Datelphone 4122
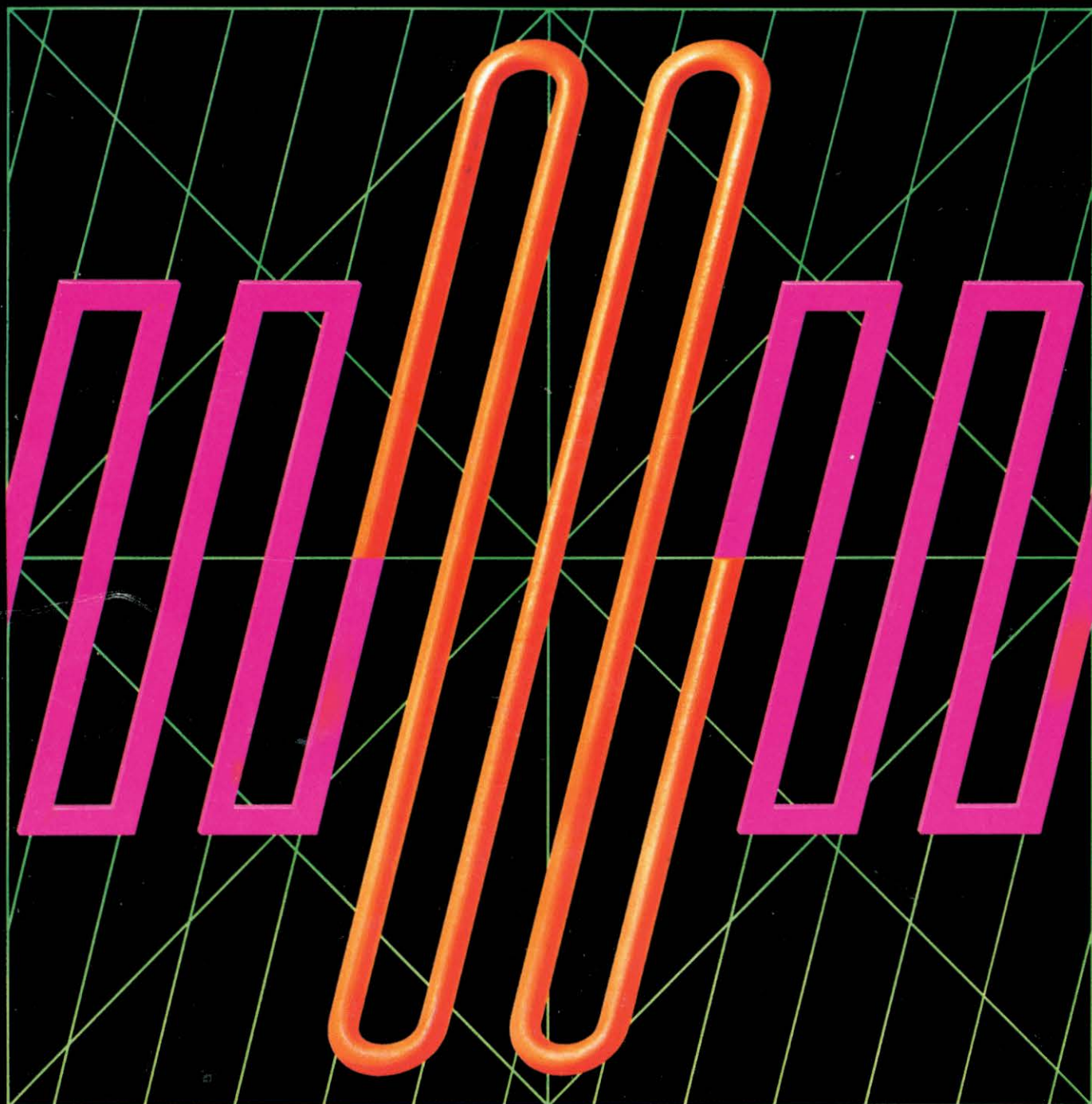# User Guide

Note:

British Telecom Enterprises Merlin (BTE Merlin) reserves
the right to revise this Modem Operational Manual for any
reason, including, but not limited to, conformity with
standards promulgated by CCITT, ISO, BSI,* or similar
authorities, or to reflect changes in the design of equipment
or services described therein.

Datelphone 4122
User Guide

British Telecom Enterprises Merlin

BTE Merlin is a part of British Telecom

© BTE Merlin May 1983

Preface

Damage in Transit

Unpack the equipment and examine it thoroughly to ascertain whether any damage has occurred in transit. Report immediately any such damage to your BTE Merlin supplier. Retain the packing surrounds, in case it should be necessary to return the equipment.

Warranty

All goods supplied by BTE Merlin are warranted to the extent hereafter mentioned against defects arising from faulty material or workmanship subject to the goods not having suffered maltreatment or interference. BTE Merlin's liability under this warranty is limited as follows:

i) The equipment is warranted to the original purchaser for a period of one year from the original purchase date under normal use and service against defective material or workmanship.

ii) The warranty is void if the equipment has been damaged by accident or unreasonable use, neglect, improper service or other causes not arising out of defects in material or workmanship.

iii) During the above one year the equipment or its parts will be repaired, adjusted or replaced with a new or refurbished model of equivalent quality. Any replacement will not extend the original warranty.

iv) On receipt of a fault report within the warranty period, BT will make an on-site visit to remedy the fault. Should a fault turn out to be attributable to equipment other than that covered by the warranty, an abortive visit charge will be levied.

v) Any equipment subject to the Systemcare Mainenance Service will nevertheless still be covered by the above provisions and those laid down in the terms of agreement of the Systemcare Mainenance Service.

Your statutory rights remain unaffected by this warranty.

Local BTE Merlin address

The address of your local BT agent can be found in your local Telephone Directory.

Descriptive matter and illustrations

Descriptive matter, illustrations, dimensions and weights issued by BTE Merlin are typical and shall not be held as binding. BTE Merlin reserves the right to alter patterns and designs without notice.

Safety Measures

1   Any installation, adjustment maintenance and repair of the opened apparatus shall be carried out only by a skilled person who is aware of the hazard involved.

Contents

Technical Specifications

Physical Characteristics

Power Supply

240V AC +6%, —10%; 50Hz ±10% single phase

Power consumption

10 Watts nominal

Dimensions

Depth — 202 mm
Width — 349 mm
Height — 82 mm excluding handset

Environmental requirements

Operational ambient temperature range — (+5°C) to +45°C
Relative humidity (non-condensing) — 20% to 90%

Weight

3.42 kgs

Modem Characteristics

Operating Mode

Synchronous duplex between modems; synchronous or character asynchronous on the DTE/Modem interface.

Data rate (manually switchable)

1200 bit/s duplex or 600 bit/s duplex.

Line requirements

2 wire PSTN (dial up) or PBX extension.

Transmit level

—1 dBm to —15 dBm, selectable in 2 dB steps.

Line Impedance

600 ohm nominal balanced.

Receiver sensitivity

Call mode   —48dBm
Answer mode   —43 dBm.

Modulation

4 phase (1200 bit/s) or 2 phase (600 bit/s) differential Phase Shift keying in accordance with CCITT Recommendation V22 Alternative B.

Automatic Answer

In accordance with CCITT Recommendation V25 using 2100 Hz answer tone.

Integral diagnostics

CCITT Recommendation V54 Loop 3 with Test Pattern Generator and Error Detector and digital loop.

Data format

Data presented to the modem via interchange CT 103 may be optionally in —

i) Synchronous form

or

ii) Character Asynchronous (Stop-Start) form. The character size is optionally 8, 9, 10 or 11 bits (including start and stop bits).

The modem will cater for asynchronous terminals which transmit at intracharacter bit rates varying from the nominal rate by up to either —

a) —2.5%, +1.0%, which is equivalent to the transmitting modem deleting no more than 1 stop bit from 8 consecutive characters for overspeeding terminals, and the corresponding receiving modem shortening the stop bit duration in the data provided to the terminal over CT 104 by up to 12.5%

or

b) —2.5%, +2.3%, which is equivalent to up to 1 stop bit deletion in 4 consecutive characters, and a reduction in stop bit duration by up to 25%.

Underspeed data is dealt with by the transmitting modem inserting extra stop bits between characters.

Transmission on the line between the modems is always synchronous. Data from asynchronous terminals is assembled by the modem into synchronous form for transmission, and disassembled by the receiving modem.

Transmitter timing (Synchronous Operation) (TSET)

Internal (CT 114)	1200Hz ±0.12Hz or 600Hz ±0.06Hz depending on data rate	Square wave of duty cycle 50% ±5%
External (CT 114)	1200Hz ±0.12Hz or 600Hz ±0.06Hz depending on data rate	Square wave of duty cycle 50% ±10%
RESET (CT 115)	1200Hz ±0.12Hz or 600Hz ±0.06Hz depending on data rate	Square wave of duty cycle 50%±

Channel separation

Achieved by Frequency Division Multiplexing.

Call Mode

Transmit Channel Carrier Frequency — 1200 Hz
Receive Channel Carrier Frequency — 2400 Hz

Answer Mode

Transmit Channel Carrier Frequency — 2400 Hz
Receive Channel Carrier Frequency — 1200 Hz

Call/Answer mode selection

Dial-Up links

Mode selection is automatically determined by ring detection when the front panel buttons are normal (ie released). The modem originating the call will assume the CALL mode, and the answering modem the ANSWER mode prior to connection to line

Guard tone

1800Hz ±2Hz tone. transmitted to line by the ANSWER MODE modem only, at 6dB below the level of transmitted data.

Equaliser

Fixed compromise — equally shared between receiver and transmitter.

Auto disconnection from Dial-Up line

Disconnects automatically, as user options, given a continuous period of loss of carrier and/or receipt of continuous binary 0 (space)

After auto disconnection has occurred, the modem will not answer a subsequent call automatically unless —

5–10 secs have elapsed since the disconnection

or/and

CT 108 has turned OFF and then ON again.

Abort disconnect

(ANSWER mode modems only)

Following the absence of data line signals for longer than 20 secs immediately after connection to a dial-up line, the modem will automatically abort the connection

Ready for sending delays

242 ±32mS

Front panel indicators

Legend	Function when on
Ready	CCT 106 and CCT 109 on
Transmit	Bin 1 on CCT 103
Receive	Bin 1 on CCT 104
Data	Modem connected to line
Speech	Speech mode
Auto ans	Auto answer mode enabled
Error	Error detected in test pattern
Digital loop	Digital loop applied
Test modem	Internal pattern generator and loop activated

Front panel buttons

Legend	Function
Data	Selection of data mode
Speech	Selection of speech mode
Auto answer	Selection of auto answer mode
Digital loop	Activation of digital loop
Test modem	Activation of integral error test facility

Equipment interface

The DTE/Modem interface is in accordance with CCITT Recommendation V24 and the electrical characteristics conform to CCITT Recommendation V28. The pin designations on the 25 Way D type connector conform to ISD/IS2100 (1980) and BS 4505 Part 5 (1981). Table 1 lists the interchange circuits provided on the modem and their pin allocations.

Table 1: V24 Interchange Circuits

CCITT Circuit Number	Direction of Signalling	Circuit Description	Pin Number
102	DTE ⇌ Modem	Common Return	7
103	DTE → Modem	Transmitted Data	2
104	DTE ← Modem	Received Data	3
105	DTE → Modem	Request to Send	4
106	DTE ← Modem	Ready for Sending	5
107	DTE ← Modem	Data Set Ready	6
108/1(Note 1)	DTE → Modem	Connect Data Set to Line	20
108/2(Note 1)	DTE → Modem	Data Terminal Ready	20
109	DTE ← Modem	Data Channel Received Line Signal Detector	8
113	DTE → Modem	Transmitter Signal Element Timing	24
114	DTE ← Modem	Transmitter Signal Element Timing	15
115	DTE ← Modem	Receiver Signal Element Timing	17
125	DTE ← Modem	Calling Indicator	22
142	DTE ← Modem	Test Indicator	25

Note:
1. The method of switching to line is a User Option. See 1.3.1.

Any interchange circuits that are not going to be used by the DTE should be left disconnected on the 25way D-type plug

Section 1 — Introduction

1.1 General information

This User Guide provides comprehensive details on the British Telecom Datelphone 4122 (Datelphone 1200DX), which is an integral modem and telephone designed for the modern office environment. Datelphone 4122 is compatible with BT Datel Modem 4122 and is basically an outstation version of this modem.

The Datelphone 4122 conforms to CCITT Recommendation V22 Alternative B and facilitates Full Duplex data transmission at 1200/600 bit/s over a single PSTN connection. The selection of 1200/600 bit/s data rate is by means of a toggle switch at the rear of the datelphone. Although the inter-modem link always operates in synchronous mode, the Data Terminal Equipment (DTE) may use either Synchronous or Character Asynchronous data format. The integral telephone provides push button operation and optional loop disconnect or multifrequency dialling. The Datelphone 4122 makes extensive use of large scale integration and microprocessor technology to achieve compactness and low power consumption whilst providing a comprehensive range of operation facilities and excellent reliability. In common with other 4th generation equipment,

it connects to the PSTN by means of the New Plan plug and socket arrangement.

Following call set up and connection to a Dial-up line, the modem will perform a rigorous 'handshake' routine with the associated far end modem. This procedure enables the modems to achieve synchronisation over the data link prior to exchanging data.

When the modem is in the Answer mode, a built-in abort timer is operative. If the 'handshake' routine is not successfully completed within 20s of the modem connecting to line, the modem will automatically abort the routine and disconnect from line.

When the modem is in the Call mode, the abort timer is non-operational. If the 'handshake' sequence fails to be successfully completed, manual or DTE intervention will be required to disconnect the modem from line unless one of the auto-disconnect options has been enabled.

The modem incorporates a Test pattern generator and error detector to enable quick checks on the modem and the link to be carried out, thus obviating the need for special testers during preliminary checks.

Figure 1: Datelphone 4122
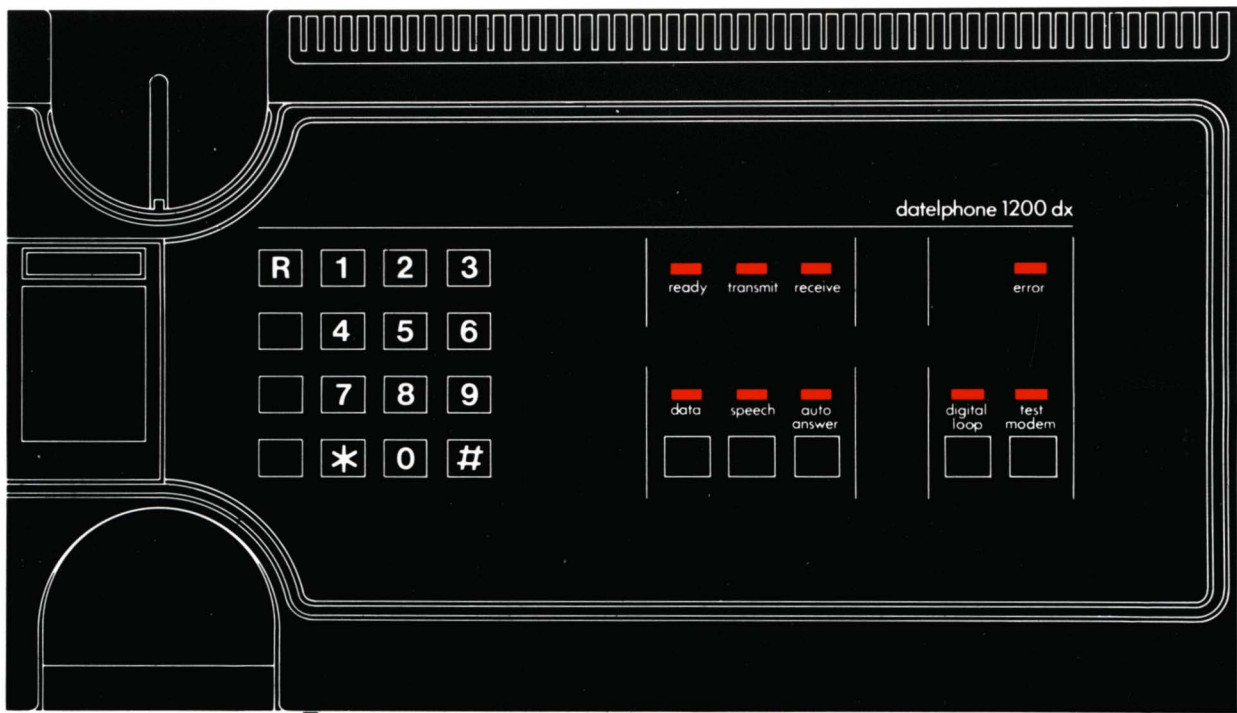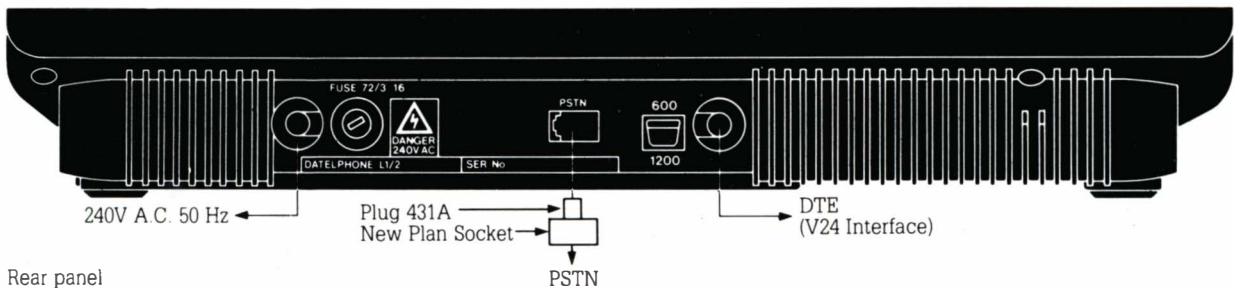
1.2 Physical description

The Datelphone is an attractively styled desk top integral modem and telephone designed for the modern office environment. The left half of the Datelphone consists of a push button keyboard for dialling and a telephone handset. The right half accommodates 5 buttons and 9 LED indicators to control and monitor modem operation. These are fully described in Section 3

The Datelphone is connected to the PSTN by means of a cord with New Plan plugs at each end. the rear of the modem carries a New Plan socket marked PSTN to accept this cord which is supplied with the modem. The socket for connection to the DTE is on the end of a flying lead. The rear of the modem houses the 1200/600 data rate selection switch and a 250V/160 mA slow blow fuse. The Datelphone comes complete with a 13 amp mains plug. Figure 1 shows the front and rear view of the Datelphone 4122

The 25 way Female D type connection for connection to a DTE uses the screw type retention method, internally threaded with 4/40 UNC thread to accept plug retaining screws.

1.3 Facility options of Modem 4122

The Datelphone 4122 offers the following major facility options which are detailed below in the same order as they appear in the customer's questionnaire. The questionnaire is reproduced in Appendix 1 and contains a few questions which are not relevant to Datelphone 4122 and therefore, are not covered below.

1.3.1 Control of connection to PSTN

Available connection methods are —

a)   Manual (using button on the Datelphone)

b)   CT 108/2 working (control by DTE in conjunction with buttons on the Datelphone).

c)   CT 108/1 working (under sole control of the DTE)

In the manual mode, the modem may be conditioned to behave as though a permanent ON condition is present on CT 108, and control of switching to and from line is by the DATA and SPEECH buttons on BT equipment.

In the Data Terminal Ready mode (108/2 working), an ON condition on CT 108/2 prepares the modem for connection to line and maintains the connection once estalished by an externally applied condition eg —

a)   Depression of the DATA PSTN button on the Datelphone.

b)   Receipt of incoming ringing where the modem is conditioned for automatic answering.

With 108/1 working an ON condition on CT 108/1 connects the modem to line, and an OFF condition disconnects it from line. The DATA and SPEECH buttons are inoperative in this mode.

The modem is capable of automatically answering incoming calls in accordance with CCITT Recommendation V25. The modem can be conditioned to automatically answer calls by operation of the auto-answer push button. When an incoming call is received the modem connects to line automatically and sends an answer tone to line, after which it enters the normal 'handshake' sequence. This is followed by data transmisson. Call termination is a critical factor in deciding whether your terminal can support this facility

DTE controlled disconnection of an exchange line call is achieved by the DTE turning either CT 108/1 (Connect Data Set to Line), or CT 108/2 (Data Terminal Ready), OFF. It is important that this is done in any one of the following circmstances —

i)   If no 'signing on' information is received.

ii)   On receipt of 'signing off' information.

iii)   On receipt of excessive errors.

iv)   If valid data is not received for a predetermined period on CT 104 (Received Data.

v)   If CT 109 (Data Channel Received Line Signal Detector) remains OFF for a predetermined time.

If any of the above conditions cannot be detected by the terminal it may not be suitable for automatic answering. It is not sufficient to monitor CT 109 only to determine whether valid data is being received and hence when to turn CT 108/1 or CT 108/2 OFF.

Note: CT 109 will turn ON to any line signal, eg dial tone, in excess of —43 dBm or —48 dBM (depending on the mode), and of longer duration than a nominal 155 mS

Having turned CT 108 OFF to disconnect an exchange line call, the DTE must not turn CT 108 ON again until after the ON to OFF transition on CT 107, Data Set Ready.

If a terminal cannot initiate disconnection of an exchange line call correctly, the exchange line may be held and further receipt of calls precluded. With this type of DTE, Auto Answer facility should not be used.

1.3.2 Carrier fail disconnect

This facility may be —

a) disabled (not required)

or

b) enabled

and is only operative after successful completion of the Dial-Up handshake indicated by CT 106 turning ON.

When enabled, the modem will disconnect from line in response to loss of line signal for over 425 mS.

1.3.3 Receive long space disconnect

This facility may be —

a) disabled (not required)

or

b) enabled

and is only operative after successful completion of the Dial-Up synchronising procedure (ie, CT 106 has turned ON)

When enabled, the modem will disconnect from line in response to continuous Binary 0 (space) being received for longer than 3.0 secs.

If disconnection occurs as a result of either of the two methods described in 1.3.2 and 1.3.3 above, the modem will not automatically answer subsequent incoming calls unless either a period of 5–10 secs has elapsed sisnce the disconnection, and/or CT 108 has been turned OFF and then ON again. This is to protect against a follow-on call.

1.3.4 Data Format and TSET (Transmitter Signal Element Timing) Source

The modem can accept signals from the DTE in either asynchronous format where no timing signals are exchanged, or in synchronous format. These formats are listed below —

a) Synchronous format, with TSET provided by the modem internal clock to the DTE on CT 114.

b). Synchronous format, with TSET derived from received data and supplied to the DTE on CT 114.

c) Synchronous format, with TSET provided by the DTE to the modem on CT 113.

d) Asynchronous (Start-Stop) format, with 8 bit character length (including start and stop bits).

e) Asynchronous (Start-Stop) format, with 9 bit character length (including start and stop bits).

f) Asynchronous (Start-Stop) format with 10 bit character length (including start and stop bits).

g) Asynchronous (Start-Stop) format, with 11 bit character length (including start and stop bits).

1.4 Diagnostics

As mentioned earlier, the Datelphone 4122 has a range of integral diagnostics features. For example a local Analogue Loop is activated by means of the TEST MODEM button which also connects an internal Test Pattern generator to the transmitter and an error detection circuit to the receiver, enabling the modem to be checked out. The modem can also be configured into a digital loop for testing from the distant end. Full details of the diagnostic features is contained in Section 3.

Section 2 — Installation

2.1 Modem strapping

The Datelphone 4122 has been produced in two alternative electrical designs. Whilst the Datelphone's facilities and exterior physical design are identical the component board layout and strapping are different. Two board layouts and strapping charts are shown under section 2.1.1 and 2.1.2. The two types of Datelphone can be identified by the serial number on the back of the datelphone.

Board layout, figure 2, and strapping chart, table 2, in section 2.1.1 refers to serial number range 1XXXX where X is any numeral.

Board layout, figure 3, and strapping chart, table 3, in section 2.1.2 refers to serial number range 0XXXX where X is any numeral.

2.1.1 Modem strapping for datelphone with serial number range 1XXXX

The modem provides a number of facility options which are strap selectable. Figure 2 shows the positions of all the switches and links mentioned in this section, which are accessed by separating the modem top panel from its base.

To separate the modems top panel from its base —

a) turn the modem upside down and loosen the 4 self retaining cross head screws in the base;

b) with the modem upright lift the top panel just clear of the base;

c) carefully fold the top panel backwards on the interconnecting ribbon cables.

To access the left hand side of the base board —

i) pull the telephone handset cord free from the base;
ii) lift the middle board off its 2 retaining posts.

Figure 2: Modem switch and link positions for serial number range 1XXXX
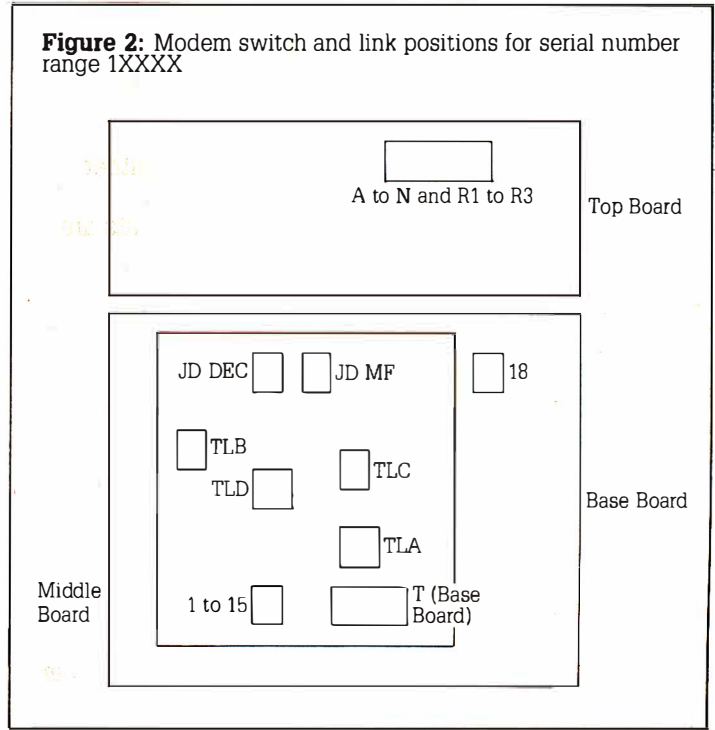
Table 2: Modem strapping chart for serial number range 1XXXX

The FACILITY OPTION column in this chart is a quick reference guide based on the Customer Questionnaire (see Appendix 1). Unmarked options are not recommended for normal use.

Function	Operation	Switch	Position	Facility Option
PSTN line connection method				
Manual switching	DATA and SPEECH buttons enabled	N	Closed	
	108/1 switching disabled			
	CT 108 forced ON	L	Closed	3a
Data Terminal Ready (108/2) switching	DATA and SPEECH buttons enabled	N	Closed	
	108/1 switching disabled			
	CT 108 DTE controlled	L	Open	3b
Connect Data Set To Line (108/1) switching	108/1 switching enabled	N	Open	
	DATA and SPEECH buttons disabled			3c
	CT 108 DTE controlled	L	Open	
Disconnect on 60s Transmit Space				
Not required	Send 60s space disconnect disabled.	M	Closed	4a
Send 60s Space Disconnect	Send 60s space disconnect enabled.	M	Open	4b
Carrier fail disconnect facility				
Not required	Carrier fail disconnect disabled	C	Closed	5a
Carrier fail disconnect	Carrier fail disconnect enabled	C	Open	5b
Receive long space disconnect facility				
Not required	Long space disconnect disabled	B	Closed	6a
Long space disconnect	Long space disconnect enabled	B	Open	6b

For switches A to R; OPEN= ⊟   CLOSED= ⊟   'T' and '18' are LINKS

Function	Operation	Switch	Position	Facility Option
Data format and Transmitter Signal Element Timing (TSET) source				
Synchronous, timing from modem	Synchronous data selected	R1	Open	
		R2	Open	
		R3	Open	9a
		R4	Open	
	Internal clock selected	E	Open	
	Internal clock=modem clock	F	Closed	
Synchronous, timing from received data	Synchronous data selected	R1	Open	
		R2	Open	
		R3	Open	9b
		R4	Open	
	External clock selected	E	Closed	
	External clock=Receiver signal element timing	F	Open	
Synchronous, timing from DTE	Synchronous data selected	R1	Open	
		R2	Open	
		R3	Open	9c
		R4	Open	
	External clock selected	E	Closed	
	External clock=DTE clock	F	Closed	
Asynchronous, 8 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	8 bit characters	R1	Closed	
		R2	Open	9d
		R3	Closed	
		R4	Open	
Asynchronous, 9 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	9 bit character length	R1	Open	
		R2	Open	9e
		R3	Open	
		R4	Closed	
Asynchronous, 10 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	10 bit character length	R1	Open	
		R2	Open	9f
		R3	Closed	
		R4	Open	
Asynchronous, 11 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	11 bit character length	R1	Open	
		R2	Closed	9g
		R3	Open	
		R4	Open	
Maximum stop bit deletions				
1 in 4	No more than 1 stop bit in 4 characters removed	J	Open	Normal
1 in 8	No more than 1 stop bit in 8 characters removed	J	Closed	—
Remote Digital Loop test feature				
Not required	Receipt of RDL command disabled	A	Closed	—
Command accepted	Receipt of RDL command enabled	A	Open	Normal
PSTN transmit level				
—1dBm		T	1-2	—
—3dBm		T	3-4	—
—5dBm		T	5-6	—
—7dBm		T	7-8	—
—9dBm		T	9-10	Normal
—11dBm		T	11-12	—
—13dBm		T	13-14	—
—15dBm		T	15-16	—

For switches A to R; OPEN= [↑] CLOSED= [↓] 'T' and '18' are LINKS

Function	Operation	Switch	Position	Facility Option
Protective earth				
Separate	Protective earth not connected to Common Return	18	2-4	Normal
Linked	Protected earth strapped to Common Return	18	3-4	—
Line signalling method				
Loop disconnect	10 pps loop disconnect signalling to the Telephone Exchange	TLA TLB TLC TLD Jumper Lead to socket JD DEC	Closed Closed Open Open	Normal
MF	Multi Frequency signalling to the Telephone Exchange	TLA TLB TLC TLD Jumper Lead to socket JD MF	Open Open Closed Closed	

For switches A to R; OPEN= [▯] CLOSED= [▯] 'T' and '18' are LINKS

2.1.2 Modem strapping for modems with serial number range 0XXXX

The modem provides a number of facility options which are strap selectable. Figure 3 shows the positions of all the switches and links mentioned in this section, which are accessed by separating the modem top panel from its base

To separate the modem top panel from its base —

a) turn the modem upside down and loosen the 4 self retaining cross head screws in the base;

b) with the modem upright lift the top panel just clear of the base;

c) carefully fold the top panel backwards on the interconnecting ribbon cables.
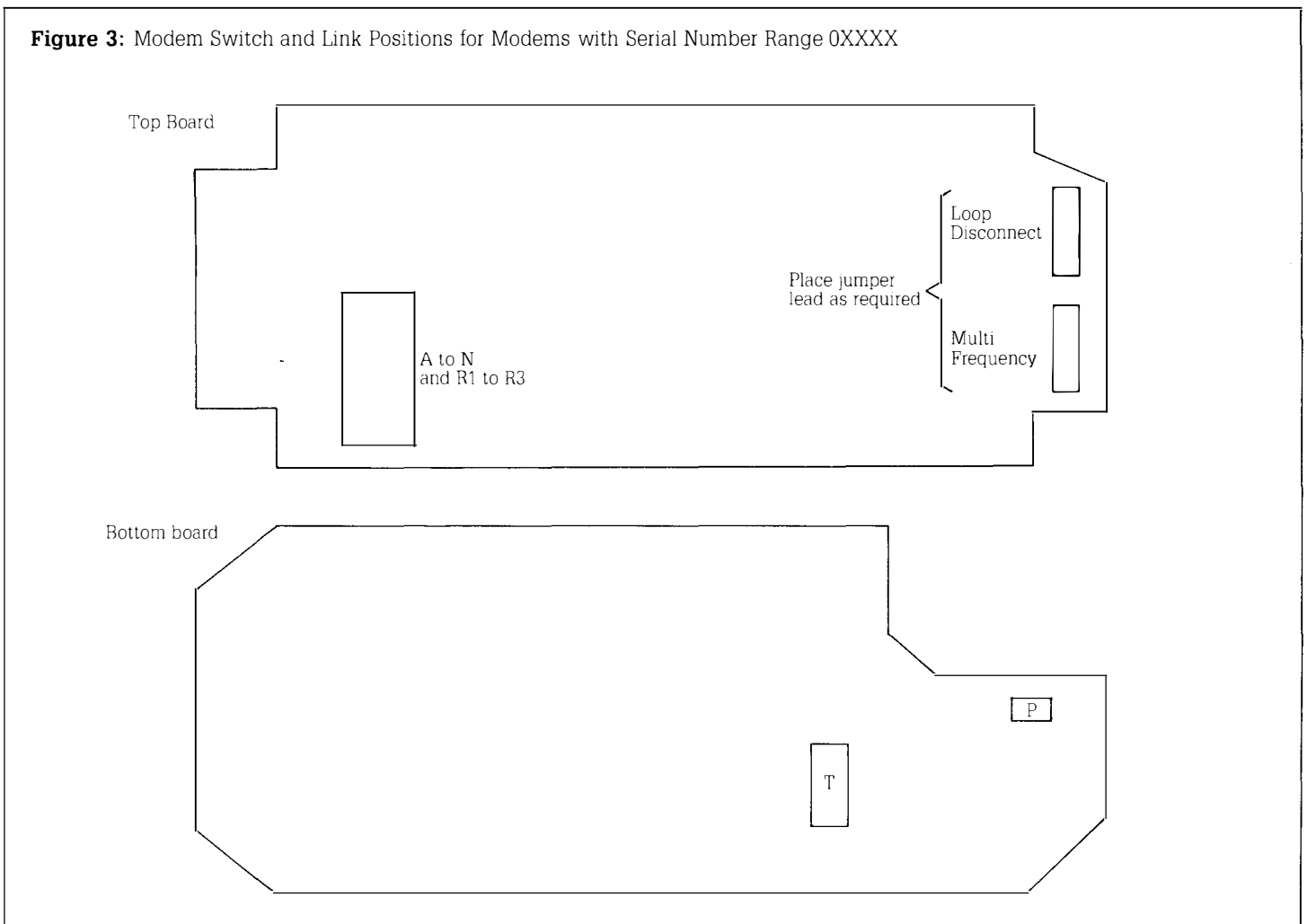

Figure 3: Modem Switch and Link Positions for Modems with Serial Number Range 0XXXX

Table 3: Modem strapping chart for serial number range 0XXXX

The FACILITY OPTION column in this chart is a quick reference
guide based on the Customer Questionnaire (see Appendix 1)
Unmarked options are not recommended for normal use.

Function	Operation	Switch	Position	Facility Option
PSTN line connection method				
Manual switching	DATA and TELE buttons enabled	N	Closed	
	108/2 switching disabled			3a
	CT 108 forced ON	L	Closed	
Data Terminal Ready (108/2) switching	DATA and TELE buttons enabled	N	Closed	
	108/1 switching disabled			3b
	CT 108 DTE controlled	L	Open	
Connect Data Set To Line (108/1) switching	108/1 switching enabled	N	Open	
	DATA and TELE buttons disabled			3c
	CT 108 DTE controlled	L	Open	
Carrier fail disconnect facility				
Not required	Carrier fail disconnect disabled	C	Closed	5a
Carrier fail disconnect	Carrier fail disconnect enabled	C	Open	5b
Receive long space disconnect facility				
Not required	Long space disconnect disabled	B	Closed	6a
Long space disconnect	Long space disconnect enabled	B	Open	6b
Data format and Transmitter Signal Element Timing (TSET) source				
Synchronous, timing from modem	Synchronous data selected	R1	Open	
		R2	Open	
		R3	Open	9a
	Internal clock selected	E	Open	
	Internal clock=modem clock	F	Open	
Synchronous, timing from received data	Synchronous data selected	R1	Open	
		R2	Open	
		R3	Open	9b
	External clock selected	E	Open	
	External clock=Receiver signal element timing	F	Closed	
Synchronous, timing from DTE	Synchronous data selected	R1	Open	
		R2	Open	
		R3	Open	9c
	External clock selected	E	Closed	
	External clock=DTE clock	F	Closed	
Asynchronous, 8 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	8 bit characters	R1	Closed	
		R2	Closed	9d
		R3	Closed	
Asynchronous, 9 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	9 bit character length	R1	Closed	
		R2	Closed	9e
		R3	Open	
Asynchronous, 10 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	10 bit character length	R1	Closed	
		R2	Open	9f
		R3	Closed	
Asynchronous, 11 bit characters	Asynchronous data selected	E	Open	
		F	Open	
	11 bit character length	R1	Closed	
		R2	Open	9g
		R3	Open	
Maximum stop bit deletions				
1 in 4	No more than 1 stop bit in 4 characters removed	J	Open	Normal
1 in 8	No more than 1 stop bit in 8 characters removed	J	Closed	---

For switches A to R; OPEN= [⎕]   CLOSED= [⎕] 'T' are LINKS

Function	Operation	Switch	Position	Facility Option
Remote Digital Loop test feature				
Not required	Receipt of RDL command disabled	A	Closed	—
Command accepted	Receipt of RDL command enabled	A	Open	Normal
PSTN transmit level				
—1dBm		T	1-2	—
—3dBm		T	3-4	—
—5dBm		T	5-6	—
—7dBm		T	7-8	—
—9dBm		T	9-10	Normal
—11dBm		T	11-12	—
—13dBm		T	13-14	—
—15dBm		T	15-16	—
Protective earth				
Separate	Protective earth not connected to Common Return	P	2-3	Normal
Linked	Protected earth strapped to Common Return	P	1-2	—
Line signalling method				
Loop disconnect	10 pps loop disconnect signalling to the Telephone Exchange	Jumper lead to upper socket		Normal
MF	Multi Frequency signalling to the Telephone Exchange	Jumper lead to lower socket		

For switches A to R; OPEN= [☐] CLOSED= [☐] 'T' are LINKS

2.2 Modem installation and confidence check

Replace the modem top panel in the reverse order to that given in Paragraph 2.1. Insert the Connecting Cord plug into a New Plan socket terminating the PSTN line. The connection point for the DTEs 25 way plug is on the end of the 'flying lead'.

2.2.1 Modem confidence check

Before attempting to use the modem its basic functioning capability may be checked as follows —

a) Make sure that the modem is powered and ON.

b) Operate the 'TEST MODEM' button.

c) The monitor LEDs will light for a few seconds.

d) the 'TEST MODEM' LED will remain ON.

e) The 'ERROR' LED should be OFF to indicate an error free test.

If further tests are required, refer to Section 3.3.

Section 3 — User Information

3.1 Datelphone controls and indicators

The Datelphone 4122 combines the features of a push-button telephone with those of a Modem 4122 for use over the PSTN only.

The telephone controls are on the left side of the case, adjacent to the handset cradle. These consist of a 4×4 matrix of pushbuttons, of which the 3 unmarked buttons are blanks.

The Recall (R), Star (*) and Hash (#) buttons are used on PBX extensions only.

The hinged cover at the extreme left side of the case houses a card which may be used as a directory of up to 10 important or frequently used phone numbers.

The modem controls and indicators and their respective functions are described in Tables 4 and 5 below.

Table 4: Description of modem controls

Button/Switch	Function
Data (Note 1)	Operating this button connects the modem to the exchange line, provided the DTE has been correctly conditioned.
Speech (Note 1)	Operating this button disconnects the modem from the exchange line
Auto Ans	Operating this button enables the automatic answering facility, whereby the modem will automatically connect to the exchange line on receipt of an incoming call—provided the DTE has been conditioned correctly. Re-operating this button disables this facility.
600 1200	Data rate selector switch—selects 600 or 1200 bit/s operation depending on the switch position during connection to line.
Digital Loop (Note 2)	Operating this button places a local digital loop (received data looped to transmit data) within the modem. Re-operation of this button removes the loop.
Test Modem	Operating this button tests both: i) the Datelphone LEDs by turning them ON for a few seconds. and ii) for the correct functioning of the modem—if a fault exists, the error LED will flash Re-operation of this button restores the modem to normal operation.

Notes:
1. The Data and Speech buttons are inoperative when using 108/1 switching.
2. For further details of Digital Loop and Test Modem see Section 3.3 Diagnostic Facilities.

Table 5: Modem LED indicator functions

Legend	Function when Glowing
Data	Indicates that the modem has been instructed to connect to line
Speech	Indicates that the Datelphone is in the speech mode and that the handset is off the cradle.
Auto ans	Indicates that the automatic answering facility within the modem has been enabled by operation of the auto answer push-button.
Ready	Indicates that the modem is ready to start exchanging data over the exchange line link.
Transmit (Note 1)	Indicates that the data bit currently presented by the DTE for transmission is a Binary 0, or a Binary 1 if the LED is off.
Receive (Note 1)	Indicates that the data bit currently presented by the modem to the DTE is a Binary 0, or a Binary 1 if the LED is off.
Digital loop	Indicates that the modem is in a digital loop. The loop may be remotely or locally instigated.
Test modem	Indicates that the modem is in a self test mode which is instigated by operation of the test modem button.
Error	Indicates the presence of a fault in the modem during the self test.

Note:
1. Transmit and Receive LEDs functions are only valid when the 'ready' LED is glowing.

3.2 Operating instructions

Before any operations can be performed using the Datelphone 4122, it should be correctly installed (see Section 2) and powered up.

Connection to line

i) Manual switching

a) Arrange for the DTE to provide the correct conditions for connection to line.

b) Lift the handset and dial out the required number.

The speech LED should be ON during this procedure

c) If the call is answered manually, ask the called party to connect the associated remote modem to line

This latter operation—or if the call is answered automatically—results in a high-pitched tone being sent down the line.

d) On hearing this tone, operate the data button on the Datelphone

Initially : The 'speech' LED will turn OFF
The 'data' LED will turn ON
After a few seconds: The 'ready' LED will turn ON

The modem should now be ready to exchange data over the link. The handset should be left 'ON HOOK'.

ii) DTE controlled switching (under the sole control of the DTE)

a) Follow (a), (b) and (c) as described above.

The 'speech' LED should be OFF during this procedure

b) The DTE should be conditioned to connect the modem to line during receipt of the high-pitched answer-tone.

Initially : The 'data' LED will turn ON
After a few seconds: The 'ready' LED will turn ON.

Disconnection from line

To disconnect the modem from the line either —

a) condition the DTE to take the modem off line;

　　or

b) (when using manual switching) operate the speech button.

Alternatively, if any of the auto-disconnect options is enabled, the modem will disconnect automatically from line given the correct conditions.

Automatic answering

To enable this facility on the Datelphone —

1) the terminal should be conditioned correctly;

2) The 'auto answer' push button should be operated, which should turn the 'auto answer' LED ON;

3) the handset must be left on its cradle

The modem will then connect to line automatically when incoming ringing is received

Speech facilities

To use the Datelphone as a normal telephone, ensure that the modem is off line. Lifting the handset in this mode turns the 'speech' LED ON

3.3 Datelphone diagnostic facilities and maintenance

The Datelphone 4122 has a range of integral diagnostics which facilitate fault detection and isolation. The use of these diagnostics is explained in figures 4, 5 and 6 and associated tables when a Datelphone 4122 operates over a link to a Modem 4122. If these tests indicate a fault it should be reported to the BT fault reporting number provided that the modem is rented, under guarantee, or covered by the BT Systemcare Maintenance Service.
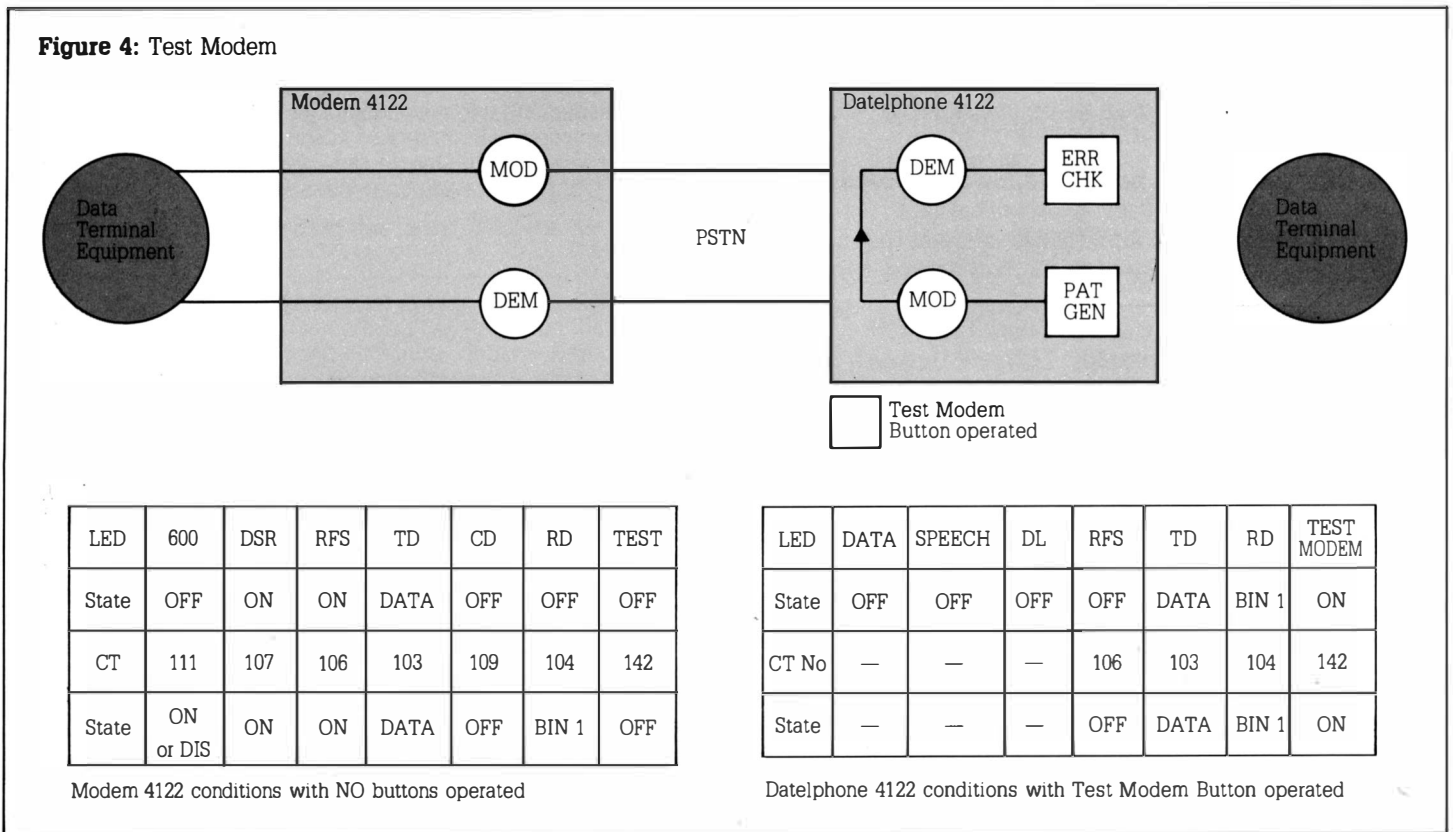
A. Local analogue loop self test (see figure 4)

This test is made by first ensuring the 'data' lamp is off (the 'data' lamp can be turned off by depressing the 'speech' button) and then operating the 'test modem' button. By doing this the Datelphone is tested in two ways.

1) It tests the LEDs by turning all of them ON for a few seconds, after which the 'test modem' LED stays on.
2) It places a local analogue loop (the output of the modulator is looped to the input of the demodulator) on the modem line terminals, and at the same time transmits a test pattern. If the 'error' lamp on the Datelphone flashes then the modem is faulty.

The Datelphone will disconnect from line during this test, and al the DTE originated interface signals will be ignored.

To restore to normal operation, re-operate the 'test modem' button.

Figure 4: Test Modem

Test Modem
Button operated

LED	600	DSR	RFS	TD	CD	RD	TEST
State	OFF	ON	ON	DATA	OFF	OFF	OFF
CT	111	107	106	103	109	104	142
State	ON or DIS	ON	ON	DATA	OFF	BIN 1	OFF

Modem 4122 conditions with NO buttons operated

LED	DATA	SPEECH	DL	RFS	TD	RD	TEST MODEM
State	OFF	OFF	OFF	OFF	DATA	BIN 1	ON
CT No	—	—	—	106	103	104	142
State	—	—	—	OFF	DATA	BIN 1	ON

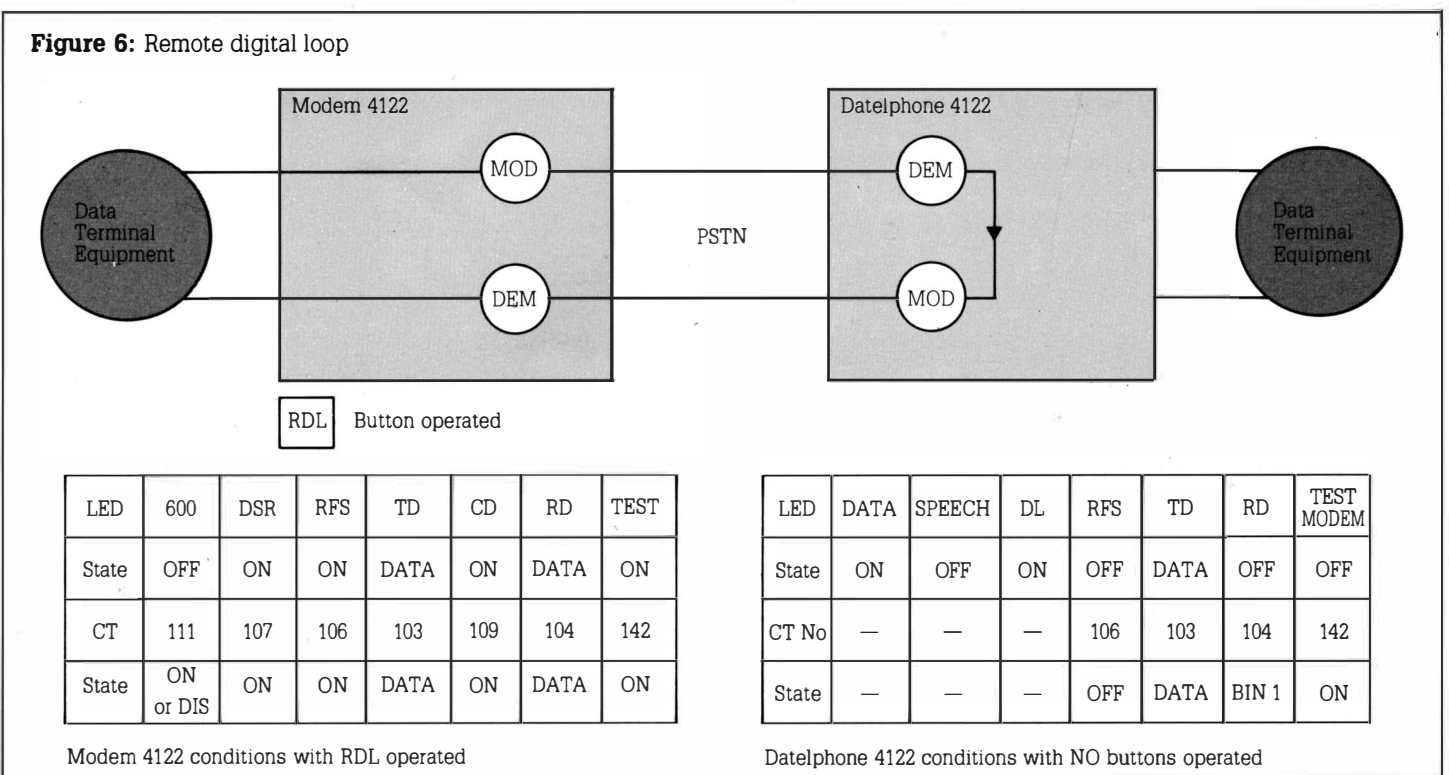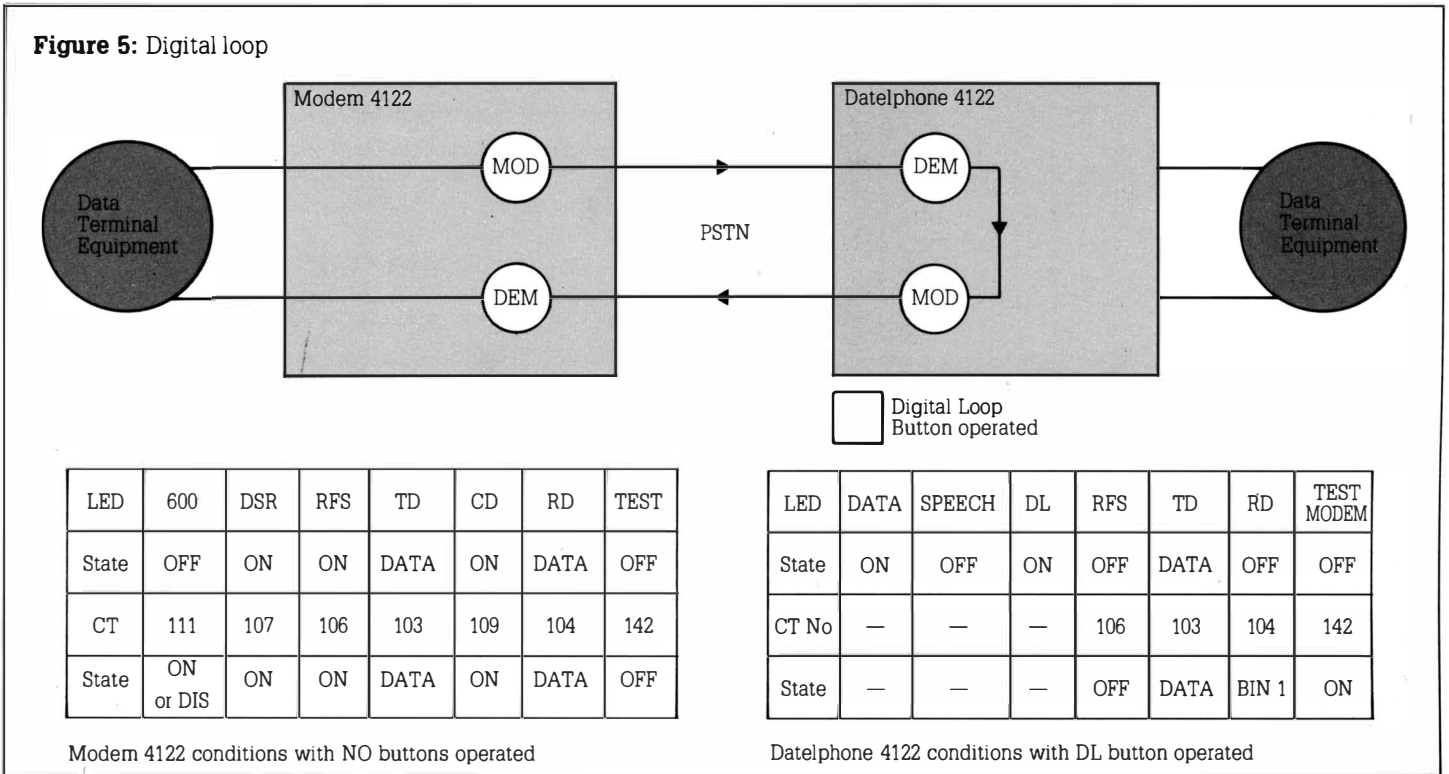Datelphone 4122 conditions with Test Modem Button operated

B. Digital loop (see figures 5 and 6)

This test is made by operating the 'digital loop' button. The associated LED lights. By doing this the distant end can check the local Datelphone by sending signals around the loop on the digital interface.

Note that the 'local digital loop' can be operated remotely by pressing the 'remote digital loop' button on the Modem 4122. The local Datelphone operator will know this has occurred as the 'digital loop' LED will light.

To clear down this loop test condition re-operate the 'digital loop' button for a locally originated loop. When the loop was originated remotely the distant operator will restore the 'remote digital loop' button on the Modem 4122.

Figure 5: Digital loop

Digital Loop Button operated

LED	600	DSR	RFS	TD	CD	RD	TEST
State	OFF	ON	ON	DATA	ON	DATA	OFF
CT	111	107	106	103	109	104	142
State	ON or DIS	ON	ON	DATA	ON	DATA	OFF

Modem 4122 conditions with NO buttons operated

LED	DATA	SPEECH	DL	RFS	TD	RD	TEST MODEM
State	ON	OFF	ON	OFF	DATA	OFF	OFF
CT No	—	—	—	106	103	104	142
State	—	—	—	OFF	DATA	BIN 1	ON

Datelphone 4122 conditions with DL button operated

Figure 6: Remote digital loop

RDL Button operated

LED	600	DSR	RFS	TD	CD	RD	TEST
State	OFF	ON	ON	DATA	ON	DATA	ON
CT	111	107	106	103	109	104	142
State	ON or DIS	ON	ON	DATA	ON	DATA	ON

Modem 4122 conditions with RDL operated

LED	DATA	SPEECH	DL	RFS	TD	RD	TEST MODEM
State	ON	OFF	ON	OFF	DATA	OFF	OFF
CT No	—	—	—	106	103	104	142
State	—	—	—	OFF	DATA	BIN 1	ON

Datelphone 4122 conditions with NO buttons operated

British Telecom
Datel 1200 Duplex

In order that the needs of your data communication system are precisely met, British Telecommunications require the information asked for below. Ticks should be placed in the appropriate boxes and in some cases if a box is not ticked, or incompatible facilities are requested, British Telecommunications will provide a default option. These options are indicated by an asterisk*. To complete the form you may find it necessary to seek the advice of your data terminal equipment (DTE) supplier. Separate forms should be used for modems at different locations and/or with different facilities.

When all sections have been completed and the form signed, please return it to the Telephone Area sales office.

General information

Name of Company

Head Office Address

Telephone Number

Address where equipment is required
(if different from above)

Customer contact on site

Telephone Number

Equipment Supplier

Equipment Title and Type

How many modems are required at this site with the facilities described below? ☐

1 Type of modem
a) Datel modem in its own case ☐ Ⓜ
b) Datel modem card for rack mounting ☐ Ⓒ
c) Datelphone ☐ Ⓟ

2 Type of circuit
a) 2-wire private circuit only ☐ Ⓐ
b) 2-wire private circuit with PSTN standby ☐ Ⓑ
c) Single PSTN exchange line ☐ Ⓒ

Note: Datelphone is for PSTN operation

3 Connection to and disconnection from the PSTN
Manual by operation of control buttons on BT equipment ☐ ▣ⓐ
Controlled by the DTE via interchange circuit 108/2 in conjunction with buttons on BT equipment ✳ Ⓑ
Controlled by the DTE via interchange circuit 108/1 ☐ Ⓒ

Notes:
i. Automatic answering is available with options b and c.

ii. Automatic answering is normally provided only when the modem is connected to an exclusive exchange line which does not have a directory entry.

4 Automatic standby switching
If your data communication system can operate and control the automatic standby facility, specify if required.
NO ✳ ⓐ
YES ☐ Ⓑ

5 Carrier fail disconnect for PSTN modem
If your DTE controls interchange circuit 108/2 for switching modem to line, indicate whether or not the carrier fail disconnect facility is needed.
Not required ☐ ▣ⓐ
Required ☐ Ⓑ

6 Receive long space disconnect for PSTN modem
If your DTE controls interchange circuit 108/2 for switching modem to line, is the facility
Not required ☐ ▣ⓐ
Required ☐ Ⓑ

7 Carrier control
For private circuit operation, which do you require?
Constant Carrier ☐ ▣ⓐ
Switched Carrier ☐ Ⓑ

8 Request to send control
Do you require interchange circuit 105 to be
Controlled by the DTE or ✳ ▣ⓐ
Permanently ON? (invalid if switched carrier or PSTN operation specified) ☐ Ⓑ

9 Synchronous timing source or asynchronous (start-stop) data format
If *synchronous* data is presented to the modem, what is the source of transmitter signal element timing?
the modem internal clock ✳ ▣ⓐ
from the received data ☐ Ⓑ
from the data terminal equipment ☐ Ⓒ

Note: internal timing will be provided for asynchronous data formats.

If *asynchronous* (start-stop) data is presented to the modem, what character length, including start and stop bits, will be used?

8 bit characters	☐	d
9 bit characters	☐	e
10 bit characters	☐	f
11 bit characters	☐	g

Signature

_____

Position in company

_____

Date

_____

_____

For British Telecom use only

_____

Advice Note Number(s)

_____

Exchange Line Number(s)

_____

Private Circuit Number

_____

_____

_____

File reference

PH 3309

Glossary of Terms

Answer sequence

The initial section of the Handshake sequence.

Asynchronous (stop-start) (also Character Asynchronous)

A form of data transmission where the inter-character spacing is variable but with a strict timing relationship between the data bits in the character.

Baud

Unit of rate of change of line signal information per second; the modulation rate.

Bit

A binary digit, having the value of either 0 or 1.

Character

A grouping of a fixed number of bits. In asynchronous mode, the data in the character is sandwiched between stop and start bits.

Constant carrier operation

A method of operation whereby a modem transmitter always generates data line signals irrespective of the electrical condition on the Request to Send interchange circuit (105).

Data circuit-terminating equipment (DCE)

The equipment installed at the user's premises which provides all the functions required to establish, maintain and terminate a connection, the signal conversion and coding between data terminal equipment (DTE) interface and the line. An example of DCE is a Datel Modem.

Data terminal equipment (DTE)

Equipment comprising: the data source, the data sink, or both, typically a computer or VDU.

Dial-Up

The British Telecom Enterprises term 'Dial-Up' is synonymous with the CCITT term 'General Switched Telephone Network (GSTN)' and with the UK British Telecom term 'Public Switched Telephone Network (PSTN)'.

Duplex

Permitting the transmission of data in both directions simultaneously.

Dibit

A grouping of 2 consecutive data bits, with the aim of reducing the baud rate.

Handshake sequence

A routine which modems connecting to a Dial-Up line go through to achieve recognition, synchronisation and echo suppression. See CCITT Recommendation V22B for details.

Intracharacter Bit Rate

The effective data rate within a character period, ignoring the stop bits.

Leased circuit

A pair of wires or more, rented from a telecommunications service between two specific points for use by the user only. This term is synonymous with the UK British Telecom expression 'Private Circuit (PC), and 'Private Wire (PW)'.

Modem

A contraction of the words MODulator and DEModulator. A type of Data Circuit-Terminating Equipment.

Modulation

A process by which certain characteristics of a wave are modified in accordance with a characteristic of another wave or signal.

PC

See Leased Circuit.

PSTN

See Dial-Up.

PW

See Leased Circuit.

RFS delay

When DTE turns CT 105 (Request to Send) ON, the modem responds by turning CT 106 (Reading for Sending) ON after a pre-determined time period known as the RFS delay. This delay usually allows the far end modem to synchronise.

Serial transmission

Transmission, at successive intervals, or signal elements constituting the same telegraph or data signal. The sequential elements may be transitted with or without interruption provided that they are not transmitted simultaneously.

Standby-Back-Up

An expression indicating that the modem can be used over the Dial-Up service instead of the leased circuit.

Switched carrier operation

A method of operation whereby a modem transmitter generates data line signals dependent upon the electrical condition on the Request to Send Interchange circuit (105).

Synchronous transmission

The transmission of data in a continuous train of characters under control of a master clock. A block of data transmitted asynchronously may contain data transmitted synchronously. (See asynchronous).

References

1 CCITT (Yellow Book) Volume VIII 1 — Data Communication over the Telephone Network Published by the International Telecommunications Union (ITU) Geneva 1981.

Recommendations

V22 — 1200 bits per second duplex modem standardised for use on the General Switched Telephone Network and on Leased Circuits.

V24 — List of Definitions for Interchange Circuits between Data Terminal Equipment and Data Circuit-Terminating Equipment.

V25 — Automatic Calling and/or Answering Equipment on the General Switched Telephone Network, including disabling of Echo Suppressors on Manually Established Calls.

V28 — Electrical Characteristics for Unbalanced Double-Current Interchange Circuits.

V54 — Loop Test Device For Modems.

2 International Standard ISO/1S 2110 (1980) Data Communication — 25 pin DTE/DCE interface connector and pin assignments.

3 British Telecom Technical Guide No 2 General requirements for Data Terminal Equipment.

4 British Standard BS 6328 PART 1 1982. Apparatus for connection to British Telecommunicatons private circuits.