DATEL 200 SERVICE

Datel Modem No. 13A: Installation and Testing

(As this Instruction has been completely REVISED, individual paragraphs have not been "starred").

1 AUTHORITY Given by Advice Note which will quote the Datel Service Code.

2 DATEL SERVICE CODES See I1220.

3 EQUIPMENT REQUIRED See I1225.

4 MODEM PRELIMINARY TESTING Carry out the strapping and testing as detailed in Table 1 before assembling the modem and telephone. The strapping points are accessible by removing the base plate of the Modem No. 13A. (It may be found easier to perform the strapping with the printed circuit board removed from the modem plinth. Ensure that the base-plate is retained with the appropriate modem, because it is the only part carrying the serial number).

The following test equipment, or equivalent, is required.

Attenuator No. 70A

Measuring Set No. 44C

Meter, Multirange, No. 12A

Power Unit No. 53A

Block, Terminal, No. 35A.

Table 1 follows

TABLE 1

PRELIMINARY TESTING

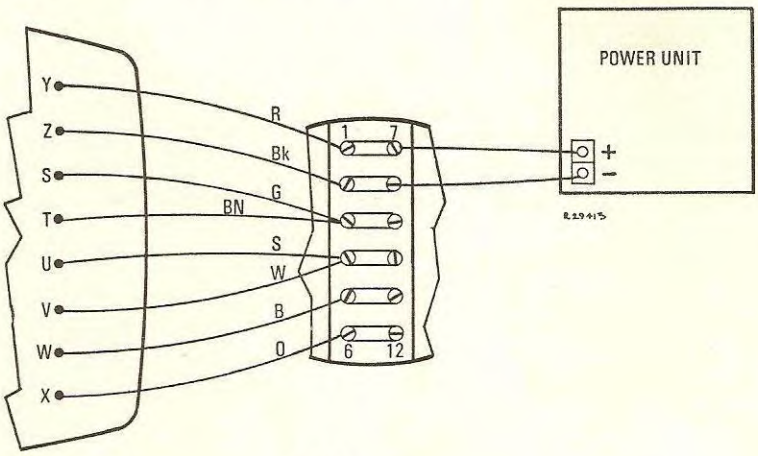
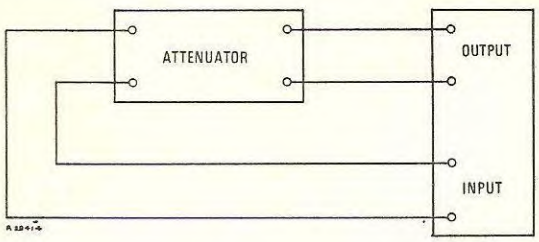
ACTIVITY	METHOD
1 TEST STRAPPING	Strap F-G Fail to Mark (Binary 1) J-K, M-N, P-Q Local powering
2 TEST CONNECTIONS AND POWERING	(i) Connect the modem to the Power Unit No. 53A using the Block, Terminal No. 35A as shown in Figure 1.  FIG 1 (ii) Check that the output voltage of the power unit is not less than 10 volts.
3 CARRIER FAIL	(i) Set up the Measuring Set and Attenuator as shown in Figure 2.  FIG 2 (ii) With 0 dB set on the Attenuator, adjust the output level for 0 dBm input. (iii) Disconnect the Attenuator output from the Measuring Set and connect it to the modem line terminals as shown in Figure 3.

TABLE 1 (contd)

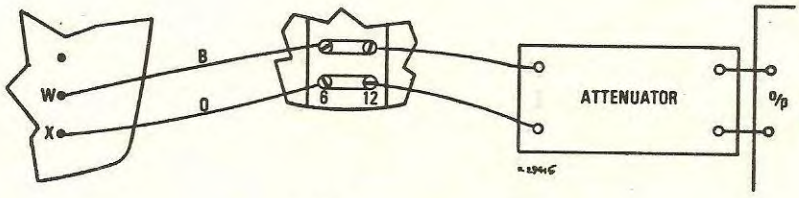
ACTIVITY	METHOD
3 CARRIER FAIL (contd)	 FIG 3 (iv) Switch 40 dB into the attenuator and with the Meter, Multirange, measure the voltage between BTA1 and BTA4 located on the printed circuit board. This should be at least 3 volts with BTA4 positive with respect to BTA1. (v) Increase the attenuation until the voltage measured changes to a negative value of more than 3 volts. The setting of the attenuator should not be more than 48 dB. (vi) Reduce the attenuation until the voltage changes to a positive value. The setting of the attenuator should be in the range 46 to 43 dB and there should be at least 2 dB between this setting and that obtained in (v). (vii) Disconnect the Measuring Set and Attenuator. If the limits in any of the above tests are not met, change the modem.
4 MODEM OUTPUT LEVEL	A MODEMS CONNECTED TO THE PSTN (i) Either, obtain an estimate of the loop resistance of the line from the routing and records duty or arrange for the loop resistance to be measured and calculte the required signal level transmitted to line as shown in NOTE at end of Table. (ii) This calculated level is then set, over the range -1 to -9 dBm in 4 dB steps by the following soldered straps. -1 dBm Strap E to A -5 dBm Strap E to B -9 dBm Strap E to C (iii) Make a 600 ohm terminated level measurement, with the Level Measuring Set No. 44C connected to the modem line terminals (the blue and orange wires from the Modem). (iv) If the level reading is not within ±1 dBm of the strapped level check the strapping.

TABLE 1 (contd)

ACTIVITY	METHOD
4 MODEM OUTPUT LEVEL (contd)	(v) If the level reading is then still not within range, change the modem. (vi) Switch off the power supply and disconnect the modem. B MODEMS CONNECTED TO 2-WIRE PRIVATE CIRCUITS (i) Set the output level to -13 dBm (Strap E to D). (ii) Make a 600 ohm terminated level measurement, a Level Measuring Set No. 5B connected to the modem line terminals (the blue and orange wires from the Modem). (iii) If the level reading is not within -13 ± 1 dBm check that only strap E to D is connected. (iv) If the level reading is still not within -13 ± 1 dBm change the Modem. (v) Switch off the power supply and disconnect the Modem.

NOTE: The required level, for exchange lines, which must not exceed -1 dBm (nominal) is calculated as follows:-

Where the local exchange is:-

(a) in the same building as the serving trunk unit:-

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

(b) not in the same building as the serving trunk unit:-

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

(a) and (b) give sufficiently accurate approximations irrespective of the cable conductor size used.

5 MODEM STRAPPING AND ASSEMBLY

5.1 Modem Strapping Strap the modem for line or local powering according to Table 2 in accordance with the following rules, depending on the type of connection.

A. PRIVATE CIRCUITS

Local powering in all cases.

B. DIRECT EXCHANGE LINES

Line powering on all lines for which the estimated loop resistance is 500 ohms or less.

Local powering for lines of estimated loop resistance greater than 500 ohms and lines routed on subscribers carrier systems.

C. PMBX AND PABX 1, 2 AND 3 EXTENSIONS (INTERNAL)

Line powering on all lines for which the estimated loop resistance is 400 ohms or less. (Public exchange to PBX).

Local powering on lines of estimated loop resistance greater than 400 ohms. (Public exchange to PBX).

D. PABX (EXCEPT PABX 1, 2 AND 3) EXTENSIONS (INTERNAL)

Line powering

TABLE 2

POWERING	STRAP
LINE	F-G, J-H, L-M
LOCAL	F-G, J-K, M-N, P-Q

5.2 Assembly of Modem on Telephone Remove the main cover from the telephone and the four rubber feet from the base of the telephone.

Remove the three fixing screws from the modem and pass the eight flying leads from the modem through the circular hole, vacated by one of the rear rubber feet, in the base-plate of the telephone and route these leads such that they emerge from the rear of the terminal block within the telephone.

Place the telephone on top of the modem, with the interface cord emerging from the rear of the combination, and attach the modem to the telephone by means of the three 4BA x $\frac{7}{16}$" cheese-headed screws which pass through apertures in the telephone base-plate into threaded bushes in the modem plinth. One aperture is located at the rear centre of the telephone base-plate and the other two are located at each side and about two inches from the front of the telephone base-plate.

6 ACCOMMODATION Before commencing installation check that the following accommodation requirements are met. (Further details of accommodation are given in I1000).

POSITION OF THE MODEM:	Mounted under the telephone and 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 apparatus.
VENTILATION:	Air, at room temperature, must be able to circulate freely around the modem.
SAFETY:	No change in floor level within 1 m of the modem and a minimum clear height above this area of 2 m, and no other object in this area that would hinder PO Staff or render maintenance activity unsafe.

TESTING AND MAINTENANCE ACCESS: There must be direct access to the modem with adequate clearance for testing and maintenance.

ACCIDENTAL DAMAGE: There must be minimal excess sunlight, condensation etc.

MAINS SUPPLY: When a Power Unit No. 53A is to be used (see para 5.1) then the customer must provide a mains socket-outlet of 13A fusing capacity, for use exclusively for the Power Unit No. 53A, and must connect it to a 230-240 V 50 Hz mains supply and an efficient connection to a protective earth.

Additionally, at all installations, a 3-pin socket-outlet should be available for use by PO staff when testing the installation.

CONNECTION OF OTHER EQUIPMENT: Check that the Data Terminal Equipment which the customer proposes to use in connection with the Datel Modem No. 13A is included in the "List of Privately Owned Equipment for which permission has been granted for connection to Post Office Telecommunications Services" held by GM(s) (see D5 C0010).

Warning: When a Modem 13 is being used as a replacement for a Modem 2, the fact that a terminal is listed in the above list as suitable for connection to a Modem 13 does not necessarily mean that the terminal can operate with the Modem 13 without modification. In such cases, the customer should be requested to contact his terminal equipment supplier to determine the suitability of his existing equipment for connection to the Modem 13.

7 **INSTALLATION** Install to relevant DTW(L) diagram as follows:

Direct exchange lines and PBX extensions	DTW(L) 1117
2-wire presented private circuits with speech and signalling	DTW(L) 1118
2-wire presented private circuits without speech or signalling	DTW(L) 1119

When the installation wiring etc has been completed the main cover can be replaced on the telephone, but the base-plate of the modem should be left off until installation testing has been completed.

8 **INSTALLATION TESTING** Carry out the test programme detailed in Table 3, with the customer's equipment not connected to the Datel Modem No. 13A. The following test equipment will be required:-

Datel Tester No. 1

Tester, Line-Earth-Loop-Impedance (see A2 E1006 - only required for local powering with a Power Unit No. 53A).

Meter, Multirange, No. 12A.

TABLE 3

INSTALLATION TESTING PROGRAMME

TEST	METHOD
1 AC MAINS (PERFORM ONLY IF MODEM POWERED BY A POWER UNIT NO. 53A)	(i) Connect the Tester, Line-Earth-Loop-Impedance to the mains socket outlet to be used by the Power Unit No. 53A. (ii) Perform tests described in A2 E1006. (iii) If prescribed limits are not met:- (a) do not connect the Power Unit No. 53A to the mains socket (b) report matter to ADCO.
2 LINE CURRENT (PERFORM ONLY IF MODEM IS LINE POWERED)	(i) Connect the Meter, Multirange, set to 100 mA scale, in series with the modem and line. (ii) Lift the handset and operate the DATA button when dial tone is heard. (iii) Measure the current and restore the wiring. The Datel Test Centre will record the value of the line current. (iv) The current should be 30 mA or more. If it is less than 30 mA, the modem and installation must be converted to local powering.
3 OUTPUT FREQUENCY AND BIAS DISTORTION	(i) Connect the Datel Tester No. 1 to the 25-way interchange socket. (ii) Arrange for a call to be established from the Datel Test Centre (DTC) to the telephone associated with the modem. (iii) Under the direction of the DTC send BINARY 1 for the agreed period of time. The DTC will measure the frequency, which should be 980 Hz. Repeat for BINARY 0 which should be 1180 Hz. If these frequencies are outside the limits of ±6 Hz, change the modem. (iv) Set the Datel Tester No. 1 for sending 1:1 signals. These will be checked for excessive distortion at the DTC. (v) Repeat (iv) for 1:3 and 3:1 signals. (vi) The DTC will send 1:1 signals. Adjust the BIAS potentiometer (beneath the base-plate of the Datel Modem No. 13A) to give zero bias distortion. (vii) The DTC will then send 1:3 and 3:1 signals. Note the bias distortion readings and give them to the testing officer.

TABLE 3 (contd)

<table>
<tr><th>TEST</th><th>METHOD</th></tr>
<tr><td>4 PEAK INDIVIDUAL DISTORTION AND ELEMENT ERROR COUNT</td><td>(i) Arrange for the DTC to transmit the 511 element Pseudo Random patterns to the Datel Tester No. 1, at the same time as transmitting these patterns from the Datel Tester No. 1 to the DTC, at the signalling rate of 200 bit/s for a period of 15 minutes (Signals should be transmitted for at least one minute before starting the data transmission test to ensure correct synchronisation).

(ii) Obtain a representative value of the peak individual distortion by operating the PEAK DISTORTION DISPLAY key on the Datel Tester No. 1 to the hold maximum position for three periods each of 20 seconds, during the course of the 15 minute data transmission test. (The chosen periods to observe peak individual distortion should be error free).

(iii) The DTC will also measure error rates and the peak individual distortion as in (ii).

(iv) The peak individual distortion is the highest value obtained during these three periods.

<table>
<tr><th>SIGNALLING RATE (BIT/S)</th><th>MAX PERMISSIBLE NO. OF ERRORS</th><th>MAX PEAK INDIVIDUAL DISTORTION</th></tr>
<tr><td>200</td><td>18</td><td>20%</td></tr>
</table>

(v) If the above requirements cannot be met over the initial established connection request the DTC to release the call and re-establish the connection.

(vi) Check the new connection for speech transmission and repeat tests (i) and (iv) above.

(vii) If the test results are again unsatisfactory repeat the procedures in (v) and (vi) above.

(viii) If none of the connections will transmit data signals satisfactorily change the modem.

(ix) Repeat the previous tests (i) to (vii) above.

(x) If the test results are again unsatisfactory inform the ADCO immediately.</td></tr>
<tr><td>5 REMOTE TEST</td><td>(i) Ensure there is no interface plug in the modem.

(ii) Under the direction of the DTC listen on the telephone.</td></tr>
</table>

TABLE 3 (contd)

TEST	METHOD
5 REMOTE TEST (contd)	(iii) On hearing a tone, operate the TEST button on the telephone for an agreed period of time. (iv) Restore the TEST button and enquire if the DTC found the test satisfactory.

9 CUSTOMER'S EQUIPMENT CONNECTION TO THE MODEM It is the customer's responsibility to ensure that a suitable cable is provided for the circuit interconnecting the data-terminal equipment and the Post Office modem, and that it is terminated on a 25-way D-type connector plug of a pattern approved by the Post Office eg Carr Fastener Company Code Nos. 43/81/047 EG (plug body) and 43/81/964 (cover). Cases of doubtful acceptability should be referred to Sales Special Service Division who hold a copy of the list of acceptable attachments.

Interchange circuits should be terminated on the connector-plug pins as specified in Table.

TABLE

INTERCHANGE CIRCUITS

CONNECTOR-PLUG PIN NO.	CCITT CIRCUIT NO.	INTERCHANGE CIRCUIT
1	-	Not used
2	103	Transmitted Data
3	104	Received Data
4 to 6	-	Not used
7	102	Common Return
8	109	Data Channel Received Line Signal Detector
9 to 25	-	Not used

10 COMPLETION On satisfactory completion of installation and testing supply the customer with a completed card A738 and ensure that the relevant information is given to the appropriate Repair Service Control to enable cards A2714 and A2715 to be completed. Form A6035 should be completed as described in A8 H0301.

Modems connected to private circuits will require further commissioning tests as detailed in I0501.

References: A2 E1006
A8 H0301
C3 I1000
C3 I1220
C3 I1225
D5 C0010