# DATEL 4800 SERVICE

## Modem 11 - Installation, Testing and Commissioning

CONTENTS



1 INTRODUCTION The Modem 11, in conjunction with other ancilliary equipment as necessary, is used to provide the Datel 4800 service. This service offers synchronous data transmission at 4800 or 2400 bit/s on private circuits and exchange lines.

This Instruction details the installation and testing procedures for the Modem 11. Appendix 1 details the commissioning procedures for Datel 4800 Services.

Appendix 2 details the installation test results report form.

## 2 GENERAL

**2.1 Modem Description** Three models of the Modem 11 have been developed, Models 2, 3 and 4. Individual applications are detailed in Table 1. The Datel 4800 Service will be launched with Models 2; Models 3 and 4 will be introduced when available and this Instruction will be updated accordingly.

TABLE 1

| Modem 11 Model | Application |
|---|---|
| 2 | For connexion to a point-to-point private circuit and/or exchange line. |
| 3 | For the 'instation' connexion to a multipoint private circuit *only*. |
| 4 | For the 'outstation' connexion to a multipoint private circuit with or without exchange line.<br>or alternatively<br>For connexion to a point-to-point private circuit and/or exchange line. |

Each model of the Modem 11 will *only* interwork with another appropraite model of the Modem 11. A Modem 11 will *not* interwork with any other type of modem.

Each model of the Modem 11 comprises two units, a Modem Unit (MU) and a Line Switching Unig (LSU).

Figure 1 shows a Model 2 Modem 11.

The MU consists of up to 16 circuit boards, (depending upon the model), in a case, measuring 105 mm high, 360 mm wide and 422 mm deep and weighing 9.3 kg. (See Figure 2.) The LSU, which may be either table or wall mounted, is available with a choice of two Line Modules (LM); one providing for private circuit and standby exchange line operation and the other providing for exchange line operation only. The LSU is 98 mm high, 232 mm wide, 410 mm deep and weighs 6.8 kg.

For details of rack mounted installations refer to C3 I8403.

**2.2 Authority** Given by an Advice Note quoting the Datel Service Code.

**2.3 Datel Service Codes** See C3 I4820.

**2.4 Equipment Required** For each service code see C3 I4825 except for rack mounted (control) installations. For these see C3 I8403.

**2.5 Handling** Datel Service modems should be handled carefully. Cartons from new units should be retained for re-use if the units are to be transported again. When units are being transported they should have suitable packing protection.

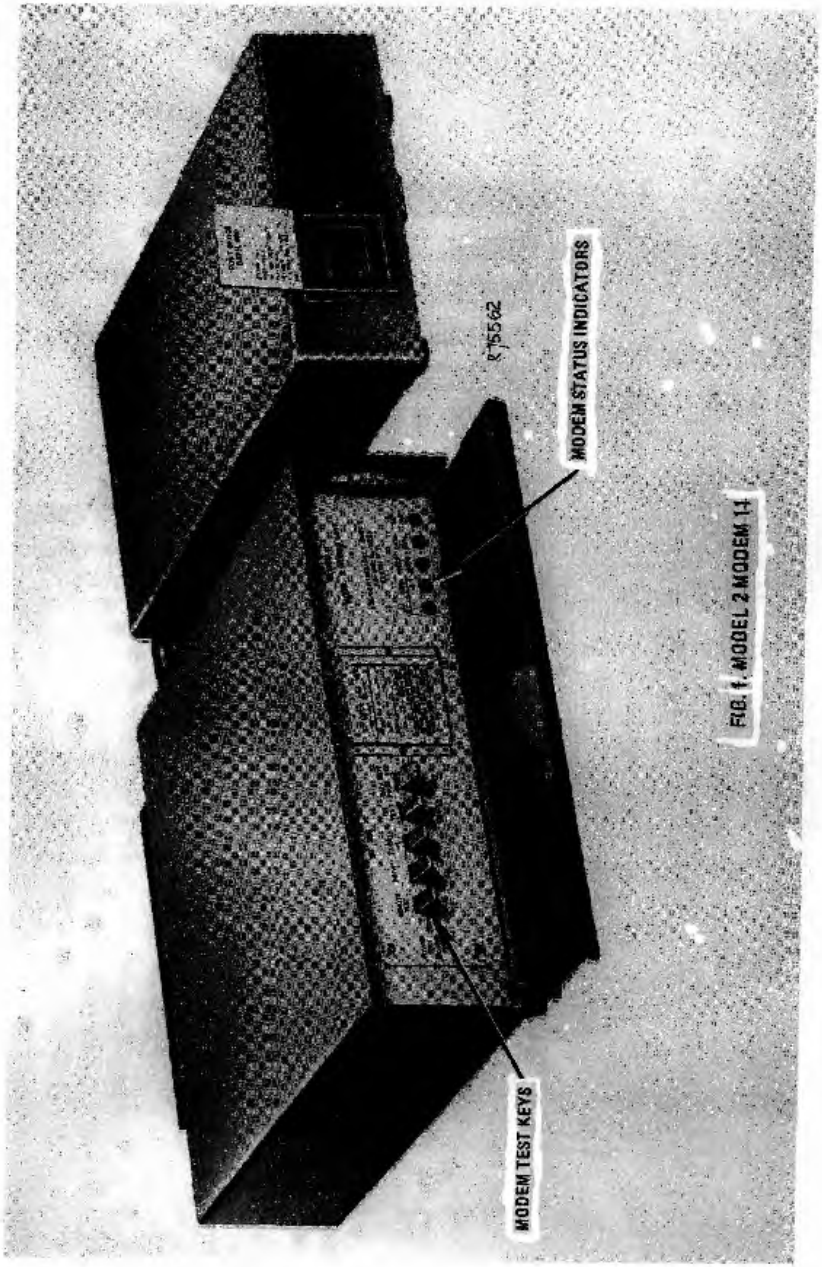



FIG. 1. MODEL 2 MODEM 14


FIG. 2: MODEL 2 MODEM 11 MODEM UNIT (MU)

**3 PRE-INSTALLATION SETTING-UP AND TESTING** Preliminary setting-up and testing of the modem should normally be carried out on PO premises unless it is judged that the installation is large enough to warrant these tests being carried out on the customer's premises.

Since the Datel 4800 Service may be provided without a test access exchange line, it will not be possible to conduct 2-wire tests to a Datel Test Centre (DTC) from such installations. It is necessary to ensure that all requisite equipment is available for any test to be performed on the modem at the customer's premises (see section 3.3.2).

If any defects are found in the equipment to be installed, a form A646 should be completed as detailed in C1 A0050, including the serial number of the defective equipment.

Note that if a MU is found to be defective, the *complete* MU must be changed and not individual circuit boards.

**3.1 Modem Modifications** Due to changes in operational requirements since the specification of the Modem 11 certain modifications have become necessary. *It is essential that these modifications are carried out prior to installation.*

**3.1.1 Interface Wiring Modification** Subsequent to the specification of the Modem 11 Modem/DTE interface, changes have been made to the International Standards Organisation (ISO) modem interface standard.

In order that the Modem 11 conforms to the new standard *it is essential that the Modem 11 interface is modified upon installation, as follows:-*

(a) Remove the cover 1/TG 2482 (if fitted).

(b) Locate and remove the two star headed screws securing the modem back panel to the sides of the case.

(c) Locate the DTE interface socket at the right hand side of the modem back panel.

(d) Cut the straps between pins 9 and 24, 10 and 25 and 11 and 23.

(e) Reassemble the modem.

**3.1.2 Modem Unit 1/TG2479 Board 4 Replacement** Remove board 4 from the Modem Unit 1/TG2479, and dispose of locally. Fit the replacement board 4 supplied in the Kit No. 360A.

**3.2 Modem Internal Connexions** The Modem 11 is supplied with certain mandatory straps and additional strapping points for the selection of the operational options. Access to MU strapping points may be gained by releasing the two star headed screws securing the MU front panel on the right hand side of the MU, opening the front panel and withdrawing the appropriate circuit boards, as shown in Figure 2.

**3.2.1 Mandatory Straps** The Modem 11 is supplied with these straps inserted on several of the MU circuit boards and on the LSU LM 1/TG2472 (where provided). *These straps are essential - check that only these straps are inserted before any further work is carried out.* The mandatory straps and their locations are detailed in Table 2.

TABLE 2

| MANDATORY STRAPS INSERTED | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modem Unit 1/TG 2479 Boards | | | | | | | | | | | LSU Line Module 1/TG 2472 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 13 | 17 | |
| 5-6<br>3-4 | 7-8 | 4-5 | 5-6<br>11-12<br>14-15 | 3-4<br>5-8<br>11-12 | 2-5 | 2-3 | 1-2<br>11-12<br>23-24<br>31-32 | 8-9 | 3-4<br>7-8<br>11-12<br>14-15<br>or<br>4-5<br>8-9<br>11-10<br>13-14<br>As Fitted | 1-2<br>4-5 | 41-42<br>44-45<br>48-49 |

### 3.2.2 Facility Strapping

**3.2.2.1 General** In addition to the mandatory straps detailed in Table 2, soldered straps are required on the LM and MU circuit boards 2 and 3 depending upon the particular Datel Service Code as indicated in Figures 3, 4 and 5.

Care must be taken when strapping the modem to ensure that printed circuit board tracks are not 'bridged' by 'blobs' of solder and strapping pins are not loosened by prolonged application of a soldering iron.

**3.2.2.2 Strapping Required** The requisite strapping for each Datel Service Code is detailed in Figures 3, 4 and 5.

Modems for connexion to the PSTN must be strapped for a PSTN output level as follows:-

(i) if the modem is to be connected to an extension of a PBX, through which access may be gained to a private circuit, set the output level to -13 dBm.

(ii) if the modem is to be directly connected to the PSTN:-

(a) Determine the loop resistance of the local line. This may either be obtained from the line record card or measured by the exchange testing officer.

(b) Determine whether or not the local exchange and serving trunk unit are in the same building.

(c) If the local exchange and serving trunk unit are in the same building set the PSTN output level to:-

$$\left\{\frac{\text{loop resistance of the customer's line in ohms}}{100} - 9\right\} \text{dBm}$$

up to a maximum of 0 dBm.

(d) If the local exchange and serving trunk unit are not in the same building set the PSTN output level to:-

$$\left\{\frac{\text{loop resistance of the customer's line in ohms}}{100} - 4\right\} \text{dBm}$$

up to a maximum of 0 dBm.

| INSERT STRAPS FOR SERVICE CODES | 4830, 4840, 4860, 4870, 4880 | | | | 48—/—Z/ | 4830, 4840, 4860, 4870, 4880 | 4840, 4850, 4880 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUNCTION | MATCH MODEM TO 600 Ω | | MATCH MODEM TO 1100 Ω | | DISABLE PW SPEECH FACILITY | SET PW OUTPUT LEVEL TO −13 dBm | SET PSTN OUTPUT LEVEL TO (dBm) | | | | | | | |
| | AS REQUIRED | | | | | | −1 | −3 | −5 | −7 | −9 | −11 | −13 | −15 |
| STRAPS | 17–18 | 24–25 | 25–26 | 18–19 | 38–39 | 19–21 | 1–2 | 4–5 | 7–8 | 10–11 | 13–14 | 16–17 | 19–20 | 22–23 |

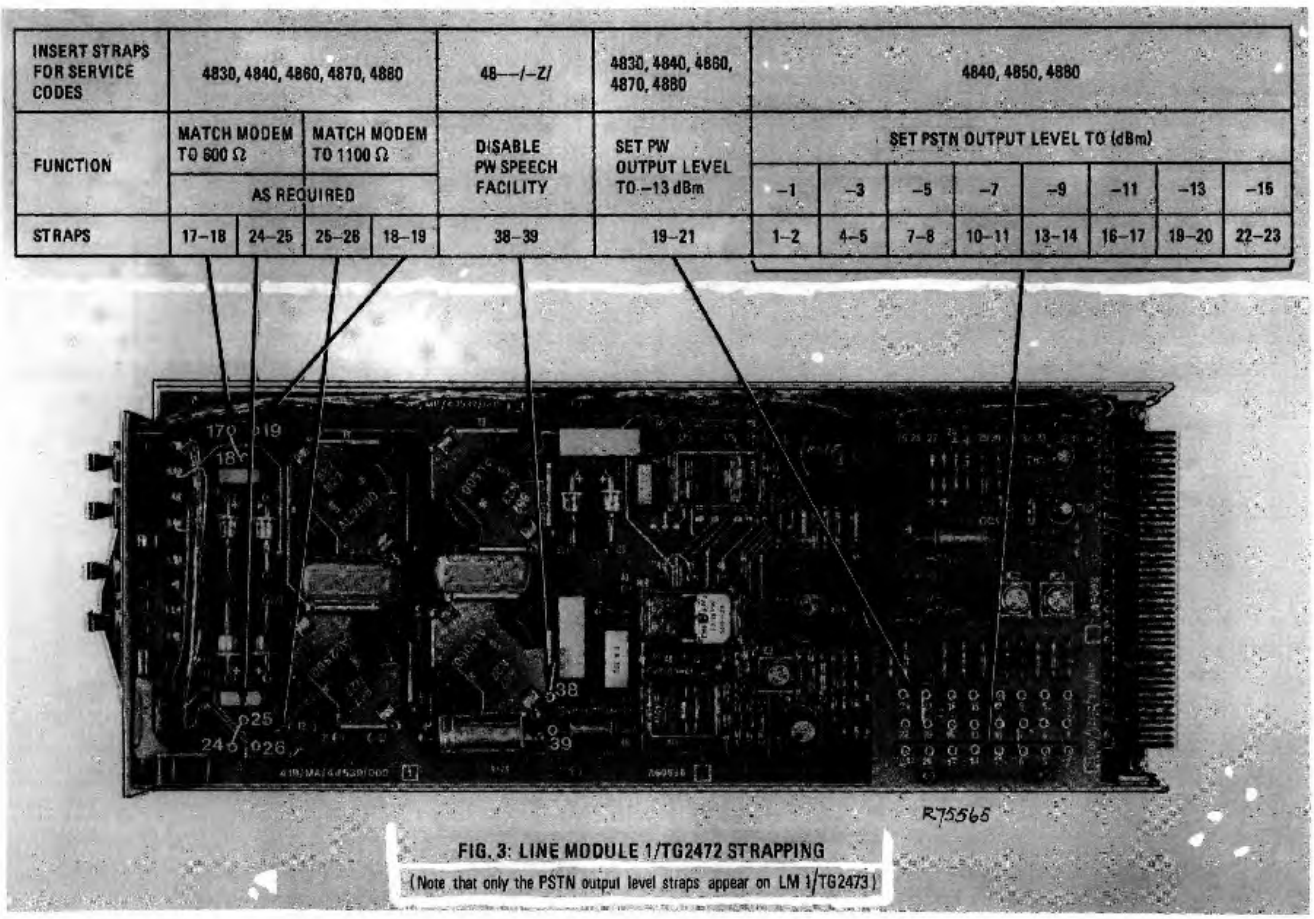
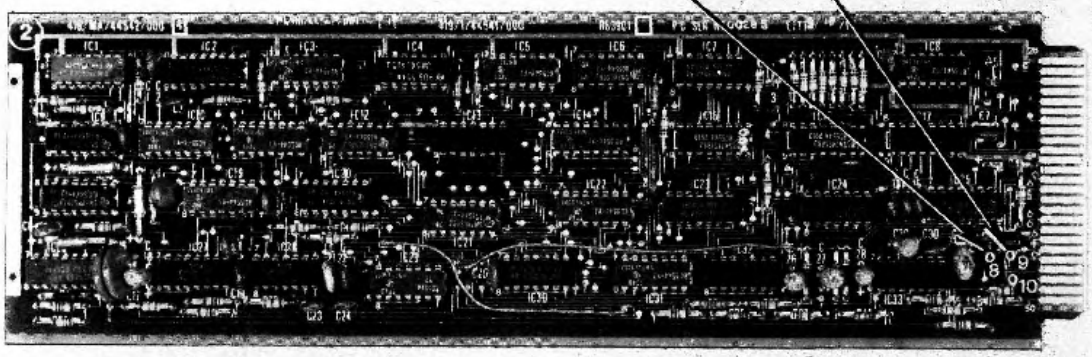



FIG. 3: LINE MODULE 1/TG2472 STRAPPING

(Note that only the PSTN output level straps appear on LM 1/TG2473)

| INSERT STRAP FOR MODEM SWITCHING CODE | S & SZ | T & TZ |
|---|---|---|
| FUNCTION | 108/2 ON | 108/2 FROM DTE |
| STRAP | 8–9 | 9–10 |




R75564

FIG. 4: MODEM UNIT 1/TG2479 BOARD 2 STRAPPING

| INSERT STRAP FOR TERMINAL CONFIGURATION CODE | 1 | 5 |
|---|---|---|
| FUNCTION | INTERNAL TIMING | EXTERNAL TIMING |
| STRAP | 14–15 | 14–16 |

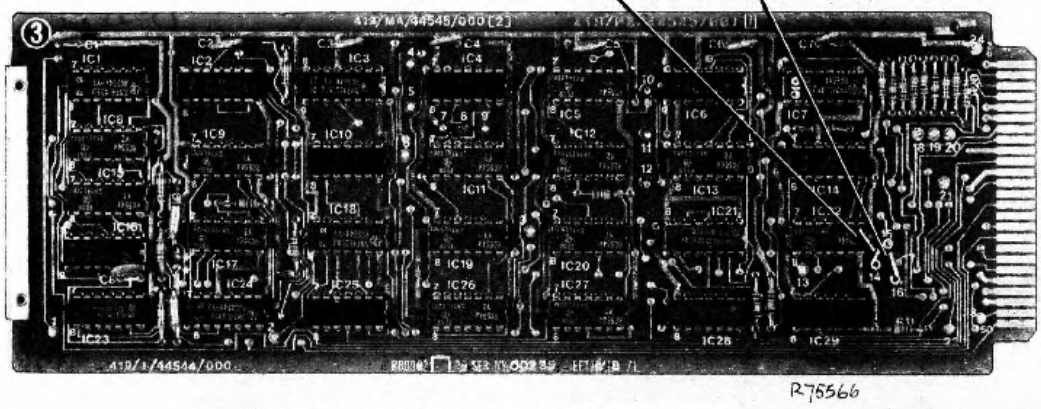



FIG. 5: MODEM UNIT 1/TG2479 BOARD 3 STRAPPING

## 3.3 Pre-Installation Testing

**3.3.1 Modem 11 System Operation** The Modem 11 incorporates an automatic adaptive equaliser. The operation of this equaliser places certain constraints on the connexion to line procedure of the modem. It is advisable to read the following paragraphs in order to gain an appreciation of this before attempting to carry out the testing procedures outlined in Tables 3 and 5.

**3.3.1.1 Private Circuit Operation** When operating on a 4-wire private circuit the Model 2 Modem 11 operates in a "constant carrier mode".

The initial equalisation procedure takes approximately 6s, after which the modem receiver continuously adapts to the incoming data stream to maintain equalisation. In the absence of data signals presented from the DTE, the modem transmits signals to line to maintain receiver equalisation at the remote modem. Should the modem detect no incoming line signals for a period in excess of 600 ms the Received Data and Received Line Signal Detector circuitry will be clamped OFF until a line signal is detected whereupon the initial equalisation sequence will be re-initiated.

Because the Model 3 and Model 4 modems have been designed for operation at the instation and outstation connexions respectively to multipoint private circuits, the equalisation sequences for these modems are slightly different. The Model 3 modem transmits line signals continuously to which the Model 4 modem receiver continuously adapts in a similar manner to the Model 2. The Model 4 modem commences every transmission to the Model 3 with a 25 ms synchronisation pattern to which the Model 3 receiver rapidly adapts.

*Therefore upon connexion of a Model 2 or a Model 4 modem to a private circuit a delay of 6s will be experienced before data can be exchanged. No significant delay will be experienced with a Model 3 modem - it will however be dependent upon the Model 4 attaining equalisation.*

**3.3.1.2 Exchange Line Operation** When operating on an exchange line the Modem 11 follows a more rigorous equalisation procedure than when on a private circuit. This involves the exchange of Long Training Patterns (LTP) between modems to equalise their respective receivers prior to the transmission of data. When answering an incoming exchange line call, either manually or automatically, under the control of the telephone keys, the Modem 11 will transmit a 2.4s 2100 Hz answertone, followed by 2s of silence and a 3s LTP. The calling station (which *must* be connected to line during the receipt of the 2100 Hz tone) will respond with the transmission of a LTP to the answering station. Upon completion of this equalisation sequence, which takes about 12s, both modems will present an ON condition to the DTE on the Data Set Ready interchange circuit. This indicates to the DTE that the modem receiver has equalised. Should a modem fail to receive a LTP at the correct time it will automatically disconnect from line within 20s of connexion.

*Therefore upon connexion to an exchange line, under the control of the telephone keys, a delay of 12s will be experienced before data may be exchanged.*

The Modem 11 is equipped with test keys on the front panel of the MU which may be used to connect the modem to line for testing purposes. When this method is used to connect the modem to an exchange line slightly different equalisation sequences are followed, as follows:-

When transmitting data from the DTE a 3s LTP is only transmitted to line subsequent to the first application of an ON condition on the Request to send interchange circuit.

When transmitting data under the control of the BIN1/BIN0 test key a 3s LTP is transmitted to line subsequent to connexion to line. When the modem is connected to line under the control of the test keys the ON TEST key must always be operated last of all. In addition, before reconfiguring the test keys for subsequent tests, the ON TEST key must always be released, and re-operated after reconfiguration of the other test keys, to ensure correct re-equalisation of the modem.

*Therefore upon connexion to an exchange line, under the control of the test keys a delay of 3s will be experienced before data may be exchanged.*

**3.3.2 Preliminary Modem Testing** Carry out the test programme detailed in Table 3 either prior to, or at the time of installation, depending upon local arrangements. The following test equipment will be required:-

1 Attenuator No. 70A

2 Datel Testers No. 10 (Note)

1 Datel Tester No. 12

1 Meter Multirange No. 12

1 Measuring Set No. 44C

1 Modem 11, - appropriate model, equipped with suitable LSU LM, to work "back-to-back" to the modem under test (see C3 I4820 for service codes for compatible modems).

1 Tester; Line-Earth-Loop Impedance (see A2 E1006) - only required if the preliminary test programme below is carried out at the customer's premises.

NOTE:- Should Datel Testers No. 10 be unavailable Datel Testers No. 1 may be used.

Table 3 follows

TABLE 3

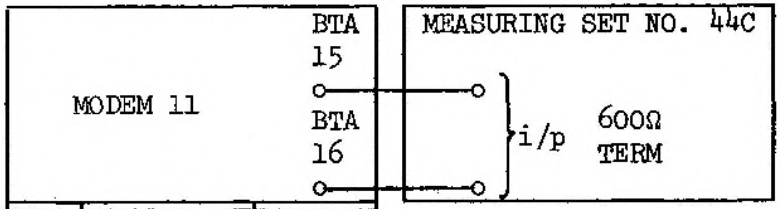
PRELIMINARY TESTING PROGRAMME

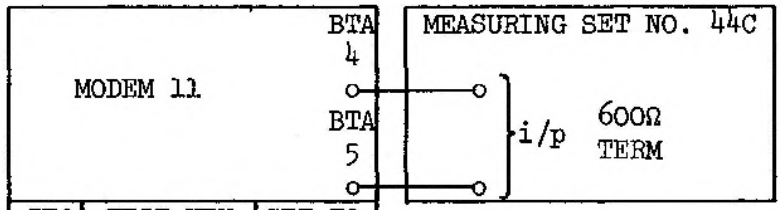
| TEST | PERFORM FOR DATEL FACILITY CODES | PROCEDURE |
|---|---|---|
| 1 AC MAINS (Perform only if testing carried out at customer's premises) | All | (i) Connect the Tester; Line-Earth-Loop Impedance, to the mains socket outlet.<br>(ii) Perform the tests detailed in A2 E1006.<br>(iii) If the prescribed limits are not met:-<br>(a) Do *NOT* connect the Modem 11 to the mains socket.<br>(b) Report the matter to the Assistant Datel Co-ordination Officer (ADCO). |
| 2 MODEM EARTHING | All | (i) Set the Meter Multirange No. 12 to measure resistance.<br>(ii) Check that there is *NO* connexion in the LSU between Control Common (BTA 10) and protective earth (BTA 64).<br>(iii) With the MU and the LSU connected together check for continuity between the earth wire of the mains supply cord and the metalwork of the MU and the LSU Main Unit 1/TG 2485.<br>(iv) If either check (ii) or (iii) proves a unit to be faulty, change the relevant unit. |
| 3 AC VOLTAGE SETTING | All | (i) Ascertain the nominal mains voltage available.<br>(ii) Ensure that the mains supply is *NOT* connected to the LSU.<br>(iii) Loosen the screws securing the metal cover marked 'DANGER 250 V AC' on the right hand side of the LSU, (see Fig 6) and remove the cover.<br>(iv) Loosen the screws securing the white plastic cover marked 'DANGER 250 V AC' and remove the cover.<br>(v) Connect the black and red leads to the appropriate terminals on the block terminal as indicated in the following table (see Fig 7):- |

TABLE 3 (Contd)

<table>
<tr><th>TEST</th><th>PERFORM FOR DATEL FACILITY CODES</th><th>PROCEDURE</th></tr>
<tr><td>3 AC VOLTAGE SETTING (Contd)</td><td>All</td><td>
<table>
<tr><th>Nominal Mains Voltage</th><th>Connect Red Lead to:</th><th>Connect Black Lead to:</th></tr>
<tr><td>250</td><td>240</td><td>10</td></tr>
<tr><td>240</td><td>240</td><td>0</td></tr>
<tr><td>230</td><td>220</td><td>10</td></tr>
<tr><td>220</td><td>220</td><td>0</td></tr>
<tr><td>210</td><td>200</td><td>10</td></tr>
<tr><td>200</td><td>200</td><td>0</td></tr>
</table>
(vi) Replace the white plastic label and metal cover.<br>
(vii) Check that all the fuses (FS1, FS2 and FS3) are fitted, are of the correct value and intact.
</td></tr>
<tr><td>4 DC VOLTAGE MEASUREMENT</td><td>All</td><td>
(i) Check that the correct length of MU/LSU interconnecting cord is fitted. If necessary change the cord. Details of alternative cords are given in C3 I4825. Wiring information for the cords is given in Figure 8.<br>
(ii) Depending on the customer's mains socket outlet, terminate the mains cord on a 5A or 13A (BSI) 3-pin plug (fused at 3A) and insert in the socket outlet.<br>
(iii) Remove the cover located over the test points on the front of the MU. Using a meter Multirange No. 12 measure the voltages between the test points.
<table>
<tr><th>Test Points</th><th>Test Limits</th></tr>
<tr><td>+12 V and 0 V</td><td>+ 12 ± 1.0 V</td></tr>
<tr><td>-12 V and 0 V</td><td>- 12 ± 1.0 V</td></tr>
<tr><td>+ 5 V and 0 V</td><td>+ 5 ± 0.5 V</td></tr>
</table>
(iv) If the voltages measured fall outside these limits change the MU.
</td></tr>
</table>

TABLE 3 (Contd)

<table>
<tr><th rowspan="2">TEST</th><th rowspan="2">PERFORM FOR DATEL FACILITY CODES</th><th colspan="2">PROCEDURE</th></tr>
<tr><th>METHOD OF SETTING-UP EQUIPMENT</th><th>OBSERVATIONS</th></tr>
<tr>
<td>5<br>MODEM<br>PSTN<br>OUTPUT<br>LEVEL</td>
<td>4840<br>4850<br>4880</td>
<td>


<table>
<tr><th>SEQ</th><th>TEST KEY</th><th>SET TO</th></tr>
<tr><td>1</td><td>Remote/ Local Test</td><td>Normal</td></tr>
<tr><td>2</td><td>PSTN/PW</td><td>PSTN</td></tr>
<tr><td>3</td><td>BIN1/BIN0</td><td>BIN1</td></tr>
<tr><td>4</td><td>Data Rate</td><td>4800</td></tr>
<tr><td>5</td><td>On Test/ IND Check</td><td>On Test</td></tr>
</table>
</td>
<td>Measure the modem output level and check that it is within ± 1 dBm of the level set (see section 3.2.2.2).<br><br>If the level cannot be adjusted to within this range change the LM 1/TG 2472 or 1/TG 2473 (as fitted).</td>
</tr>
<tr>
<td>6<br>MODEM<br>PW<br>OUTPUT<br>LEVEL</td>
<td>4830<br>4840<br>4860<br>4870<br>4880</td>
<td>


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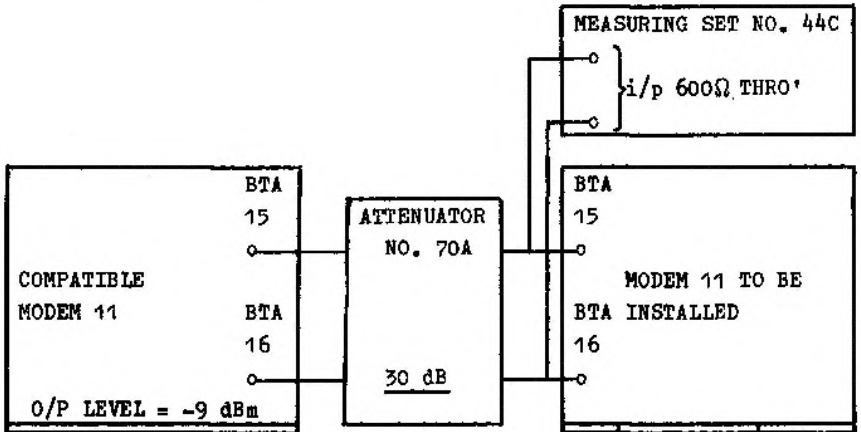
<tr><td>1</td><td>Remote/ Local Test</td><td>Normal</td></tr>
<tr><td>2</td><td>PSTN/PW</td><td>PW</td></tr>
<tr><td>3</td><td>BIN1/BIN0</td><td>BIN1</td></tr>
<tr><td>4</td><td>Data Rate</td><td>4800</td></tr>
<tr><td>5</td><td>On Test IND Check</td><td>On Test</td></tr>
</table>
</td>
<td>Measure the modem output level and check that it is -13 ± 1 dBm.<br><br>If the level cannot be adjusted to within this range change the LM 1/TG 2472.</td>
</tr>
</table>

TABLE 3 (Contd)

| TEST | PERFORM FOR DATEL FACILITY CODES | PROCEDURE |
|---|---|---|
| | | METHOD OF SETTING-UP EQUIPMENT |
| 7<br>PSTN LINE SIGNAL FAIL TEST | 4840<br>4850<br>4880 |  |

| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PSTN |
| 3 | BIN1/BIN0 | BIN1 |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PSTN |
| 3 | BIN1/BIN0 | Normal |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

OBSERVATIONS

(i) Operate the ON TEST/IND CHECK key, on the modem under test, to the IND CHECK position and check that all the indicators glow.

(ii) Operate ON TEST/IND CHECK key, on the modem under test, to the ON TEST position.

(iii) Operate the ON TEST/IND CHECK key on the compatible modem to the ON TEST position. Observe the indicators on the modem under test and note that after 3s only the BIN1, TEST MODE, and LIN SIG indicators glow.

(iv) Increase attenuation until LIN SIG indicator extinguishes and DATA QUAL indicator glows.

(v) Note the level measurement.

(vi) Decrease attenuation until the DATA QUAL indicator extinguishes and the LIN SIG indicator glows.

(vii) Note the level measurement.

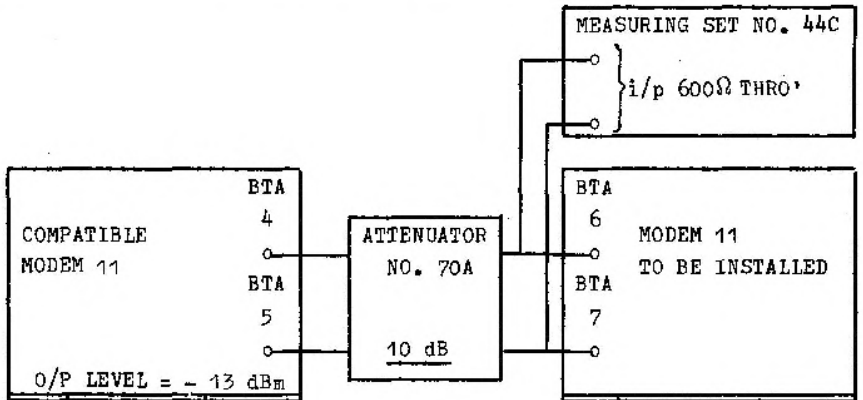
(viii) Check that levels measured in (iv) and (vi) are within the limits:-

| PSTN LINE SIGNAL LEVEL dBm | | |
|---|---|---|
| FAIL LEVEL (iv) | RESTORE LEVEL (vi) | DIFFERENCE ((vi)-(iv)) |
| ≤ -48 | ≥ -43 | ≥ 2 |

(ix) If the levels measured are outside limits change the complete MU

TABLE 3 (Contd)

| TEST | PERFORM FOR DATEL FACILITY CODES | PROCEDURE | |
|---|---|---|---|
| | | METHOD OF SETTING-UP EQUIPMENT | OBSERVATIONS |
| 8<br>PW LINE<br>SIGNAL<br>FAIL TEST | 4830<br>4840<br>4860<br>4870<br>4880 | | (i) Operate the ON TEST/IND CHECK key to IND CHECK on the modem under test, and check that all indicators glow.<br>(ii) Operate the ON TEST/IND CHECK keys on both modems to the ON TEST position. Check that after 6s only the BIN1, TEST MODE and LIN SIG indicators glow on the modem under test.<br>(iii) Increase attenuation until LIN SIG indicator extinguishes and DATA QUAL indicator glows.<br>(iv) Note the level measurement.<br>(v) Decrease attenuation until DATA QUAL indicator extinguishes and the LIN SIG indicator glows.<br>(vi) Note the level measurement.<br>(vii) Check that the levels noted in (iv) and (vi) are within the limits:- |




| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PW |
| 3 | BIN1/BIN0 | BIN1 |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

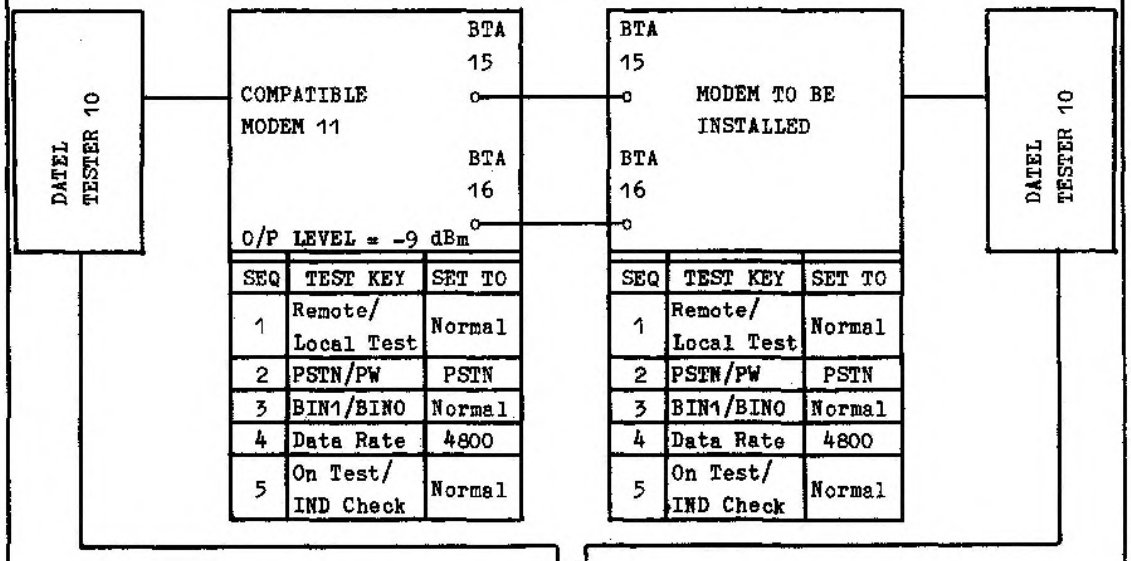
| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PW |
| 3 | BIN1/BIN0 | BIN1 |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

| PW LINE SIGNAL LEVEL dBm | | |
|---|---|---|
| FAIL LEVEL (iv) | RESTORE LEVEL (vi) | DIFFERENCE (vi)-(iv) |
| ⩽ -31 | ⩾ -26 | ⩾ 2 |

(viii) If the levels are outside limits change the complete MU.

TABLE 3 (Contd)

| TEST | PERFORM FOR DATEL FACILITY CODES | PROCEDURE |
|---|---|---|
| | | METHOD OF SETTING-UP THE EQUIPMENT |
| 9<br>ERROR COUNTS<br><br>MODEMS FOR CONNEXION TO PSTN | 4840<br>4850<br><br>4880 | |




| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PSTN |
| 3 | BIN1/BIN0 | Normal |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PSTN |
| 3 | BIN1/BIN0 | Normal |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

Set tester controls as specified - controls not specified should remain unoperated

| CONTROL | SET TO |
|---|---|
| Forward Channel Rate | Modem |
| Pattern | 511 BIT P-R |
| Receive Rate | Modem |
| Error Run | On |
| Function | Errors Cont |

OBSERVATIONS

(i) Operate the ON TEST/IND CHECK keys on both modems to the ON TEST position.

(ii) Check that initially the BIN1, and TEST MODE indicators glow on both modems.

(iii) Operate the REQUEST TO SEND control, on the tester associated with the compatible modem.

(iv) Check that the BIN1, TEST MODE, DATA QUAL and LIN SIG indicators, on the receiving modem, glow for approximately 3s whilst the modem equalises.

(v) Check that, after equalisation has been achieved, the BIN1, BIN0, TEST MODE and LIN SIG indicators glow and the DATA QUAL indicator extinguishes.

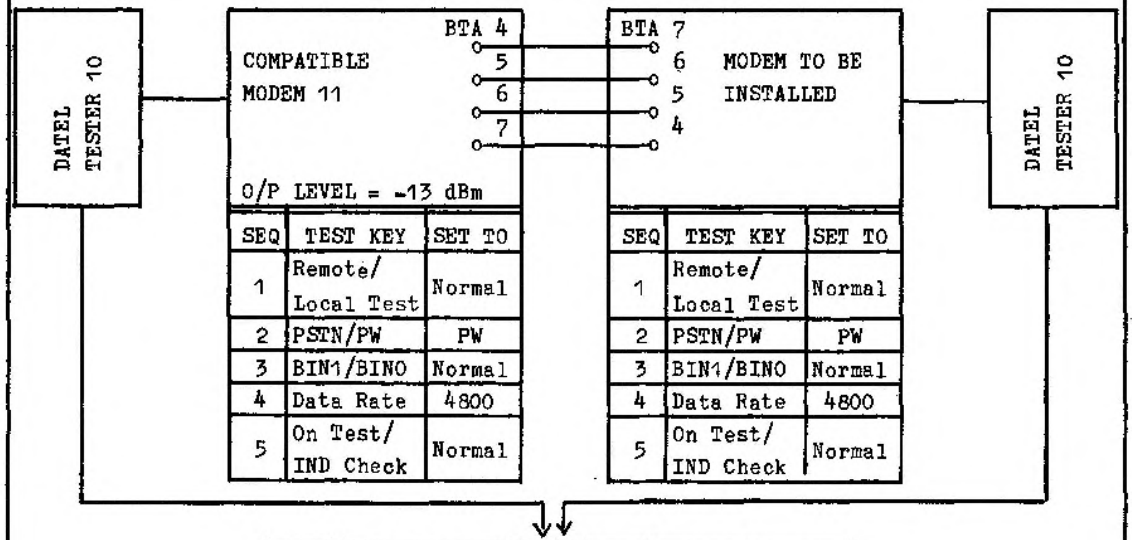
(vi) Check that no errors are recorded during a 5 minutes transmission period.

(vii) Reset the ON TEST/IND CHECK keys to the NORMAL position and repeat tests (i)-(vi) in the opposite direction of transmission.

(viii) If tests prove unsatisfactory change the complete MU.

TABLE 3 (Contd)

| TEST | PERFORM FOR DATEL FACILITY CODES | PROCEDURE |
|---|---|---|
| | | METHOD OF SETTING-UP THE EQUIPMENT |




| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PW |
| 3 | BIN1/BINO | Normal |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

| SEQ | TEST KEY | SET TO |
|---|---|---|
| 1 | Remote/ Local Test | Normal |
| 2 | PSTN/PW | PW |
| 3 | BIN1/BINO | Normal |
| 4 | Data Rate | 4800 |
| 5 | On Test/ IND Check | Normal |

Set tester controls as specified - controls not specified should remain unoperated

| CONTROL | SET TO |
|---|---|
| Forward Channel Rate | Modem |
| Pattern | 511 BIT P-R |
| Receive Rate | Modem |
| Error Run | On |
| Function | Errors Cont |

10 ERROR COUNTS 4830 4840 4860 MODEMS FOR CONNEXION TO PW 4870 4880

OBSERVATIONS

(i) Operate the ON TEST/IND CHECK key on each modem to ON TEST.

(ii) Check that initially the BIN1 TEST MODE, DATA QUAL and LIN SIG indicators glow.

(iii) Check that after 6s, equalisation time the BIN1, TEST MODE and LIN SIG indicators glow and DATA QUAL indicator extinguishes.

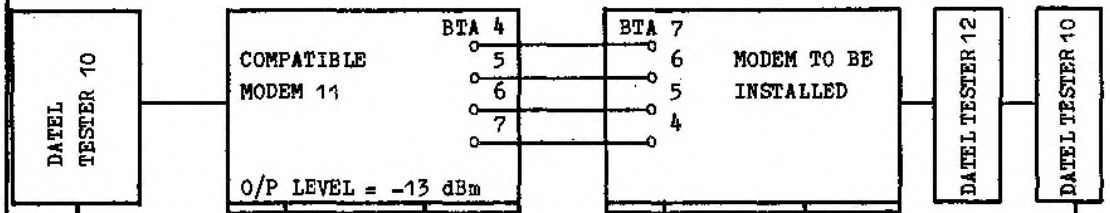
(iv) Operate the BIN1/BINO key, on the modem under test, to the BINO position and check that the BIN1 indicator extinguishes and the BINO indicator glows on the compatible modem. Repeat test in opposite direction of transmission.

(v) With BIN1/BINO keys returned to NORMAL operate the REQUEST TO SEND control on both testers and transmit data for 5 minutes.

(vi) Check that no errors are recorded in either direction.

(vii) If the tests prove unsatisfactory change the complete MU.

TABLE 3 (Contd)

| TEST | PERFORM FOR DATEL FACILITY CODES | PROCEDURE |
|---|---|---|
| | | METHOD OF SETTING-UP THE EQUIPMENT |
| 11<br>RECEIVER<br>SIGNAL<br>ELEMENT<br>TIMING<br>(RSET)<br>CHECK | 4830<br>4840<br>4860<br>4870<br>4880 |  <br>**COMPATIBLE MODEM 11**<br>O/P LEVEL = -13 dBm<br>BTA 4<br>5<br>6<br>7<br>BTA 7<br>6<br>5<br>4<br>MODEM TO BE INSTALLED<br>DATEL TESTER 12<br>DATEL TESTER 10<br><br>**SEQ / TEST KEY / SET TO**<br>1 Remote/Local Test — Normal<br>2 PSTN/PW — PW<br>3 BIN1/BIN0 — Normal<br>4 Data Rate — 4800<br>5 On Test/IND Check — Normal<br><br>**SEQ / TEST KEY / SET TO**<br>1 Remote/Local Test — Normal<br>2 PSTN/PW — PW<br>3 BIN1/BIN0 — Normal<br>4 Data Rate — 4800<br>5 On Test/IND Check — Normal<br><br>Set tester controls as specified - controls not specified should remain unoperated<br><br>**CONTROL / SET TO**<br>Forward Channel Rate — Modem<br>Pattern — 511 BIT P-R<br>Receive Rate — Modem<br>Error Run — On<br>Function — Errors Cont |

**OBSERVATIONS**

(i) Operate the ON TEST/IND CHECK key on each modem to ON TEST.

(ii) Check that initially the BIN1 TEST MODE, DATA QUAL and LIN SIG indicators glow.

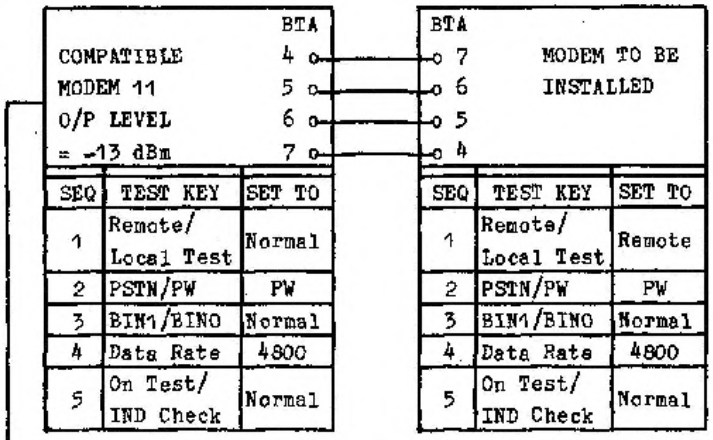
(iii) Check that after 6s, equalisation time the BIN1, TEST MODE and LIN SIG indicators glow and DATA QUAL indicator extinguishes.

(iv) Operate the REQUEST TO SEND control on the tester associated with the compatible modem.

(v) Use the Tester 12 to check that 4800 Hz (± 1%) timing signals are present on pin 17 of the interface of the modem to be installed.

(vi) If this test proves unsatisfactory change the complete MU.

TABLE 3 (Contd)

<table>
<tr><th>TEST</th><th>PERFORM FOR DATEL PACILITY CODES</th><th>PROCEDURE<br>METHOD OF SETTING-UP THE EQUIPMENT</th><th>OBSERVATIONS</th></tr>
<tr><td>12<br>REMOTE<br>TEST<br>(DIGITAL<br>LOOP)</td><td>All</td><td>


<table>
<tr><th>SEQ</th><th>TEST KEY</th><th>SET TO</th></tr>
<tr><td>1</td><td>Remote/<br>Local Test</td><td>Normal</td></tr>
<tr><td>2</td><td>PSTN/PW</td><td>PW</td></tr>
<tr><td>3</td><td>BIN1/BINO</td><td>Normal</td></tr>
<tr><td>4</td><td>Data Rate</td><td>4800</td></tr>
<tr><td>5</td><td>On Test/<br>IND Check</td><td>Normal</td></tr>
</table>
<table>
<tr><th>SEQ</th><th>TEST KEY</th><th>SET TO</th></tr>
<tr><td>1</td><td>Remote/<br>Local Test</td><td>Remote</td></tr>
<tr><td>2</td><td>PSTN/PW</td><td>PW</td></tr>
<tr><td>3</td><td>BIN1/BINO</td><td>Normal</td></tr>
<tr><td>4</td><td>Data Rate</td><td>4800</td></tr>
<tr><td>5</td><td>On Test/<br>IND Check</td><td>Normal</td></tr>
</table>
<table>
<tr><th colspan="2">DATEL TESTER 10</th></tr>
<tr><td colspan="2">Set tester controls as specified - controls not specified should remain unoperated</td></tr>
<tr><th>CONTROLS</th><th>SET TO</th></tr>
<tr><td>Forward Channel Rate</td><td>Modem</td></tr>
<tr><td>Pattern</td><td>511 BIT P-R</td></tr>
<tr><td>Receive Rate</td><td>Modem</td></tr>
<tr><td>Error Run</td><td>On</td></tr>
<tr><td>Function</td><td>Errors Cont</td></tr>
</table>
</td><td>(i) Operate the ON TEST/IND Check Keys on both modems to ON TEST.<br>(ii) Check that initially the BIN1, TEST MODE, DATA QUAL and LIN SIG indicators glow on both modems.<br>(iii) Check that after 6s the DATA QUAL indicators extinguish.<br>(iv) Operate the REQUEST TO SEND control on the tester.<br>(v) Check that the BINO, BIN1, TEST MODE and LIN SIG indicators glow on both modems and the tester 'phases in'.<br>(vi) If this test is unsatisfactory change the complete MU.</td></tr>
</table>

TABLE 3 (Contd)

<table>
<tr><th rowspan="2">TEST</th><th rowspan="2">PERFORM FOR DATEL FACILITY CODES</th><th colspan="2">PROCEDURE</th></tr>
<tr><th>METHOD OF SETTING-UP THE EQUIPMENT</th><th>OBSERVATIONS</th></tr>
<tr>
<td>13<br>LOCAL TEST (ANALOGUE LOOP)</td>
<td>All</td>
<td>
<table>
<tr><th colspan="3">MODEM TO BE INSTALLED</th></tr>
<tr><th>SEQ</th><th>TEST KEY</th><th>SET TO</th></tr>
<tr><td>1</td><td>Remote/ Local Test</td><td>Local</td></tr>
<tr><td>2</td><td>PSTN/PW</td><td>PSTN</td></tr>
<tr><td>3</td><td>BIN1/BIN0</td><td>Normal</td></tr>
<tr><td>4</td><td>Data Rate</td><td>4800</td></tr>
<tr><td>5</td><td>On Test/ IND Check</td><td>Normal</td></tr>
</table>
<table>
<tr><th colspan="2">DATEL TESTER NO. 10</th></tr>
<tr><td colspan="2">Set tester controls as specified - controls not specified should remain unoperated</td></tr>
<tr><th>CONTROL</th><th>SET TO</th></tr>
<tr><td>Forward Channel Rate</td><td>Modem</td></tr>
<tr><td>Pattern</td><td>511 BIT P-R</td></tr>
<tr><td>Receive Rate</td><td>Modem</td></tr>
<tr><td>Error Run</td><td>ON</td></tr>
<tr><td>Function</td><td>Errors Cont</td></tr>
</table>
</td>
<td>
(i) Operate the REQUEST TO SEND control on the tester and the ON TEST/IND CHECK Key on the modem to ON TEST.<br>
(ii) Check that initially the BIN1, TEST MODE, LIN SIG and DATA QUAL indicators glow.<br>
(iii) Check that after 3s the DATA QUAL indicator extinguishes and the tester 'phases in'.<br>
(iv) Reset the ON TEST/IND CHECK Key to NORMAL, and the PSTN/PW Key to PW.<br>
(v) Repeat tests (i)-(iii) noting that the delay involved in (iii) is now 6s.<br>
(vi) If this test is unsatisfactory change the <u>complete</u> MU.
</td>
</tr>
</table>

# 4 INSTALLATION

**4.1 Accommodation for Free Standing Modems** Before commencing the installation, check that the following accommodation requirements are met (further details of accommodation requirements are given in C3 I1000). Note that the modem consists of a Modem Unit and a Line Switching Unit.

| | |
|---|---|
| Position: | Not more than 1.5 m (5 ft) above floor level (normally table height), and it must be possible to change the modem without removing or requiring access to any non Post Office equipment (other than the mains socket outlet). Whenever the LSU is wall-mounted, the test links must be accessible, and there should be no obstruction to the cable entry, and to the removal of the Line Module. The LSU should be positioned within 3 m of the mains socket, and 5 m of the position of the MU. |
| Ventilation: | Air must be able to circulate at room temperature on all sides of the modem. |
| Safety: | No sudden change in floor level within 1 m of the modem and a minimum clear headroom above this area of 2.2 m, and no other object in this area that would hinder PO staff or render maintenance unsafe. |
| Testing and Maintenance Access: | There must be direct access to both the Modem Unit and Line Switching Unit with adequate clearance for testing and maintenance. It must be possible to remove connector plugs without hindrance. |
| Accidental Damage: | There must be minimal risk of damage to the modem through excess sunlight, condensation etc. |
| Mains Supply: | The customer must provide a switched mains socket-outlet of 5A or 13A fusing capacity, for use exclusively with the modem, and must connect it to a 200-250 V 50 Hz mains supply, and an efficient connexion to a protective earth. |
| Customer-Provided Rack Mounting: | Before mounting the modem in any customer-provided rack ensure that the title of the rack is listed in "List 1 of permissible attachments (Datel Services)" held by GM(s). |
| Connexion of other equipment: | Check that the Data Terminal Equipment which the customer proposes to use in connexion with the modem is included in "List 1 of permissible attachments (Datel Services)" held by GM(s). (See D5 C0010.) |

**4.2 Installation Wiring** Remove the LSU cover by turning through 90° the two screws on the top of the unit and lifting the cover free. Remove the plastic plate covering the BTA terminations (see Fig 6) and wire the modem to the relevant DT/DTW(L) diagram (listed in C3 I4825). Secure the cables in the cable clamp at the rear of the LSU. The mains cord may be shortened if necessary.

Fit the rubber feet provided (with Cover 1/TG 2482) to the MU, if it is to be table mounted.

If the LSU is to be table mounted fit the rubber feet, provided on the storage bracket within the LSU main unit, to the LSU main unit.

If the LSU is to be wall mounted use No. 8 woodscrews, each at least 1½ inches long, bearing in mind the wall construction. The LSU fixing holes are keyed to enable the LSU to be wall mounted front uppermost. The fixing holes are shown in Fig 6.

When installing the modem, it is recommended that in addition to the LSU/MU inter-connecting cord fitted, an alternative length of Cord Connecting No. 22/2- be taken along to the installation, in case the customer's requirements have changed. If the inter-connecting cord has to be changed, it should be wired to the LSU as detailed in Fig 8. Figure 8 details all the BTA connexions, and this information is also printed on the plastic cover fitted over the BTA connexions. Complete both the label on the MU and the label on the LSU in soft pencil.

Figures 6, 7 and 8 follow:

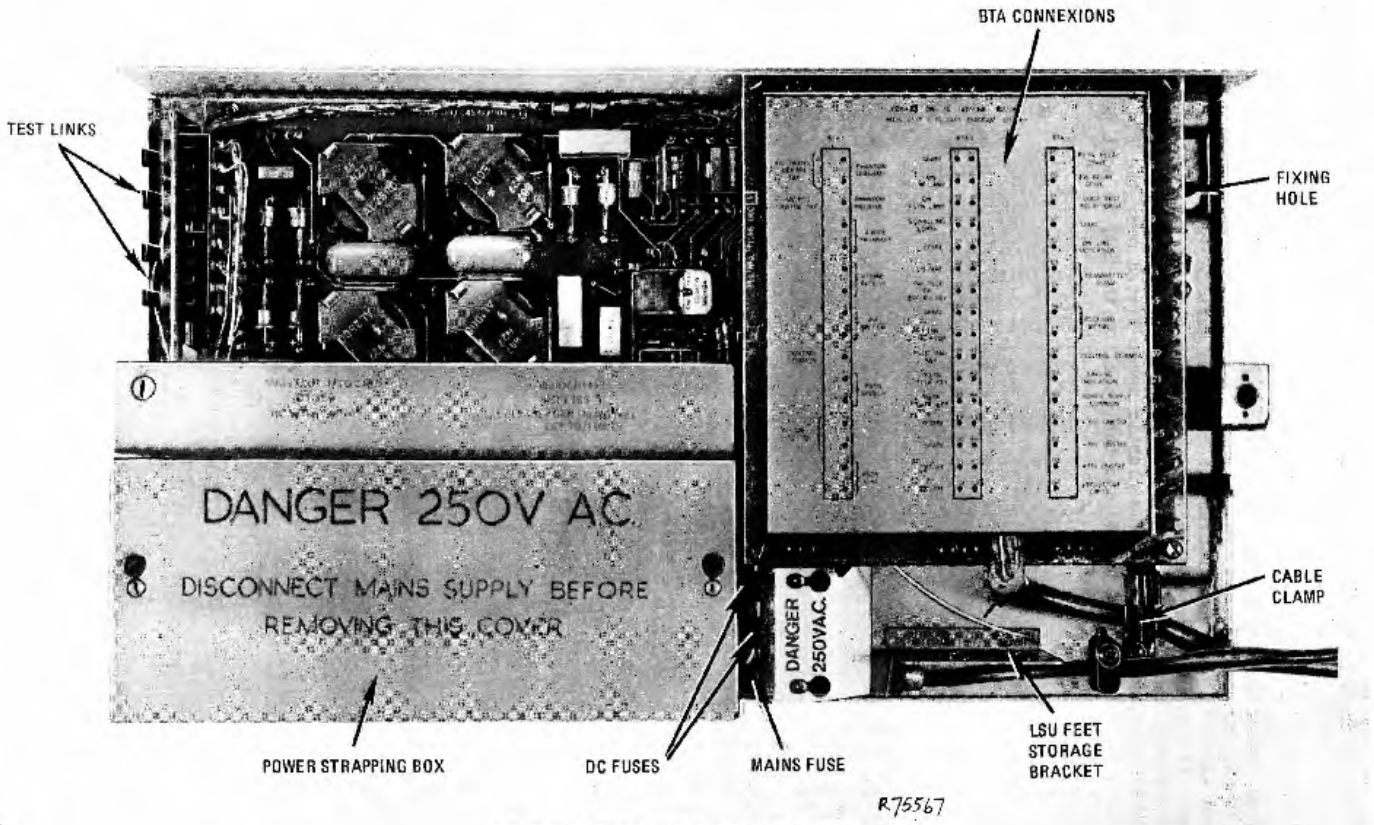



FIG. 6: MODEM 11 LINE SWITCHING UNIT

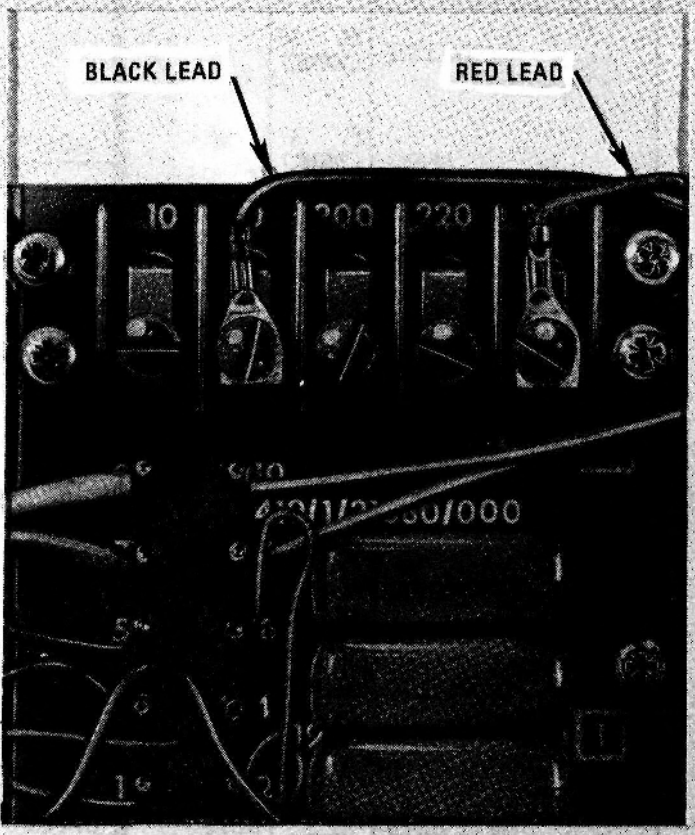



FIG. 7: POWER STRAPPING BOX

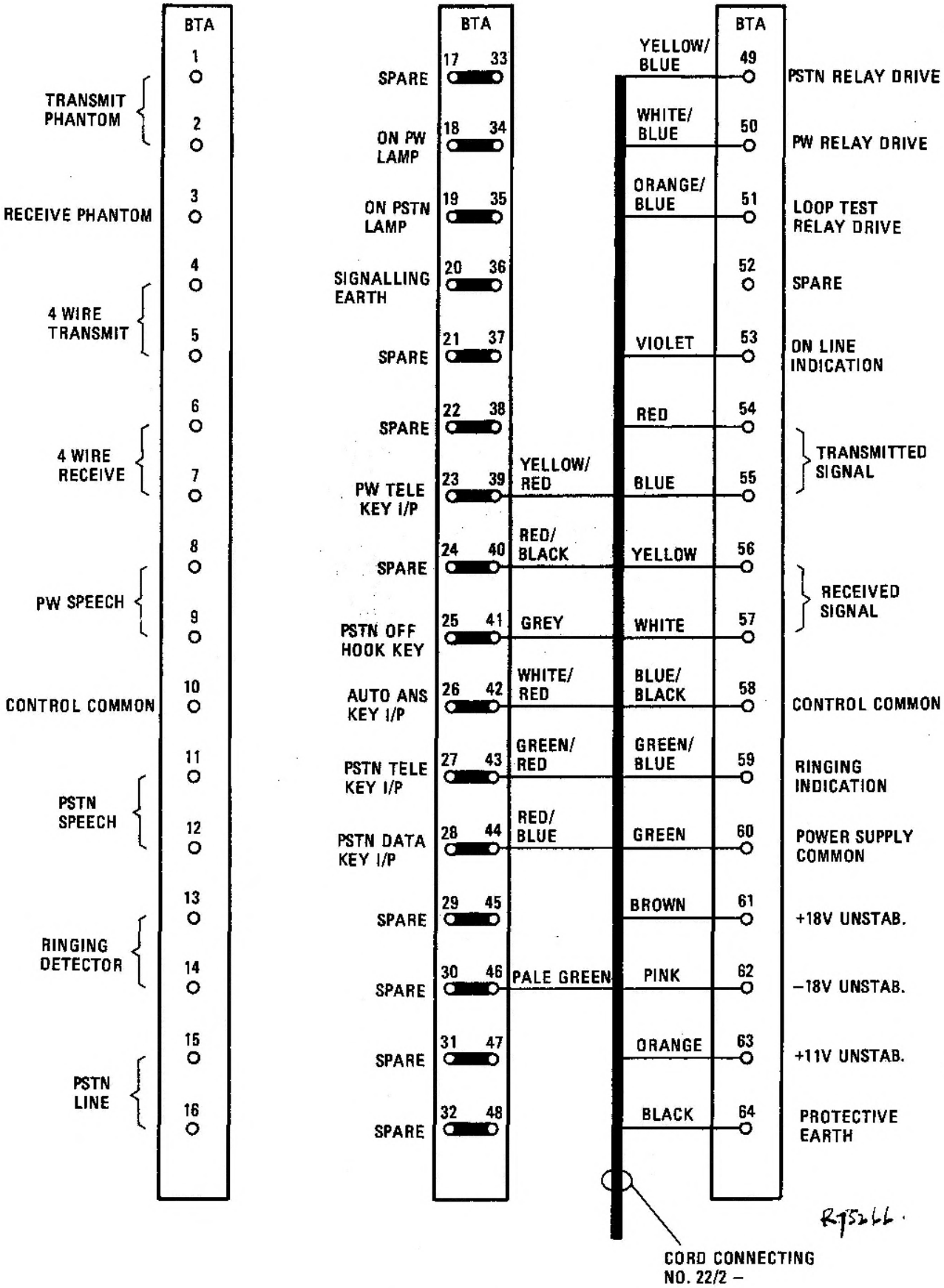



FIG. 8 – BLOCK TERMINAL (BTA) CONNEXIONS

**4.3 Equipment Diagrams** Diagrams for the modem equipment are as follows:-

| | |
|---|---|
| Line Module 1/TG 2472 | DT 357 |
| Line Module 1/TG 2473 | DT 359 |
| Main Unit 1/TG 2485 | DT 369 |
| Modem Unit 1/TG 2479 | DT 366 |
| Modem Unit 1/TG 2519 | DT 442 |
| Modem Unit 1/TG 2530 | DT 443 |
| Modem 11 Block Diagram | DT 364 |

**4.4 Installation Testing**

**4.4.1 AC Mains Test** Only perform the test detailed in Table 4 if the Preliminary Test Programme, para 3.3.2, was *not* carried out on the customer's premises. Check also the mains voltage setting as described in Table 3, Test 3.

The following test equipment will be required:-

Tester-Line-Earth Loop Impedance (see A2 E1006).

TABLE 4

AC MAINS TEST

| | Method |
|---|---|
| (i) | Connect the "Tester-Line-Earth Loop Impedance" to the mains socket outlet. |
| (ii) | Perform the tests detailed in A2 E1006. |
| (iii) | If the prescribed limits are not met:<br>(a) Do *not* connect the modem to the mains socket.<br>(b) Report the matter to the ADCO. |

**4.4.2 Data Tests** These tests apply to modems with Datel Service Codes 4840, 4850 and 4880. For modems on private circuits only it is not possible to carry out the tests listed in Table 5. For these modems all data tests must be carried out at the commissioning stage (see Appendix 1) unless 4-wire test access to the DTC is available via the TMCC. In this case the *private circuit* tests detailed in Appendix 1 may be carried out.

Carry out the tests detailed in Table 5. The following test equipment will be required.

1 Datel Tester No. 10
1 Datel Tester No. 12

Should a Datel Tester No. 10 be unavailable a Datel Tester No. 1 may be used. Under these circumstances 5 minute 511 bit P-R tests should be carried out instead of automatic turnrounds. The maximum error counts are 1440 and 720 at 4800 bit/s and 2400 bit/s respectively.

Note that where a Datel Tester No. 1 is used to test a Modem 11, strapped for *external* turning (service code 48--/-/5), a Datel Tester No. 12 (or suitable equivalent) will be required to effect the cross connexion between pin 9 on the Datel Tester No. 1 interface and pin 24 on the modem interface.

TABLE 5

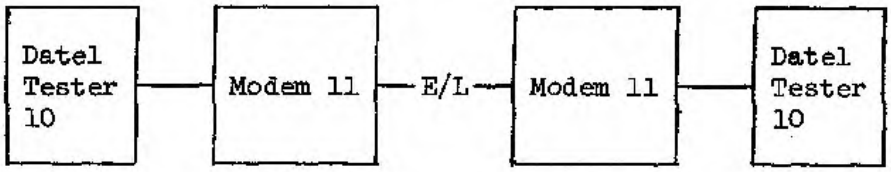
<table>
<tr><th>Test</th><th>Procedure</th></tr>
<tr><td>1 Setting-up of equipment</td><td>(i) If necessary restrap the modem for INTERNAL timing.<br>(ii) Connect the equipment as shown below:<br>  <br></td></tr>
<tr><td>2 Calling Station Automatic Disconnect</td><td>(i) Operate the TELE/OFF PW key on the private circuit telephone, and the DATA key on the PSTN telephone.<br>(ii) Note that the red lamp glows on the telephone(s) for a period of approximately 20s and then extinguishes.<br>(iii) If the test proves unsatisfactory change the MU.</td></tr>
<tr><td>3 Called Station Automatic Disconnect</td><td>(i) Request the DTC to call the telephone associated with the installation.<br>(ii) Upon receipt of the call connect the Modem 11 to line. The DTC will not connect a modem to line.<br>(iii) Check that the modem automatically disconnects within approximately 20s of connexion.<br>(iv) If the test proves unsatisfactorily change the MU.</td></tr>
<tr><td>4 Calling Station Data Test</td><td>(i) Set the tester to perform 511 bit automatic turnrounds at 4800 bit/s, measuring errors continuously, and re-dial the connexion to the DTC.<br>(ii) The DTC should connect to line first - upon receipt of the 2100 Hz answer tone connect the modem to line immediately.<br>(iii) The DTC should initiate the test programme detailed below. Should a test stop before the expiry of a 5 minute period the DTC will restart the test which must run continuously for a further 5 minute period.
<table>
<tr><th>Test type</th><th>Data rate</th><th>Duration</th><th>Max errors</th></tr>
<tr><td rowspan="2">511 bit automatic turnround</td><td>4800 bit/s</td><td>5 minutes</td><td>251</td></tr>
<tr><td>2400 bit/s</td><td>5 minutes</td><td>172</td></tr>
</table></td></tr>
</table>

TABLE 5 (Cont'd)

| Test | Procedure |
|---|---|
| 4 Calling Station Data Tests (Cont'd) | IMPORTANT NOTE: Should the modem be disconnected from line, during the course of the test programme, it will be necessary to re-dial the connexion (to ensure correct equalisation) before further data transmission may take place.<br>(iv) Should tests prove unsatisfactory request the DTC to release the connexion and repeat (i)-(iii).<br>(v) If tests remain unsatisfactory repeat (i)-(iii) first ensuring that the connexion is satisfactory for speech.<br>(vi) If tests still fail change the *complete* MU and repeat (i)-(iii).<br>(vii) If tests still fail inform the ADCO at once. |
| 5 Called Station Data Tests | (i) Request the DTC to call the telephone associated with the installation.<br>(ii) Upon receipt of the call connect the modem to line.<br>(iii) The DTC will connect a modem to line during receipt of the answer tone.<br>(iv) Repeat the test programme detailed in 4(i)-(vii) to ensure correct equalisation of modem in 'called' mode. |
| 6 Automatic Answering (when provided) | (i) Operate the AUTO ANS button on the telephone.<br>(ii) Arrange for the DTC to call the telephone associated with the installation.<br>(iii) Upon receipt of ringing do not lift the handset but check that the CALLING INDICATOR lamp flashes on the tester.<br>(iv) Operate the CONNECT TO LINE button on the tester and note that ringing is tripped.<br>(v) Release the AUTO ANS button on the telephone.<br>(vi) If this test proves unsatisfactory change the *complete* MU. |
| 7 Error Rates when operating to a second DTC (Perform for Service Codes 4850 and 4880) | (i) Ascertain the Region to which the customer intends to operate.<br>(ii) Request the DTC appropriate to that Region to co-operate in performing Tests 4 and 5 above.<br>(iii) The DTC will record the test results in a format similar to that shown in Appendix 2. |

5 CUSTOMER'S EQUIPMENT CONNEXION TO THE MODEM 11 See C3 I0104.

6 COMPLETION For modems connected to private circuits carry out the commissioning tests detailed in Appendix 1. When all tests have been satisfactorily concluded follow the completion procedure detailed in C3 I0502.

Appendix 1 follows

# APPENDIX 1

## DATEL 4800 SERVICE

Commissioning Limits for Private Circuit Services

1 GENERAL The arrangements for commissioning tests are described in C3 I0501.

2 COMMISSIONING LIMITS

2.1 Modem 11, Model 2, working to a Modem 11, Model 2, with or without PSTN standby facilities.

TABLE 1

| Datel Tester | Type of Connection | Type of Test and Pattern (bit) | Data Siganalling Rate (bit/s) | Duration of Test (minutes) | Maximum Permitted Errors (bit) |
|---|---|---|---|---|---|
| 10A or 1 | PC | Static, 511 (Note 1) | 4800 | 15 | 216 |
| 10A | PSTN | Turnround (Notes 2 and 3) | 4800 | 5 (without stopping) | 251 |
| 10A | PSTN | Turnround (Notes 2, 3 and 4) | 2400 | 5 (without stopping) | 172 |
| 1 | PSTN | Static, 511 (Notes 1, 3 and 5) | 4800 | 5 | 1440 |
| 1 | PSTN | Static, 511 (Notes 1, 3, 4 and 5) | 2400 | 5 | 720 |

NOTES: 1 If the modem is strapped for external timing (pin 24) a Datel Tester No. 12A will be required to make the necessary cross connexion.

2 If modem is strapped for external timing (ie from DTE) it must be restrapped to internal timing for the duration of this test.

3 PSTN calls should be dialled in the direction normally to be used by the customer.

4 This test should be carried out only if unsatisfactory results were obtained at 4800 bit/s due to the PSTN routing. The ADCO must be advised immediately if unsatisfactory results were obtained at 4800 bit/s.

5 These tests should only be carried out (in place of the turnround tests) when Datel Testers No. 10A are not available and the ADCO has authorised the use of Datel Testers No. 1.

2.2 Failure to meet Commissioning Limits If any one of the limits specified in Paragraph 2.1 cannot be met the Datel Service is unsatisfactory and should not be handed to the customer until any faults have been identified and cleared, and the commissioning limits met.

Appendix 2 follows

## APPENDIX 2

TO: Datel Test Centre .....

FROM: Datel Test Centre .....

DATEL 4800 TEST RESULTS (TI C3 I4832, Para 4.4.2, Table 5, Test 8)

CUSTOMER: .....

.....

EXCHANGE LINE NUMBER .....

ERRORS RECEIVED AT DTC

4800 _____

2400 _____

ERRORS RECEIVED AT INSTALLATION

4800 _____

2400 _____

Signed .....

Date .....

*References:* A2 E1006, C1 A0050, C3 I0104, C3 I0502, C3 I1000, C3 I4820, C3 I4825 C3 I8403, D5 C0010.

THQ/NP3.3.5

E N D