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Model 224 - Short Haul Modem *Reference Manual*

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1.0 General Description

The Model 224 is a limited distance modem that provides data communication over two twisted pairs with DC continuity from one end to the other. These twisted pairs may be customer provided private lines or unconditioned telephone company metallic circuits.

The Model 224 provides the capability of transmitting data and one control signal in each direction.

1.1 DataSpy™ Feature

Your new Telebyte product incorporates the patent pending DataSpy feature, an LCD display designed to provide meaningful information to you, the user. It will assist in the initial installation and check out and thereafter can be used as a performance monitor. In the case of a system problem it provides information as to the status of the local link.

The Telebyte logo displayed on the LCD display indicates that the unit is powered (see Figure below). For power stealing devices such as your modem, it is an indication that sufficient power is being applied to operate the device. The LCD display uses less than 1 milliwatt of power.

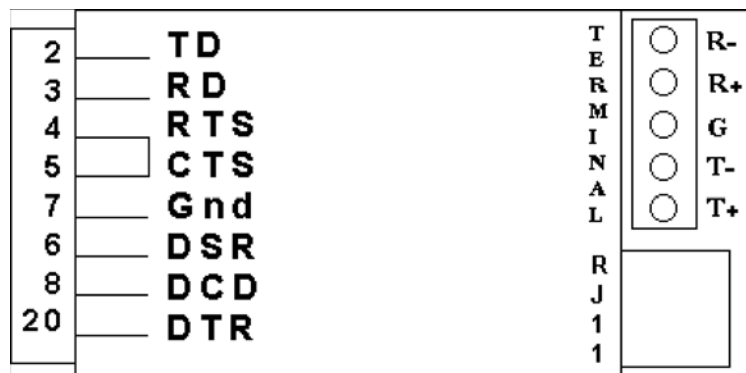
The data display on the LCD consists of graphical representations of TD (Transmit Data) and RD (Receive Data.). Each of these signals are displayed as a bit change waveform would appear on an oscilloscope. Ordinarily, TD and RD are low or a minus volt-age in the quiescent state. When data is transmitted, the transmit signal is brought high to a positive voltage. These two (2) signal states are displayed on the LCD by either a low segment or a high segment. The low segment represents the minus voltage, the mark condition, while the upper segment represents a positive



voltage, the space condition. The vertical bar connecting the lower segment to the upper segment is always on when power is applied.

If the transmit signal is in the quiescent state, continuously low, only the lower segments and the vertical bar will be illuminated. This is an indication of a constant negative state. If the transmit or receive inputs to the device were streaming, i.e. in the positive mode continuously, the LCD display would show the vertical segment and the upper segments only. For those cases where there is valid data transmission both the upper and lower segments will be displayed simultaneously. A variation in display intensity between lower and upper segments will give the user a perception of the amount of data being transmitted.

The LCD display also presents to the user the status of the following control signals: CTS, RTS, DSR, DCD, and DTR. These signals are displayed as mnemonic symbols composed of three letters each on the bottom line of the display. The presence of the three letter mnemonic indicates that the respective control signal is high or positive. If the control signal is negative, the three letter mnemonic is not displayed. For most full duplex data only modems CTS and RTS are connected together while DSR, DCD, and DTR are connected together. For hand shaking modems there will be a relationship between various control signals on both ends of the link. This relationship is dependent upon which control signals are utilized. The DataSpy LCD display will help verify correct operation.



2.0 Specifications

2.1 Interface : Conforms to EIA RS-232 and CCITT V.24 specifications.

2.2 Connectors

2.2.1 RS-232 : DB25M or DB25F

2.2.2 Analog : RJ-11 and 5 screw terminals

Note : To order a RJ-45 instead of the RJ-11, add a P2 to the end of the Model number, i.e., 224MP2

2.3 Data Rate : Model 224 - 0 to 19.2Kbps

2.4 Switches

: Each modem is equipped with a DTE/DCE switch to allow reversing the TD and RD signals and DTR/DCD on the RS-232 interface.

2.5 Transmission : Asynchronous full duplex over 4 wires (two twisted pairs)

2.6 Indicators : The Model 224 is equipped with an LCD display for data, 5 control signals and power.

2.7 Operating Distance

The following table gives maximum distance as a function of Baud rate (over 24 AWG wire).

Data Rate (KBPS)	19.2K	9.6	4.8	2.4
Miles/Km	.8/1.3	2/3.2	3/4.8	5/8

2.8 Power : 115 Volts AC 60 Hz (220 Volts AC 50 Hz optional)

2.9 Size : 2"W x 4.15"L x .79"H (50.8mm x 105.4mm x 20.1mm)

2.10 Environment : 0° to 50° C, 5% to 95% relative humidity

3.0 Installation

3.1 Digital Interface

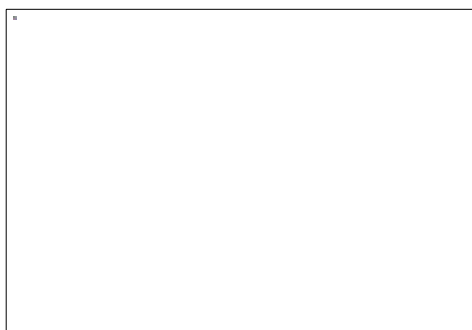
3.1.1 The digital interface for the Model 224 is a DB-25 connector and can be ordered with either a male or female connector. The gender of the connector is indicated by the first letter in the suffix of the model number.

3.2 Analog Interface

Note: The four wire line between modems must be two twisted pairs. On each modem, the wires marked T+ and T- must be members of the same twisted pair, R+ and R- members of the other.

3.2.1 Screw Terminals - The Model 224 is supplied with a 5 position terminal block marked T+, T-, R+, R-, and G. When connecting two line drivers together the T+ of one unit goes to the R+ of the other, while T- goes to R-. The Model 224 has built in surge suppression that is discharged to Frame Ground, pin 1 on the RS-232 interface. In applications that do not support frame ground, the ground connection on the 5 position terminal block, G, is to be used to connect the internal surge suppressors to an external earth ground. When doing so, the connection between the 224 and earth ground should be less than 6 feet and connected using 14 gauge wire.

3.2.2 Phone Plug - The Model 224 is equipped with a standard RJ-11 modular phone connector. If ordered with the RJ-45 option (P2) then only the 4 middle pins are used. The designation of the wires are shown below:



4.0 Operation

4.1 Data Transmission

The Model 224 comes equipped with a DTE/DCE switch that allows the reversing of pins 2 and 3 and pins 8 and 20 of the RS-232 connector. When the switch is in the DTE position, Pins 2 and 20 of the RS-232 connector are outputs and Pin 3 and 8 are inputs. When the switch is reversed to the DCE connection, pin 2 and 20 become an input and pin 3 and 8 the output. When interfacing to a terminal or PC the switch should be in the DCE position. The Model 224 has a LCD that will display the operation and status of the RS-232 signals.

4.2 Handshake Signal

The Model 224 provides the capability of transmitting a handshake signal in each direction. When the unit is set for DCE pin 20 is used as the input control signal and Pin 8 the output. When configured as a DTE pin 20 is the output and pin 8 is the input.

It should be noted that normal data transmission from one side to the other will be inhibited if the input control signal is low.

4.3 Model 224 as Model 74 Replacement

When using the Model 224 as a replacement for the Model 74, it should be noted that the older Model 74 did not switch the handshake signals, DCD/DTR, with the DTE/DCE switch. The Model 224 does switch the handshake signal. In addition the RJ-11 pinout the Model 74 is different then the Model 224 (see Section 3.2.2).

5.0 Troubleshooting

The following is a list of possible problems that may arise during the installation:

1. The data being received is garbled?

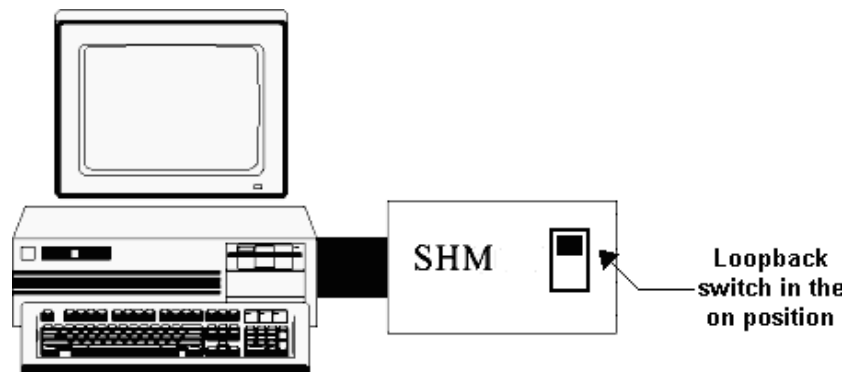
- The DTE/DCE switch is not set properly (see section 4). Observe the LCD and verify that TD and RD are shown as low in the quiescent state (see Section 1.1).
- The equipment that the Model 224 is connected to does not have the communication parameters set the same.
- T+ and T- are reversed going to R+ and R-. Look at the LCD and if RD is shown as a constant high or streaming (see Section 1.1) then the wires are reversed - T+ is to go to R+ and T- to R-.
- One of the four wires is broken
- Wires are not paired properly : T+ and T- should be one twisted pair and R+ and R- are the other pair.

2. No data is being received.

- Customer equipment not connected to the 224.
- The DTE/DCE switches are not set properly (see section 4). Observe the LCD and verify that TD and RD are shown as low in the quiescent state (see Section 1.1).
- Verify that hardware handshaking (control lines) are required.
- Customer equipment must support pins 8 and 20 as the handshake signal. On the LCD if the units are functioning properly then the control input signal must be high and the control output signal must be high.
- One or more wires between the modems are open.
- Link connection exceeds maximum specified distance.

3. Data OK at first then becomes garbled.

- Verify that hardware handshaking is being used. Observe the LCD and see if the control out signal is being maintained high. If it is, then the device on the far end is not configured for proper hardware handshaking. If the unit is believed to be defective, operation can be verified if one of the devices to which the modem is attached is capable of operating in a full duplex mode (such as a terminal or a PC using communications package such as Procomm). Connect the Model 224 to the terminal or PC and place the loop-back switch into the ON position.



If the modem is functioning correctly, any data entered on the keyboard should appear on the screen. Observe the LCD and verify correct operation of loopbacked data and control.

6.0 Pin Number Assignments

Pin	EIA	CCITT	Name	
2	BA	103	Transmit Data	*
3	BB	104	Receive Data	*
4	CA	105	Request to Send	**
5	CB	106	Clear to Send	**
6	CC	107	Data Set Ready	***
7	AB	102	Signal Ground	Gnd

8	CF	109	Data Carrier Detect	***
20	CD	108.2	Data Terminal Ready	

* These signals can be reversed using the DTE/DCE selection switch.

,* Connected together

DCD and DSR can be disconnected by removing the jumpered JP1

7.0 Power

The Model 224 is powered by a small, wall mounted power supply that supplies 12 VDC @ 500 mA. The power supply must be connected to the Model 224, through the 1.3mm connector located on the side of the unit, prior to plugging the power supply into the wall.

8.0 Help

If any assistance is required please visit our [Technical Support Center](#).

Warranty

Telebyte warrants the equipment to be free from defects in material and workmanship, under normal and proper use and in its unmodified condition, for 12 months, starting on the date it is delivered for use. TELEBYTE's sole obligation under this warranty shall be to furnish parts and labor for the repair or replacement of products found by TELEBYTE to be defective in material or workmanship during the warranty period. Warranty repairs will be performed at the point of manufacture. Equipment approved for return for warranty service shall be returned F.O.B. TELEBYTE factory and will be redelivered by TELEBYTE freight prepaid, except for non-continental U.S.A. locations. These deliveries will be sent COD freight and import/export charges.

THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TELEBYTE SHALL NOT BE LIABLE FOR ANY DAMAGES SUSTAINED BY RESELLER OR ANY OTHER PARTY ARISING FROM OR RELATING TO ANY EQUIPMENT FAILURE, INCLUDING, BUT NOT LIMITED TO CONSEQUENTIAL DAMAGES NOR SHALL TELEBYTE HAVE ANY LIABILITY FOR DELAYS IN REPLACEMENT OR REPAIR OF EQUIPMENT.

Out of warranty equipment may be returned to the Greenlawn, NY customer service facility prepaid as described above. Return shipping charges will be billed to the customer. The repaired unit will have a 90 day warranty. In those cases where "NO TROUBLE" is found, a reduced charge will be billed to cover handling, testing and packaging.

Whether in or out of warranty a Return Material Authorization number (RMA) is necessary and can be obtained by visiting our [Technical Support Center](#). Reference RMA number on the outside container.

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Model	Product Info
224	Product Page App Note Specs

