DATEL 200 SERVICE

Installation and Setting-up of Datel Modem 2A

1. General. This Instruction describes the method of installing and setting-up a Datel Modem 2A at customers' premises to provide Datel 200 Service.

The Datel Modem 2A, referred to in this Instruction as the modem, converts serial binary data signals transmitted from a customer's data terminal equipment into a form suitable for transmission over a telephone circuit and also receives signals in this form and converts them back into serial binary signals, received by the customer's data terminal equipment.

The maximum signalling rate is 200 bits/second in each direction. The modem may be connected to either an exchange line or a private circuit.

The signalling frequencies used are listed in Table 1.

TABLE 1

Mode	Signalling condition	Frequency *(Hz)*
Modem in call mode	Mark	980
	Space	1180
Modem in answer mode	Mark	1650
	Space	1850

The line is switched from the telephone to the modem by relays within the modem. The relays are controlled from a switch either on the customer's data terminal equipment or on the telephone but not on both at the same installation. The customer may choose where to mount the switch, except that where the automatic answering facility is provided the DATA/TELEPHONE switch must be on the customer's data terminal equipment.

INSTALLATION DETAILS

2. Facilities. The facilities required for a particular installation will be specified on the Advice Note. A Telephone 710 or 711, Grey, to match the modem, should be installed. The modem should be installed in accordance with this Instruction and the diagrams listed in Table 2, according to the requirements of the customer.

(Table 2 follows)

TABLE 2

Diagram	Title
N 810	Telephone 710...
N 811	Telephone 711...
N 848	Auxiliary units for Telephones 710... and 711...
N 849	Press-buttons for Telephones 710... and 711...
DT 40 (Sheets 1-8)	Datel 200 Service using Datel Modem 2. Wiring for D.E.L. & P.B.X. Extn.
DT 41 (Sheets 1-2)	Datel 200 Service using Datel Modem 2. Wiring for two-wire private circuit with local battery
DTW(L) 104 (Sheets 1-4)	Datel 200 Service using Datel Modem 2. Wiring for two-wire private circuit with standby on D.E.L. or P.B.X. Extn.

3. Tables 3 and 4 show the additional parts required for the Telephone 710 and Telephone 711, respectively, and Table 5 shows the parts fitted in relation to the type of line and facilities required.

TABLE 3. TELEPHONE 710 PARTS

Table 5 reference	Part	Part number	Button engraving	Latch setting
(a)	Auxiliary spring-set	Spring-set Part 1/DSP/1242		
(b)	Data to line	Spring-set Part 1/DSP/1245 Press-button Part 39/DBU/260, Grey	DATA	1
(c)	Telephone	Part 1/DST/26 Press-button Part 40/DBU/260, Grey	TELE	2
(d)	Normal	Part 1/DST/26 Press-button Part 34/DBU/260, Grey	NORM	2
(e)	Channel reverting	Spring-set Part 1/DSP/1245 Press-button Part 41/DBU/260, Grey	BKD CALL	3
(f)	Channel selection	Spring-set Part 1/DSP/1245 Press-button Part 42/DBU/260, Grey	RECD CALL	3
(g)	Automatic answering	Spring-set Part 1/DSP/1245 Press-button Part 38/DBU/260, Grey	AUTO ANS	NOTE
(h)	Recall	Spring-set Part 1/DSP/1245 Press-button Part 28/DBU/260, Grey	RECALL	2
(i)	Thermistor	Thermistor No. 1A-1		

NOTE:- Gravity switches X and Y should be put at setting 5.

TABLE 4. TELEPHONE 711 PARTS

Table 5 reference	Part	Part number	Button engraving	Latch setting
(a)	Auxiliary spring-set	Spring-set Part 1/DSP/1269		
(b)	Data to line	Spring-set Part 1/DSP/1245 Press-button Part 1/DBU/268, Grey	DATA	1
(c)	Telephone	Press-button Part 1/DBU/269, Grey	TELE	2
(d)	Normal	Press-button Part 1/DBU/268, Grey	NORM	2
(e)	Channel reverting	Spring-set Part 1/DSP/1245 Press-button Part 1/DBU/268, Grey	BKD CALL	3
(f)	Channel selection	Spring-set Part 1/DSP/1245 Press-button Part 1/BBU/268, Grey	RECD CALL	3
(g)	Automatic answering	Spring-set Part 1/DSP/1245 Press-button Part 1/DBU/268, Grey	AUTO ANS	5 (Note)
(h)	Recall	Spring-set Part 1/DSP/1245 Press-button Part 1/DBU/268, Grey	RECALL	2
(i)	Thermistor	Thermistor No. 1A-1		
(j)	Latching mechanism	Part 1/DFR/107		

NOTE:- The X and Y latches must be either removed or bent clear of the gravity switch bar.

(Table 5 follows)

TABLE 5. PARTS FITTED IN RELATION TO TYPE OF LINE AND FACILITIES REQUIRED

Type of telephone line	Type of channel selection	Location of connect data set to line control	Location of auto answer control	Part numbers fitted to telephone *(listed in Table 3 or 4)* (Note 2)
Auto exchange or P.A.B.X.	Automatic	Telephone		(a), (b), (c), (e), (i) and (j)
		Customer's equipment		(a), (e), (i) and (j)
		Customer's equipment (Note 1)	Telephone	(a), (d), (e), (g), (i) and (j)
		Customer's equipment (Note 1)	Customer's equipment	(a) and (e)
		Customer's equipment (Note 1)	Ans. set	(a) and (e)
Manual exchange, P.M.B.X. or P.A.B.X. with manual ringing	Manual	Telephone		(a), (b), (c) and (f)
		Customer's equipment		(a) and (f)
		Customer's equipment (Note 1)	Telephone	(a), (d), (f), (g) and (i)
		Customer's equipment (Note 1)	Customer's equipment	(a), (f) and (i)
		Customer's equipment (Note 1)	Ans. set	(a), (f) and (i)
Two-wire private circuit with local battery	Pre-set	Telephone		(b) and (c)
		Customer's equipment		

NOTE 1:- On installations where automatic answering is required, the connect-data-set-to-line control must be located on the customer's equipment.

NOTE 2:- Provide part (h) where necessary.

4. Equipment description. The dimensions of the Datel Modem 2A are 16 in. wide, 14 in. front to back, and 6 in. high. It weighs 21 lb. The modem is finished in two shades of grey, to match the Telephone 710, Grey.

5. Interface connexions. An interface plug, Connector No. 217A, is issued with each modem. The cabling between the interface plug and the customer's equipment is the responsibility of the customer, who should arrange for this cable to be terminated on the plug.

Connexions to the plug are shown in Table 6.

TABLE 6

Connector No. 217A/25A *(Pin No.)*	Customer's conductor identification
2	Transmitted data
3	Received data
4	Request-to-send
5	Ready-for-sending
6	Data-set-ready
7	Common return
8	Data-carrier-detection
20	Connect data-set-to-line
22	Calling indicator

6. Position of modem. The modem is suitable for mounting on a table or similar support. The following requirements should be observed when installing the modem:-

(a) The POWER ON indicator should always be visible from the front.

(b) There must be free circulation of air at room temperature on all sides of the equipment.

(c) In the event of a fault it should be possible for the customer to remove the interface plug from the modem and operate the REMOTE TEST push-button situated by the side of the interface socket.

(d) Direct access to the equipment, with adequate clearance for testing and maintenance, is essential.

(e) It must be possible to change the modem without removing or requiring access to any non-Post Office apparatus other than the customer's power socket-outlet.

7. Removal of modem cover. When removing the cover, be careful to avoid marking the top surface or exerting undue pressure on the internal printed circuits. The recommended method is to place the modem on a table so that one corner is protruding over the edge of the table. The fixing screw located at that corner of the base of the modem can then be released. The remaining screws can be similarly unscrewed and the cover lifted from the modem in its normal position, taking care not to damage the POWER ON indicator.

8. Power supplies. The modem requires a 50 Hz mains supply having a nominal voltage within the range 190V - 260V. A mains switch is not provided on the modem, and a switched socket-outlet of at least 5 amp capacity, for exclusive use of the modem, must be provided by the customer. It should be verified that the socket-outlet is correctly wired and that an earth connexion is provided.

A Cord, Instrument, No. 3/114AU, Grey, 96 in. is supplied with the modem to connect to the power plug, which should be provided by the P.O. A range of suitable plugs should be carried by the installer.

9. Pre-installation tests. To reduce the work necessary at the time of installation and to demonstrate efficient working methods to the customer, the modem should be set-up and tested functionally before being taken to the customer's premises.

10. Tools and test equipment. In addition to the normal installation tools, the following are required for installation and testing of the Datel Modem 2A

15-watt soldering iron,
Meter, Multi-range, No. 12,
Level-Measuring Set No. 5B,
Datel Tester No. 2B,
Oscillator No. 98B,
Attenuator No. 5.

SETTING-UP

NOTE:- The modem should be set-up and tested completely before being connected to the customer's data terminal equipment.

11. Voltage setting. *WARNING: Before attempting to make any adjustments to the voltage setting on the modem, remove the power plug from the power socket-outlet.* Set the soldered strap on the voltage-adjustment tag board, which is located under the white protective cover marked DANGER 250V A.C., to the nominal voltage quoted by the electricity supply authority. Replace the protective cover.

12. Earthing arrangements at Datel installations. Check with a multi-meter, set to its resistance range, that there is no internal connexion between common return and protective earth.

Reinsert the power plug.

13. Measure the following voltages between the appropriate test point and COM RET using a Meter, Multi-range, No. 12.

+ 12V: limits ± 1V
+ 6V: " + 5.5V to 7.2V
- 6V: " - 5.5V to 7.2V
- 25V: " - 22V to 26V

If the readings are outside these limits, change the modem.

14. Strapping of modem. According to the requirements of the customer's data terminal equipment, straps are required on the test and facility panel situated at the front of the modem. The straps required for the various facilities are indicated in Table 7.

TABLE 7

Facility	Straps required	Remarks
Carrier fail lock (Note)	To hold to mark (Binary 1) strap C/F LOCK COM to MK	The customer will specify which condition is required
	To hold to space (Binary 0) strap C/F LOCK COM to SPACE	
Carrier detector delay timing	Strap C/D TIMING COM to 50 MS or 100 MS	According to the customer's requirements
Request-to-send	Strap RQ/S LOCK ON 1-2, 3-4, 5-6	If data terminal equipment provides a request-to-send signal
	Strap 2-3, 5-6, 7-4	If no request-to-send signal provided
Ready-for-sending delay timing	Strap RFS TIMING COM to 20 MS or 200 MS	Necessary when the request-to-send signal is used
-	Strap terminal T17 - T18	T17, T18 are on the telephone
-	Connect the hold coil	Required on circuits using loop-disconnect signalling

NOTE:- This facility provides either a mark or a space on the received data wire when the received carrier is absent.

15. Printed-circuit cards. Ensure that the printed-circuit cards are correctly fitted and pushed fully home.

16. Transmit signal level.

(A) Modems connected to the public switched telephone network. The level can be adjusted in 2 dB steps by strapping as required between OUTPUT LEVEL COM and OUTPUT LEVEL, and should never be set above 0 dBm.

(i) *For modems connected to an automatic exchange,* operate the BKD CALL press-button on the telephone.

(ii) *For modems connected to a manual exchange or a P.M.B.X. extension,* do not operate any press-buttons on the telephone.

(iii) Set the test switches on the modem to CALL and MK to transmit a signal of 980 Hz. With the two-wire line disconnected, make a 600-ohm terminated level measurement at the modem line terminals, and adjust the modulator output by means of the wire strap to give a level calculated as follows, but subject to a maximum of 0 dBm:-

(a) If the local exchange is in the same building as the serving trunk unit:

$$-9 \text{ dBm} + \frac{\text{loop resistance of subscriber's line in ohms}}{100} \pm 1 \text{ dB}$$

(b) If the local exchange is not in the same building as the serving trunk unit:

$$-4 \text{ dBm} + \frac{\text{loop resistance of subscriber's line in ohms}}{100} \pm 1 \text{ dB}$$

The loop resistance of the line can be obtained from the line record card or can be measured by the exchange testing officer. The Area Trunking and Grading Duty can advise whether *(a)* or *(b)* is appropriate.

(iv) Restore the test switches and the line connexions to normal.

(B) Modems connected to private circuits. To enable the modem to be tested by the Datel Test Centre, and to enable the public switched telephone network to be used instead of the private circuit, if required, it is necessary to provide access to a telephone exchange line or P.B.X. extension, as shown on Dgm. DTW(L) 104.

(i) Disconnect the two-wire line from the modem.

(ii) Set the test switches as in *(A)*(iii) and make a 600-ohm terminated-level measurement at the modem line terminals. The level should be adjusted to -13 dBm ± 1 dB.

(iii) Restore the test switches and the line connexions to normal.

17. Carrier-fail test. The carrier-detector circuit on the printed-circuit board M4 should be checked, and adjusted if necessary, as follows, to ensure that its threshold of operation lies between -48 dBm and -43 dBm.

(a) Connect an oscillator, via an attenuator, to BTA 11 and 12 on the modem.

(b) Connect a 600-ohm transmission measuring set to BTA 11 and 12.

(c) Connect a Meter, Multi-range, No. 12 to check the voltage on the carrier-detector test point, SKTA 8. The polarity of this voltage will depend on the carrier-fail lock option required by the customer (see Table 7).

(d) Set switch S2 on the modem to CALL MODE.

(e) Set the oscillator frequency to 1650 Hz and the input level to about -40 dBm. The carrier-detector test point should be ON (+6V).

(f) Slowly reduce the input signal level until the voltage on the carrier-detector test point goes negative. The level should be -48 dBm.

(g) Adjust VR1 on the limiting-amplifier board M4 to meet the conditions required by *(e)* and *(f)*.

(h) Slowly increase the level again and check that the voltage at the carrier-detector test point goes positive again at -43 dBm.

If the threshold of operation cannot be adjusted satisfactorily, the limiting-amplifier board M4 should be replaced.

18. Installation tests. Contact the Datel Test Centre, using the customer's telephone. On being called back, the modem will automatically be in the ANS MODE. The testing officer at the Datel Test Centre will request that a Datel Tester No. 2B be connected to the modem and set-up for sending at 200 bauds (see Note). Under the direction of the testing officer carry out the following tests:-

(a) Send a MARK for an agreed period of time. The testing officer will measure the frequency, which should be 1650 Hz. Repeat for a SPACE, which should be 1850 Hz.

(b) If these frequencies are outside the limits of ±5 Hz, change the modem.

(c) Set the tester for sending 1:1 signals. These will be checked for excessive distortion at the Datel Test Centre.

(d) Set the tester for 1:3 and 3:1 signals to be sent.

(e) The Datel Test Centre will then send 1:1 signals. Adjust the bias potentiometer on card M3 in the modem to give minimum bias distortion.

(f) The Datel Test Centre will then send 1:3 and 3:1 signals. Note the bias distortion readings and give them to the testing officer.

NOTE:- Instructions for operating the Datel Tester No. 2B are included in the handbook supplied with the tester. There is also an abbreviated form of instructions on the cover of the tester.

19. The testing officer will now ask for the BOOKED CALL press-button on the telephone to be depressed. This will put the modem back to the CALL MODE. Under the direction of the testing officer, carry out the following tests:-

(a) Send a MARK for an agreed period of time. The testing officer will measure the frequency, which should be 980 Hz. Repeat for a SPACE, which should be 1180 Hz.

(b) If these frequencies are outside the limits of ±5 Hz, change the modem.

(c) Proceed as detailed in par. 18*(c)* and *(d)*.

(d) The Datel Test Centre will then send 1:1 signals. Adjust the bias potentiometer on card M2 in the modem to give minimum bias distortion.

(e) Proceed as in par. 18*(f)*.

NOTE:- Where the DATA press-button is fitted on the telephone, check that, when it is operated, the two-wire line is switched from the telephone to the modem.

20. *Remote test.* Under the direction of the testing officer at the Datel Test Centre, remove the interface plug from the modem and listen on the telephone for a tone. On hearing the tone, operate the REMOTE TEST button for three seconds and then replace the telephone handset on its rest.

To ensure that the channel-switching circuit in the modem is operating correctly the testing officer will call back. The test should be repeated, but with the handset off its rest.

For modems connected to manual exchanges or P.M.B.X. extensions, operate the RECD CALL press-button on the telephone before operating the REMOTE TEST button.

21. *Automatic answering.*

(a) Manual/Auto selection switch located on the telephone.

(i) Reinsert the interface plug from the Datel Tester No. 2B and operate the AUTO ANS press-button on the telephone.

(ii) Request the Datel Test Centre to call the telephone associated with the modem. Do not lift the handset on the receipt of ringing but observe that the CALLING INDICATOR lamp on the Datel Tester No. 2B glows. Operate the CONNECT DATA-SET-TO-LINE press-button on the Datel Tester No. 2B and note that the ringing is tripped.

(iii) Restore the press-buttons on the telephone and Datel Tester No. 2B to normal.

(b) Manual/Auto selection switch located on the customer's equipment. The calling indicator circuit will respond to every incoming call and the customer's selection switch can be disregarded.

(i) Reinsert the interface plug from the Datel Tester No. 2B.

(ii) Perform the tests as detailed in *(a)*(ii).

(iii) Restore the press-button on the Datel Tester No. 2B to normal.

(c) Manual/Auto selection switch located on the Answering-set No. 1B.

(i) Reinsert the interface plug from the Datel Tester No. 2B and switch the Manual/Auto selection switch on the Answering-set No. 1B to the ON position.

(ii) Request the Datel Test Centre to call the telephone associated with the modem. Do not lift the handset on the receipt of ringing but observe that the CALLING INDICATOR lamp on the Datel Tester No. 2B glows for 5-10 seconds in sympathy with the ringing before the set answers automatically and transmits a recorded announcement. Operate the CONNECT DATA-SET-TO-LINE press-button on the Datel Tester No. 2B and note that the modem is switched to line.

(iii) Restore the press-button on the Datel Tester No. 2B to normal.

22. Restoration. Replace the cover and the interface plug from the customer's data terminal equipment.

The modem is now ready for service.

Reference:- None
(NP3.2.2)

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