

**Prism Modem 2000
Direct Connect
Modem**

**Specification and
Instructions for use**

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Introduction

Congratulations and welcome to the fast growing network of Prism Modem 2000 users. This product is the result of research and development involving a British company recognised as a leading supplier of Telecommunications equipment worldwide. It is manufactured to standards that should give many years of reliable service.

Please read this guide carefully; it explains the comprehensive facilities offered by the 2000, describes how it is connected into your existing computer system, and lists the steps required for successful operation.

1 About your Prism Modem 2000

Introduction

The Prism Modem 2000 is a 'V23' standard modem introduced specifically for use with home or small business computer systems. Connected between an RS232C communications port on your computer and the domestic telephone installation it will enable you to access the national Prestel (viewdata) service* or exchange messages/programs with other users of this type of modem anywhere in the world! These facilities, available in the past only to dedicated viewdata subscribers and large system users, have often proved too expensive for even the serious hobbyist, but are now available to you at a realistic price made possible by the recent introduction of single-chip modems and inexpensive microcomputers.

**NOTE:* Before you can access the viewdata service, your personal computer will require additional software. This is available from Micronet and converts your existing screen into a 40-column screen with full viewdata graphics.

The Modem

The modem, or modulator/demodulator as it is more correctly known, accepts serial binary data from the computer as a random sequence of 1's and 0's and converts them into voice frequencies suitable for transmission over the telephone network. For this purpose the modulator uses a frequency shift keying technique (FSK) which transmits two frequencies - one used to represent a binary 1 (mark) and the other to represent a binary 0 (space). When receiving data from the telephone line the demodulator reverses the process converting the respective frequencies back into binary 1's and 0's.

Unlike other modems which are 'acoustically coupled' to the line using the telephone handset (rather like a microphone and loudspeaker) the 2000 has a direct line interface preventing interfering voice frequencies from corrupting the flow of computer data

Operating Modes

The Prism Modem 2000 has two operational modes catering separately for viewdata service and 'personal-link'

Viewdata

The viewdata service requires a full-duplex link - this allows simultaneous transmission and receipt suitable for interactive working. So that the modem can separate your request for information from the corresponding data page, the outgoing and incoming transmissions employ different frequencies to represent binary 1 and binary 0. At the same time the maximum transmission rates are different, due to the different bandwidths available for outgoing and incoming channels. The slower (and often shorter) outgoing message, used to request information is transmitted at up to 75 b.p.s. at frequencies of 390Hz and 450Hz representing binary 1 and binary 0 respectively. The faster (and usually longer) incoming messages, used to send page data, are transmitted at 1200 bps. In this mode the modem can receive data at any time, and, once the link is established, can transmit data if the request to send interface signal (RTS) is ON.

Personal-link

The personal-link uses half-duplex transmission - this allows alternate transmission and reception at up to 1200 bps. in either direction. Because the modem is either transmitting or receiving, only one pair of modulation frequencies is required, in this case 1300Hz and 2100Hz representing binary 1 and binary 0 respectively.

Switching between the transmit and receive mode (turn-round) is controlled by user software which monitors the received data content (case 1) or, alternatively, the status of a carrier detect signal (CD) (case 2). The modem generates CD provided the voice frequency signal level received is above a predetermined limit. Either way, the computer must wait for the incoming data to cease before it requests the modem to transmit.

Case (1): In many personal computers using a DIN interface connector (see - Installation), the user software may be unable to monitor the condition of CD. In this case the parties concerned should agree beforehand to add 'end of message' characters to the tail-end of all transmitted data. These can be readily detected by software when in the receiving mode, enabling turn-round by turning ON the request to send signal (RTS) which controls transmission from the modem.

Case (2): Turn-round using CD is only possible if your computer's RS232C port is hard-wired to accept the CD status signal. Provided this condition is satisfied your communications software should monitor CD when receiving. The modem will automatically apply an OFF condition to CD when the remote computer has ceased transmitting.

The Microcomputer Controller

The microcomputer in the Prism Modem 2000 is programmed to control the line and RS232C interfaces; to route information to and from the modem section; and to accept operators' actions signalled via the DATA and MODE pushbuttons. It also drives the ON-LINE and SIGNAL l.e.d.'s which give essential status information, and provides a useful self-test facility.

Line Interface

The line interface employs a switching relay which connects the modem to the telephone line when the DATA pushbutton is operated. An l.e.d. signals the on-line condition.

Mode Control

Mode switching is controlled using the MODE pushbutton. Immediately after your Prism Micro 2000 is powered-up, operation of the MODE pushbutton forces the microcomputer to conduct a limited self-test of the modem section. A successful test will be indicated by the SIGNAL l.e.d. turning ON; if unsuccessful it will flash. The MODE pushbutton must be

pressed again to end the test mode and restore normal operation. Operation of the DATA pushbutton in isolation selects the viewdata (Prestel) mode or in conjunction with the MODE pushbutton selects the 'personal-link' mode.

RS232C Interface

The most simple RS232C interface uses the DIN connector. This includes the mandatory transmit and receive data circuits (TXD and RXD) and two control signals - RTS (Request to Send) from your computer and CD (Carrier Defect) from the modem to your computer.

When RTS is ON, the modem first transmits a short conditioning signal to the line, then the data signal. When CD is ON, the modem is receiving a line signal at a satisfactory level, and the SIGNAL Led. will be ON. It may also be ON because of a high level of noise on the telephone line.

2 Installing your Prism Modem 2000

Mains Connection

VOLTAGE

The Prism Modem 2000 requires a 240v, 50Hz mains supply.

FUSE

The recommended fuse for use with this modem is 3 Amps.

1. The mains cable contains two wires, colour-coded for easy recognition. These colours, or an initial, will be marked at the connection points on most good quality plugs. Attach the wires to their respective points in the plug:

BROWN or BLACK wire to BROWN or L (LIVE)

BLUE wire to BLUE or N (NEUTRAL).

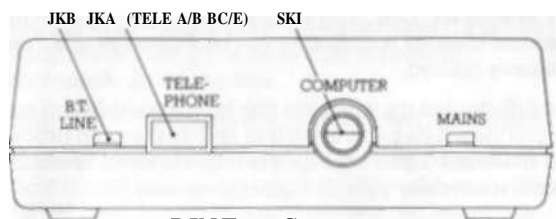
2. Check that correct 3A fuse is fitted.

3. Before refitting the top cover of the plug, make sure that the cable clamp is tight and firmly holding the cable outer sheath.

Connecting the Modem to the Telephone Line/Microcomputer

The 'standard' RS232C interface connector suitable for most microcomputers is the DIN connector. Figure 1 shows the rear view of the modem, illustrating the interface connector.

FIGURE 1 REAR VIEW OF PRISM MODEM 2000



How to Connect with a 'New Plan' Installation

1. Connect your modem to your microcomputer's RS232C port.
2. Disconnect telephone handset from the wall socket and plug into socket JKA (see Figure 1) at rear of the modem case.
3. Connect the fixed cable from rear of the modem and plug it into the telephone wall socket. Connections for the Type 600 Series plug are listed in Figure 2.

FIGURE 2 TYPE 600 SERIES PLUG CONNECTIONS

Plug Pin No.	Function
2	A wire
3	Signal Earth
4	Shunt wire
5	B wire

The telephone remains available for normal use if the modem is not being used for data transmission. When a connection has been set up for data transmission the telephone is automatically disconnected.

NOTE: If you do not have a Type 600 Series wall socket, contact your local BT area sales office and arrange for one to be installed

Power Up

When the installation is complete, plug in the mains plug to a power point and apply power.

Modem 2000 to Microcomputer Interface

Figure 3 sets out the signal/pin wiring for the DIN interface connector.

FIGURE 3 DIN CONNECTOR WIRING

Pin	Signal	V23 Circuit
1	Receive Data (RXD)	104
2	Transmit Data (TXD)	103
3	Carrier Detect (CD)	109
4	Signal Ground	102
5	Request to Send (RTS)	105*

* RTS may be made permanently ON for viewdata operation if required by connecting the '105 ON link inside the modem.

3 Operating Procedures

Introduction

These procedures are restricted to switching your computer on and off-line ready for full-duplex (viewdata) or half-duplex (personal link) operation. They make no attempt to describe the viewdata or user software protocol which will vary according to the type of computer installation and the ingenuity of individual programmers. Once your computer is connected to the telephone line - it's up to you!

Viewdata Operation

Going on-line

1. To access the viewdata service first dial the appropriate service number using your telephone in the normal way.
2. If the lines are not all busy the viewdata computer will answer your call by transmitting a high pitch tone (1300Hz). This tone should be strong and continuous. If there is crackling or other interference, you may wish to dial again to avoid possible corruption of the data on your screen during operation.
3. On hearing the tone, press the 'DATA' pushbutton on your modem, and when the 'LINE' l.e.d. illuminates, replace your telephone receiver. Your computer is now on-line.
4. The modem's 'SIGNAL' l.e.d. will illuminate and after a short delay the viewdata computer sends a message asking you to key in your ID code. You should reply promptly with the personal identity supplied to you by Prestel or other service you have dialled.
5. The full-duplex transmission link is now established and normal viewdata page selection and display can proceed. The modem's 'LINE' and 'SIGNAL' l.e.d.'s should remain illuminated while your computer is on-line.

Going off-line

There are two ways in which a telephone line connection can be dropped and your computer taken off-line. The first is a deliberate action which you should take when you have finished using the viewdata service. This simply involves pressing the modem's 'DATA' pushbutton again. The second method is completely automatic and can occur without warning when your Prism Modem 2000 detects 'loss of carrier' from the viewdata computer. Special abort logic will then cause the modem to drop the line.

In both cases the 'LINE' and 'SIGNAL' l.e.d's will be extinguished and the interface signals turned OFF. A 3-second internal delay will prevent you from placing any further calls until the exchange equipment has settled.

Personal-link Operation

Going on-line

1. To connect a half-duplex transmission link with a remote Prism Modem 2000 user, first establish telephone contact in the normal way, with both microcomputers ON (and fully prepared with the information you want to send if you are going to transmit).
2. Decide between you if the message is simplex, i.e. one way transmission only, or true half-duplex using a polling technique to transmit and receive alternately. If polling is to be adopted decide if you both wish to receive 'end-of-message' characters.
3. Decide who will receive first and proceed accordingly.
 - a) If you are receiving first; press your modem's 'DATA' pushbutton followed by the 'MODE' pushbutton. When the 'LINE' l.e.d. has illuminated replace the telephone receiver. Your modem is now on-line and will transmit a

2100Hz tone. After approximately 4 seconds, when the remote computer starts to transmit, the 'SIGNAL' l.e.d. will illuminate telling you that your computer is receiving data.

- b) If you are transmitting first; wait until you hear the 2100Hz answer tone from the remote modem, and then press your modem's 'DATA' pushbutton followed by the 'MODE' pushbutton. When the 'LINE' l.e.d. is illuminated, replace the telephone receiver. Your computer can then begin transmission by turning the RTS interface signal ON.

Turn-round

At the end of the first transmission, signalled either by loss of carrier or 'end of text' messages the transmitting modem takes on the receiver role and vice-versa. Consequently the 'SIGNAL' l.e.d. will alternately illuminate and extinguish to show which role it is currently in.

Going off-line

There is only one way in which a telephone line connection can be dropped and your computer taken off-line. This simply involves pressing the modem's 'DATA' pushbutton again.

The 'LINE' and 'SIGNAL' l.e.d's will be extinguished and the interface signal turned off. A 3-second internal delay will prevent you from placing any further calls until the exchange equipment has settled.

It is up to the two parties involved to decide how and when a decision to terminate the link is made.

4 Technical Data

Modem Characteristics

System of Modulation Operation Frequency Shift Keying (FSK)
Asymmetric Full-Duplex (FDX) or
alternatively Half-Duplex (HDX)

Transmit Channel	FDX	HDX
Characteristic Frequencies	450Hz \pm 3Hz	2100Hz \pm 6Hz (Binary 0)
	390Hz \pm 3Hz	1300Hz \pm 6Hz (Binary 1)
Data Rate	0-75b.ps.	0-1200b.ps.
Output Level	Maximum of -9dBm into 600 ohms resistive termination	
Line Termination	600 ohms nominal Return loss - 18dB minimum 300Hz to 3400Hz with respect to 600 ohms resistive termination	



Receive Channel

Characteristic Frequencies	2100Hz \pm 16Hz (Binary 0) 1300Hz \pm 16Hz (Binary 1)
Data Rate	0-1200 b.p.s.
Maximum Input Level	Not to exceed - 13dBm
Carrier Detect Level	-43dBm \pm 1dB at 1300Hz (The modem will accept carrier signals greater than the carrier detect level)
Minimum Carrier Fail Level	-48dBm

Interchange Circuit Delays

RTS-CTS	This is the duration of the 1300Hz conditioning signal in Half-Duplex mode at the transmission start up. May be extended to 80ms by opening 'DELAY' strap
Echo Delay Clamp	This is the time for which received data is protected from spurious line echoes in Half-Duplex mode when transmitter turns off. May be extended to 150ms by opening 'V23' strap