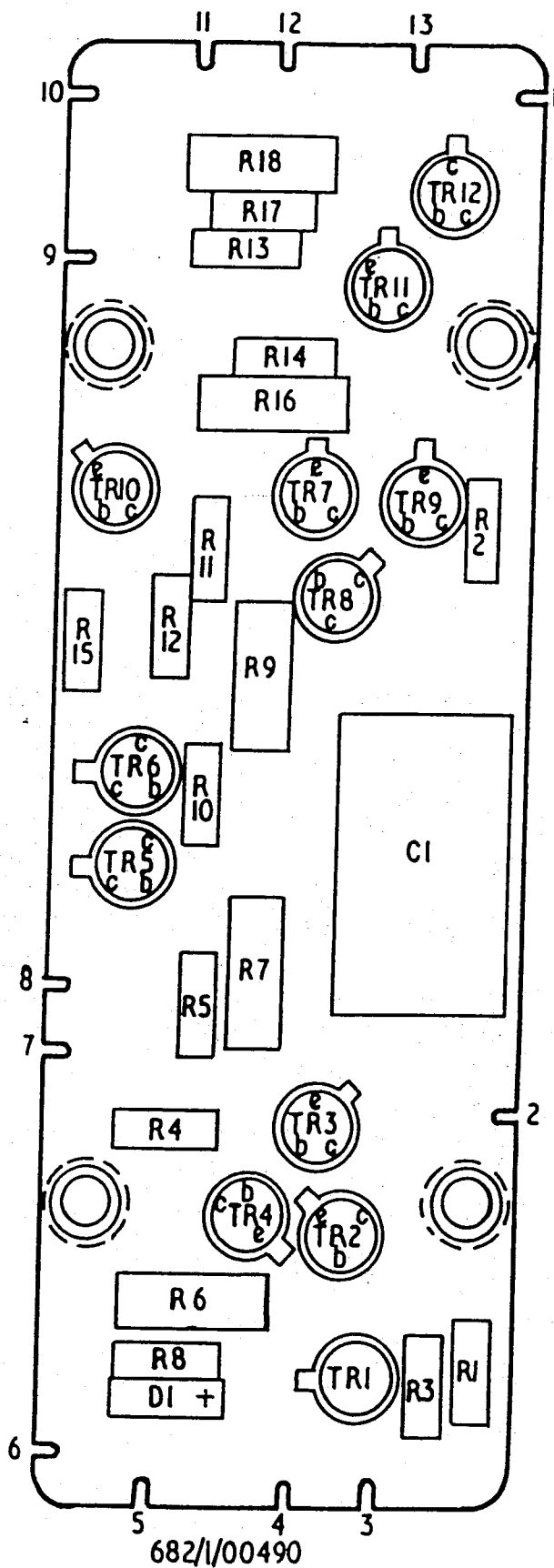


Fig.14 Unit 9e - component layout

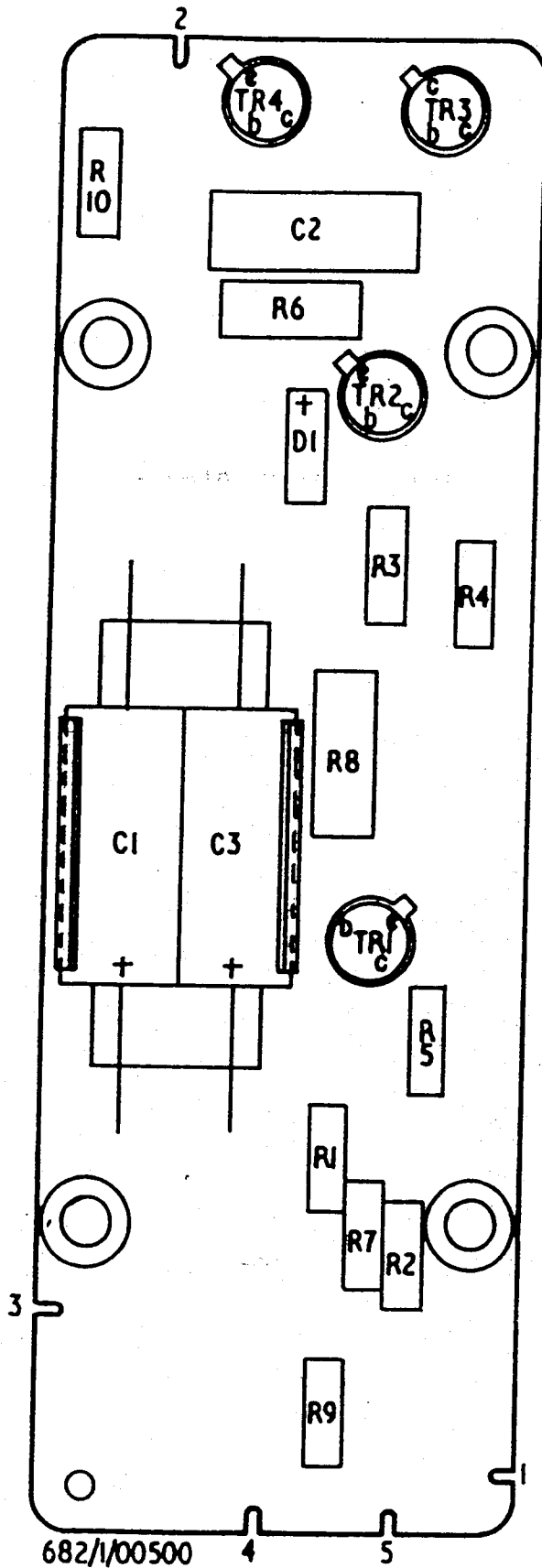


Fig. 15 Unit 9f - component layout