
DataTalker™

Data/Voice/Fax Concentrator

Desktop Models: DT101, DT102, DT101/xx, DT102/xx

Rack-Mount Models: DT101R, DT102R, DT101R/xx, DT102R/xx

Owner's Manual



Owner's Manual
82052704 Revision E
DataTalker™ Series

Desktop Models: DT101, DT101/xx, DT102, DT102/xx
Rack-Mount Models: DT101R, DT101R/xx, DT102R, DT102R/xx

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Glossary

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DataTalker™

Chapter 1 - Introduction and Description



1.1 Introduction

Congratulations! Your new Multi-Tech DataTalker™ is one of the finest data/voice/fax concentrators on the market today. The DataTalker optimizes wide area network (WAN) links by simultaneously transmitting voice and/or fax with LAN or computer data over a single phone line, digital service, or ISDN service.

The DataTalker basic model (DT101) supports one asynchronous or synchronous input data channel, one voice/fax channel, and a synchronous external composite link. Options include a second voice/fax channel (DT102) and an internal composite link modem (DT101/V34 or DT102/V34), DSU (DT101/56 or DT102/56), or ISDN terminal adapter (DT101/IS or DT102/IS). It comes in two basic versions: a desktop version for home offices and a rack-mount version for central office applications (DT101R and DT102R models). The DataTalker is software driven using configuration menus, and is controlled by you through its command port for great flexibility and ease of operation. This *Owner's Manual* will help you to install and use your DataTalker, and also serve as a valuable information resource in the future.

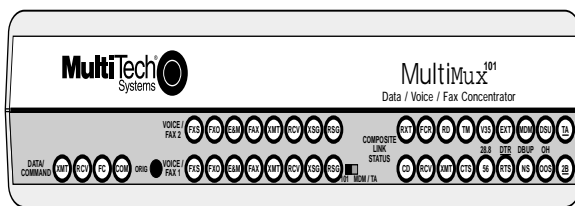


Figure 1-1. DataTalker (Desktop Version)

1.2 About This Manual

This manual has eight chapters. There are also several appendices at the end of the manual, most of which summarize information contained in the chapters. These appendices can be used as quick references. The information contained in each chapter is as follows:

Chapter 1 - Introduction

This chapter is an introduction to the world of multiplexing. If you already have an extensive background in multiplexing, this introduction will provide a good review.

Chapter 2 - Configuration Examples

This chapter describes DataTalker configurations and provides examples of how the DataTalker is typically used. The basic model has a synchronous or asynchronous data channel, a voice/fax channel, and a composite link supporting synchronous communications. Options include a second voice/fax channel and an internal V.34 (33.6K bps) modem, 56K bps DSU, or ISDN terminal adapter.

Chapter 3 - Front and Back Panel Descriptions

Chapter 3 describes the front panel indicators, back panel connections, and switches. The front panel indicators are grouped into data and command port, voice/fax channels, and composite link status. The back panel provides all cable connections.

Chapter 4 - Unpacking and Configuration

This chapter describes the contents of the shipping container; provides a customizable configuration summary; discusses configuration considerations for the data port, voice/fax channel, and the composite link; and provides a detailed configuration procedure. The configuration procedure simplifies the process by asking questions about your application, which allows you to glide through the configuration process by configuring only the items that need to be changed.

Chapter 5 - Installation

Chapter 5 provides procedures for cabling your DataTalker, moving the V.35 shunt, applying power, and checking it out. Cabling involves a minimum of three cables. Each cable connection is explained in detail. If a V.35 interface is used, a procedure on how to move the shunt is provided. Finally, a power-on and checkout procedure is provided with some suggestions on what to do in case something goes wrong.

Chapter 6 - Menus

The DataTalker is software driven using menus, and is controlled through a command port device. This chapter describes the menus and the impact each option has on your system's operation.

Chapter 7 - Troubleshooting

This chapter is a guide to troubleshooting your DataTalker. It contains lists of error conditions, probable causes, and suggested fixes or steps designed to isolate the failing unit in your communications network.

Chapter 8 - Service, Warranty and Tech Support

Chapter 8 provides instructions on getting service for the DataTalker at the factory; a statement of the limited warranty; information about our user bulletin board service, and space for recording information about your DataTalker prior to calling Multi-Tech's Technical Support.

1.3 Product Description

The DataTalker series of multiplexers has a single synchronous or asynchronous data channel, a command port, one or two voice/fax channels, and a single synchronous composite link with an internal data service unit (DSU), modem, ISDN terminal adapter, or an external synchronous link device. The DataTalker can be connected to an asynchronous device such as a PC or host computer, an external synchronous device such as a LAN router, or the composite link of an MMH900 series MultiMux. It also can be connected to telephone equipment for voice or fax traffic over your standard composite link. The DataTalker's data port allows either synchronous or asynchronous devices to be connected to it. The command port allows you to configure your data channel, composite link, and voice mode of operation. The composite link can be configured for an internal 28.8K bps dial-up/leased line modem, an internal DSU for digital communications over a digital data service (DDS) network, or an ISDN terminal adapter for Basic Rate Interface Service. It can also be configured for external synchronous link devices. The voice/fax channel supports phone, fax, or key telephone system equipment through an FXS interface, a PBX station-side connection through an FXO interface, or a PBX trunk connection through an E&M interface. The DT101/V34 and DT102/V34 DataTalkers are dual-function models. If the user requires traditional data communications, these models provide a simple switch to enable a standalone V.34 modem mode, which supports dial-in/dial-out data communications for Internet, BBS, and other on-line access.

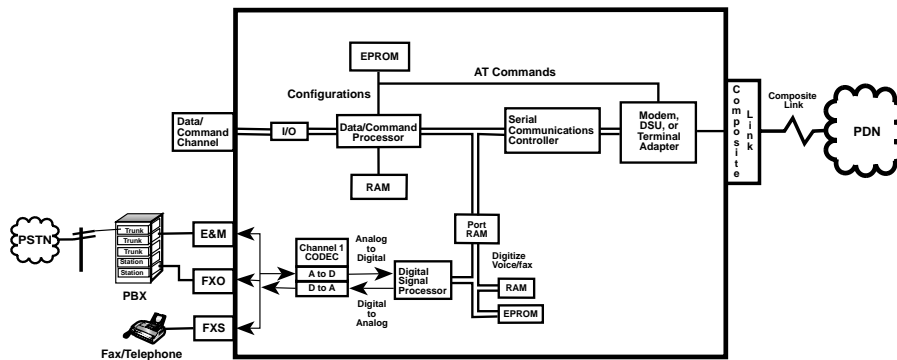


Figure 1-2. Block Diagram

A simplified block diagram of the DataTalker is shown in Figure 1-2. The data channel on the top left and the voice/fax channel on the bottom left feed data to a serial communications controller that provides the path through a modem, DSU, or ISDN terminal adapter to the public data network. The data channel, voice/fax channel, and the serial communications controller are on the main printed circuit board. The internal modem, DSU, or terminal adapter is a daughter board that plugs into the main board. The data/command channel is a dual purpose channel to which a synchronous or asynchronous device can be connected when it is used in its data mode. The voice/fax channel allows you to connect a telephone, a PBX (Private Branch eXchange) extension, or a PBX E&M trunk for voice or fax communication. On the other end of the DataTalker, an internal 33.6K bps modem, 56K bps DSU, or ISDN terminal adapter provides the composite link interface to the public data network.

The data/command channel can have a terminal or PC connected to it for configuring the DataTalker. The versatility of the data/command port allows the DataTalker to be connected to a synchronous or asynchronous device in the data mode or to an asynchronous device in the command mode when the DataTalker needs to have the configuration of the data channel, voice/fax channel, or the composite link changed. The data/command channel can be switched between data and command modes by setting a DIP switch. If the data/command channel is in data mode, it is also possible to switch to command mode by entering the escape command **+++AT<CR>**.

Before you can transfer data over the channel, you must connect a terminal or PC running

communications software to the DATA/COMMAND connector on the back panel and configure the data channel for the type of data that is going to be transferred. For example, if an asynchronous device is going to be connected to the data channel, you must set the speed of the channel, the word length, the number of stop bits, whether or not you are going to have parity checking, the flow control type, and other aspects of asynchronous data. After you have configured the data channel, remove the command port device and connect the data channel device, allowing data to be transferred from the asynchronous device to the MultiMux's input/output circuitry.

To operate the data channel in synchronous mode, as when connecting to a remote LAN bridge or to the composite link of an MMH900 series MultiMux, use the same DATA/COMMAND connector. The sync device you connect to the data channel must be an SLDC or HDLC device. Configure the data channel for sync channel operation with any SLDC/HDLC protocol, for internal or external clocking, and for speed. Configuration information is stored in non-volatile memory, which informs the data/command processor how data is received from the input/output (I/O) circuitry.

To set up the DataTalker for voice or fax operation, connect the VOICE/FAX CHANNEL 1 FXS connector on the back panel to a telephone or fax machine, connect the FXO connector to a PBX station circuit, or connect the E&M connector to a PBX E&M trunk. The FXS (Foreign eXchange Station) circuitry in the DataTalker allows a telephone or fax machine to be directly connected to the DataTalker. This circuitry provides a ringing voltage to the remote instrument when it detects an off-hook condition from the attached device, so that when two telephones are used, picking up one of the handsets rings the telephone at the other end. If the FXO (Foreign eXchange Office) connection is used at one end of the network and a telephone set is used at the other end of the network, the PBX provides the dial tone, and the remote user can dial a number as if locally attached to the PBX. The E&M connector is used to link two PBXs.

Before a voice or fax operation can take place, the DataTalker must be configured for the types of local and remote connections and for the line conditioning for the voice circuitry. The voice/fax channel is configured in the same way as the data channel: by connecting a command port device to the DATA/COMMAND connector on the back panel and setting the voice/fax configurations. Once the channel is configured, the analog to digital conversion circuitry accepts the incoming analog signal and converts it to a digital representation of the signal. The digitized signal is stored in the dual-port RAM for transmission to the serial communications controller when it requests the dual-port RAM for data. The serial communications controller conditions the digitized voice or fax data for transmission to the composite link.

In order to transfer data from the serial communications controller over the composite link to the remote site, the composite link must be configured. Factors to be considered include whether an external device or an internal modem, DSU, or terminal adapter is installed, the speed of the link, who is providing the clocking, and other link conditioning factors. The composite link is configured using a command port device and menus the same way we configured the data and voice/fax channels. This is accomplished by setting the link configurations to match the link device installed in the DataTalker and the requirements of the link service and remote system. If, for example, an internal DSU is installed that will be connected to a DDS network that provides clocking, the DataTalker detects that the link device is an internal DSU. Through the configuration stored in nonvolatile memory, it knows that the clocking is going to be provided by the DDS network. When you look at the versatility of the composite link, many other factors must be considered, such as answer or originate, two- or four-wire, and dial-up or leased line operation. But all these considerations are handled in the same manner as the example of the DSU above.

This is basically how your DataTalker is connected to a data device and voice or fax equipment, how the internal logic is conditioned to transfer data, and how the composite link passes that data on to the remote site.

1.4 System Features

1.4.1 Voice/Fax

The voice/fax feature of the DataTalker allows you to establish voice or fax traffic on top of your normal data communications over a composite link, saving the expense of extra communications lines. The DataTalker provides three types of telephone circuits (FXS, FXO, and E&M) that allow a telephone, a fax machine, a PBX station card, or a PBX E&M trunk to be directly connected to it. In one configuration, these telephone circuits cause the telephone at a remote location to ring when you pick up the handset on the local telephone. In another configuration, an off-site extension moves your office extension to a remote location. In a third configuration, you can use the DataTalker to tie two PBXes together.

1.4.2 Data Channel

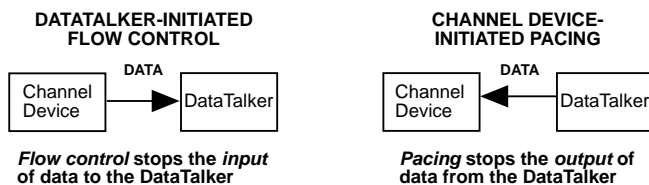
The DataTalker data channel is able to accommodate any asynchronous device or any SDLC/HDLC synchronous device. Configuration of the data channel is controlled by menus that determine the mode of operation (sync or async), whether or not clocking is necessary, the speed of the channel, and a number of async channel conditioning parameters.

1.4.3 Composite Link

The DataTalker's composite link is capable of synchronous and full duplex communications with an internal or external link device. Using an internal modem, ISDN terminal adapter, DSU, or external device, the DataTalker can be connected to different types of communications links, such as a dial-up line, a leased line, a Basic Rate Interface (BRI) ISDN service, or a DDS network. If an external link device is used, the DataTalker can communicate with it using either the RS232 or V.35 standard.

1.4.4 Flow Control

Flow control regulates the volume of data entering the data port. When the channel buffer is almost full, a flow control command is issued which tells the device attached to the data port to stop sending data. The devices on both ends of the link must be configured for the same flow control method. The most common flow control methods are XON/XOFF and RS232C signal control (using CTS). The DataTalker supports these and ENQ/ACK.



1.4.5 Parameter Memory

A nonvolatile memory for storing configurations and options means that the DataTalker remains configured until you change it. You can configure a DataTalker and save the parameters to memory, turn it off, ship it, and use it without having to reconfigure it.

1.4.6 Diagnostics

Diagnostics in a network are of considerable importance. That is why the DataTalker is equipped with several diagnostic modes that will test every aspect of the network. The diagnostics include easy-to-execute tests for the data channel, voice/fax channel, composite link, and various components of the DataTalker unit itself. The diagnostic tests are executed from a single diagnostic tests menu by selecting the test number and following any corresponding instructions given by the DataTalker.

1.4.7 Operational Statistics

Operational statistics provide an activity report of the DataTalker network. Statistics such as receive-block errors pinpoint composite link device or line problems. Composite link statistics are displayed in a single screen.

1.5 FCC Regulations for Telephone Line Interconnection

1. This equipment complies with Part 68 of the FCC rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company.
2. As indicated below the suitable jack (USOC connecting arrangement) for this equipment is shown. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. The ringer equivalence number (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the telephone company to determine the maximum REN for the calling area.
4. If this equipment causes harm to the telephone network, the telephone company will notify you in advance. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
6. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
7. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)
9. If so required, this equipment is hearing aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Model Number:	DT10x and DT10xR Series
FCC Registration Number:	AU7USA-22313-DE-N (DSU) AU7USA-22271-MM-E (Modem)
Ringer Equivalence:	0.3B (Modem)
Modular Jack (USOC):	RJ-11 or RJ-48 (single line)
Service Center in U.S.A.	Multi-Tech Systems Inc. 2205 Woodale Drive Mounds View, MN 55112 USA (612) 785-3500 or (800) 328-9717 Fax (612) 785-9874

1.6 Canadian Limitations Notice

Notice: The Canadian Department of Communications label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian facility designated by the Supplier. Any repairs or alterations made by the user to this equipment; or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should insure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The **Load Number** (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combinations of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100.

The load number for the composite link modem is 4.

1.7 Specifications

1.7.1 Async Data Channel

Number of Channels	One
Maximum Speed	115,200 bps
Channel Speed	All standard speeds from 300 bps to 115,200 bps
Data Format	5, 6, 7, or 8 data bits, with 1, 1.5, or 2 stop bits
Parity	Odd, even, or none
Local Echo	On or off selectable
Flow Control	XON/XOFF, CTS, or HP ENQ/ACK selectable
Pacing	On or off selectable, RTS on/off, or XON/XOFF
Interface	RS-232D/ITU-T V.24; DB-25 female connector

1.7.2 Sync Data Channel

Data Format	Synchronous
Channel Speed	Up to 128K bps
Protocol	SDLC/HDLC
Error Correction	16-bit CRC block check with ARQ
Interface	RS-232D/ITU-T V.24; DB-25 female connector

1.7.3 System Control (Command Port)

Local Access	Through DataTalker's RS232C command port
Device	Any asynchronous keyboard terminal or PC in terminal mode (local access only)
Menus	Menus to configure data channel, voice/fax channel(s), and composite link. Statistics menu and test menus are provided to monitor performance and diagnose problems.
Diagnostics	Data or voice loopback, memory, watch dog tests, and DIP switch definitions and settings

1.7.4 Composite Link

Number of Links	One
Data Format	Synchronous
Link Speeds	Up to 256K bps
Link Protocol	Proprietary modified HDLC
Error Correction	16-bit CRC block check with ARQ
Interface	RS-232D/V.24 or ITU-T V.35, or use DataTalker integral modem, DSU, or ISDN terminal adapter

1.7.5 Internal Modem

Modulation	ITU-T V.34; AT&T V.32 terbo; ITU-T V.32bis, V.32, V.22bis, V.22; Bell 212A and 103 (North America) or V.23 and V.21 (international)
Speeds	300 bps to 33.6K bps
Commands	Fully AT command compatible
Usage	Synchronous full duplex over unconditioned 2-wire or 4-wire leased line; asynchronous half or full duplex over 2-wire dial-up
Line Interface	RJ-11C jack for dial-up and 2-wire or 4-wire leased line; in Canada, one CA02B connector

1.7.6 Internal DSU

Speed	56K, 19.2K, 9.6K, 4.8K, or 2.4K bps
Format	Synchronous DDS or compatible
Usage	Full duplex over LADS (Local Area Data Set) or two-pair non-loaded metallic wire
Line Interface	DDS interface with an RJ-48 keyed jack

1.7.7 ISDN Terminal Adapter

Description	Integral ISDN terminal adapter card
Operating Mode	ISDN Basic Rate; 1B+D or 2B+D
Synchronous Data Rates	2.4–128 Kbps
Clocking	Normal network clock (slaved to network receive clock); private network master (internal); external clock of DTE data
Commands	Menu system
D-Channel Switch	AT&T 5ESS [®] , 5E6; NT DMS-100 [™] , BCS-32;
Compatibility	Siemens Stromberg-Carlson EWSD [®] , National ISDN-1; NEC International Switch
Line Interface	2-wire ISDN Basic Rate 2B1Q U-interface; ANSI T1.601-1992 compliant; RJ-48 jack
B-Channel Aggregation	BONDING Protocol, Mode 1

1.7.8 Voice/Fax Channel

Number of Channels	One or two channels
Voice Digitization Rates	9600 and 16K bps
Automatic Fax	Group 3 fax rates
Modulation/Demodulation	(2400, 4800, 7200 and 9600 bps)
Analog Interfaces	FXS, FXO, and E&M (channel 1 only)
Signaling	DTMF
Line Interface	FXS and FXO: RJ-11 jacks E&M: RJ-48 jack

1.7.9 Electrical/Physical

Desktop Models:

Power Supply Input	100 to 250 VAC
Power Supply Output	+5v@5A, +12v@1A, -12v@0.5A
Power Consumption	20 watts
Dimensions	2.3" high x 9" wide x 12.8" deep 5.7 cm high x 22.9 cm wide x 32.7 cm deep
Weight	7 pounds (3.2 kg)

Rack-mount Models:

Power Supply Input	100 to 250 VAC
Frequency	47 to 63 Hz
Power Consumption	20 watts
Dimensions	2.00" high x 9.98" wide x 12.75" deep 5.1 cm high x 25.2 cm wide x 32.4 cm deep
Weight	5 pounds (2.3 kg)

DataTalker™

Chapter 2 - Configuration



2.1 Introduction

The Multi-Tech DataTalker is available in both desktop (DT10x) and rack-mount (DT10xR) versions. The desktop version is designed for home office applications. It is mounted in a horizontal cabinet and has an external power supply, a power switch, an originate switch, and a switch that allows you to use it also as a stand-alone modem or terminal adapter. The rack-mount version is designed for main office applications. It is mounted for vertical insertion into a Multi-Tech RackTalker rack, has an internal power supply, is hot-swappable, and has a reset switch. Otherwise, they are identical. DataTalkers are available with a synchronous or asynchronous data channel, one or two voice/fax channels, and an optional internal composite link V.34 modem, 56K bps DSU, or 2B+D link ISDN terminal adapter.

DataTalker Configurations

Desktop Models:

Base Model with...	1 Data Channel & 1 Voice/Fax Channel	1 Data Channel & 2 Voice/Fax Channels
No Additional Options Installed	DT101	DT102
33.6K bps Modem	DT101/V34	DT102/V34
56K bps DSU	DT101/56	DT102/56
2B+D ISDN Terminal Adapter	DT101/IS	DT102/IS

Rack-Mount Models:

Base Model with...	1 Data Channel & 1 Voice/Fax Channel	1 Data Channel & 2 Voice/Fax Channels
No Additional Options Installed	DT101R	DT102R
33.6K bps Modem	DT101R/V34	DT102R/V34
56K bps DSU	DT101R/56	DT102R/56
2B+D ISDN Terminal Adapter	DT101R/IS	DT102R/IS

Valid Voice/Fax Configurations:

Configuration	Description
E&M to E&M	Any phone or fax machine connected to the PBX at one site can call any phone or fax machine connected to the PBX at the other end.
FXS to FXS	No number must be dialed. If the phone or fax machine on one end goes off hook, the phone or fax machine on the other end rings.
FXS to FXO	The phone and fax machine at the FXS site act as though they are extensions of the PBX at the FXO site.

2.2 Configuration 1 - Dial-Up Link

Configuration 1 is a dial-up link using a pair of DataTalkers to provide data communications between a home office PC and the main office host computer and telephone services through the main office telephone system. The data and telephone services are provided using a single line between the home office and the main office. In this application, the main office DataTalker is tied to a host computer via an async channel, and the data channel of the home office DataTalker is connected to the serial port of the home office PC. The composite link is provided by internal 33.6K modems in a dial-up configuration. All of the telephone services of the main office are supplied to the home office as if the home office was directly connected to the main office telephone system.

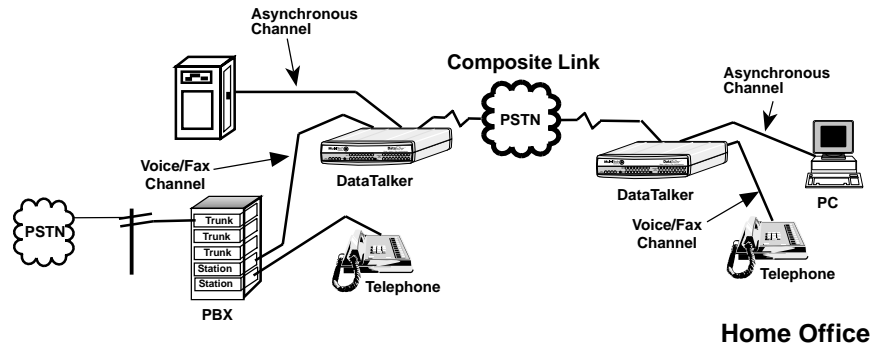


Figure 2-1 Dial-Up Link

To set up this configuration, connect the main office DataTalker to the host computer, to the in-office telephone system (PBX), and to the public switched telephone network (PSTN). Connect the home office DataTalker to the serial port of your PC, to a telephone set, and to your local telephone line. You must also connect a terminal or a PC running communications software (such as Multi-Tech's MultiExpress™ for DOS) to the dual function data/command port and configure the DataTalkers. Configure the DataTalker for the main office application; i.e., set up the voice/fax channel for a local interface of FXO and a remote interface of FXS. Configure the home office unit for DTR dialing of the main office DataTalker, a local interface of FXS, and a remote interface of FXO.

You must configure the DataTalkers before you connect them to the computers. To configure a DataTalker, place DIP switch position 3 in the down (closed) position and connect a command port device such as a terminal or a PC to the DATA/COMMAND connector on the back of the DataTalker. Turn on the DataTalker and PC and run your communications software in terminal mode. (Set it for direct connection at a serial port speed of 19,200 bps or slower.) Press the ENTER key to establish communications with DataTalker and see the Main Menu.

A series of configuration menus provides simple and complete configuration information for each aspect of the DataTalker. Using the menus, we will configure one DataTalker for the main office and the second one for the home office.

The menu flow from the Main Menu through the Configurations menu to configuration menus for specific parts of the DataTalker. From the Configurations menu you will use the first menu to configure the data port of the main office unit to talk to the host computer, and that of the home office unit to talk to the async channel of the home office PC. You will use the next one to configure the voice/fax channel for connection of the main office DataTalker to an extension of the local PBX, and the home office DataTalker to your telephone and your local telephone service. You will use the final group of configuration menus to set up the internal MMH2834 modem to dial the main office from the home office and for the main office to answer the call.

As you go through these configuration menus, you must supply the specifics of your configuration.

When you established communication, the Main Menu appeared. From the Main Menu you can configure the unit, display statistics, reset various functions within the DataTalker, and run diagnostic tests:

```
Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _
```

To configure the DataTalker, enter **1** and press ENTER.

The Configurations menu is displayed. From this menu you can configure the data port, voice/fax channel(s), or the composite link. You can also select various factory defaults and store your current configuration:

```
Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

For the main office and the home office units, let's use the default data port configuration. If your specific configuration requires that the data port be set up differently, select the option and choose the new parameter.

From the Configurations menu, select option 2, Voice/Fax Channel(s) Configuration, to configure the voice/fax channels. For the main office, set up the local interface type (option 6) for an FXO connection. For the remote interface type (option 11), accept the default FXS connection. For the other selections, accept the defaults .

```
Voice/Fax Channel 1 Configuration
1 - Destination Channel      : 1
2 - Digitizing Rate         : 9600
3 - Output Level Atten.     : 12
4 - Input Level Gain        : 03
5 - Silence Suppression     : Off
6 - Local Interface Type    : FXS
7 - Ground/Loop Start (FXS) : Loop
8 - 2 or 4 Wire (E&M)       : N/A
9 - Dialtone/Wink (E&M)     : N/A
10 - Wink Timer (E&M)       : N/A
11 - Remote Interface Type  : FXS
12 - Ground/Loop Start (FXS) : Loop
13 - 2 or 4 Wire (E&M)     : N/A
14 - Dialtone/Wink (E&M)    : N/A
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

Enter **S** and press ENTER to store all configurations for the main office.

Set up the home office unit the same way, except that you should switch the local and remote interface types (FXS for the local interface and FXO for the remote interface). After you select the home office options, enter **S** to store all configurations. Enter **P** to return to the Configurations menu.

At the Configurations menu, select option 3, Composite Link Configuration. The composite link settings for the MMH2834 internal modem are displayed.

The main office will be set up to receive a call from the home office. The home office will be set up for DTR Dialing of the phone number at the main office.

```

Composite Link Settings - Internal MMH2834

1 - Enter AT commands to 2834
2 - On-Line XMT Rate:          28800
3 - Speed Setting:            33600
4 - Dial/Leased:              Dial
5 - 2 or 4 Wire:              2 Wire
6 - Answer/Originate:         Answer
7 - Transmit Level            -10db
8 - DOD/DOI:                  On
9 - DOI Timer:                 03min
10 - DOD Toggle DTR:          40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

Set up the main office unit to use the default composite link settings. Set up the home office unit for DTR dialing. To set up for DTR dialing, select option 1, Enter AT Commands to 2834, and enter the following AT commands:

ATDT[Number to Dial]N0 <CR>

AT\$D1 <CR>

AT&W <CR>

Q <CR>

ATDT[Number to Dial]N0 is the AT command to store the main office phone number in location N0. The **AT\$D1** command sets the modem for DTR dialing when the home office DataTalker is powered up. The **AT&W** stores the **\$D1** command as a user default. The **Q** command returns you to the Composite Link Settings menu. **<CR>** is shorthand for a carriage return (press ENTER). Enter **S** and press ENTER to store the new configuration.

This completes the configuration of both DataTalkers. The main office DataTalker can now be connected to the host computer, PBX, and phone line. The home office DataTalker can be taken home.

To connect the main office DataTalker, first disconnect the PC or terminal from the DATA/COMMAND connector on the DataTalker. Place DIP switch position 3 in the OPEN (up) position to change the data/command port over to the data channel. Connect an RS232C cable between the DATA/COMMAND connector on the DataTalker and an asynchronous port on the host computer. Connect an RJ-11 phone cable from the VOICE/FAX CHANNEL 1 FXO connector on the back panel to the station side of the PBX. Connect an RJ-11 phone cable between the DIAL-UP jack on the DataTalker and the dial-up phone line.

To connect the home office DataTalker to its PC, connect an RS232C cable between the DATA/COMMAND connector on the DataTalker and an async port on the PC (typically, COM1 or COM2). Place DIP switch position 3 on the side of the DataTalker in the OPEN (up) position to enable the data channel.

To connect your home telephone to the DataTalker, remove the telephone cable from the wall jack and connect it to the VOICE/FAX CHANNEL 1 FXS connector on the DataTalker. Connect a second RJ-11 phone cable between the Dial-Up jack on the DataTalker and your wall jack.

The home office DataTalker is now ready to communicate with the main office. When you power on the home office DataTalker, the internal MMH2834 modem dials the previously stored number for the main office. The OH (Off-Hook) LED lights, indicating that the modem is active. After the main office DataTalker answers, the CD (Carrier Detect) LED lights and the RD (Remote Down) LED goes off. At this point, voice and data communication can begin.

If you do not configure the DataTalker for DTR dialing, there is an alternate way to dial the main office computer. Connect a phone to the FXS jack and a dial-up phone line to the internal composite link DIAL-UP jack. Pick up the receiver and listen for a dial tone, then dial the main office number. When you hear the answer tone, press and release the Originate switch on the DataTalker's front panel. The OH light will come on, then the modem will handshake and connect. Hang up the phone and data communications will proceed normally.

2.3 Configuration 2 - MMH900 Series with Voice/Fax

Configuration 2 adds voice capability to an existing data-only network using the same composite link. The example shown in Figure 2-2 had an existing data-only network consisting of a MultiMux MMH904C multiplexer connected to a host computer at the local site and a second MMH904C connected to terminals and/or PCs and a shared printer at the remote site. To add voice capability, a DataTalker is added between the composite link of the MMH904 and the public data network (PDN) at both sites. The composite link between the two sites is now moved from the MMH904 multiplexer to the new DataTalker. The composite link of the MultiMux MMH904 is reconfigured as an external synchronous link device and connected to the synchronous data channel of the DataTalker. The voice capability is added by connecting a telephone to the FXS port on the back panel of the DataTalker at each site and configuring the voice/fax channel of the DataTalkers for FXS to FXS. Now, while you are transferring data over the composite link, you can pick up the telephone and have a simultaneous voice conversation.

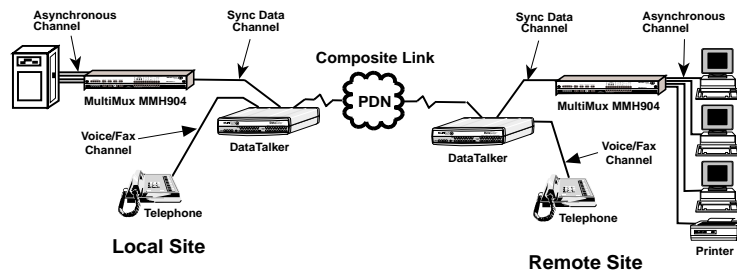


Figure 2-2. Adding Voice to Data-Only Network

The async channels of the MultiMux MMH904s operate the same way as in the data-only network. The MMH904 is reconfigured for an external link device by changing the 8-position DIP switch position 2 to the down (closed) position, ensuring that the composite link is configured for sync mode, and setting clocking to External. An RS232C cable can now be connected to the COMPOSITE LINK EXTERNAL RS232C/V.35 connector on the back panel of the MMH904.

The composite link connection of the DataTalker to the PDN depends on the type of link device being used. If the link device is an internal 33.6K bps modem, connect the Modem DIAL-UP or LEASED connector to the PDN. If the link device is an internal DSU or ISDN terminal adapter, connect the DSU/TA DIGITAL connector to the PDN. If an external link device is used, cable it to the EXTERNAL COMPOSITE RS232C/V.35 connector. The connection type depends on whether the interface of the external link device is RS232C or V.35. If it is V.35, a shunt on the main board of the DataTalker must be moved to the V.35 position.

You must configure the DataTalker before you connect it to the MultiMux MMH904. To configure the DataTalker, place DIP switch position 3 in the down (closed) position and connect a command port device such as a terminal or a PC to the DATA/COMMAND connector on the back of the DataTalker. Turn on the DataTalker and PC and run your communications software in terminal mode. (Set it for direct connection at a serial port speed of 19,200 bps or slower.) Press the ENTER key to establish communications with DataTalker and see the Main Menu.

A series of configuration menus provides simple and complete configuration information for each aspect of the DataTalker. From the Main Menu, you can access menus to configure the unit, display statistics, reset various functions within the DataTalker, and run diagnostic tests:

```
Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _
```

To go to the Configurations menu, enter **1** and press ENTER. The Configurations menu appears. From this menu you can configure the data port, voice/fax channel(s), or the composite link. This menu also allows you to select various factory defaults and store your current configuration.

```
Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

For configuration 2, start by configuring the data port. Enter **1** and press ENTER. The Data Port Configuration menu appears:

```
Data Port Configuration

1 - Async/Sync:      Async
2 - Speed:           19200
3 - Word Length:    8
4 - Stop Bits:      1
5 - Parity:          None
6 - Flow Control:   CTS
7 - Enq/Ack Flow Control: Off
8 - Echo:            Off
9 - Pacing:          Off
10 - EIA Pass Through: Off
11 - Pass Xon:       Off
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

The data port in this configuration will be set up for synchronous operation. To configure the data port for sync operation, enter 1 (Aysnc/Sync) option and change the default Async to Sync. The data port configuration menu displays the sync parameters.

```

Data Port Configuration
1 - Async/Sync:           Sync
2 - Speed:               19200
3 - Clocking:            Internal
4 - Idle Condition:      Flags
5 - NRZ/NRZI Encoding:   NRZ
6 - CRC Preset:          All 1s
7 - Inter-frame Timer:   Off
S - Store All Configuations
M - Main Menu
P - Previous Menu
Selection : _

```

Enter **2** and press ENTER to set the speed of the sync data port. Select the appropriate speed by entering its menu list number. The speed you select should be no faster than the composite link speed. At the sync data port configuration menu, determine who is supplying the clocking. The default internal clocking allows the DataTalker to supply the clock. Enter the letter **S** to store all configurations and then press **P** to return to the previous menu.

For configuration 2, where both sites have a telephone connected to the DataTalker, initially accept the defaults for the second choice in the Configurations menu, Voice/Fax Channels Configuration.

At the Configurations menu, enter **3** and press ENTER to display the Composite Link Settings menu.

The DataTalker detects the type of link device being used from the way a DIP switch is set or by reading the device when it is installed on the main PC board. In this configuration, a 56K bps internal DSU is being used as the composite link device. So, when the internal composite link settings menu is displayed, it is for a DSU:

```

Composite Link Settings - Internal DSU
1 - Speed:                56k
2 - Clocking:             DDS
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

The internal DSU has two options: speed and clocking. The speed option should match the DDS line speed. The clocking option depends on how you have set up your link with the telephone company. If the link is set up as a DDS link, use the default DDS setting. If the link is set up for the DataTalker to provide the clocking, change the clocking option to Internal.

This completes the configuration of both DataTalkers. Disconnect the data/command port from the terminal or PC and connect it to the composite link of the MMH904. Place DIP switch position 3 on both DataTalkers in the up (OPEN) position to change the data/command port over to a data channel.

2.4 Configuration 3 - LAN to LAN

Configuration 3 is an example of a pair of DataTalkers providing the link between two LANs with the added benefit of voice or fax traffic over the same composite link. Bridging the LANs over a single high speed composite link expands the capacity of each LAN. The LAN bridge on each LAN is provided by a router/bridge with a synchronous interface connected to the DataTalker's data channel. The composite link could be an internal ISDN terminal adapter, an internal 56K DSU, or one of a variety of external high speed link devices up to fractional T1 devices. The additional feature provided by the DataTalkers is free voice or fax traffic without the need to establish a separate voice connection between the two LANs.

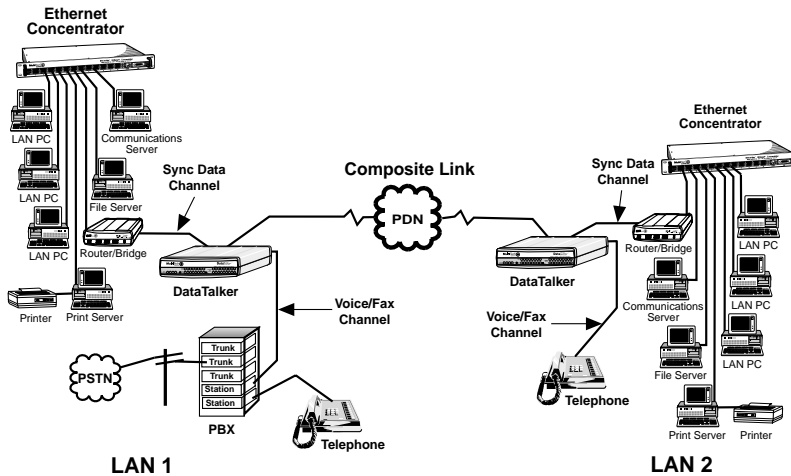


Figure 2-3. LAN to LAN Configuration

In the configuration shown in Figure 2-3, the voice/fax channel 1 FXO port on the DataTalker at LAN 1 is connected to a station card on the local PBX, and the voice/fax channel 1 FXS port on the DataTalker at LAN 2 is connected to a telephone. On both ends, the data channel of the DataTalker is connected to the router's synchronous port, and the router's Ethernet port is connected to the Ethernet concentrator. An RJ-48 telephone cable connected to the composite link at the DataTalker's DSU/TA DIGITAL connector links the DataTalker's internal DSU to the public data network.

You must configure the DataTalkers before you connect them to the LANs. To configure a DataTalker, place DIP switch position 3 in the down (closed) position and connect a command port device such as a terminal or a PC to the DATA/COMMAND connector on the back of the DataTalker. Turn on the DataTalker and PC and run your communications software in terminal mode. (Set it for direct connection at a serial port speed of 19,200 bps or slower.) Press the ENTER key to establish communications with DataTalker and bring up the Main Menu.

A series of configuration menus provides simple and complete configuration information for each aspect of the DataTalker. From the Main Menu, you can configure the unit, display statistics, reset various functions within the DataTalker, and run diagnostic tests:

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _
    
```

To configure the DataTalker, enter **1** and press ENTER.

The Configurations menu is displayed. From this menu you can configure the data port, voice/fax channel(s), or the composite link. You can also select various factory defaults and store your current configuration:

```
Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

For configuration 3, let's start by configuring the data port. Enter **1** and press ENTER. The Data Port Configuration menu is displayed:

```
Data Port Configuration
1 - Async/Sync: Async
2 - Speed: 19200
3 - Word Length: 8
4 - Stop Bits: 1
5 - Parity: None
6 - Flow Control: CTS
7 - Eng/Ack Flow Control: Off
8 - Echo: Off
9 - Pacing: Off
10 - EIA Pass Through: Off
11 - Pass Xon: Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _
```

Since the data port in this configuration is going to be set up for synchronous operation, only two options apply: Clocking and Speed. Enter **1** and press ENTER to change to the synchronous mode of operation. At the Sync Data Port Configuration menu, select the appropriate speed by entering its menu list number. Use caution when setting the speed—the sync data channel could very easily overrun the composite link if the speed is set too high. Enter **2** and press ENTER to change the clocking to internal, which allows the DataTalker to provide the clock.

```
Data Port Configuration

1 - Async/Sync:          Sync
2 - Speed:              19200
3 - Clocking:           Internal
4 - Idle Condition:     Flags
5 - NRZ/NRZI Encoding:  NRZ
6 - CRC Preset:         All 1s
7 - Inter-frame Timer:  Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _
```

Press **P** to return to the Data Port Configuration menu, enter **S** to store all configurations, and then press **P** again to return to the previous menu. At the Configurations menu, enter **2** and press ENTER.

The Voice/Fax Channel 1 Configuration menu is displayed. For LAN 1, set voice/fax channel 1 for an FXO connection as the local interface type (option 6), and keep the default FXS as the remote interface type (option 11). LAN 2 must be set just the opposite (FXS for the local interface and FXO for the remote interface). For the other selections, accept the defaults .

```
Voice/Fax Channel 1 Configuration

1 - Destination Channel      : 1
2 - Digitizing Rate         : 9600
3 - Output Level Atten.     : 12
4 - Input Level Gain        : 03
5 - Silence Suppression     : Off
6 - Local Interface Type    : FXS
7 -   Ground/Loop Start (FXS) : Loop
8 -   2 or 4 Wire (E&M)      : N/A
9 -   Dialtone/Wink (E&M)   : N/A
10 - Wink Timer (E&M)       : N/A
11 - Remote Interface Type  : FXS
12 -   Ground/Loop Start (FXS) : Loop
13 -   2 or 4 Wire (E&M)    : N/A
14 -   Dialtone/Wink (E&M)  : N/A
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

Enter **S** and press ENTER to store all configurations for LAN 1.

Set up LAN 2 in the same manner, but switch the local and remote interface types (FXS for the local interface and FXO for the remote interface). When you have finished selecting the LAN 2 options, enter **S** to store all configuration. Enter **P** to return to the Configurations menu.

At the Configurations menu, enter **3** and press ENTER to display the composite link configuration menu.

The DataTalker knows the type of link device being used by the way a DIP switch is set or by detecting a device installed on the main PC board. In this configuration, a 56K bps internal DSU is used for the composite link device, so when the Composite Link Settings menu is displayed, it is for a DSU:

```

Composite Link Settings - Internal DSU

1 - Speed:                56k
2 - Clocking:             DDS
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

The internal DSU has three options: speed and clocking. The speed option should match the DDS line speed. The clocking option depends on how you have set up your link with the telephone company. If the link is set up as a DDS link, use the default DDS setting. If the link is set up for the DataTalker to provide the clocking, change the clocking option to Internal. Enter **S** and press ENTER to store all configurations.

If you are setting up the composite link for an external composite link device, set up the device for internal clocking and the type of connection between the device and the DataTalker, i.e., an RS232 or a V.35 connection.

```

Composite Link Settings -External Device

1 - On-Line XMT Rate:     56000
2 - Clocking:             External
3 - Back to Back:        Off
4 - DOD/DOI:             On
5 - DOI Timer:           03min
6 - DOD Toggle DTR:     40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

When you select option 3 in the Configurations menu, the Composite Link Settings - External Device menu will be displayed. Set the clocking and speed options to match the external device. The back to back option should remain off. Enter **S** and press ENTER to store all configurations.

This completes the configuration of both DataTalkers. Disconnect the data/command port from the terminal or PC and connect it to the router. Place DIP switch position 3 on both DataTalkers in the up (OPEN) position to change the data/command port over to a data channel.

2.5 Configuration 4 - PBX to PBX

Configuration 4 is a data/voice/fax configuration that uses two DataTalkers to link two PBXs. Using a single ISDN composite link, they connect a minicomputer and a PBX E&M trunk at the local site to a remote PC on the data part of the network and a second PBX E&M trunk on the voice/fax channel. The configuration is shown in Figure 2-4.

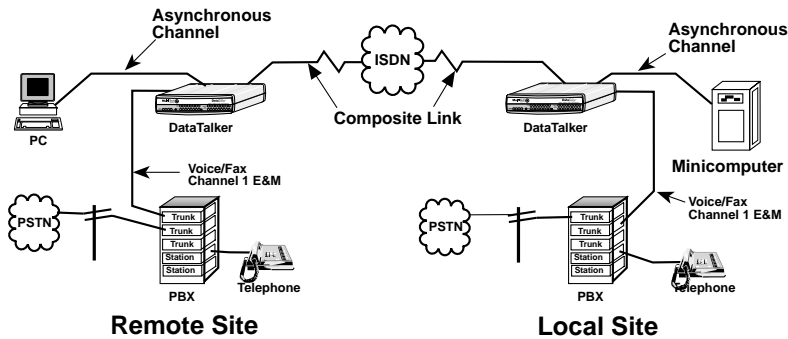
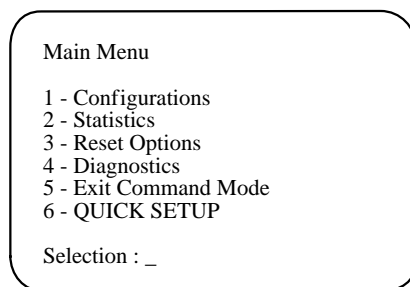


Figure 2-4. PBX to PBX Configuration

At both the local and the remote sites, connect the DATA/COMMAND connector on the DataTalker to an asynchronous port on the computer; connect the DSU/TA DIGITAL jack on the DataTalker to the jack for the ISDN service; and connect the VOICE/FAX CHANNEL 1 E&M jack on the DataTalker to a PBX E&M trunk connector. When you are making an E&M connection, you should also run a ground wire from the ground connector on back of the DataTalker or the RackTalker rack to a ground connection on the PBX.

Before you install the DataTalkers, you must configure them. To configure a DataTalker, place DIP switch position 3 in the down (closed) position and connect a command port device such as a terminal or a PC to the DATA/COMMAND connector on the back of the DataTalker. Turn on the DataTalker and PC and run your communications software in terminal mode. (Set it for direct connection at a serial port speed of 19,200 bps or slower.) Press the ENTER key to establish communications with DataTalker. The Main Menu will appear.

The Main Menu provides access to a series of configuration menus providing simple and complete configuration information for each aspect of the DataTalker. From the Main Menu, you can configure the unit, display statistics, reset various functions within the MMV, and run diagnostic tests:



To configure the DataTalker, enter **1** and press ENTER.

The Configurations menu is displayed. From this menu you can configure the data port, voice/fax channel(s), or the composite link. You can also select various factory defaults and store your current configuration.

```

Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

For both the local and the remote DataTalkers, the data communications will be asynchronous, so you may accept the defaults in the Data Port Configuration menu (option 1). If your configuration requires you to set up the data ports differently, enter **1** and press ENTER to select the Data Port Configuration menu, and select the new parameters.

To configure the voice/fax channels, enter **2** and press ENTER. The Voice/Fax Channel 1 Configuration menu appears. For both DataTalkers, change the local interface type (option 6) and the remote interface type (option 11) to E&M . For the other selections, accept the defaults .

```

Voice/Fax Channel 1 Configuration
1 - Destination Channel      : 1
2 - Digitizing Rate         : 9600
3 - Output Level Atten.    : 12
4 - Input Level Gain       : 03
5 - Silence Suppression    : Off
6 - Local Interface Type   : FXS
7 - Ground/Loop Start (FXS) : Loop
8 - 2 or 4 Wire (E&M)     : N/A
9 - Dialtone/Wink (E&M)   : N/A
10 - Wink Timer (E&M)     : N/A
11 - Remote Interface Type : FXS
12 - Ground/Loop Start (FXS) : Loop
13 - 2 or 4 Wire (E&M)   : N/A
14 - Dialtone/Wink (E&M)  : N/A
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

Enter **S** and press ENTER to store your selections. Enter **P** to return to the Configurations menu.

At the Configurations menu, enter **3** and press ENTER to display the Composite Link Settings menu.

The DataTalker knows the type of link device being used by the way a DIP switch is set or by reading an installed device on the main PC board. In this configuration, an internal ISDN terminal adapter is being used as the composite link device. So, when the Composite Link Settings menu is displayed, it is for an internal terminal adapter:

```
Composite Link Settings - Internal TA
1 - On-Line XMT Rate:          128000
2 - Configure TA
3 - DOD/DOI:                   Off
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

The terminal adapter menu displays the transmit rate and option 2 allows you to configure the terminal adapter. Use option 2 (Configure TA) to access the terminal adapter's built-in configuration menus (refer to the *ISDN Terminal Adapter Owner's Manual* for details). The Flush Time option is used only with an Alpha microcomputer or Wyse terminal. Enter **S** and press ENTER to store all configurations.

This completes the configuration of both DataTalkers. Disconnect the data/command port from the terminal or PC and connect it to the data computer or PC. Place DIP switch position 3 on both DataTalkers in the up (OPEN) position to change the data/command port over to a data channel.

DataTalker™

Chapter 3 - Front and Rear Panel Descriptions



3.1 Introduction

This chapter describes the DataTalker front and back panels and switches. The front panel contains LED indicators for the data channel device, voice/fax channels, and the composite link. It also contains one or two switches, depending on whether it is a desktop or rack version. The back panel contains connectors for the data/command device, internal and external composite link devices, and the voice/fax channel devices. The desktop version also has a power switch.

3.2 Indicators

The DataTalker is equipped with a complete set of LED indicators on the front panel that show precisely what is occurring on the network at all times. By periodically checking the indicators you can keep abreast of system activity without tying up the channel device. There are three groups of indicators: data/command, voice/fax channel, and composite link. Use black legends on dual function composite link indicators with an internal DSU, blue legends with an internal modem, and underlined legends, such as TA, with an ISDN terminal adapter. On the desktop DataTalker the indicators are arranged horizontally, whereas on the rack-mounted DataTalker they are arranged vertically, but the relative position and function is the same on each. Table 3-1 explains the function of each indicator by group.

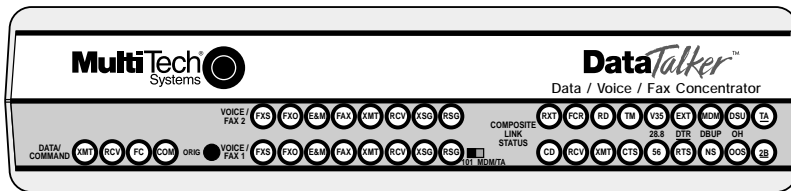


Figure 3-1. Front Panel (Desktop Version)

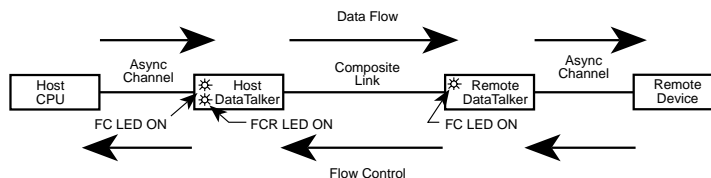
Table 3-1. LED Indicators

Data/Command Indicators

XMT (Transmit) This indicator lights when the device connected to the data or command channel is transmitting data to the DataTalker.

RCV (Receive) This indicator lights when the device connected to the data or command channel is receiving data from the DataTalker.

FC (Flow Control) This indicator lights when the DataTalker has stopped channel data flow because the channel buffer is almost full. If the DataTalker stops data flow at the request of a remote device, the Flow Control Received (FCR) indicator also lights. If the DataTalker stops data flow for any other reason, the FCR indicator remains off.



COM (Command) This LED indicates whether the data or the command channel is selected. It lights when the command channel is selected (DIP switch 3 is down), and is off when the data channel is selected (DIP switch 3 is up).

Voice/Fax Channels

FXS (Foreign Exchange Station) This indicator lights when the voice/fax channel is configured for FXS operation.

FXO (Foreign Exchange Office) This indicator lights when the voice/fax channel is configured for FXO operation.

E&M (E&M Operation) This indicator lights when the voice/fax channel is configured for E&M operation (voice/fax channel 1 only).

FAX (Fax) This indicator lights when there is fax traffic on the voice/fax channel.

XMT Transmit. This indicator lights when voice or fax data is being transmitted.

RCV (Receive) This indicator lights when voice or fax data is being received.

XSG (Transmit Signal) This indicator lights when the FXS-configured channel is off-hook, the FXO-configured channel is receiving a ring from the telco, or the M lead is active when the voice/fax channel is configured for E&M operation (i.e., the DataTalker is receiving a ring from the PBX).

RSG (Receive Signal) This indicator lights when the FXS-configured channel is ringing or the E lead is active on the E&M-configured channel.

Composite Link Status

RXT (Retransmit) This indicator lights when the local DataTalker is retransmitting a block of data on request. The RXT indicator lights for both internal and external link devices.

FCR (Flow Control Received) This indicator lights when the remote DataTalker's buffers are full and the local DataTalker has been told to stop sending data. This indicator lights for both internal and external link devices.

RD (Remote Down) This indicator lights when the local DataTalker cannot establish communications with the remote DataTalker. The RD lights for both internal and external link devices.

TM (Test Mode) This indicator lights when one of the diagnostic tests is active.

V35 (V.35 Interface) This indicator lights when the V.24/V.35 shunt is in the V.35 position.

EXT (External) This indicator lights when the DataTalker is configured for an external composite link device (DIP switch 2 is down).

MDM (Modem) This indicator lights when the internal composite link device is a modem.

DSU (Data Service Unit) This indicator lights when the internal composite link device is a DSU.

TA (Terminal Adapter) This indicator lights when the internal composite link device is an ISDN terminal adapter.

CD (Carrier Detect) This indicator lights when the composite link detects a carrier signal from a remote DataTalker or a local external DSU or modem.

RCV (Receive) This indicator flashes as data is being received from a remote DataTalker. The RCV indicator flashes for both internal and external link devices.

XMT (Transmit) This indicator flashes as data is being transmitted to the remote DataTalker. The XMT indicator flashes for both internal and external link devices.

CTS (Clear To Send) This indicator lights when the composite link device is ready to transmit data. The CTS indicator lights for both internal and external link devices.

28.8/56 (28.8K bps/56K bps) This composite link speed indicator displays the baud rate of the internal modem (28.8) or DSU (56K). The type of composite link device is indicated by which of the EXT, MDM, DSU, or TA indicators lights.

This indicator lights steadily when a DSU is installed. It has three states when an internal MMH2834 modem is installed (ON, flashing seven or eight times per second). When the LED is ON solid, it indicates a link speed of 33.6K bps. When the LED flashes eight times with a one second off time, the link speed is 31.2K and when it flashes seven times with a one second off time, the link speed is 28.8K bps.

RTS/DTR (Request to Send/Data Terminal Ready) This dual function indicator functions as a Request To Send (RTS) indicator when a DSU is the internal composite link device or as a Data Terminal Ready (DTR) indicator when an internal modem or an ISDN terminal adapter is the composite link device.

NS/DBUP (No Signal/Dial Backup) This dual function indicator functions as a No Signal (NS) indicator when a DSU is installed. It lights when no signal at all is received from a DDS line or when the signal is too weak for normal operation. When a 33.6K bps modem is selected as the composite link device, it functions as a Dial Backup (DBUP) indicator, lighting when the modem is in dial backup mode.

OOS/OH (Out of Service/Off-Hook) This dual function indicator functions as an Out Of Service (OOS) indicator when an internal DSU is installed. It lights when an out of service signal is detected by the telco. When a 33.6K bps modem is selected as the composite link device, it functions as an off-hook (OH) indicator, lighting when the modem is active (off-hook).

2B (2B Operation) If an ISDN terminal adapter is installed, this indicator lights when the two ISDN B channels are operating as a single, high-speed, 128K bps channel. The indicator is off when one B channel is operating.

3.3 Connectors

The cable connections for the DataTalker are made at the back panel. Refer to Chapter 5 for cabling installation procedures. Refer to Appendix C for cabling diagrams. The DataTalker back panel is shown in Figure 3-2.

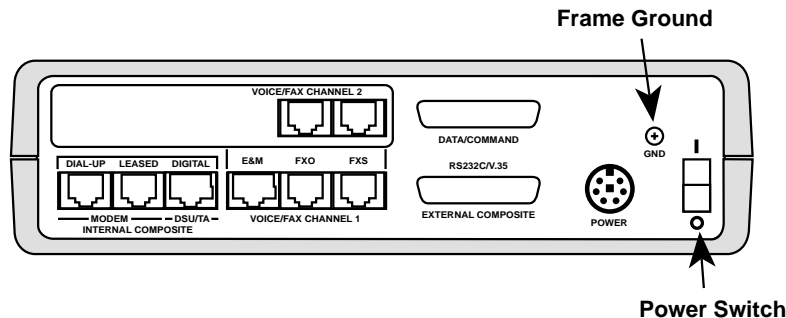


Figure 3-2. Back Panel (Desktop Version)

3.3.1 Frame Ground Connector (GND)

Use the GND connector to connect the DataTalker frame ground to the PBX's frame ground when the DataTalker is configured for E&M operation. (The frame ground connector for the rack version is on back of the RackTalker rack.)

3.3.2 POWER Connector

The POWER connector shown in Figure 3-2 is the receptacle for the DC power module supplied with the desktop DataTalker. The rack-mounted DataTalker has an AC power connector that plugs into the power bus on a Multi-Tech RackTalker rack when the DataTalker is inserted.

3.3.3 DATA/COMMAND Connector

Use this female DB-25 connector to connect the DataTalker to a data channel device such as a terminal, PC, or router, or to configure the DataTalker in command mode. The data channel device can be synchronous or asynchronous. In command mode, an ASCII terminal or a PC with a serial port can be used to configure the DataTalker. The connector's function (data or command) is determined by the position of DIP switch position 3.

3.3.4 EXTERNAL COMPOSITE RS232C/V.35 Connector

Use this male DB-25 connector to connect to an external modem, DSU, ISDN terminal adapter, or any device that is synchronous, full duplex, and supplies clocking signals on pins 15 and 17. The connection interface can be either RS232C or V.35, selected by moving an internal V.35 shunt.

3.3.5 VOICE/FAX CHANNEL 1 FXS Connector

Use the FXS (Foreign eXchange Station) connector to connect the DataTalker to an analog station instrument (telephone, fax machine, or key telephone system). The FXS connector is an RJ-11 jack. If a second voice/fax channel is installed, it has an identical connector.

3.3.6 VOICE/FAX CHANNEL 1 FXO Connector

Use the FXO (Foreign eXchange Office) connector to connect the DataTalker to a analog station card on the local PBX (Private Branch eXchange). This connection is also commonly referred to as an OPX (Off Premises eXtension). The FXO connector is an RJ-11 jack. If a second voice/fax channel is installed, it has an identical connector.

3.3.7 VOICE/FAX CHANNEL 1 E&M Connector

Use the E&M connector to connect the DataTalker to the E&M connector on an analog PBX trunk when linking two PBXs together. The E&M connector is an RJ-48 jack. This connector is available on voice/fax channel 1 only.

3.3.8 DSU/TA DIGITAL Connector

Use the DSU/TA Digital connector to connect the DataTalker to a DDS or dedicated network line when an internal DSU is installed, or to an ISDN line when the ISDN terminal adapter is installed. The connector is an RJ-48 jack.

3.3.9 MODEM LEASED Connector

Use the LEASED connector to connect the DataTalker to a leased line when an internal composite link modem is installed. The connector is an RJ-11 jack.

3.3.10 MODEM DIAL-UP Connector

Use the DIAL-UP connector to connect the DataTalker to the PSTN when an internal composite link modem is installed. The connector is an RJ-11 jack.

3.4 Switches and Shunts

DataTalker switches include one or two switches on the front panel, a power switch on the back panel of the desktop version, and a DIP switch and shunt on the main printed circuit board (Figures 3-3 and 3-4).

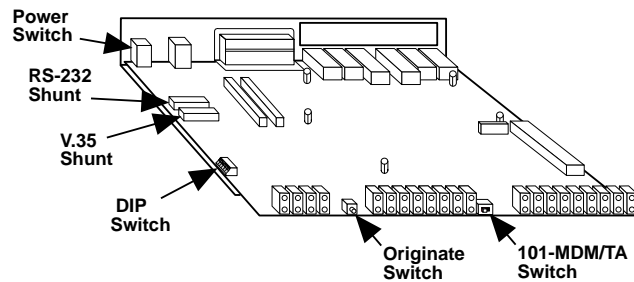


Figure 3-3. Switches and Shunts (Desktop Version)

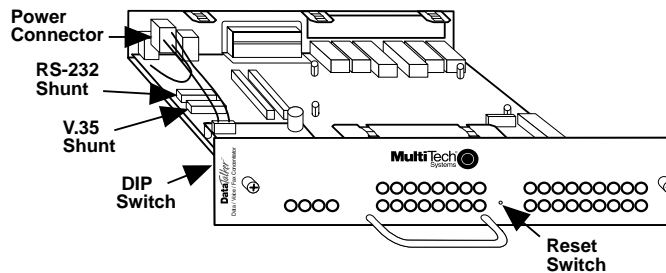


Figure 3-4. Switches and Shunts (Rack Version)

3.4.1 Front Panel Switches

- ORIG** **Originate Mode.** *Desktop version only.* Use this pushbutton to manually dial a modem or another DataTalker. To use the Originate switch, manually dial the remote modem's number on a phone connected to the voice/fax channel 1 FXS connector on your DataTalker. Listen for the dialed modem's answer tone. When you hear it, press and release the Originate switch. Replace the telephone handset in its cradle, and your data communications can begin.
- 101-MDM/TA** **DataTalker or Modem/TA Mode.** *Desktop version only.* Place this slide switch in the 101 position to use the DataTalker's standard features. If an internal modem or ISDN terminal adapter is installed, place it in the MDM/TA position to use the DataTalker as a stand-alone modem or ISDN terminal adapter (e.g., to call a BBS or an on-line information service).
- RESET** **Reset.** *Rack version only.* This is a pushbutton switch located behind a hole on the front panel. Use it to reset the DataTalker. (Turn the desktop version off and on again to achieve the same result.) Insert a narrow object such as a pen or pencil point through the hole to activate it.

3.4.2 Power Switch

The power switch on the back panel of the desktop DataTalker provides DC power when placed in the I (on) position, and removes power when in the O (off) position. The rack-mounted DataTalker is hot-swappable, and has no power switch.

3.4.3 DIP Switch

The eight-position DIP switch is accessible through a cutout in the left side of the DataTalker series enclosure; its location is shown in Figures 3-3 and 3-4.

- | | |
|--------------------|---|
| Position 1: | Not used |
| Position 2: | OPEN (up) Internal composite link device selected
Closed (down) External composite link device selected |
| Position 3: | OPEN (up) Data channel selected
Closed (down) Command channel selected |
| Position 4: | Not used |
| Position 5: | OPEN (up) MMV8/16/32 mode—for communicating with an MMV800-, MMV1600-, or MMV3200-series mux
Closed (down) 101 mode—for communicating with an MMV101 or a DataTalker |
| Position 6: | Not used |
| Position 7: | Not used |
| Position 8: | Not used |

3.4.4 RS232C/V.35 Shunt

You can connect an external composite link device using either an RS232C/V.24 or a V.35 interface to the DataTalker's External Composite connector. To configure the DataTalker for V.35 operation you must move a shunt on the main circuit board. Two shunt sockets are located on the back left side of the board (Figures 3-3 and 3-4). When an external composite link device with an RS232C/V.24 interface is connected to the composite link, the shunt is installed in the RS232C socket (factory default). When the external composite link device has a V.35 interface, you must move the shunt from the default RS232C socket to the V.35 socket. The V.35 indicator on the front panel lights when the shunt is in the V.35 position.

DataTalker™

Chapter 4 - Unpacking and Configuration



4.1 Introduction

This chapter describes what to expect in your DataTalker shipping box, then describes how to configure the DataTalker. It provides a helpful configuration summary to give you a snapshot of how your unit is set up; summarizes options you should consider when configuring the data channel, router port, voice/fax channel, and composite link; and then guides you step by step through the initial configuration procedure.

4.2 Unpacking

The shipping box contains the DataTalker, an external power supply (if it is a desktop model), a plastic bag containing the cables, and the *Owner's Manual*. Additional manuals may be included for options such as an internal link device. Inspect the contents for signs of any shipping damage. If damage is observed, do not power up the unit; contact Multi-Tech's Technical Support for advice (see Chapter 8). If no damage is observed, configure the DataTalker using the information in this chapter.

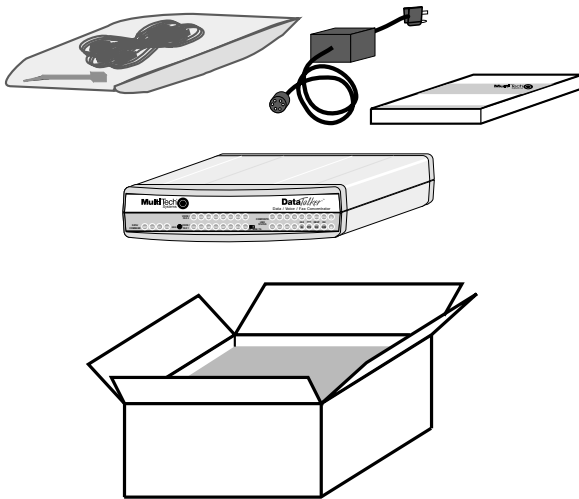


Figure 4-1. Unpacking

The plastic bag contains two 14-foot telephone cables and test cables. The two telephone cables may be used during installation.

4.3 Configuration Summary

The following chart shows possible configurations for your DataTalker. Use it as a snapshot of how your unit is set up. Circle the parameters that apply to your unit. For example, if your unit has the data channel set up for asynchronous communications, circle "Async."

Data Port	Sync	Async	
Optional Port	None	Voice/Fax	
Voice/Fax Channel(s)	1 Channel	2 Channels	
	FXO (PBX)	FXS (Phone)	E&M (Trunk)
Composite Link	Internal Device	External Device	
External Device	RS-232	V.35	
Internal Composite Link Device	Modem	DSU	ISDN TA
Internal Device Connector	Dial-Up	Leased	Digital

4.4 Data Port Configuration Considerations

When configuring the data port on your DataTalker, the first question you should ask yourself is what the port is connected to (e.g., an async channel of a host computer, a LAN gateway or bridge, or the composite link of an MMH900 series MultiMux).

If the port is connected to an asynchronous channel of a host computer, you should

- set the data port to "Async."
- set the speed of the port.
- verify all the other parameters of the Data Port Configuration menu.

If the port is connected to a dedicated PC serving as a LAN gateway or bridge, the interface is most likely synchronous and you should

- set the data port to "Sync."
- set clocking to "Internal" or "External."
- set the desired speed if you select internal clocking.
- ignore all the other parameters in the Data Port Configuration menu.

If the port is connected to the composite link of a MultiMux MMH900 series, the interface is most likely synchronous and you should

- set the data port to "Sync."
- set clocking to "Internal."
- set the desired speed.
- ignore all other parameters in the Data Port Configuration menu.

4.5 Voice/Fax Channel Configuration Considerations

When configuring the voice/fax channels on your DataTalker, the first question you should ask yourself is what the voice/fax port is connected to. The possibilities are an in-plant telephone switch, or PBX, (Private Branch eXchange); a PBX E&M trunk; or a telephone. If the voice/fax channel is being connected to a PBX, use the FXO connector. If it is being connected to a telephone, use the FXS connector. If it is being connected to a PBX E&M trunk in order to connect two PBXs, use the E&M connector.

Caution: When you configure the local DataTalker remote interface type (option 11), you are not setting the remote interface. You must know how the remote DataTalker is being used. You may need to call the remote site to determine this.

If the local voice/fax channel is connected to a PBX extension and the remote voice/fax channel is connected to a telephone, you should

- set option 6 to "FXO."
- use the default remote interface type ("FXS").

If the voice/fax channels are connected to PBX E&M trunks at both the local and the remote sites, you should

- set option 6 to "E&M."
- set the remote interface type (option 11) to "E&M."

If the voice/fax channel is connected to a telephone, you should

- use the default local interface type ("FXS").
- verify the remote interface type (call if necessary).
- set the remote interface type (option 11) to "FXO" if the remote unit is being connected to a PBX, or use the default "FXS" if it is being connected to a telephone.

4.6 Composite Link Configuration Considerations

The composite link configuration depends on the type of device used as the composite link device. The DataTalker knows the type of composite link device being used by the setting of a DIP switch and the sensing of conditions within the unit. In most cases you can use the default composite link configuration.

One of four menus will appear (MMH2834 modem, DSU, ISDN terminal adapter, or external device) depending on the device used.

If the MMH2834 modem is the composite link device, consider the following questions:

- Is DTR dialing being used? If yes, select option 1 and enter AT commands to enable DTR dialing.
- Is the modem using a dial-up or a leased line? If dial-up, use the default configuration; if leased, set option 4 to "Leased."
- Is the modem being used in originate or answer mode? If answer mode, use the default configuration; if originate, set option 6 to "Originate."

If an internal DSU is the composite link device, consider the following questions:

- Is a DDS line being used? If yes, use the default configuration.
- Is the speed of the line 56K bps? If yes, use the default configuration.
- Is a 4-wire non-loaded metallic wire being used? If yes, set clocking on one unit to "Internal," and the other to "DDS."

If an internal ISDN terminal adapter is the composite link device, consider the following questions:

- What are your network options, channel rate, and DTE options?
- What central office switch type and protocol is provided by your ISDN service provider—AT&T 5ESS, 5E6; Northern Telecom DMS-100, BCS-32; Siemens Stromberg-Carlson EWSD, National ISDN-1; or NEC International Switch?
- What are the SPID and LDN numbers assigned by your service provider?
- Will the terminal adapter use dial mode operation or point-to-point leased mode operation?
- Is the terminal adapter being used in originate or answer mode?

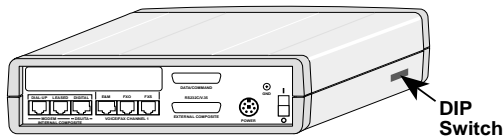
If an external device is the composite link device, consider the following questions:

- Type of external interface (RS232C or V.35). If V.35, you must move an internal shunt.
- Set clocking and speed to match the specific external device.

4.7 Configuration Procedure

Table 4-1. Configuration Procedure

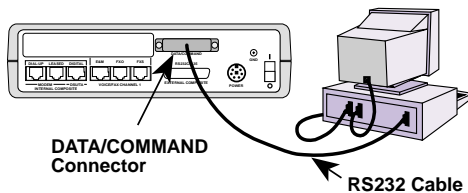
- | Step | Procedure |
|------|--|
| 1 | Review the configuration considerations for the data port, the voice/fax channel, and the composite link in the previous sections. |
| 2 | Place DIP switch position 3 in the down (closed) position to enable the command port. |



- 3 Desktop version: Connect the DC power supply shipped with the DataTalker to the power connector on the back panel and to the AC outlet.

Rack-mounted version: Insert the DataTalker into a RackTalker rack.

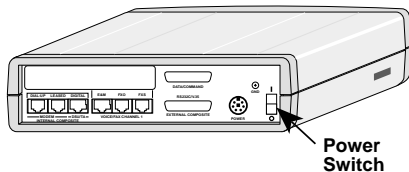
- 4 Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker. Use an appropriate RS232 cable to connect the DATA/COMMAND connector to your PC's serial port. The terminal or PC serial port may be labeled COM1, COM2, or Serial Port. The DATA/COMMAND connector has a DCE physical interface.



Note: Any cables connected to the computer should be shielded to reduce interference.

- 5 Desktop version: Apply power to the DataTalker by placing the power switch on the back panel in the on (I) position.

Rack-mounted version: Apply power to the RackTalker rack if it is not already on.



- 6 Apply power to the terminal or PC. Run your PC communications software in terminal mode. Press the ENTER key twice to establish communications with the DataTalker; the Main Menu then appears:

```

Main Menu

1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _

```

- 7 To configure the DataTalker, enter number 1 and press ENTER. The Configurations menu appears:

```

Configurations

1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

- 8 If the data channel is async and the channel speed is 19.2K bps, you can use the data port configuration defaults to start. Proceed to the voice/fax channel configuration (step 11).

If the data channel speed is higher or lower than 19.2K bps, then you must change the data port configuration. Enter 1 and press ENTER to go to the Data Port Configuration menu. Enter 2 and press ENTER to change the speed.

```

Data Port Configuration

1 - Async/Sync:          Async
2 - Speed:              19200
3 - Word Length:        8
4 - Stop Bits:          1
5 - Parity:              None
6 - Flow Control:       CTS
7 - Enq/Ack Flow Control: Off
8 - Echo:                Off
9 - Pacing:              Off
10 - EIA Pass Through:  Off
11 - Pass Xon:           Off
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

If you are connecting the data channel to a synchronous device, then you must change the data port configuration. Enter 1 and press ENTER to go to the Data Port Configuration menu. Only the first three options have to be considered for a synchronous device.

- 9 Configure the data port to meet the conditions of your installation by selecting option numbers from the menus. Refer to Chapter 6 for a description of the Data Port Configuration menu options.

For example, if you are setting up the data port as a sync data channel, enter number **1** and press ENTER. The Data Port Async/Sync menu appears:

```
Data Port Async/Sync
1 - Async
2 - Sync
P - Previous Menu

Selection : _
```

Select option 2 to select the sync mode of operation, and the data port configuration menu reappears.

- 10 When all options for the data port configuration have been set, enter the letter **S** and press ENTER to store all configurations. Then enter the letter **P** and press ENTER to return to the configuration menu.

Voice/Fax Channel Configuration

- 11 If the voice/fax channels of both the local and remote DataTalkers are being connected to telephone sets, i.e., both local and remote interfaces are FXS type, then you can skip the Voice/Fax Channel Configuration menu. Proceed to the Composite Link Configuration menu.

If either the local or the remote voice/fax channel is being connected to a PBX, then you must configure the voice/fax channel. Enter **2** and press ENTER for the Voice/Fax Channel Configuration menu.

If two voice/fax channels are installed in the DataTalker, a voice/fax channel configuration menu appears that allows you to configure either channel. Select the voice/fax channel that needs to be configured.

```
Voice/Fax Channel 1 Configuration
1 - Destination Channel      : 1
2 - Digitizing Rate         : 9600
3 - Output Level Atten.     : 12
4 - Input Level Gain        : 03
5 - Silence Suppression     : Off
6 - Local Interface Type    : FXS
7 - Ground/Loop Start (FXS) : Loop
8 - 2 or 4 Wire (E&M)       : N/A
9 - Dialtone/Wink (E&M)     : N/A
10 - Wink Timer (E&M)       : N/A
11 - Remote Interface Type  : FXS
12 - Ground/Loop Start (FXS) : Loop
13 - 2 or 4 Wire (E&M)     : N/A
14 - Dialtone/Wink (E&M)   : N/A
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

- 12 Configure voice/fax channel 1 to meet the conditions of your installation by selecting option numbers from the menus.
 - Accept the defaults for the first five options.
 - Select the local interface type (option 6).
 - Select the remote interface type (option 11). The remote interface option does not change the interface type on the remote unit; it only tells the local DataTalker how the remote unit is configured. The actual changing of the remote interface must be done at the remote site. See Chapter 6, "Menus," for a description of the menu options for the voice/fax channel configuration.
- 13 When you have set all options for the voice/fax channel 1 configuration, enter **S** and press ENTER to store all configurations. Then enter **P** and press ENTER to return to the Configurations menu.
- 14 If the DataTalker has a second voice/fax channel, select option 2 from the Configurations menu, then select "Voice/Fax Channel 2 Configuration" from the Voice/Fax Channel Configuration menu and repeat the steps for voice/fax channel 1.

Composite Link Configuration

- 15 From the Configurations menu, enter **3** and press ENTER to go to the Composite Link Configuration menu.
 - If the composite link device is an internal MMH2834 modem, the Internal MMH2834 Modem Settings menu appears. Verify the configuration of the internal MMH2834 modem.
 - If the composite link has an internal DSU, the Internal DSU menu appears. If the composite link is set up as a DDS link, use the default parameters.
 - If the composite link has an internal ISDN terminal adapter, the Internal TA menu appears. Use the default flush time and go to the terminal adapter's built-in menus (option 2) to verify and/or change the terminal adapter's configuration. Refer to the *ISDN Terminal Adapter Owner's Manual* for details on menu choices.
 - If the composite link is configured for an external link device, the Composite Link Settings - External Device menu appears. The default port parameters set clocking to external and speed to 56K bps. The external device must provide the clocking, must be a sync device, and must be full duplex. Refer to the device's user documentation to set these parameters.

The four composite link settings menus are shown on the following pages.

Composite Link Settings - Internal MMH2834

```

1 - Enter AT commands to 2834
2 - On-Line XMT Rate:      28800
3 - Speed Setting:        33600
4 - Dial/Leased:          Dial
5 - 2 or 4 Wire:          2 Wire
6 - Answer/Originate:     Answer
7 - Transmit Level        -10db
8 - DOD/DOI:              On
9 - DOI Timer:            03min
10 - DOD Toggle DTR:      40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

- Configure the internal MMH2834 modem to meet the conditions of your installation by selecting option numbers from the menus.
- If you are setting up DTR dialing, select option 1, Enter AT Commands to 2834. Wait 5 seconds and then enter the following commands (press ENTER after each command):

ATDT[Number Modem to Dial]**NO**

AT\$D1 - DTR Dialing command

AT&W - Store New Parameters to memory

Q - Return to modem menu

- If you have four-wire service from the telephone company, set option 5 to "4 Wire"; otherwise, accept the default.
- If the MMH2834 modem is to answer automatically when it receives a call, accept the option 6 default, "Answer"; otherwise, set it to "Originate." (If the leased line option is selected, one modem must be set to "Answer," the other to "Originate.")

When you have set all the options for the port and modem, enter **S** and press ENTER to store all configurations. Then enter **P** and press ENTER to return to the Composite Link Configuration menu.

- 16 If the composite link device is an internal DSU, verify that the configuration options meet the conditions of your installation.

```
Composite Link Settings - Internal DSU

1 - Speed:                56k
2 - Clocking:             DDS
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

If you need to change an option, select its number from the menu.

When you have set all the options for the DSU, enter **S** and press ENTER to store all configurations. Then enter **P** and press ENTER to return to the configuration menu.

- 17 If the composite link device is an ISDN terminal adapter, verify that the configuration options meet the conditions of your installation.

```
Composite Link Settings - Internal TA

1 - On-Line XMT Rate:     128000
2 - Configure TA
3 - DOD/DOI:              Off
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

To verify and/or change the terminal adapter's configuration, select option 2, wait 5 seconds, and enter **ATIV** to access the terminal adapter's configuration menu. Refer to the *ISDN Terminal Adapter Owner's Manual* for configuration commands. To exit the terminal adapter's configuration menu, enter **CTRL+X**; then, to return to the DataTalker's Composite Link Settings - Internal TA menu, press **ENTER, Q**.

When you have set all the options for the terminal adapter, enter **S** and press ENTER to store all configurations. Then enter **P** and press ENTER to return to the Configurations menu.

- 18 If the composite link device is an external device, verify that the configuration options meet the conditions of your installation.

```

Composite Link Settings -External Device

1 - On-Line XMT Rate:      56000
2 - Clocking:              External
3 - Back to Back:         Off
4 - DOD/DOI:              On
5 - DOI Timer:            03min
6 - DOD Toggle DTR:      40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

If you need to change an option, select its number from the menu.

- Set option 1, Clocking, to match the external device; i.e., if the external device supplies clocking, set option 1 to "External."
- Set option 2, Speed, to the same rate as the external device.

When you have set all the options for the external device, enter **S** and press ENTER to store all configurations. Then enter **M** and press ENTER to return to the Main Menu. Enter **5** and press ENTER to exit command mode.

- 19 When you have finished configuring the DataTalker, disconnect the terminal or PC from the command port and place DIP switch position 3 in the OPEN (up) position to change the data/command port over to a data channel.

This completes the configuration of the DataTalker. Proceed to Chapter 5, "Installation," to cable the DataTalker.

DataTalker™

Chapter 5 - Installation



5.1 Introduction

This chapter describes how to connect the DataTalker to your system (Table 5-1) and how to move the RS232/V.35 shunt when a V.35 interface is used (Table 5-2). Then it describes how to power on your DataTalker, check that the unit is cabled and configured correctly, and what to do if you run into problems.

5.2 Cabling

Connecting the DataTalker to your system requires two to four cables, depending on how you intend to use the DataTalker. Each cable connection will be explained in detail in the following procedures. When you cable the unit, you should consider how you configured it in Chapter 4. For instance, if you configured the unit for a sync data channel, you cannot connect a standard RS232C cable to the DATA/COMMAND connector on the back of the DataTalker. The following cabling procedures relate the cables to the configuration.

Table 5-1. Cabling Procedure

Step	Procedure
Composite Link	
1	Verify that DIP switch position 2 is set for the composite link device being used:
<u>Device</u>	<u>DIP Switch 2</u>
Internal	OPEN (Up)
External	Closed (Down)

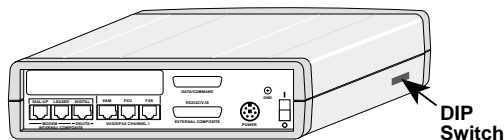


Figure 5-1. DIP Switches

- 2 If you are using your DataTalker with an internal composite link device, connect one of the two phone cables supplied with your unit to the appropriate internal composite connector:

MMH2834 Modem, Dial-up

Connect the RJ-11 phone cable supplied with the DataTalker from the internal modem DIAL-UP jack on the back panel to the dial-up line jack.

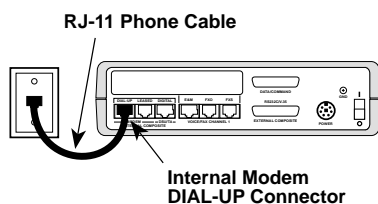


Figure 5-2. Dial-Up Line Connection

MMH2834 Modem, Leased Line

Connect the RJ-11 phone cable supplied with the DataTalker from the internal modem LEASED connector on the back panel to the leased line connection.

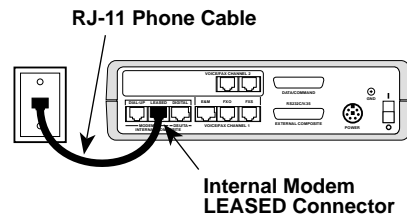


Figure 5-3. Leased Line Connection

DSU

Connect the RJ-48 phone cable supplied with the DataTalker from the internal DSU/TA DIGITAL connector on the back panel to the digital line connector.

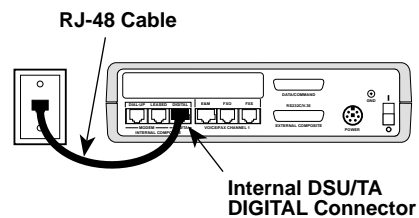


Figure 5-4. DSU Line Connection

ISDN Terminal Adapter

Using the RJ-48 cable supplied with the DataTalker, connect the internal DSU/TA DIGITAL connector on the back panel to the ISDN line jack.

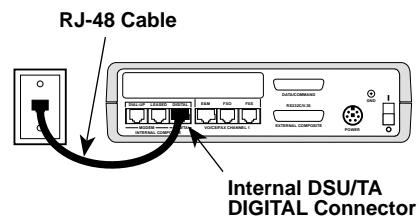


Figure 5-5. ISDN Terminal Adapter Line Connection

External Modem, DSU, or ISDN Terminal Adapter

- 3 If the external device has an RS232 interface, connect the composite link cable supplied with the DataTalker from the EXTERNAL COMPOSITE RS232C/V.35 connector on the back panel to the external device.

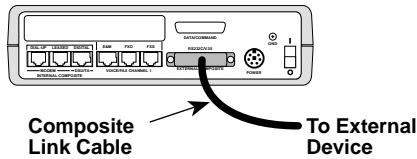


Figure 5-6. External Modem, DSU, or Terminal Adapter Connection

If the external device has a V.35 interface, connect a V.35 interface adapter cable (a cable with a 34-pin Winchester male connector on one end and a DB-25S connector on the other end) from the EXTERNAL COMPOSITE RS232C/V.35 connector to the external device. You can order a V.35 interface adapter cable from Multi-Tech (part number 90056210).

If the external device has a V.35 interface, you must move the V.35 shunt from its default RS232 position to the V.35 position. See Table 5-2 for the procedure on how to move the shunt.

Data Channel

- 4 If you are connecting the data channel to an asynchronous device, such as a PC or other type of host, connect an RS232C cable from the DATA/COMMAND connector on the DataTalker to the serial port of the async device.

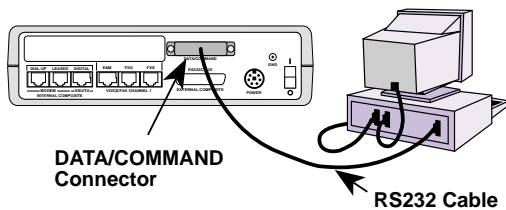


Figure 5-7. Data Channel Connection

If you are connecting the data channel to a sync device, connect a cable appropriate for a synchronous interface from the DATA/COMMAND connector on the DataTalker to the appropriate connector on the sync device.

Voice/Fax Channel

- 5 If you are connecting the voice/fax channel to a station device (a normal telephone, a KTS telephone, or a fax machine), connect an RJ-11 phone cable from the VOICE/FAX CHANNEL 1 FXS Connector on the DataTalker to the station instrument.

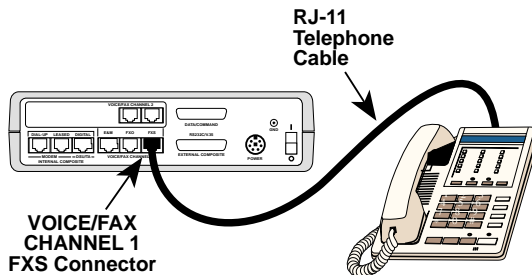


Figure 5-8. Telephone Connection

If you are connecting the voice/fax channel to the station side of a PBX, connect an RJ-11 phone cable from the VOICE/FAX CHANNEL FXO connector on the DataTalker to the station side of the PBX. Refer to the PBX manual for the station side connection.

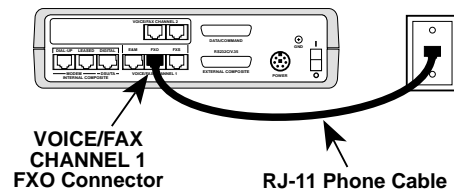


Figure 5-9. PBX Connection

If you are connecting the voice/fax channel to a PBX E&M trunk, connect an RJ-48 phone cable from the VOICE/FAX CHANNEL 1 E&M connector on the DataTalker to an E&M trunk connector on the PBX. (Voice/Fax Channel 2 does not have an E&M connector.) Also, run a ground wire from the ground connector on the back of the DataTalker or RackTalker to frame ground on the PBX E&M trunk. Refer to the PBX manual for the trunk connection.

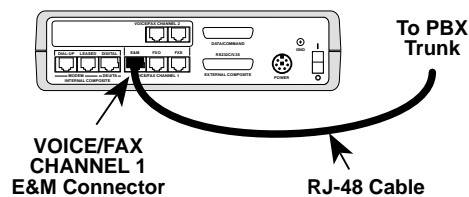


Figure 5-10. PBX E&M Trunk Connection

This completes the cabling of your DataTalker. Proceed to Table 5-3 to power on and test your unit.

5.3 V.35 Shunt

Table 5-2. V.35 Shunt Procedure

Step	Procedure
1	Desktop version: Unplug the power supply from the back of the unit. Rack version: Remove the unit from the RackTalker rack. Go to step 4.
2	Desktop version only: Turn the unit upside down and remove the two cabinet mounting screws from the middle of the cabinet.

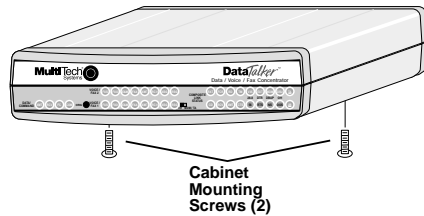


Figure 5-11. Cabinet Mounting Screws

- Desktop version only : Turn the cabinet right-side up, tilt the back down slightly, and the base unit will slide out of the cabinet.
- Desktop and rack versions: Place the unit with the LEDs facing you.
- Pry the shunt out of the RS232 socket and insert it into the V.35 socket. Rack version: Go to step 8.

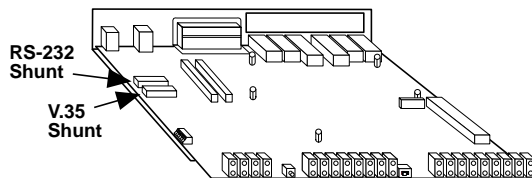


Figure 5-12. V.35 Shunt Location (Desktop Version)

- Desktop version only: Slide the base back into the cabinet with the LEDs toward the front and the rear grounding tabs pressing against the side of the cabinet.
- Desktop version only: Turn the unit upside down and replace the two cabinet mounting screws.
- Desktop version: Turn the unit right-side up and reconnect the power supply.
Rack version: Slide the unit into the RackTalker card guides and, after ensuring that the DataTalker is fully seated, fasten the retaining screws.

5.4 Power-On and Checkout

The desktop and rack-mounted versions of the DataTalker differ in how power is applied. The desktop version has a power switch that you must turn on. The rack version has no power switch; you apply power by inserting it into a powered-up rack. It is always on as long as the rack is powered up.

Table 5-3. Power-On and Checkout Procedure

Step	Procedure
1	Desktop version: Ensure that the power supply is connected to the unit's power connector and an AC outlet. Rack version: Ensure that the DataTalker is properly seated in a RackTalker rack. Tighten the front panel screws to ensure a good connection with the RackTalker power bus.
2	Desktop version: Apply power (press the power switch on the back of the unit to I [on]). Rack version: Plug the RackTalker rack into an AC outlet, if it is not already powered up.

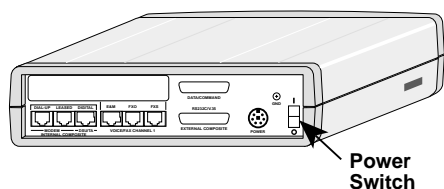


Figure 5-13. Power Switch (Desktop Version)

- 3 Verify the states of the following composite link LEDs. The LED should be on for each installed feature and off for each uninstalled feature:

Composite Link Device	LED
Internal 28.8K bps modem	MDM
Internal 56K DSU	DSU
Internal ISDN terminal adapter	TA
External modem, DSU, or TA	EXT
External V.35 interface	V35

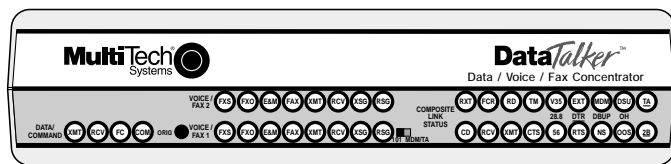


Figure 5-14. Front Panel

- 4 Establish a link with the remote DataTalker if the local DataTalker is not configured to link automatically.
- 5 Verify that the composite link is communicating with the remote DataTalker. The RD LED should be off. The following LEDs should be on:

Terminal adapter:	CD, RCV, XMT, CTS, DTR, and 2B (if so configured)
Modem:	CD, RCV, XMT, CTS, and DTR
DSU:	CD, RCV, XMT, CTS, and RTS

- 6 Verify that the voice/fax channel is connected at the remote site. One of the following conditions will apply depending on how your local and remote sites are set up:
 - If the local voice/fax channel is connected to a telephone switch in your facility (FXO connection) and the remote site has just a telephone (FXS connection), dial the number of the extension plugged into the FXO jack of the local DataTalker and listen for a ringing at the remote site. If a voice conversation can take place, the connection is good.
 - If the local and remote DataTalkers have only a telephone connected to the voice/fax channel, pick up the telephone hand set and listen for a ringing at the remote site. If a voice conversation can take place, the connection is good.
 - If the local and remote DataTalker each has an E&M trunk connection to its PBX, follow the PBX procedure for dialing any extension at the remote PBX. If a voice conversation can take place, the connection is good.
- 7 Now have the remote site call the main office to see if they can transfer data and establish a phone conversation. If the remote site is set up for DTR dialing, they only have to power up the remote DataTalker to dial; if it is a leased line connection, they have to pick up the telephone to make the main office phone ring; if it is a dial-up situation, they must dial the main office number to make its phone ring.
- 8 If the above functional tests do not all work, you must conduct further tests. Analyze the failure one function at a time to determine what does and doesn't work. The DataTalker has three basic functions:
 - Composite link
 - Data channel
 - Voice/fax channel

Composite Link

If the composite link is down, refer to the troubleshooting procedures in Chapter 7. Also, look for the following items:

- The composite link cabling does not match the link device. Ensure that the link configuration matches how the link is cabled.
- The shunt is in its default position when an external V.35 interface device is connected. See Table 5-2.
- The remote site (home office) cannot contact the main office when using a dial-up link. DTR dialing commands may be incorrect; refer to Chapter 6 while verifying the main office telephone number.
- DIP switch position 2 is set for the wrong device. See the cabling procedure in Table 5-1.
- The remote site cannot contact the main office. The remote site has a wrong phone number for the main office DataTalker or the leased line is not set up by the telephone company.

Data Channel

If the channel device (the device connected to the data channel) is not communicating with the DataTalker, check the following items:

- DIP switch position 3 is closed (down). Flip the position 3 switch up.
- The data channel configuration is wrong. See Chapter 4.
- The async or sync cable is wrong. See Appendix C.

Voice/Fax Channel

If the voice/fax channel is not communicating with the remote site or the remote site cannot communicate with you, check the following items:

- The channel configuration does not match how the channel is cabled. Verify that the channel configuration and cabling match.
- The remote DataTalker does not match the remote interface type. See Chapter 4.
- The telephone or fax machine is connected to the wrong connector. Verify the cable connection.
- The telephone must be an analog phone. Check with your telephone people to ensure that the telephone is not a digital instrument.
- The line connection to your local telephone switch is a digital line. Have your telephone people provide an analog line.

This completes the installation of your DataTalker.

DataTalker™

Chapter 6 - Menus



6.1 Introduction

The menu system for the DataTalker provides a set of user-friendly configuration menus that are accessible from a main menu. The Main Menu contains five options that allow you to configure your DataTalker, display statistics, reset options, run diagnostic tests, and exit the command mode.

```
Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _
```

To select one of the options from the Main Menu, enter the number corresponding to the option and press ENTER. A submenu is displayed that allows you to configure your DataTalker; display statistics; reset a voice/fax channel, data channel or the complete unit; or run one of many diagnostics tests.

6.2 Configurations Menu

From the Configurations menu you can configure the data port, voice/fax channel(s), or composite link; display factory defaults; store all current configurations; or return to the Main Menu.

```
Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

To configure the data port, voice/fax channel(s), or composite link, enter the corresponding option number and press ENTER. To change to factory defaults, enter number 4 and press enter. You can set factory defaults for the entire unit or for only the composite link, data channel, or the voice/fax channels. Select the option you wish to change, and a message will appear on your screen saying to wait for 10 seconds. Then press ENTER to return to the Main Menu. To store the current configuration, enter **S** and press ENTER. To return to the Main Menu, enter **M** and press ENTER.

6.2.1 Data Port Configuration

The Data Port Configuration menu allows you to configure the data channel for either asynchronous or synchronous operation, depending on the type of device connected to the channel. If the port is configured for synchronous operation, refer to Sync Data Port Configuration.

When the port is configured for asynchronous operation, options such as speed, flow control, and pacing may need to be changed. The following Data Port Configuration menu displays the default parameters for async mode of operation:

```

Data Port Configuration
1 - Async/Sync:           Async
2 - Speed:               19200
3 - Word Length:        8
4 - Stop Bits:          1
5 - Parity:              None
6 - Flow Control:       CTS
7 - Enq/Ack Flow Control: Off
8 - Echo:                Off
9 - Pacing:              Off
10 - EIA Pass Through:  Off
11 - Pass Xon:           Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

The **Async/Sync** option configures the port for either asynchronous or synchronous operation. When an asynchronous device such as a PC or a host computer is connected to the channel, the data port needs to be configured for asynchronous operation. The default for this option is Async.

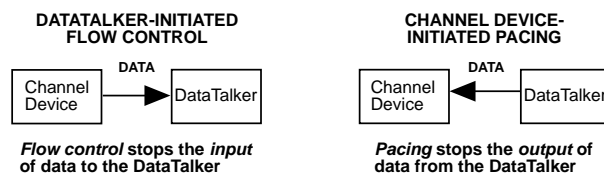
The **Speed** option needs to be set when the async device is operating at a channel speed other than 19.2k. When the data channel is connected to an asynchronous device, the channel baud rate is from 300 bps to 115.2K bps. The default channel speed is 19.2k bps.

The **Word Length** option sets the number of bits in a word. The word length range is 5 to 8 bits. The default is 8 bits.

The **Stop Bits** option sets the number of stop bits. The number of stop bits is 1, 1.5, 2. The default is 1 bit.

The **Parity** option sets parity for odd, even or none. Under normal conditions, parity is set to none. The default is none.

The **Flow Control** option allows for two types of flow control: the software-based XON/XOFF and the hardware-based Clear to Send (CTS). The default condition is CTS. Flow control is the means by which data flow from the channel device into the DataTalker is controlled. Flow control is necessary when the data handling capacity of the data channel cannot keep up with the volume of data sent to it. When the channel device controls data flow to itself, it is called pacing (see Pacing option). The combination of flow control from the channel device and pacing to the channel device is how data transfers are regulated so that no data is lost.

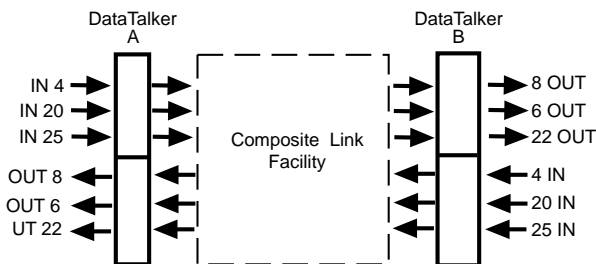


The **Enq/Ack Flow Control** option is a special flow control protocol used in Hewlett Packard computer systems. This option is sometimes referred to as Enquire/Acknowledge flow control because it's based on the computer sending an enquiry (ENQ) and then expecting an acknowledgment (ACK). The default condition for this option is off.

The **Echo** option enables data entered on the channel device keyboard to be returned to the channel device monitor. The purpose of this option is so that an operator will not experience undue delays in seeing entered data appear on their monitor. The default condition for the echo option is off.

The **Pacing** option controls the data flow to the channel device. This option only applies to the async mode of operation. Pacing is necessary when the flow of data to a device operating on the data channel is more than it can process. If the channel device cannot process the volume of data sent to it, then the pacing option should be turned on. The pacing method used is determined by the type of flow control. The default condition is for this option to be turned off.

The **EIA Pass Through** option allows the channel device to receive EIA control signals through the DataTalker. This option only applies during the async mode of operation. Since, in normal interactive operation, the existence of a DataTalker should be transparent to the user, the EIA pass through option allows a terminal to operate as if it were connected directly to a communications line and not through a DataTalker. This is done by allowing selected pins (signals) on one DataTalker to be passed through to selected pins on a remote DataTalker. The default condition is for this option to be turned off. The following diagram shows how the EIA pass through option routes the selected signals:



The **Pass Xon** option enables the XON/XOFF flow control signals to be passed on to the channel device. This option only applies during the async mode of operation. This option has to be used in conjunction with the software-based XON/XOFF flow control option. The default condition is for this option to be turned off, and normally it should remain off.

6.2.2 Sync Data Port Configuration

The Data Port Configuration menu allows you to configure the data channel for either asynchronous or synchronous operation, depending on the type of device connected to the channel.

When the port is configured for synchronous operation, the following Data Port Configuration menu displays the default parameters:

```

Data Port Configuration
1 - Async/Sync:          Sync
2 - Speed:              19200
3 - Clocking:           Internal
4 - Idle Condition:     Flags
5 - NRZ/NRZI Encoding:  NRZ
6 - CRC Preset:         All 1s
7 - Inter-frame Timer:  Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

The **Async/Sync** option configures the port for either asynchronous or synchronous operation. When a synchronous device such as a LAN bridge or router is connected to the channel, the data port needs to be configured for synchronous operation.

The **Speed** option needs to be set when the sync device is operating at a channel speed other than 19.2k. When the data channel is connected to a synchronous device, the channel baud rate is from 300 bps up to 128K bps. The default channel speed is 19.2k bps.

The **Clocking** option needs to be set for either internal or external clocking. When the DataTalker is providing the clocking, the option needs to be set for internal clocking. When clocking is provided by the synchronous device, this option must be set for external clocking. The default for the clocking option is internal clocking.

The **Idle Condition** option must be set to match the idle condition of the synchronous device connected to the data port. The idle condition must set when the synchronous data line is in an idle condition (i.e., no data frames are being transmitted). The default condition is to continuously send SDLC flags (Flags). The other idle condition is the mark state (Mark). The transmit LED will be off during idle time if the synchronous device is in the mark state during idle conditions.

The **NRZ/NRZI Encoding** option refers to the fact that synchronous data can be encoded by using either the NRZ (Non-Return to Zero) or NRZI (Non-Return to Zero Inverted) method. This option must match the synchronous device's encoding. The default is NRZ. Most synchronous devices are configurable. If a synchronous device is not configurable, it is set to NRZ. Refer to the device's user documentation for the encoding method.

The **CRC Preset** option allows the user to specify whether the polynomial used to calculate the CRC for each frame is present to all 1s or all 0s. This option must match the synchronous device's CRC setting. The default is All 1s.

The **Inter-frame Timer** option can be changed to make the DataTalker wait a specified length of time between frames being transmitted on the data channel. The user can choose delay times of 2,5,10 and 15 milliseconds. A typical use for this parameter is to simulate transmission delays encountered with equipment that toggles hardware signals after transmission of each frame, like PC cards used to connect to legacy systems. The following options can be specified for the timer: Off, 2mS, 5mS, 10mS, and 15mS. The default is off.

6.2.3 Voice/Fax Channel Configuration

The Voice/Fax Channel Configuration menu is displayed only if the second voice/fax channel card is installed in the DataTalker. If only one voice/fax channel is installed in the DataTalker, this menu does not appear. If you select the Voice/Fax Channel(s) Configuration option from the Configurations menu when you have only one voice/fax channel, the Voice/Fax Channel 1 Configuration menu is displayed:

```

Voice/Fax Channel Configuration

1 - Voice/Fax Channel 1 Configuration
2 - Voice/Fax Channel 2 Configuration
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection: _

```

To configure voice/fax channel 1, enter number **1** and press ENTER. To configure the second voice/fax channel 2 (if installed), enter number **2** and press ENTER. The options for both voice/fax channels are the same. To return to the previous menu, enter **P** (upper or lower case) and press ENTER. To return to the Main Menu, enter **M** and press ENTER.

Voice/Fax Channel 1 Configuration

The Voice/Fax Channel 1 Configuration menu allows you to select the voice/fax channel 1 operating conditions:

```

Voice/Fax Channel 1 Configuration

1 - Destination Channel           : 1
2 - Digitizing Rate               : 9600
3 - Output Level Atten.           : 12
4 - Input Level Gain               : 03
5 - Silence Suppression           : Off
6 - Local Interface Type          : FXS
7 - Ground/Loop Start (FXS)      : Loop
8 - 2 or 4 Wire (E&M)            : N/A
9 - Dialtone/Wink (E&M)          : N/A
10 - Wink Timer (E&M)             : N/A
11 - Remote Interface Type       : FXS
12 - Ground/Loop Start (FXS)    : Loop
13 - 2 or 4 Wire (E&M)          : N/A
14 - Dialtone/Wink (E&M)        : N/A
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

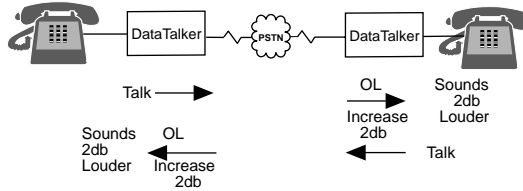
```

The **Destination Channel** option selects the voice/fax channel at the remote DataTalker that will receive the voice/fax traffic. The options are 1 for the remote voice/fax channel 1 and 2 for the remote voice/fax channel 2. The default is 1.

The **Digitizing Rate** option selects from two digitized or compressed rates of 9600 and 16000 bps. The default is 9600 bps. Note that with the silence suppression option, less bandwidth is used.

The **Output Level Attenuation** option selects the output signal level of the voice/fax channel transmission. This will change the volume level that the person at the receiving DataTalker hears. As the output level attenuation increases, the amplitude decreases. The signal levels are incremented in decibel levels of 0.75 dB and range from zero to 31. You must enter two digits. No signal level attenuation is 0 dB.

The output level attenuation needs to be set at the DataTalker that is receiving (hearing). Increasing the output level gain at the transmitting DataTalker will have no affect on the loudness heard by the person at the receiving DataTalker:



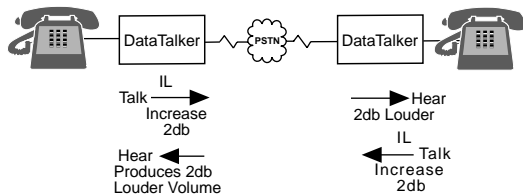
Note: For the best results, increase or decrease both the local output level (OL) and remote input level (IL) settings by a small amount to change the volume level heard at the local voice/fax channel.

The default settings are as follows:

Configuration	Local		Remote	
	IL	OL	IL	OL
FXS to FXO	4	0	6	1
FXS to FXS	3	12	3	12
E&M to E&M (4-wire)	3	4	3	4

The **Input Level Gain** option selects the gain of the input voice/fax signal for voice/fax channel. As the input level gain increases, the volume level increases. The input level gain ranges from 0 to 24 in increments of 1db with 0db producing no gain. Two digits have to be entered.

When the input level on the local DataTalker is adjusted, the volume level heard on the remote DataTalker will change accordingly. The input level gain needs to be set on the transmitting DataTalker (talking). This will increase the volume that the person at the receiving DataTalker hears. To increase the input level gain at the receiving DataTalker will have no affect on what this person hears.



Note: For best results, increase or decrease both the local output level (OL) and remote input level (IL) settings by a small amount.

The default settings are as follows:

Configuration	Local		Remote	
	IL	OL	IL	OL
FXS to FXO	4	0	6	1
FXS to FXS	3	12	3	12
E&M to E&M (4-wire)	3	4	3	4

The **Silence Suppression** option keeps moments of silence from using up bandwidth on the composite link. The options are Off, Medium, and Maximum. Typically, a voice conversation is 50 to 60% silence. Silence suppression is helpful when using a slow composite link speed such as 19.2K bps. When silence suppression is off, all sound passes through the link, even silence. Silence suppression is active when there is no activity on the voice/fax channel. The maximum setting increases the volume necessary for sound to be sent over the link.

The **Local Interface Type** option configures the local voice/fax channel interface. The options are for an FXS, FXO, or E&M interface. When the voice/fax channel is connected to a telephone set or fax machine, the local interface type must be FXS. When the voice/fax channel is connected to the station side of a PBX, the local interface type must be FXO. When the voice/fax channel is connected to a PBX E&M trunk, the local interface type must be E&M. When the local DataTalker is configured for an FXO interface, the remote DataTalker must be configured for an FXS interface. FXS to FXS is another local-to-remote interface. When used to connect PBXs, both local and remote DataTalkers must be configured for E&M.

The **Ground/Loop Start (FXS)** option selects between ground start and loop start. Select Ground when the DataTalker local interface type is FXS ground start and the remote interface is E&M wink. The default is Loop.

The **2 or 4 Wire (E&M)** option selects how the DataTalker is connected to the PBX E&M trunk. The choice is between 2- and 4-wire connections. The default is 4 Wire.

The **Dialtone/Wink (E&M)** option selects between dialtone and wink signals when the interface type is E&M. The default is Dialtone.

The **Wink Timer (E&M)** option is used in the E&M interface to delay the sending of address information from the remote MultiMux. The wink timer range is from 100 to 350 milliseconds. The default delay is 250 ms.

The **Remote Interface Type** option informs the local voice/fax channel of how the remote channel may be configured. The options are for an FXS, FXO, or E&M interface. **Caution:** This option does not actually change the remote interface. You may have to contact the remote site for verification of its actual interface. When the remote voice/fax channel is connected to a telephone set or fax machine, the remote interface type must be FXS. When the remote voice/fax channel is connected to the station side of a PBX, the remote interface type must be FXO. When the remote voice/fax channel is connected to a PBX E&M trunk, the remote interface type must be E&M. If the remote DataTalker is configured for an FXO interface, the local DataTalker must be configured for an FXS interface. FXS to FXS is another remote-to-local interface. When used to connect PBXs, both local and remote DataTalkers must be configured for E&M. If erratic voice/fax operation is noticed, the remote interface may be incorrectly set at the local DataTalker.

The **Ground/Loop Start (FXS)** option selects between ground start and loop start. Select Ground when the DataTalker local interface type is FXS ground start and the remote interface is E&M wink. The default is Loop.

The **2 or 4 Wire (E&M)** option selects how the DataTalker is connected to the PBX E&M trunk. The choice is between 2- and 4-wire connections. The default is 4 Wire.

The **Dialtone/Wink (E&M)** option selects between dialtone and wink signals when the interface type is E&M. The default is Dialtone.

6.2.4 Composite Link Configuration

The Composite Link Configuration menu that is displayed depends on whether an internal or external device is installed as well as on the position of DIP switch position 2. If DIP switch position 2 is in the up (OPEN) position and an internal MMH2834 modem installed, the Composite Link Settings menu for the MMH2834 modem is displayed. If DIP switch position 2 is in the up (OPEN) position and an internal DSU is installed, the Composite Link Settings menu for a DSU is displayed. If DIP switch position 2 is in the up (OPEN) position and an internal ISDN terminal adapter is installed, the Composite Link Settings menu for a terminal adapter is displayed. If DIP switch position 2 is in the down (closed) position, the Composite Link Settings menu for an external device is displayed.

Composite Link Settings - Internal MMH2834

The Composite Link Settings - Internal MMH2834 menu allows you to configure the composite link for an MMH2834 modem. Additional AT commands may be needed to set up the modem. (See Appendix F.)

```
Composite Link Settings - Internal MMH2834

1 - Enter AT commands to 2834
2 - On-Line XMT Rate:          28800
3 - Speed Setting:            33600
4 - Dial/Leased:              Dial
5 - 2 or 4 Wire:              2 Wire
6 - Answer/Originate:         Answer
7 - Transmit Level            -10db
8 - DOD/DOI:                  On
9 - DOI Timer:                 03min
10 - DOD Toggle DTR:          40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _
```

The **Enter AT Commands to 2834** option allows you to use AT commands to reconfigure the MMH2834 through the command port. For example, to set up the MMH2834 for DTR dialing, select this option and enter the following commands:

```
ATDT[Number to Dial]NO
AT$D1 (DTR dialing command)
AT&W (Store new parameters to memory)
Q (Return to menus)
```

Additional AT commands are described in Appendix F.

The **On-Line Transmit (XMT) Rate** option displays the on-line transmit rate of the composite link device. If the composite link is not up, off-line is displayed. The On-Line XMT Rate may be different than the Speed Setting.

The **Speed Setting** option configures the link port for a speed of 9600, 14400, 19200, or 33600 bps. A 2834 Speed Setting submenu is displayed when this option is selected. The default speed setting is 33600 bps.

```
2834 Speed Setting
1 - 33600
2 - 19200
3 - 14400
4 - 9600
P - Previous Menu
Selection : _
```

The **Dial/Leased** option selects the type of connection to the telephone company. If the data line provided by the telephone company is a dial-up line, then you must select the dial option. The options are Dial and Leased with the default being Dial.

The **2 or 4 Wire** option selects how the MMH2834 modem is connected to the telephone line. E.g., if the telephone company is supplying a 4-wire lease, select the 4 Wire option. The options are 2 Wire and 4 Wire, with the default being 2 Wire.

The **Answer/Originate** option selects the line frequency used when leased line operation is selected. When dial operation is selected, it enables or disables auto answer. For leased line operation, one MMH2834 modem should have Originate selected and the other MMH2834 should have Answer selected. For dial operation, select Answer if the MMH2834 needs to answer an incoming call.

The **Transmit Level** option selects the output transmission level in decibels. The options are 0 and -10db, with a default of -10db. The closer the transmit level is to zero the greater the level (strength) of the output signal. This option should only be changed under the direction of Multi-Tech Tech Support personnel.

The **Dial On Demand (DOD)/Disconnect On Inactivity (DOI)** option drops DTR to the MMH2834 modem to disconnect if the inactivity timer has expired and raises DTR to reconnect if the voice/fax or data channel goes active. The default is to have the DOD/DOI option turned off. If this option is off, options 9 and 10 do not appear on the menu.

The **Disconnect on Inactivity (DOI) Timer** option signals the MMH2834 to hang up the composite link by dropping DTR to it when the timer expires. When the DOI Timer option is selected, a submenu is displayed in which you can enter the number of minutes that the inactivity timer is set for. The range of the timer in minutes is 01 to 99. The default setting for the timer is three minutes.

```
Disconnect On Inactivity Timer. This is
the timer for inactivity -> DTR drop.

x - Enter the number of minutes
P - Previous Menu
Selection : _
```

The **Dial On Demand (DOD) Toggle DTR** option activates the DTR Toggle Timer. When activity on the voice/fax or data channels cause DTR to go high telling the MMH2834 modem to DTR dial, this timer is started. If the connection is established before this timer expires, the timer is stopped. Otherwise, when the timer expires, DTR is toggled to tell the MMH2834 to dial again and this timer is restarted. The default is 40 seconds.

```
DTR Toggle Timer. This is the timer to
toggle DTR if the link does not come up.

x - Enter the number of seconds(0 is off)
P - Previous Menu
Selection : _
```

Composite Link Settings - Internal 56K DSU

The Composite Link Settings - Internal DSU menu allows you to configure the composite link for a DSU. The default parameters for an internal DSU are displayed in the following menu:

```

Composite Link Settings - Internal DSU

1 - Speed:                56k
2 - Clocking:             DDS
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

The **Speed** option sets the speed of the internal DSU. The options are 2400, 4800, 9600, 19200 and 56000 bps with the default being 56K bps.

The **Clocking** option allows the internal DSU to accept timing from its internal timing oscillator or from the DDS network's receive bipolar signal. The options are Internal and DDS clocking with the default being DDS clocking.

Composite Link Settings - Internal TA

The Composite Link Settings - Internal TA menu allows you to configure the composite link for an ISDN terminal adapter using the terminal adapter's built-in configuration menu.

```

Composite Link Settings - Internal TA

1 - On-Line XMT Rate:     128000
2 - Configure TA
3 - DOD/DOI:             Off
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

The **Link Transmit Rate** option displays the speed that the DataTalker is sensing on the composite link.

The **Configure TA** option allows you to verify and/or change the terminal adapter's configuration using its internal configuration menu. After you select the option, wait five seconds, then enter **AT!V** to access the terminal adapter's configuration menu. To change a setting, enter the menu choice number and press ENTER. Refer to the *ISDN Terminal Adapter Owner's Manual* for descriptions of the terminal adapter settings. To exit the terminal adapter's configuration menu, enter **CTRL+X**; then, to return to the DataTalker's Composite Link Settings - Internal TA menu, press **ENTER, Q**.

The **Dial On Demand (DOD)/Disconnect On Inactivity (DOI)** option drops DTR to the terminal adapter to disconnect if the inactivity timer has expired and raises DTR to reconnect if the voice/fax or data channel goes active. When this option is turned ON, a new menu is displayed. The default is to have the DOD/DOI option turned off.

```
Composite Link Settings - Internal TA
1 - On-Line XMT Rate:      128000
2 - Configure TA
3 - DOD/DOI:              On
4 - DOI Timer:            03min
5 - DOD Toggle DTR:      40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

The **Disconnect on Inactivity (DOI) Timer** option signals the terminal adapter to hang up the composite link by dropping DTR to it when the timer expires. When the DOI Timer option is selected, a submenu is displayed in which you can enter the number of minutes that the inactivity timer is set for. The range of the timer in minutes is 01 to 99. The default setting for the timer is three minutes.

```
Disconnect On Inactivity Timer. This is
the timer for inactivity -> DTR drop.

x - Enter the number of minutes
P - Previous Menu
Selection : _
```

The **Dial On Demand (DOD) Toggle DTR** option activates the DTR Toggle Timer. When activity on the voice/fax or data channels cause DTR to go high telling the terminal adapter to DTR dial, this timer is started. If the connection is established before this timer expires, the timer is stopped. Otherwise, when the timer expires, DTR is toggled to tell the terminal adapter to dial again and this timer is restarted. The default is 40 seconds.

```
DTR Toggle Timer. This is the timer to
toggle DTR if the link does not come up.

x - Enter the number of seconds(0 is off)
P - Previous Menu
Selection : _
```

Composite Link Settings - External Device

The Composite Link Settings - External Device menu allows you to configure the composite link for an external device. The default parameters for an external device are displayed in the following menu:

```

Composite Link Settings -External Device

1 - On-Line XMT Rate:      56000
2 - Clocking:              External
3 - Back to Back:         Off
4 - DOD/DOI:              On
5 - DOI Timer:            03min
6 - DOD Toggle DTR:      40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

The **On-Line Transmit (XMT) Rate** option displays the on-line transmit rate of the composite link device. If the composite link is not up, Off-Line is displayed.

The **Clocking** option allows the internal composite link to accept timing from either its internal timing oscillator or from a synchronous full-duplex external device. The options are Internal and External clocking, with a default of External.

The **Back to Back** option is used to test the port by connecting two DataTalkers together using a back-to-back cable. The options are On and Off with a default of Off.

The **Dial On Demand (DOD)/Disconnect On Inactivity (DOI)** option to the external device to disconnect if the inactivity timer has expired and raises DTR to reconnect if the voice/fax or data channel goes active. The default is to have the DOD/DOI option turned off. If this option is off, options 5 and 6 do not appear on the menu.

The **Disconnect on Inactivity (DOI) Timer** option signals the external device to hang up the composite link by dropping DTR to it when the timer expires. When the DOI Timer option is selected, a submenu is displayed in which you can enter the number of minutes that the inactivity timer is set for. The range of the timer in minutes is 01 to 99. The default setting for the timer is three minutes.

```

Disconnect On Inactivity Timer. This is
the timer for inactivity -> DTR drop.

x - Enter the number of minutes
P - Previous Menu
Selection : _

```

The **Dial On Demand (DOD) Toggle DTR** option activates the DTR Toggle Timer. When activity on the voice/fax or data channels cause DTR to go high telling the external device to DTR dial, this timer is started. If the connection is established before this timer expires, the timer is stopped. Otherwise, when the timer expires, DTR is toggled to tell the external device to dial again and this timer is restarted. The default is 40 seconds.

```

DTR Toggle Timer. This is the timer to
toggle DTR if the link does not come up.

x - Enter the number of seconds(0 is off)
P - Previous Menu
Selection : _

```

6.3 Statistics

The Statistics menu allows you display or clear the composite link statistics, or return to the previous menu or to the Main Menu.

```
Statistics
1 - View Composite Link Statistics
2 - Clear Composite Link Statistics
M - Main Menu
P - Previous Menu

Selection : _
```

To display or clear the composite link statistics, enter the corresponding option number and press ENTER. To return to the previous menu, enter **P** and press ENTER. To return to the Main Menu, enter **M** and press ENTER.

The Composite Link Statistics display provides information concerning the operation of the composite link that can aid you in testing for problems on the link.

```
Composite Link Statistics

Elapsed Time           : 00 Days 00 Hours 00
Minutes
Data Blocks Transmitted : 0
Data Blocks Retransmitted : 0
Data Blocks Received    : 0
Receive Block Errors    : 0
Voice/Fax Blocks Transmitted : 0
Voice/Fax Blocks Received : 0
Link Alarms             : 0
Remote Downs            : 0
```

Comparing the number of blocks transmitted with the number of retransmits needed to get data over the link can indicate a line problem. Comparing the blocks received and receive block errors indicates the same problem from the other end of the link. Comparative numbers that you might encounter could be 10,000 blocks transmitted (or received) with 500 or 1000 retransmits (or receive block errors). Link alarms simply tell you that there are some sort of problems on the link. You will find that the link alarms numbers will correspond to the retransmit and receive block numbers. Specifically, a link alarm means that it has been 10 seconds since the DataTalker has received an acknowledgement. Normally, three acknowledgements are received during a 10-second period.

The remote down entry means that the DataTalker has sent data 30 times and could not get it through (the link has been broken).

6.4 Reset Options

The Reset Options menu allows you to reset the unit, the data and voice/fax channels, each voice/fax channel, or just the data channel.

```

Reset Options
1 - Reset Unit
2 - Reset Data and Voice/Fax Channels
3 - Reset Voice/Fax Channel 1
4 - Reset Voice/Fax Channel 2
5 - Reset Data Channel
M - Main Menu
P - Previous Menu

Selection : _

```

To reset the unit, enter **1** and press ENTER. To reset the data and voice/fax channels, **2** and press ENTER. To reset either voice/fax channel, enter the appropriate number and press ENTER. To reset just the data channel, enter **5** and press ENTER. To return to the previous menu, enter **P** and press ENTER. To return to the Main Menu, enter **M** and press ENTER.

6.5 Diagnostic Tests

The Diagnostic menu allows you to run three different tests, display the DIP switch settings, and return to the previous menu or the Main Menu. The loop test option produces a submenu that allows either a data loopback function or voice loopback function. (Tests for the ISDN terminal adapter are described in the *ISDN Terminal Adapter Owner's Manual*.)

```

Diagnostics
1 - Loop Test
2 - Memory Test
3 - Watch Dog Test
4 - Dip Switch Definitions and Settings
5 - Product and Firmware ID
M - Main Menu
P - Previous Menu

Selection : _

```

The **Loop Test** option checks the operation of the local unit. When this option is selected, a loop test menu is displayed. See "Loop Tests" in section 6.5.1.

The **Memory Test** option checks the on-board memory. When this option is selected, a warning message is displayed. The memory test will destroy all stored configurations. See "Diagnostic Testing" in section 7.12.

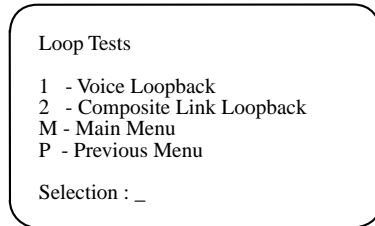
The **Watch Dog Test** option verifies the watch dog timer circuitry. A message is displayed that the test will reset the unit. See "Diagnostic Testing" in section 7.12.

The **Dip Switch Definitions and Settings** option displays a screen that shows the definition of each switch and its current setting.

The **Product and Firmware ID** option defines the product and its current firmware release version.

6.5.1 Loop Tests

The Loop Tests menu provides either a voice loopback or a composite link loopback that depends on the type of link device.



The following messages are displayed, depending on the loopback test.

Voice Loopback Test

Voice Loop Test. If you have one voice channel, it loops to itself. If you have two voice channels, voice channel 1 loops to voice channel 2.

Hit any key to end the test.

While the test is running, speak into the mouthpiece of the telephone connected to the DataTalker. If you hear your voice over the speaker, the circuit is okay.

Internal DSU Test

Your internal DSU is in loopback now. The DSU loops both local and remote. To loop data exit command mode.

To end loopback, reset the unit.

External Device Test

To perform a composite link loopback test, put your external link device into loopback.

Internal MMH2834 Test

To perform a composite link loopback test, go into the composite link configuration menu and send the command **AT&M1U** to the modem. Wait for the "Connect" message, then enter **q**. After the **q**, you can exit command mode to loop data.

To end loopback, reset the unit.

6.6 Configure Remote Unit

Configuration menu option 5 is dependent on the position of DIP switch SW-5. If DIP switch SW-5 is in the Open (Up) position (MMV8/16/32), the configuration menu allows for the DataTalker to set parameters to communicate with other MultiMux products (i.e., MMV800, MMV1600, or MMV3200 series). If the DIP switch is in the Down (Closed) position (Configure Remote Unit), the local unit can display and change the configuration of the remote unit. The default for this DIP switch is the Open (Up) position.

When the position of DIP switch SW-5 is in the Down (Default) position, the Configuration menu appears as follows:

```
Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

When the composite link is established with the remote unit, option 5 is selected, and async mode is enabled, the remote unit's Main menu appears on the local unit's monitor. All menus that appear are from the remote unit. Any changes made affect the remote unit.

6.6.1 MMV8/16/32 Configuration Options

When DIP switch SW-5 is in the Open (up) position, the Configuration menu appears as follows:

```
Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

If option 5 is selected, the MMV8/16/32 menu is displayed and the source and destination nodes and the source and destination channels can be selected.

```
MMV8/16/32 Configurations Options
1 - Unit Source Node           :00
2 - Data Destination Node      :01
3 - Data Source Channel        :01
4 - Data Destination Channel   :01
5 - Voice/Fax Ch. 1 Dest. Node :01
6 - Voice/Fax Ch. 2 Dest. Node :01
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

The **Unit Source Node** option specifies the node number of the local node. This number has to be unique and any number from 0 to 9. Remember that the node number will be used by other nodes.

The **Data Destination Node** option specifies the node number of the remote node. This number has to be unique and any number from 0 to 9.

The **Data Source Channel** option specifies the source channel to which the destination channel is communicating with. The Data Source Channel options are 1 or 2 and the default is 1.

The **Data Destination Channel** option specifies the destination channel to which the source channel is communicating with. The Data Destination Channel options are 1 or 2 and the default is 1.

The **Voice/Fax Ch. 1 Destination Node** option specifies the node number of the remote node for Voice/Fax channel 1. This number must be unique and any number from 0 to 9. The default for this option is 1.

The **Voice/Fax Ch. 2 Destination Node** option specifies the node number of the remote node for Voice/Fax channel 2. This number must be unique and any number from 0 to 9. The default for this option is 1.

6.6.2 Quick Setup

The Quick Setup option (Option 6 in the main menu) allows you to configure your DataTalker by answering a few questions and then following a set of installation instructions. The following description

Warning: The memory test will destroy all stored configurations.

Do you wish to continue (y/n)?

If you answer Yes to this question, the next question is presented. If you answer No to this question, you are returned to the Main Menu.

Is this a home/small office application? (Y/N/Q)

If you answer Yes to this question, the next question is presented.

Will this unit be installed at the main office? (Y/N/Q)

If you answer Yes to this question, the unit is configured for a main office application and installation instructions are presented for cabling your unit. Refer to Table 6-1 for the main office cabling procedure.

If you answer No to this question, the next question asks you:

Enter the number to dial the main office:

You need to enter a 7-digit telephone number if you are using the public telephone service. You do not need to add a hyphen between the first three digits and the last four digits. If you are interPBX, you need to enter only the 4-digit number. When the telephone number is entered, the unit will configure itself based on your input and the installation instructions will be presented to cable your unit. Refer to Table 6-2 for home office cabling procedure.

Table 6-1. Main Office Installation

Step Procedure

- 1 Voice/Fax - Plug an analog PBX extension into the FXO jack on the back of the Data Talker.

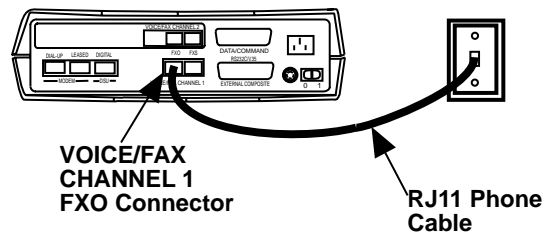
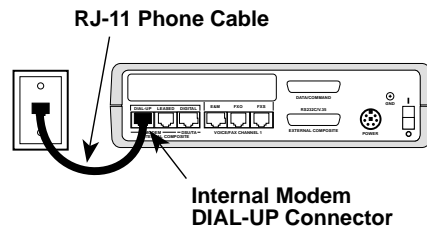


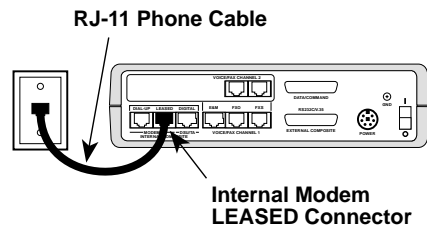
Table 6-1. Main Office Installation

- 2 Composite Link - Plug the dial up phone line into the dial-up jack on the back of the Data Talker.

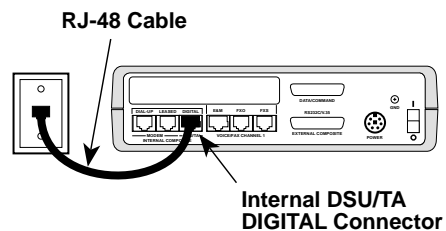
MMH2834 Modem Dial-up



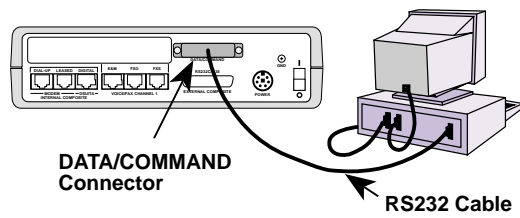
MMH2834 Modem Leased Line



Digital DSU



- 3 Data Port - Plug the host computer into the Data/Command port and put dip switch 3 up (located on the side of the Data Talker).



Configuration and installation is complete.

To view or change the current configurations, select option 1 from the main menu.

Press any key to continue.

Storing parameters.

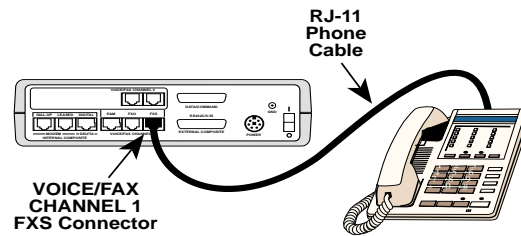
Resetting unit.

Please wait 10 seconds. Then hit ENTER to display the Main Menu.

Table 6-2. Home Office Installation

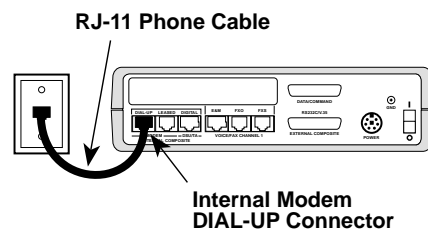
Step Procedure

- 1 Voice/Fax - Plug your telephone into the FXS jack on the back of the Data Talker.

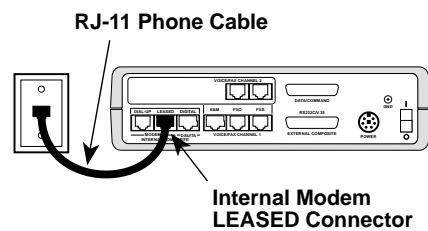


- 2 Composite Link - Plug the dial up phone line into the dial-up jack on the back of the Data Talker.

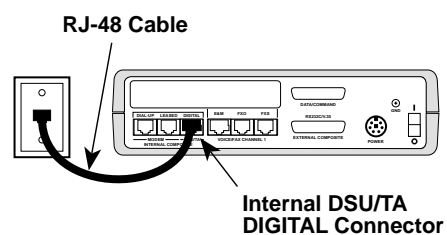
MMH2834 Modem Dial-up



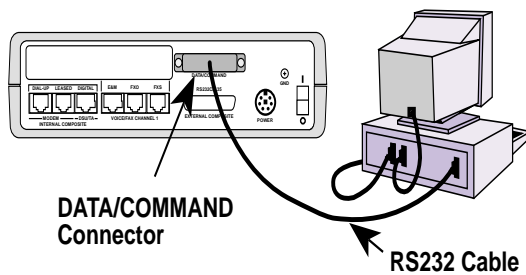
MMH2834 Modem Leased Line



Digital DSU



- 3 Data Port - Plug your PC into the Data/Command port and put dip switch 3 up to exit command mode and enable data mode (located on the side of the Data Talker).



Configuration and installation is complete.

To connect to the main office turn the Data Talker off and on. It will call the main office every time it is powered up.

To view or change the current configurations, select option 1 from the main menu.

Press any key to continue.

Storing parameters.

Resetting unit.

Please wait 10 seconds. Then hit ENTER to display the Main Menu.

DataTalker™

Chapter 7 - Troubleshooting



7.1 Introduction

The DataTalker is designed to be easy to operate and maintain. The procedures in this chapter will help isolate any problem to a specific network component, at which point you will be instructed to call the appropriate personnel or execute commands to adjust operating conditions. You are not expected to perform any specific repair procedures on the DataTalker besides command execution and switch settings.

7.2 Importance of the Composite Link Statistics Report

The Composite Link Statistics report provides information about the operation of your composite link that can aid you in testing for problems. It can be very valuable when used in conjunction with analog loopback testing, which tests the DataTalker itself, since it can help identify problems when the problem source is on the other end of the data line or in the line itself.

Data in the Composite Link Statistics report give information about line failure conditions. Your Composite Link Statistics report contains the following items:

Composite Link Statistics	
Elapsed Time	: 00 Days 00 Hours 00 Minutes
Data Blocks Transmitted	: 0
Data Blocks Retransmitted	: 0
Data Blocks Received	: 0
Receive Block Errors	: 0
Voice/Fax Blocks Transmitted	: 0
Voice/Fax Blocks Received	: 0
Link Alarms	: 0
Remote Downs	: 0

Comparing Data Blocks Transmitted with Data Blocks Retransmitted (the number of retransmits needed to get the data through) can indicate a line problem. Comparing Data Blocks Received with Receive Block Errors can indicate the same problem from the other end of the link. Numbers that you might encounter could be 10,000 data blocks transmitted (or received) compared to 500 or 1000 retransmits (or receive block errors).

Link Alarms tells you simply that there is some sort of problem on the link. You will find that the Link Alarms numbers will correspond to the Data Blocks Retransmitted and Receive Block Errors numbers. Specifically, a Link Alarm means that it has been 10 seconds since the DataTalker has received an acknowledgment. Normally, three acknowledgments will be received during a 10-second period.

The Remote Downs entry means that a DataTalker has sent data 30 times and could not get it through (the link has been broken).

The other entries in the Composite Link Statistics report do not apply to link problems.

7.3 Test Cables

If you are using the DataTalker internal DSU or MMH2834 modem, there are three test cables you can use to check out your system. Two DataTalker back-to-back test cables allow you to connect your two DataTalkers locally before installing them on either end of a phone line. There is also a composite link loopback cable that you can use with the internal DSU to loop the DataTalker composite link signal back to itself.

To test the internal DSU back-to-back, connect the DSUs in the two units with the RJ-45 back-to-back cable, then configure one DSU for internal clocking and the other DSU for external clocking. Set the speed to the same value on both units. To perform the composite link loopback test, configure the DSU for internal clocking and use the composite link loopback cable.

To test the internal MMH2834 modem back-to-back, use the RJ-11 back-to-back cable and configure both modems for 4-wire leased line operation. Configure one modem for originate and the other modem for answer. Set the speed to the same value on both units and set transmit level to -10. To test 2-wire leased line operation, substitute a regular RJ-11 cable in place of the back-to-back cable and reconfigure the modem for 2-wire operation.

If you are using an external synchronous modem for the link communications, refer to its documentation for testing procedures.

If you have any problems in performing these procedures, contact Multi-Tech's Technical Support department for assistance (see Chapter 8).

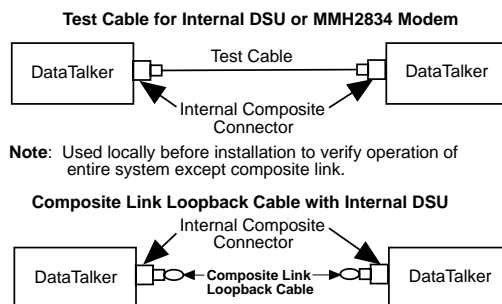


Figure 7-1. Off-Line Test Modes

7.4 Troubleshooting Guide

This troubleshooting guide is designed to help you pinpoint the cause of your problem and correct it as quickly as possible. Because equipment from different manufacturers is typically involved in multiplexer networks, you may encounter "finger pointing" as to who is at fault. Who is at fault is not as important as getting you back on line as soon as possible. The intent of this guide is to indicate the most probable causes of specific error conditions, but, since similar conditions may have different causes, please keep in mind that this is a guide, not a cookbook, and you must use your best judgement.

For purposes of troubleshooting, you can divide your mux network into three main parts:

Data Channel

- Sync/async channel device (printer, terminal, PC, etc.)
- Channel communications (RS232 cabling, modems, etc.)

Voice/Fax Channel

- Telephones and fax machines
- Station side of PBX
- E&M trunk of PBX (channel 1 only)

Composite Link

- Digital composite link communications line with internal or external DSU or ISDN terminal adapter
- Internal/external link modem
- Composite link communications line (4-wire non-loaded metallic wire for DSU or 2-wire or 4-wire lease line or dial-up line for internal or external modem)

Once you have found the probable cause of your problem, refer to the specific manual chapter for additional help, or contact Multi-Tech Technical Support (see Chapter 8).

Table 7-1. Command Port Troubleshooting

Problem	Possible Causes	Solution
Command port device not communication with DataTalker	Communications software not installed on command port PC	1. Install communications software on command port PC (refer to communications software documentation of installation instructions).
	Command port not enabled	1. Set DIP-Switch #3 to the closed (down) position.
	Bad cable or cable connection	1. Check RS-232 cable connections between command port device and Command port on DataTalker for loose connections or bent pins. 2. Check RS-232 cable connections between command port device and Command port on DataTalker for correct cable wiring (see cabling diagrams in Appendix C). 3. Call Tech Support for assistance (see Chapter 8).

Table 7-2. Composite Link Troubleshooting Internal DSU

Problem	Possible Causes	Solution
Composite link down with CTS, XMT, and RD LED on	DSU not communication with communication line	Verify that the DSU LED is on. If off, ensure that DIP-Switch #2 is in the open (up) position. Verify that a cable is connected to the internal composite DSU/TA Digital connector. Verify DSU configuration. See Composite Link Settings - Internal DSU in Table 7-5. Call Tech Support for assistance (see Chapter 8).
	Faulty communication line	Call phone company and verify communication line. Call Tech Support for assistance (see Chapter 8).

Table 7-2. Composite Link Troubleshooting Internal DSU

Problem	Possible Causes	Solution
Composite link down with CD, CTS, XMT, RD and RCV LEDs on	Composite link not configured correctly	<ol style="list-style-type: none"> 1. Verify DSU configuration. See Composite Link settings - Internal DSU in Table 7-5. 2. Call Tech Support for assistance (see Chapter 8).
Flashing RXT LED	High error rate on communication line	<ol style="list-style-type: none"> 1. View composite link statistics (refer to Table 7-10). 2. Perform composite link loopback tests (refer to Table 7-12). 3. Call phone company and verify communication line. 4. Call Tech Support for assistance (see Chapter 8).
	DSU clocking configured incorrectly	<ol style="list-style-type: none"> 1. For DDS line, both DSUs should be set for DDS clocking. 2. Call phone company and verify communication line. 3. Call Tech Support for assistance (see Chapter 8).

Internal ISDN Terminal Adapter

Problem	Possible Causes	Solution
Composite link down with CTS, XMT and RD LEDs on	Terminal adapter not communicating with ISDN line	<ol style="list-style-type: none"> 1. Verify that the the TA LED is on. If off, ensure that DIP-Switch #2 is set to OPEN (Up). 2. Verify that a cable is connected to the internal composite DSU/TA Digital connector. 3. Verify ISDN configuration. See Composite Link Settings - Internal ISDN in Table 7-6. 4. Call Tech Support for assistance (see Chapter 8).
	Faulty communication line	<ol style="list-style-type: none"> 1. Call phone company and verify communication line. 2. Call Tech Support for assistance (see Chapter 8).
Composite link down with CD, CTS, XMT, RCV and RD LEDs on	Composite link not configured correctly	<ol style="list-style-type: none"> 1. Verify ISDN configuration, See Composite Link Settings - Internal ISDN in Table 7-6. 2. Call Tech Support for assistance (see Chapter 8).
Flashing RXT LED	High error rate on communication line	<ol style="list-style-type: none"> 1. View composite link statistics (refer to Table 7-9). 2. Perform composite link loopback tests (see Diagnostic Testing in Table 7-12). 3. Call phone company and verify communication line. 4. Call Tech Support for assistance (see Chapter 8).
	ISDN clocking configured incorrectly	<ol style="list-style-type: none"> 1. For ISDN line, both terminal adapters should be set for normal clock source. 2. Call Phone company and verify communication line. 3. Call Tech Support for assistance (see Chapter 8).

Internal MMH2834 Modem

Problem	Possible Causes	Solution
Composite link down with CTS, XMT, and RD LEDs on	MMH2834 modem not communicating with communications line	<ol style="list-style-type: none"> 1. Verify MDM LED is on. If off, ensure that DIP-Switch #2 is in the OPEN (Up) position. 2. Verify that cables are connected to internal composite Modem Dial-up or Leased connector. 3. Verify modem configuration (see Composite Link Settings - Internal MMH2834 in Table 7-7). 4. Perform Local Analog Loopback test (see Appendix G, "Testing your MMH2834"). 5. Call Tech Support for assistance (see Chapter 8).
	Faulty communications line	<ol style="list-style-type: none"> 1. Call phone company and verify communication line. 2. Call Tech Support for assistance (see Chapter 8).
Composite link down with CD, CTS, XMT, RCV and RD LEDs on	Composite link not configured correctly	<ol style="list-style-type: none"> 1. Verify modem configuration (see Composite Link Settings - Internal MMH2834 in Table 7-7). 2. Call Tech Support for assistance (see Chapter 8).
Flashing RXT LED	High error rate on communication line	<ol style="list-style-type: none"> 1. View composite link statistics (refer to Table 7-9). 2. Perform Local Analog Loopback test (see Appendix G, "Testing your MMH2834"). 3. Call phone company and verify communication line 4. Call Tech Support for assistance (see Chapter 8).

External Composite Link Device

Problem	Possible Causes	Solutions
Composite link down with CTS, XMT and RD LEDs on	Composite link not communicating with communications line	<ol style="list-style-type: none"> 1. Verify EXT LED is on. If off, ensure that DIP-Switch #2 is in the Closed (down) position. 2. Verify that cable is connected to External Composite RS232C/V.35 connector. 3. Verify composite link configuration (see Composite Link Settings - External Device in Table 7-8).
	Faulty communications line	<ol style="list-style-type: none"> 1. Call phone company and verify communication line. 2. Call Tech Support for assistance (see Chapter 8).
Composite link down with CD, CTS, XMT, RCV and RD LEDs on	Composite link not configured correctly	<ol style="list-style-type: none"> 1. Verify composite link configuration (see Composite Link Settings - External Device in Table 7-8).
Flashing RXT LED	High error rate on communication line	<ol style="list-style-type: none"> 1. View composite link statistics (refer to Table 7-9) 2. Perform composite link loopback tests (see Diagnostic Testing in Table 7-12). 3. Call phone company and verify communication line. 4. Call Tech Support for assistance (see Chapter 8).
		External device settings	1. Verify that external device is set for sync, full duplex, and internal clocking.

Table 7-3 Data Channel Troubleshooting

Problem	Possible Causes	Solution
Async Data Channel		
Channel Device not communicating with DataTalker; composite link up with CD,, CTS, XMT, RCV and RD LEDs on	Incorrect channel parameter settings	<ol style="list-style-type: none"> 1. Verify configuration of data port (see Data Port Configuration in Table 7-10). 2. Call Tech Support for assistance (see Chapter 8).
	Channel device incorrectly cabled	<ol style="list-style-type: none"> 1. See cabling diagrams in Appendix B and C on both DataTalker and data channel device. 2. Call Tech Support for assistance (see Chapter 8).
Async Data Channel device losing data	Flow control not properly set	<ol style="list-style-type: none"> 1. Verify flow control options for the async data channel device (see Table 7-10).
Sync Data Channel		
Channel Device not communicating with DataTalker; composite link up with CD,, CTS, XMT, RCV and RD LEDs on	Incorrect channel parameter settings	<ol style="list-style-type: none"> 1. Verify configuration of data port (see Data Port Configuration in Table 7-10). 2. Call Tech Support for assistance (see Chapter 8).
	Channel device incorrectly cabled	<ol style="list-style-type: none"> 1. See cabling diagrams in Appendix B and C on both DataTalker and data channel device. 2. Call Tech Support for assistance (see Chapter 8).
	Incorrect Data Type	<ol style="list-style-type: none"> 1. Verify that sync device uses HDLC or SLDC protocol, NRZ encoding, and operates in full duplex.
	Incorrect Clocking	<ol style="list-style-type: none"> 1. If sync device expects clock to come from DataTalker on pins 15 and 17, set DataTalker sync data channel to internal clocking and set speed. 2. If sync device provides clock to DataTalker on pin 24, configure sync data channel for external clocking.

Table 7-4. Voice/Fax Troubleshooting

Problem	Possible Causes	Solution
Volume levels not sufficient on local voice/fax channel	Input level gain setting too low on remote voice/fax channel	1. Increase input level gain setting on remote voice/fax channel a couple db and recheck voice quality (see Table 7-11).
Local telephone goes off-hook and remote telephone does not ring (FXS to FXS configuration)	Output level attenuation setting too high on local voice/fax channel	1. Decrease output level attenuation setting on local voice/fax channel a couple of db and recheck voice quality (see Table 7-11).
	Device not connected to correct voice/fax connector	1. Verify that devices are attached to voice/fax channel FXS RJ-11 connector.
	Voice/fax channel configuration problem	1. Verify that local and remote interface types are configured correctly (see Table 7-11). 2. Observe that the XSG LED on the local voice/fax channel lights when the telephone goes off-hook and that the RSG LED on the remote FXS-configured voice/fax channel flashes with each ring.
Data throughput slows excessively when voice/fax channel is active	Too much bandwidth being used up for voice/fax	1. Decrease voice/fax channel digitizing rate to 9600 bos (see Table 7-11). 2. Enable or, if active, increase silence suppression on voice/fax channel (see Table 7-11)
FXO to FXO configuration - local telephone does not ring	Device not connected to correct voice/fax connector	1. Verify that the device is attached to the correct voice/fax channel RJ-11 connector.
	Voice/fax channel configuration problem	1. Verify that local voice/fax interface type is configured for FXS and remote interface type is set for FXO operation (see Table 7-11).
Parts of words are not being heard	Part of analog signal being clipped off	1. Lower the input level gain and the output level attenuation a couple of db and recheck voice quality (see Table 7-11).

Table 7-4. Voice/Fax Troubleshooting (continued)

Problem	Possible Causes	Solution
Voice conversation or fax traffic becomes erratic after changing the remote interface type	Remote connection is different from remote interface type	1. Contact the remote site to verify its local interface type and ensure that remote interface type at local site is the same (see Table 7-11).
No communication on voice/fax channel	Composite link down	1. Call phone company and verify communication line.
	Phone cord for the voice or fax machine is connected to the wrong interface connector	1. Verify that the phone cord for the voice or fax machine is connected to the correct interface connector.

7.5 Composite Link Settings - Internal DSU

Table 7-5. Composite Link Settings - Internal DSU

Step	Procedure
1	Toggle DIP switch position 3 to the down (closed) position to enable the command port.
2	Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker.
	Note: Any cables connected to the computer should be shielded to reduce interference.
3	Apply power to the DataTalker.
4	Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears:
	<pre> Main Menu 1 - Configurations 2 - Statistics 3 - Reset Options 4 - Diagnostics 5 - Exit Command Mode 6 - QUICK SETUP Selection : _ </pre>
5	Enter 1 and press ENTER. The Configurations menu is displayed:
	<pre> Configurations 1 - Data Port Configuration 2 - Voice/Fax Channel(s) Configuration 3 - Composite Link Configuration 4 - Factory Default Configuration Options 5 - Configure Remote Unit S - Store All Configurations M - Main Menu P - Previous Menu Selection : _ </pre>
6	Enter 3 and press ENTER to display the Composite Link Settings - Internal DSU menu.
7	Verify the internal DSU settings. To change settings, enter the appropriate option numbers. The default settings are correct for a 56K bps DDS line.
	<pre> Composite Link Settings - Internal DSU 1 - Speed: 56k 2 - Clocking: DDS S - Store All Configurations M - Main Menu P - Previous Menu Selection : _ </pre>
8	When all options for the DSU are set, enter S and press ENTER to store all configurations. Then enter M and press ENTER to return to the Main Menu.
9	Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the command/data port to a data channel.

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP
Selection : _

```

```

Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

```

Composite Link Settings - Internal DSU
1 - Speed:                56k
2 - Clocking:             DDS
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

7.6 Composite Link Settings - Internal ISDN Terminal Adapter

Table 7-6. Composite Link Settings - Internal ISDN Terminal Adapter

Step	Procedure
------	-----------

- | | |
|---|---|
| 1 | Toggle DIP switch position 3 to the down (closed) position to enable the command port. |
| 2 | Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker. |

Note: Any cables connected to the computer should be shielded to reduce interference.

- | | |
|---|--|
| 3 | Apply power to the DataTalker. |
| 4 | Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears: |

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP
Selection : _

```

- | | |
|---|---|
| 5 | Enter 1 and press ENTER. The Configurations menu is displayed: |
|---|---|

```

Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

- | | |
|---|---|
| 6 | Enter 3 and press ENTER to display the Composite Link Settings - Internal TA menu. |
| 7 | Select option 2, Configure TA, from the menu to verify the terminal adapter settings. After you select the option, wait five seconds, then enter ATIV to access the terminal adapter's configuration menu. To change a setting, enter the menu choice number and press ENTER. For further information refer to the <i>ISDN Terminal Adapter Owner's Manual</i> . |

```

Composite Link Settings - Internal TA
1 - On-Line XMT Rate:      128000
2 - Configure TA
3 - DOD/DOI:              Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

- | | |
|---|--|
| 8 | When you are done configuring the terminal adapter, enter CTRL+X to exit the terminal adapter's configuration menu; then press ENTER, Q to return to the DataTalker's Composite Link Settings - Internal TA menu, and press M, ENTER to return to the Main menu. |
| 9 | Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the command/data port to a data channel. |

7.7 Composite Link Settings - Internal Modem

Table 7-7. Composite Link Settings - Internal MMH2834

Step	Procedure
------	-----------

- | | |
|---|--|
| 1 | Toggle DIP switch position 3 to the down (closed) position to enable the command port. |
| 2 | Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker. |
| | Note: Any cables connected to the computer should be shielded to reduce interference. |
| 3 | Apply power to the DataTalker. |
| 4 | Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears: |

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP
Selection : _

```

- | | |
|---|---|
| 5 | Enter 1 and press ENTER. The Configurations menu is displayed: |
|---|---|

```

Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

- | | |
|---|---|
| 6 | Enter 3 and press ENTER to display the Composite Link Settings - Internal MMH2834 menu. |
| 7 | Verify the internal MMH2834 modem settings. To change settings, enter the appropriate option numbers. |

```

Composite Link Settings - Internal MMH2834
1 - Enter AT commands to 2834
2 - On-Line XMT Rate:          28800
3 - Speed Setting:            33600
4 - Dial/Leased:              Dial
5 - 2 or 4 Wire:              2 Wire
6 - Answer/Originate:        Answer
7 - Transmit Level            -10db
8 - DOD/DOI:                  On
9 - DOI Timer:                03min
10 - DOD Toggle DTR:         40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

- | | |
|---|--|
| 8 | When all options for the port and modem are set, enter S and press ENTER to store all configurations. Then enter M and press ENTER to return to the Main Menu. |
| 9 | Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the command/data port over to a data channel. |

7.8 Composite Link Settings - External Device

Table 7-8. Composite Link Settings - External Device

Step	Procedure
------	-----------

- | | |
|---|--|
| 1 | Toggle DIP switch position 3 to the down (closed) position to enable the command port. |
| 2 | Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker. |
| | Note: Any cables connected to the computer should be shielded to reduce interference. |
| 3 | Apply power to the DataTalker. |
| 4 | Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears: |

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _

```

- | | |
|---|---|
| 5 | Enter 1 and press ENTER. The Configurations menu is displayed: |
|---|---|

```

Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

- | | |
|---|---|
| 6 | Enter number 3 from the configurations menu and press ENTER to display the Composite Link Settings - External Device menu. |
| 7 | Verify the external device settings. To change settings, enter the appropriate option numbers. |

```

Composite Link Settings -External Device
1 - On-Line XMT Rate:      56000
2 - Clocking:             External
3 - Back to Back:         Off
4 - DOD/DOI:              On
5 - DOI Timer:            03min
6 - DOD Toggle DTR:      40sec
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _

```

- | | |
|---|---|
| 8 | When all the options for the external device are set, enter S and press ENTER to store all configurations. Then enter M and press ENTER to return to the Main Menu. |
| 9 | Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the command/data port over to a data channel. |

7.9 Composite Link Statistics

Table 7-9. Composite Link Statistics

Step	Procedure
------	-----------

- | | |
|---|---|
| 1 | Toggle DIP switch position 3 to the down (closed) position to enable the command port. |
| 2 | Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker. |

Note: Any cables connected to the computer should be shielded to reduce interference.

- | | |
|---|--|
| 3 | Apply power to the DataTalker. |
| 4 | Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears: |

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _

```

- | | |
|---|---|
| 5 | Enter 2 and press ENTER. The Statistics menu is displayed: |
|---|---|

```

Statistics
1 - View Composite Link Statistics
2 - Clear Composite Link Statistics
M - Main Menu
P - Previous Menu

Selection : _

```

- | | |
|---|---|
| 6 | Enter 1 and press ENTER to view the composite link statistics: |
|---|---|

```

Composite Link Statistics

Elapsed Time           : 00 Days 00 Hours 00
Minutes
Data Blocks Transmitted :      0
Data Blocks Retransmitted :      0
Data Blocks Received   :      0
Receive Block Errors   :      0
Voice/Fax Blocks Transmitted :      0
Voice/Fax Blocks Received :      0
Link Alarms            :      0
Remote Downs           :      0

```

- 7 Comparing Data Blocks Transmitted with Data Blocks Retransmitted (the number of retransmits needed to get the data through) can indicate a line problem. Comparing Data Blocks Received with Receive Block Errors can indicate the same problem from the other end of the link. Numbers that you might encounter could be 10,000 data blocks transmitted (or received) compared to 500 or 1000 retransmits (or receive block errors).

Link Alarms tells you simply that there is some sort of problem on the link. You will find that the Link Alarms numbers will correspond to the Data Blocks Retransmitted and Receive Block Errors numbers. Specifically, a Link Alarm means that it has been 10 seconds since the DataTalker has received an acknowledgment. Normally, three acknowledgments will be received during a 10-second period.

The remote down entry means that the DataTalker has sent data 30 times and could not get it through (the link has been broken).

The other entries do not apply to link problems.

- 8 Enter **M** and press ENTER to return to the Main Menu.
- 9 Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the command/data port over to a data channel.

7.10 Data Port Configuration

Table 7-10. Data Port Configuration

Step	Procedure
1	Toggle DIP switch position 3 to the down (closed) position to enable the command port.
2	Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker.
	Note: Any cables connected to the computer should be shielded to reduce interference.
3	Apply power to the DataTalker.
4	Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears:
	<pre> Main Menu 1 - Configurations 2 - Statistics 3 - Reset Options 4 - Diagnostics 5 - Exit Command Mode 6 - QUICK SETUP Selection : _ </pre>
5	Enter 1 and press ENTER. The Configurations menu is displayed:
	<pre> Configurations 1 - Data Port Configuration 2 - Voice/Fax Channel(s) Configuration 3 - Composite Link Configuration 4 - Factory Default Configuration Options 5 - Configure Remote Unit S - Store All Configurations M - Main Menu P - Previous Menu Selection : _ </pre>
6	Enter 1 and press ENTER to display the Data Port Configuration menu.
	<pre> Data Port Configuration 1 - Async/Sync: Async 2 - Speed: 19200 3 - Word Length: 8 4 - Stop Bits: 1 5 - Parity: None 6 - Flow Control: CTS 7 - Enq/Ack Flow Control: Off 8 - Echo: Off 9 - Pacing: Off 10 - EIA Pass Through: Off 11 - Pass Xon: Off S - Store All Configurations M - Main Menu P - Previous Menu Selection : _ </pre>

- 7 If the data port is set up as an asynchronous data channel, you should verify all 12 options.

```
Data Port Configuration
1 - Async/Sync:          Sync
2 - Speed:              19200
3 - Clocking:           Internal
4 - Idle Condition:     Flags
5 - NRZ/NRZI Encoding:  NRZ
6 - CRC Preset:         All 1s
7 - Inter-frame Timer:  Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _
```

If the data port is set up as a synchronous data channel, the sync parameters are displayed.

- 8 When you have verified or set all options for the data port, enter **S** and press ENTER to store all configurations. Then enter **M** and press ENTER to return to the Main Menu.
- 9 Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the data/command port to a data channel.

7.11 Voice/Fax Channel Configuration

Table 7-11. Voice/Fax Channel Configuration

Step	Procedure
------	-----------

- | | |
|---|--|
| 1 | Toggle DIP switch position 3 to the down (closed) position to enable the command port. |
| 2 | Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker. |
| | Note: Any cables connected to the computer should be shielded to reduce interference. |
| 3 | Apply power to the DataTalker. |
| 4 | Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears: |

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _

```

- | | |
|---|---|
| 5 | Enter 1 and press ENTER. The Configurations menu is displayed: |
|---|---|

```

Configurations
1 - Data Port Configuration
2 - Voice/Fax Channel(s) Configuration
3 - Composite Link Configuration
4 - Factory Default Configuration Options
5 - Configure Remote Unit
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _

```

- | | |
|---|--|
| 6 | Enter 2 and press ENTER. If two voice/fax channels are installed in the DataTalker, the Voice/Fax Channel Configuration menu will appear. Enter 1 to display the Voice/Fax Channel 1 Configuration menu, or 2 to display the Voice/Fax Channel 2 Configuration menu. If only one voice/fax channel is installed, the Voice/Fax Channel 1 Configuration menu will appear in place of the Voice/Fax Channel Configuration menu. |
|---|--|

```
Voice/Fax Channel 1 Configuration
1 - Destination Channel      : 1
2 - Digitizing Rate        : 9600
3 - Output Level Atten.    : 12
4 - Input Level Gain       : 03
5 - Silence Suppression    : Off
6 - Local Interface Type   : FXS
7 - Ground/Loop Start (FXS) : Loop
8 - 2 or 4 Wire (E&M)      : N/A
9 - Dialtone/Wink (E&M)    : N/A
10 - Wink Timer (E&M)      : N/A
11 - Remote Interface Type : FXS
12 - Ground/Loop Start (FXS) : Loop
13 - 2 or 4 Wire (E&M)     : N/A
14 - Dialtone/Wink (E&M)   : N/A
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

7 Verify the voice/fax channel configuration. To change the configuration, enter the appropriate option numbers.

Options 1 through 10 are for the local interface. Options 11 through 14 are for the remote interface. Note that the remote interface options do not actually change the remote interface; they only tell the local DataTalker how the remote interface is configured. Any changes in the remote interface must be done at the remote site. See Chapter 6 for descriptions of the Voice/Fax Channel 1 Configuration menu options.

8 When all the options for the voice/fax channel are set, enter **S** and press ENTER to store all configurations. Then enter **M** and press ENTER to return to the Main Menu.

9 Disconnect the terminal or PC from the command port and place DIP switch position 3 in the up (OPEN) position to change the command/data port over to a data channel.

7.12 Diagnostic Testing

Table 7-12. Diagnostic Testing

Step	Procedure
1	Toggle DIP switch position 3 to the down (closed) position to enable the command port.
2	Connect a terminal or PC running communications software to the DATA/COMMAND connector on the back panel of the DataTalker.
	Note: Any cables connected to the computer should be shielded to reduce interference.
3	Apply power to the DataTalker.
4	Apply power to the terminal or PC. Run the PC's communications software in terminal mode and press ENTER twice to establish communications with the DataTalker. The Main Menu appears:
	<pre> Main Menu 1 - Configurations 2 - Statistics 3 - Reset Options 4 - Diagnostics 5 - Exit Command Mode 6 - QUICK SETUP Selection : _ </pre>
5	Enter 4 and press ENTER. The Diagnostics menu is displayed:
	<pre> Diagnostics 1 - Loop Test 2 - Memory Test 3 - Watch Dog Test 4 - Dip Switch Definitions and Settings 5 - Product and Firmware ID M - Main Menu P - Previous Menu Selection : _ </pre>
6	Select the test you wish to run by entering its option number and pressing ENTER. If you select Loop Test, the Loop Test menu will appear.

```

Main Menu
1 - Configurations
2 - Statistics
3 - Reset Options
4 - Diagnostics
5 - Exit Command Mode
6 - QUICK SETUP

Selection : _

```

```

Diagnostics
1 - Loop Test
2 - Memory Test
3 - Watch Dog Test
4 - Dip Switch Definitions and Settings
5 - Product and Firmware ID
M - Main Menu
P - Previous Menu

Selection : _

```




Chapter 8 - Warranty, Service and Tech Support



8.1 Introduction

This chapter begins with your DataTalker's 2-year warranty. Read carefully the next section, "Tech Support," if you have questions about or problems with your DataTalker. It includes the technical support telephone numbers, space for recording your product information, and an explanation of how to send in your DataTalker should you require service. The final three sections explain how to use our bulletin board service (BBS), and get support through CompuServe and the Internet.

8.2 Limited Warranty

Multi-Tech Systems, Inc. ("MTS") warrants that its products will be free from defects in material or workmanship for a period of two years from the date of purchase, or if proof of purchase is not provided, two years from date of shipment. **MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.** This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period, or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

8.2.1 On-line Warranty Registration

To register your DataTalker on-line, click on the following link:

<http://www.multitech.com/register>

8.3 Tech Support

Multi-Tech has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, call 1-800-972-2439. Please fill out the DataTalker information form below and have it available when you call. If your DataTalker requires service, the tech support specialist will guide you on how to send it in (see section 8.3.2).

8.3.1 Recording DataTalker Information

Please fill in the following information on your Multi-Tech DataTalker. This will help Tech Support in answering your questions. (The same information is requested on the Warranty Registration Card.)

Model Number:

Serial Number:

Firmware Version:

The model and serial numbers are on the bottom of your DataTalker. The Diagnostic Test menu displays the PROM firmware version number.

Before calling Tech Support, please note in the space below if an internal DSU, modem, or ISDN terminal adapter has been added to your DataTalker. Also note status information about your DataTalker, including LED indicators, screen messages, diagnostic test results, DIP switch settings, problems with a specific application, etc.

8.3.2 Service

If your tech support specialist decides that service is required, your DataTalker may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems.

Note: Before returning your DataTalker for service, record your data port configuration and voice/fax channel configurations. When the DataTalker is returned to you, the configurations are reset to the factory defaults.

Include the following with your DataTalker:

- A description of the problem.
- Return billing and shipping addresses.
- Contact name and phone number.
- Check or purchase order number for payment if the DataTalker is out of warranty. (Check with your technical support specialist for the standard repair charge for your DataTalker).
- If possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent (see section 8.3.1).

Send DataTalkers to this address:

**MULTI-TECH SYSTEMS, INC.
2205 WOODALE DRIVE
MOUNDS VIEW, MINNESOTA 55112
ATTN: SERVICE OR REPAIRS**

You should also check with the supplier of your DataTalker on the availability of local service and/or loaner units in your part of the country.

8.4 The Multi-Tech BBS

For customers who do not have Internet access, Multi-Tech maintains a bulletin board system (BBS) that mirrors its FTP site. Information available from the BBS includes new product information, product upgrade files, and problem-solving tips. The phone number for the Multi-Tech BBS is (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).

The BBS can be accessed by any asynchronous modem operating at 1200 bps to 33,600 bps at a setting of 8 bits, no parity, and 1 stop bit (8-N-1).

To log on to the Multi-Tech BBS

1. Set your communications program to **8-N-1**.
2. Dial our BBS at (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).
3. At the prompts, type your first name, last name, and password; then press ENTER. If you are a first time caller, the BBS asks if your name is spelled correctly. If you answer yes, a questionnaire appears. You must complete the questionnaire to use the BBS on your first call.
4. Press ENTER until the Main Menu appears. From the Main Menu you have access to two areas: the Files Menu and News. For help on menu commands, type ?.

To Download a file

If you know the file name:

1. From the Main Menu, type **F** to access the Files Menu, then type **D**.
2. Enter the name of the file you wish to download from the BBS.
3. If a password is required, enter the password.
4. Answer **Y** or **N** to the automatic logoff question.
5. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
6. If you select Zmodem, the transfer will begin automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most datacomm programs, the PAGE DOWN key initiates the download.)
7. When the download is complete, press ENTER to return to the File Menu.
8. To exit the BBS, type **G** and press ENTER.

If you don't know the file name:

1. From the Main Menu, type **F** to access the Files Menu. For a list of file areas, type **L**, press ENTER, then type **L** and press ENTER again. (If you do not type the second **L**, you will list all of the files on the BBS.)
2. Mark each file area you would like to examine by typing its list number and pressing ENTER.
3. Enter **L** to list all the files in the selected file areas. Enter **C** to go forward in the file list and **P** to go back.
4. To mark one or more files for download, type **M**, press ENTER, type the list numbers of the files, and press ENTER again.
5. Enter **D**. You will see a list of the files you have marked. Enter **E** if you would like to edit the list; otherwise enter **D** again to start the download process.

6. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
7. If you select Zmodem, the file will transfer automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
8. When the download is complete, press ENTER to return to the File Menu.
9. To exit the BBS, type **G** and press ENTER.

8.5 About the Internet

Multi-Tech is a commercial user on the Internet, and we retrieve messages from our customers on a periodic basis. If you prefer to receive technical support via the Internet, you can contact Tech Support at the following address:

http://www.multitech.com/_forms/email_tech_support.htm

Multi-Tech's presence includes a Web site at:

<http://www.multitech.com>

and an ftp site at:

<ftp://ftp.multitech.com>

DataTalker™

Appendixes



Appendix A - ASCII Conversion Chart

CTRL	CODE	HEX	DEC	CODE	HEX	DEC	CODE	HEX	DEC	CODE	HEX	DEC
@	NUL	00	0	SP	20	32	@	40	64	`	60	96
A	SOH	01	1	!	21	33	A	41	65	a	61	97
B	STX	02	2	"	22	34	B	42	66	b	62	98
C	ETX	03	3	#	23	35	C	43	67	c	63	99
D	EOT	04	4	\$	24	36	D	44	68	d	64	100
E	ENQ	05	5	%	25	37	E	45	69	e	65	101
F	ACK	06	6	&	26	38	F	46	70	f	66	102
G	BEL	07	7	'	27	39	G	47	71	g	67	103
H	BS	08	8	(	28	40	H	48	72	h	68	104
I	HT	09	9	)	29	41	I	49	73	i	69	105
J	LF	0A	10	*	2A	42	J	4A	74	j	6A	106
K	VT	0B	11	+	2B	43	K	4B	75	k	6B	107
L	FF	0C	12	,	2C	44	L	4C	76	l	6C	108
M	CR	0D	13	-	2D	45	M	4D	77	m	6D	109
N	SO	0E	14	.	2E	46	N	4E	78	n	6E	110
O	SI	0F	15	/	2F	47	O	4F	79	o	6F	111
P	DLE	10	16	0	30	48	P	50	80	p	70	112
Q	DC1	11	17	1	31	49	Q	51	81	q	71	113
R	DC2	12	18	2	32	50	R	52	82	r	72	114
S	DC3	13	19	3	33	51	S	53	83	s	73	115
T	DC4	14	20	4	34	52	T	54	84	t	74	116
U	NAK	15	21	5	35	53	U	55	85	u	75	117
V	SYN	16	22	6	36	54	V	56	86	v	76	118
W	ETB	17	23	7	37	55	W	57	87	w	77	119
X	CAN	18	24	8	38	56	X	58	88	x	78	120
Y	EM	19	25	9	39	57	Y	59	89	y	79	121
Z	SUB	1A	26	:	3A	58	Z	5A	90	z	7A	122
[	ESC	1B	27	;	3B	59	[	5B	91	{	7B	123
\	FS	1C	28	<	3C	60	\	5C	92	|	7C	124
]	GS	1D	29	=	3D	61	]	5D	93	}	7D	125
^	RS	1E	30	>	3E	62	^	5E	94	~	7E	126
_	US	1F	31	?	3F	63	_	5F	95	DEL	7F	127

NUL	Null, or all zeros	VT	Vertical tab	SYN	Synchronous idle
SOH	Start of header	FF	Formfeed	ETB	End transmission block
STX	Start of text	CR	Carriage return	CAN	Cancel
ETX	End of text	SO	Shift out	EM	End of medium
EOT	End of transmission	SI	Shift in	SUB	Substitute
ENQ	Enquiry	DLE	Data link escape	ESC	Escape
ACK	Acknowledge	DC1	Device control 1	FS	File separator
BEL	Bell or alarm	DC2	Device control 2	GS	Group separator
BS	Backspace	DC3	Device control 3	RS	Record separator
HT	Horizontal tab	DC4	Device control 4	US	Unit separator
LF	Linefeed	NAK	Negative acknowledge	DEL	Delete

Appendix B - RS-232C Interface Specification

The DataTalker's RS232C interface circuits have been designed to meet the electrical specifications given in the EIA (Electronic Industries Association) RS232C and ITU-T (International Telecommunications Union) V.24 standards. All signals generated by the DataTalker are approximately 10 volts when measured across a load of 300 ohms or greater. The receiving circuits of the DataTalker will accept signals in the 3 to 25 volt range. The voltage thresholds are:

Negative = voltage more negative than -3 volts with respect to signal ground.
Positive = voltage more positive than +3 volts with respect to signal ground.

SIGNAL INFORMATION:	NEGATIVE	POSITIVE
Binary State	One	Zero
Signal Condition	Mark	Space
Control and Timing Function	Off	On

The input impedances of all DataTalker circuits which accept signals from the data processing terminal or CPU equipment have DC resistances of 4.7K. For more specific details, consult the EIA RS232C standard itself.

The following chart lists the EIA RS232C interface pins and circuits present on the DataTalker's RS232C connector. All other pins are unused. The composite side of the DataTalker is configured as a DTE device and the channel sides are DCE devices.

PIN ASS	MULTI-TECH DESIG	EIA CIRCUIT	CCITT CIRCUIT	SIGNAL SOURCE*	CIRCUIT FUNCTION
2	SD	BA	103	DTE	Transmitted Data
3	RD	BB	104	DCE	Received Data
4	RTS	CA	105	DTE	Request to Send
5	CTS	CB	106	DCE	Clear to Send
6	DSR	CC	107	DCE	Data Set Ready
7	SG	AB	102	—	Signal Ground
B	CD	CF	109	DCE	Data Carrier Detector
9	+V	+V	--	DCE	Test Voltage
15	TC	DB	114	DCE	Transmit Clock
17	RC	DD	115	DCE	Receive Clock
20	TR	CD	108/2	DTE	Data Terminal Ready
22	RI	CE	125	DCE	Ring Indicator
24	XTC	DA	113	DTE	External Transmit
25	OOS	CN	142	DTE	Terminal Busy

*DTE = Data Terminal Equipment

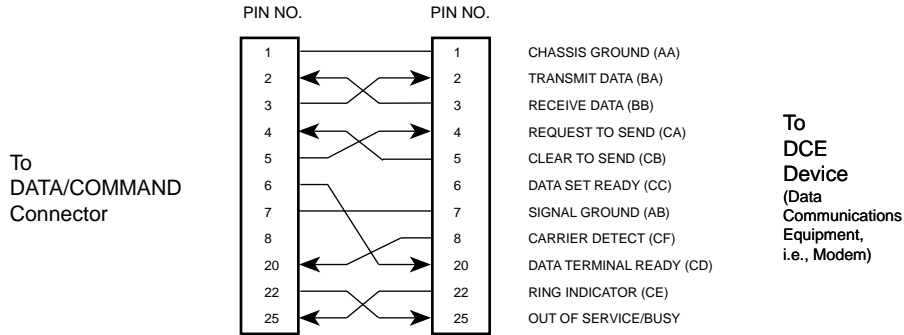
DCE = Data Communications Equipment

The computer should be supplied with a cable terminated with a Cinch DB25P (or equivalent) connector mounted in a Cinch DB51226-1 (or equivalent) hood assembly as specified by the RS232C/V.24 standard.

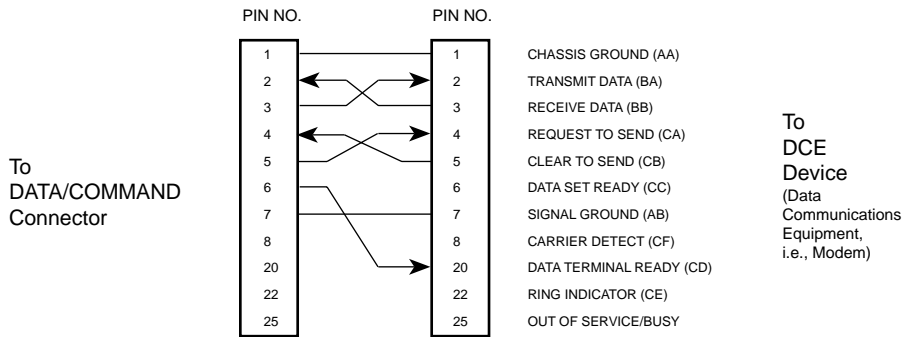
Appendix C - Cabling Diagrams

Channel Cables

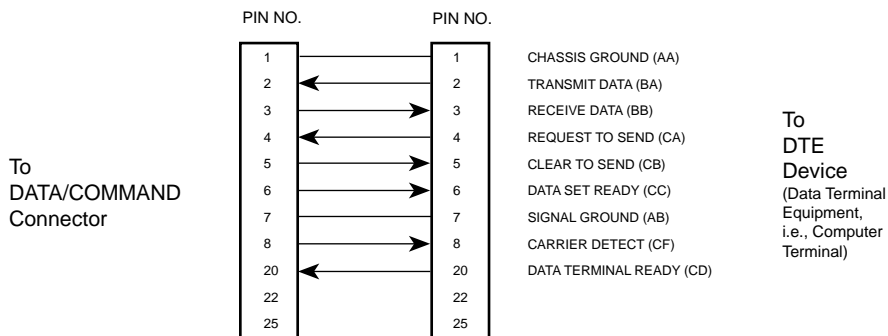
DCE to Channel Cabling
(with EIA pass-through)



DCE to Channel cabling
(without EIA pass-through)

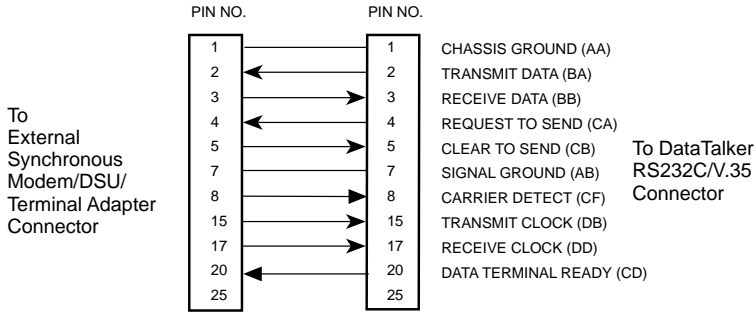


DTE to Channel cabling

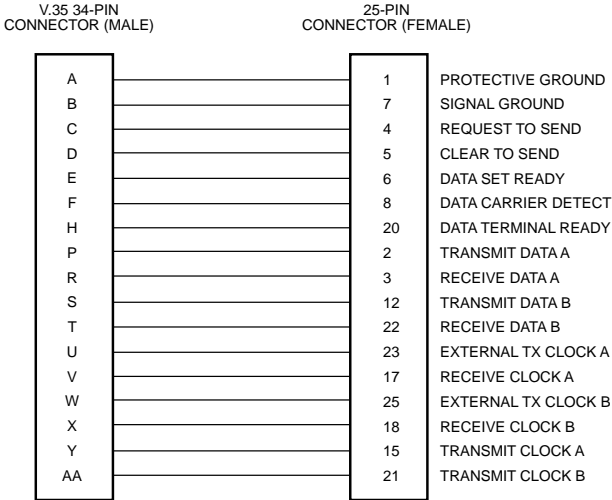


Composite Link Cabling

RS232C/V.24 Configured Composite Link*



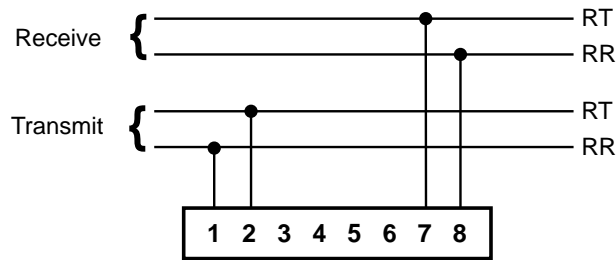
V.35 Adapter Cable Configured on a RS232C/V.35 Composite Link**



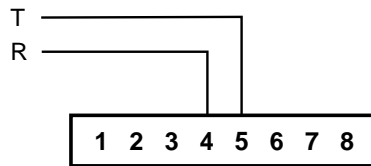
* The DataTalker RS232C interface circuits have been designed to meet the electrical specifications given in EIA (Electronic Industries Association) RS232C and ITU-T (International Telecommunications Union) V.24 Standards.

** When configured for V.35 interface operation on the composite link, the V.35 adapter cable should be used. This cable uses a 25-pin female connector at one end and a 34-pin Winchester male connector at the other end.

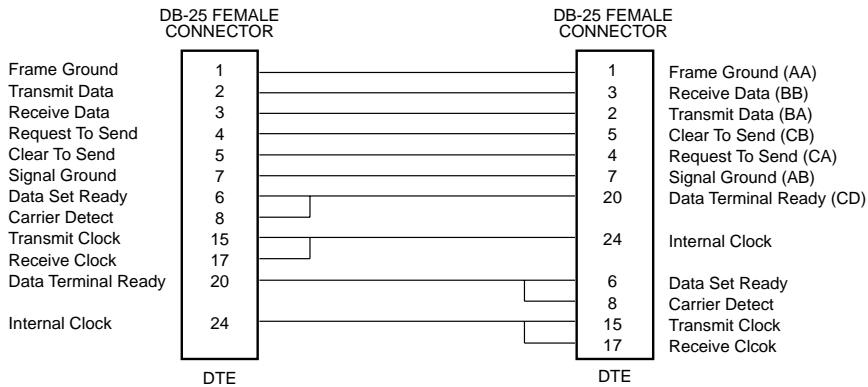
RJ-48 Cable for Internal DSU



RJ-48 Cable for Internal ISDN Terminal Adapter

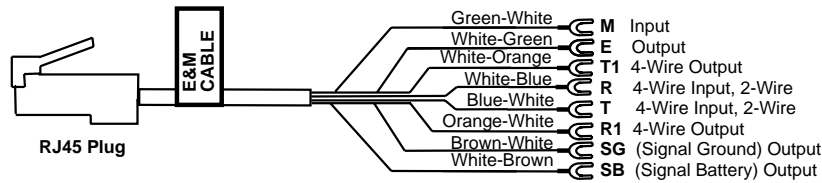


Back to Back Mux Cable



This cable is used to connect two DataTalkers back to back. The cable is asymmetrical and allows one of the DataTalkers to provide clocking to the TxC and RxC pins of the other DataTalker. Make sure the composite link configurations of the DataTalkers have one of them set for an internal clock and the other for an external clock.

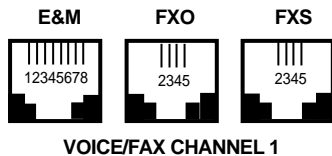
E&M Voice/Fax Channel Cable



* Cable wire is solid 24AWG. If connecting to a punch block, spade lugs may be cut off.

RJ45 Wire	Color	Spade Lug Function
1	M	Green/White Input
2	E	White/Green Output
3	T1	White/Orange 4-Wire Output
4	R	White/Blue 4-Wire Input, 2-Wire
5	T	Blue/White 4-Wire Input, 2-Wire
6	R1	Orange/White 4-Wire Output
7	SG	Brown/White (Signal Ground) Output
8	SB	White/Brown (Signal Battery) Output

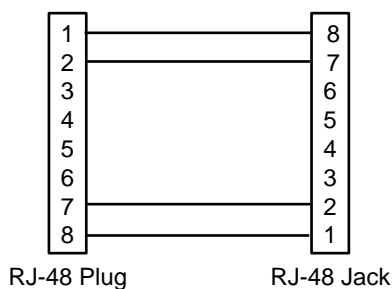
Voice/Fax Channel Connectors



Pin Connections

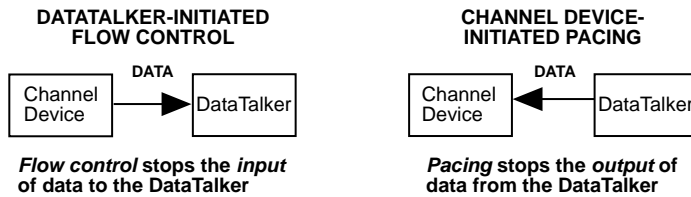
E&M	Description	FXO	Description	FXS	Description
1	M				
2	E	2	N/C	2	N/C
3	T1	3	Ring	3	Tip
4	R	4	Tip	4	Ring
5	T	5	N/C	5	N/C
6	R1				
7	SG				
8	SB				

DSU Back-to-Back Cable



Appendix D - Flow Control Background

Flow control refers to techniques used by computer devices and the DataTalker to stop and restart the flow of data between them. Flow control prevents a channel device or DataTalker from receiving more data than it can handle. Flow control initiated by the DataTalker is called *DataTalker-initiated flow control*. It might be needed, for instance, if a DataTalker is connected to a minicomputer that can output more data than the DataTalker can handle. Flow control by the channel device is called *channel device-initiated pacing*. Pacing might be required, for instance, by a printer channel device that cannot print data as fast as the DataTalker can send it, or which may need to go off-line when it runs out of paper. To state it simply, *flow control* is something the DataTalker does to the channel device, while *pacing* is something the channel device does to the DataTalker.



Flow control can be software or hardware based. In software flow control, special characters (XON and XOFF) are used to stop and start the flow of data. In hardware flow control the Clear To Send (CTS) signal on the RS-232C interface (pin 5) is brought low to stop data and high to restart it. When you select a flow control method with a DataTalker command you are also selecting the corresponding pacing method.

Appendix E - MMH2834 Modem S-Registers

Introduction

This section describes the MMH2834 memory locations called *S-registers*, where certain MMH2834 modem configurations are stored. Each S-register is assigned a number (S0, S1, S2, etc.). Use the **S** command to read and/or change the value stored in an S-register (**ATSr?** to read and **ATSr=** to change S-register values).

S0

Number of Rings Until Modem Answers

Unit: 1 count
Range: 0–255
Default: 1

Description: S0 defines the number of rings the modem waits before answering an incoming call. The default value is one ring, which means that the modem answers the call immediately after the first ring. The maximum number of rings that can be configured is 255. Setting the value to zero (0) disables auto-answer completely.

S6

Wait Time for Dial Tone

Unit: 1 second
Range: 2–255, 4–255**, 4–7***
Default: 2, 4**, 4***

Description: S6 sets the time the modem waits after the RETURN key is pressed before executing a dial command. The default setting is two seconds (Decimal 2).

S8

Pause Time for Comma

Unit: 1 second
Range: 0–255, 4–255**, 4–7***
Default: 2, 4**, 4***

Description: S8 sets the length of the pause caused by a comma in a dialing command. The default setting is two seconds (Decimal 2) or four seconds, where each unit is one second. S8 may be set for up to 255 seconds.

S8 also sets the time the modem waits before retrying a call after detecting a busy signal. Some computer systems need more than two seconds to reset (in which case you should increase the value of S8).

S11

Tone Dialing: Tone Spacing and Duration

Unit: 1 ms
Range: 1–255, 80–255*, 80–255***
Default: 70, 80*, 80***

Description: S11 sets the speed of tone dialing (spacing and tone duration times). The default value is 70 units (Decimal 7) or 80 units, where each unit is one ms, meaning that each tone is on for 70 ms with a 70 ms pause between each.

The minimum S11 value allowed by most telephone systems is 50 ms (50 units). Very few telephone systems can handle anything faster than that. The maximum S11 value is 255 ms (255 units).

S13

Remote Configuration Escape Character

Unit: Decimal number
Range: 0–127
Default: 37 (%)

Description: S13 defines the remote configuration escape character (which becomes your modem's remote configuration character) by its decimal ASCII code. The default is three percent symbols (%%%). When the S13 character is entered three consecutive times from a remotely connected site, your modem responds with its remote configuration procedure.

S18

Automatic Leased Line Restoral

Unit: 1 minute
Range: 10–255
Default: 30 minutes

Description: When the MMH2834 is in dial backup mode, it periodically checks the lease line to see if it is operational and tries to restore the lease line if necessary. S18 defines how frequently it does this. S18 can be set in one minute increments from 10 to 255 minutes; the default is 30 minutes. Setting S18 under 10 minutes causes excessive breaks in dial-up operation.

S19

Dial-Back Timer

Unit: 1 minute
Range: 0–255
Default: 1

Description: S19 is a timer that begins when the lease line goes down. S19 specifies the duration of time the modem attempts to reestablish the lease line connection.

Appendix F - MMH2834 Modem Commands

F.1 Introduction

Before you can enter commands for the MMH2834 internal composite link modem, you must access the modem using the composite link access enable command (**#CLA1**). When you have configured the MMH2834 modem, disable access from the command port to the composite link using the composite link access disable command (**#CLA0**). The following sections describe the MMH2834 modem commands.

MMH2834 Command Summary

<u>TYPE</u>	<u>COMMAND</u>	<u>DESCRIPTION</u>
Dial (Section F.2)	D	Dial
	A: or :	Continuous Redial
	\$D	DTR Dialing
	N	Dial a Stored Number
Modify Dialing Procedures (Section F.3)	P/T	Pulse/Tone Dialing
	&P	Set Pulse Dial Ratios
	,	Automatic Pauses in dialing
	Y	Long Space Disconnect
	W	Wait for New Dial Tone
	R	Reverse Mode of Operation
	!	Flash On Hook
	\$	AT&T "Calling Card" Tones
Memorize Phone Numbers (Section F.4)	D...N	Store Phone Numbers
	NN	Number Linking
	L	List Numbers Stored in Memory
	&F	Load Factory Defaults
Store Modem Configurations and Defaults (Section F.5)	&W	Store Configuration & S-Register Parameters
	Z	Reset Modem
	V	Result Code Terse/Verbose
	&M	Synchronous/Asynchronous Mode Select
	&X	Synchronous Transmit Clock Select
Configure Command Responses (Section F.6)	Q	Result Codes Enable/Disable Response
	&Q	Result Code Selection
	E	Echo Command Characters
	V	Result Code Terse/Verbose
	X	Result Code...Basic/Extended/Call Progress
Condition Phone Line (Section F.7)	&T	Remote Digital Loop Signal
	#T	Enable/Disable Trellis Coded Modulation
RS232C Interface (Section F.8)	&D	Data Terminal Ready Control

<u>TYPE</u>	<u>COMMAND</u>	<u>DESCRIPTION</u>
Configure	#L0	Negotiate V42 Mode During Handshake
Error	#L1	MNP On/LAPM Off
Correction	#L2	LAPM On/MNP Off
(Section F.9)	#L3	Direct LAPM/Phase Out Handshake
	\$A	Auto-Reliable Buffering
	\$F	Enable/Disable Auto-Reliable Fallback Character
	\$R	Retransmit Count
	\$E	Error Correction at 300 bps
Compression & Block Size	&BS	Maximum Block Size
(Section F.10)	&E14	Data Compression Disabled
	&E15	Data Compression Enabled
Configure Speed Conversion	\$BA0	Speed Conversion On
(Section F.11)	\$BA1	Speed Conversion Off
	\$MB	Set modem speed (e.g.,\$MB28800)
	\$SB	Set serial port speed (e.g.,\$SB115200)
Execute	\$H	Help
Immediate	I	Product Code Inquiry
Action	L5	List Current Operating Parameters
Commands	L6	List S-Register Values
(Section F.12)	L7	List Additional Configuration Parameters
	L8	List On-line Diagnostics
Read and Assign S-Register Values	Sr?	Read Current S-Register Value
(Appendix E)	Sr=	Assign S-Register Value

F.2 Dialing Action Commands

Dial Command **D**

The letter **D** in a command causes the MMH2834 to dial the telephone number immediately following it. For example, if you enter **ATD5551212** and hit RETURN, the MMH2834 dials the number 555-1212.

The MMH2834 gives you several choices of dialing methods. You can use tone or pulse dialing, by inserting a letter **T** or a **P** in the command string. (See section F.3 on Dial Modifiers).

You can also configure the modem to either wait for and detect dial tones and busy signals (which we call "Wait-for-Dial-Tone" dialing or "Smart" dialing), or work with timed pauses without dial tone and busy signal detection (which we call "Blind" dialing; see section F.6, Result Codes.)

Note: There is another method of dialing, called "DTR Dialing", where by manipulating the DTR signal on pin 20 of the RS232C/V.24 interface, a number stored in the modem's memory is automatically dialed. See section on DTR Dialing (**\$D** command) for details.

Continuous Redial **A: or :**

If you select the Wait-For-Dial-Tone method of dialing (see X3 or X4 command), you can command the MMH2834 to continuously redial (up to 10 redials for DOC units) a busy number until your call is answered. This is done with the **A:** command.

This command would be used only if you had already reached a busy number after executing a normal dial command. You simply enter **A:** (you need not enter AT, nor do you need to hit RETURN), and the modem will redial the number for you. If you again reach a busy signal, it redials again and again until it no longer detects a busy signal. You can stop the MMH2834 from redialing by pressing any key.

Another method used to cause the modem to redial a phone number continuously is to enter a colon **:** at the end of the phone number. The result is the same as if you had entered **A:** after personally observing that the number was busy on the first dialing attempt. Using the colon in the dialing string is a step saver.

Dialing a Stored Number **N**

A telephone number that you have stored in the MMH2834's number memory may be automatically dialed by entering **ATNn** where n = 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9. For example, a number stored at N3 would be dialed by entering **ATN3** and RETURN. Do **not** include the letter **D** in this command, or the stored number will be erased (also see section F.4, Phone Number Memory Commands).

DTR Dialing **\$D**

An alternate method of causing the MMH2834 to automatically dial is DTR Dialing. Data Terminal Ready (DTR) is a signal that comes into the modem from the terminal or computer to which it is connected, on pin 20 of the RS232C interface. In DTR dialing, the modem automatically dials a stored number as soon as it receives a high DTR signal. The DTR dialing method is popular in synchronous applications.

To activate DTR Dialing, enter **AT\$D1** and hit RETURN. The modem dials the phone number stored in the N0 location of memory when it receives a high DTR signal. DTR must remain high for the duration of the call, until disconnect. To deactivate DTR dialing, enter **AT\$D0** and hit RETURN.

F.3 Dial Modifier Commands

Pulse or Tone Dial **P** **T**

The MMH2834 dials numbers using either pulse or tone dialing, or a combination of both methods. Pulse dialing is a method used by rotary-dial telephones, which involves the timed opening and closing of line relay.

Tone dialing is the method used by pushbutton (touch tone) telephones, and is sometimes referred to as DTMF, or Dual-Tone Multi-Frequency dialing.

The method used is selected by including a **P** for **Pulse** or a **T** for **Tone** in the dialing command, right before the digits you wish to have dialed in that manner.

For example, you would pulse-dial the number 555-1212 by entering **ATDP5551212** and hitting RETURN. You could tone-dial the same number by entering **ATDT5551212** and hitting RETURN. If neither Pulse nor Tone dialing is specified in the dial command, the MMH2834 uses whatever method used last. If the modem has been reset or just powered up, it uses Pulse dialing, even if the letter *P* is not included in your dial command.

Nearly all telephone systems in the U.S. are now compatible with tone dialing. Since that is the faster method, you will probably choose the tone method for your dialing.

An example of combining pulse and tone dialing could involve a PBX system where 9 had to be pulse-dialed first, then the rest of the number tone-dialed after pausing for a second dial tone. The number would be dialed by entering **ATDP9, T5551212** and RETURN. (The comma causes a pause, which we'll explain soon.)

Set Pulse Dial Ratios **&P**

This command sets the time ratios between the open and closed portions of the dialing pulse frequencies. To set the dialing pulse ratio of 60 ms to 40 ms, enter **AT&P0**. To set a ratio of 67 ms to 33 ms, enter **AT&P1**. The factory default is **&P0**.

Automatic Pauses in Dialing **,**

You can cause the MMH2834 to pause during the dialing sequence by entering a comma character where the pause is desired. This pause will last two seconds. If a longer pause is desired, more than one comma may be entered consecutively, with each comma causing a two second pause. You also have the option of changing the length of the pause caused by the comma, from two seconds to any other value from 0 up to 255 seconds. This is done by setting register S8 (see Appendix E). Each comma in a dialing command counts as one of the sixty allowed characters.

Long Space Disconnect **Y**

When two modems are connected in Normal mode (i.e., without error correction) there is no "polite" means of requesting a disconnect. A link disconnect request packet is sent under reliable connections. As a result some "garbage" may be received when a hangup command is issued. The **Y1** command enables the modem to use the break signal which accomplishes the hangup as an instruction to shut off its receiver and disconnect (both modems must have **Y1** enabled for this feature to be effective). **Y0** (factory default) disables this function.

Wait for New Dialtone W

A **W** inserted in the dialing command causes the MMH2834 to wait for another dial tone, and not resume dialing until another dial tone is detected. It is not necessary to enter a **W** at the beginning of the dialing command to wait for a modem dial tone, because the modem will do that first (pause automatically).

In order for this command to work, you must select Wait-For-Dial Tone dialing with the **X2** or **X4** command, so that your modem will be able to detect the dial tone.

Reverse the Mode of Operation R

In certain operations you may need to reverse the mode of operation for your modem from originate to answer or answer to originate so that it would answer the phone and go into answer mode. This command turns off the reversing function with the **R0** command and turns it on with the **R1** command with the modem in either command mode. If you want to reverse from the originate mode, use **R** (with no number) in the dialing string.

Flash On Hook !

Some switchboard systems react to a momentary On Hook. An exclamation mark inserted in the command causes the modem "flash" on hook for a half second (90 mSec in BABT), as if you had held the switch hook button on a telephone down for a half second.

For example, to flash On Hook after dialing the number 555-1234 in order to transfer to extension 5678, you might enter **ATDT5551234,,!5678**. The commas cause a 4 second pause (just to be safe).

"Calling Card" Detect Tones \$

The MMH2834 has the capability to detect **AT&T** "calling card" tones for the purpose of utilizing the user's calling card number to originate an on-line connection. A **\$** symbol placed in the dialing string causes the modem to pause and wait for an **AT&T** "calling card" or a 1600 Hz tone (prevalent in the United Kingdom). When the tone is detected, the rest of the dialing string is processed. If no tones are detected within 45 seconds the modem aborts by indicating a **NO CARRIER** message. Hitting any key also aborts the **\$** command.

The following is an example of this command:

```
ATDT1028806127853500$123456789
(access/phone number) (credit card number)
```

Quiet Answer @

The **@** command causes the MMH2834 to wait before processing the next symbol in the dialing string. The wait is for one or more ringbacks followed by 5 seconds of silence.

If 45 seconds pass before the rings and silence, a **NO ANSWER (R)** result code is processed. The **@** command is used for accessing a system that does not provide a dial tone.

For example, **ATDT5551212@6313550** causes the MMH2834 to dial the first number (555-1212) and wait for 45 seconds for at least one ringback and 5 seconds of silence. If a busy signal is detected, the MMH2834 hangs up and generates a **BUSY** result code. If it does not detect 5 seconds of silence, a **NO ANSWER** result code is generated after hanging up. If 5 seconds of silence is detected, the second number (631-3550) is then dialed.

F.4 Phone Number Memory Commands

Storing Phone Numbers D...N

A telephone number and command line of up to sixty characters may be stored in the MMH2834's number memory. As many as ten of these numbers may be stored. Each number will be given a name, using the codes N0, N1, N2 up to N9. A phone number is stored by entering **ATD**, then the number as it would be dialed, along with any **P**, **T**, **R**, **;** or comma characters, and then entering **N** followed by the number's "name," which would be any number from 0 through 9, and then hitting RETURN.

For example, the tone-dialed number 1-612-631-3550 would be stored as number **N3** by entering **ATDT16126313550N3** and RETURN. The number is *not* dialed with this store command. After storing a number, check to see that it has been stored correctly by typing **ATL** and hitting RETURN.

When phone numbers are stored, the entire command line is also stored so that you can effectively create a macro for each number. For example, if you know a particular number needs to detect busy signals or dial tones, and needs extended result codes, error correction, XON/XOFF flow control, pacing, and data compression enabled, the command line would be: **ATX4&E1&E5&E13&E15DT16126313550N3**. This would store the entire command at location **N3**.

Number Linking N...N

You may command the MMH2834 to dial another number automatically if the first number dialed is busy. This would be useful in a situation where a computer can be accessed through more than one phone number. This is called "linking." To link the number in N1 to the number N2, simply enter **ATN1N2** and hit RETURN. Several numbers can be linked in the same command. For example, you could link N1 to N2 to N3 to N4 by entering **ATN1N2N3N4** and RETURN or you could link N1 to N2 and back to N1 and then back to N2 by entering **ATN1N2N1N2** and RETURN.

The only limit on the number of numbers that can be linked is the 60 characters allowed in a command line. Number linking can not be used with blind dialing, since busy signals would not be detected. You would have to select the Wait-for-Dial tone dialing method using the **X** Command in order to use the Number Linking feature.

Listing Numbers Stored in Memory L

Telephone numbers that you have stored in the MMH2834's memory may be listed and displayed with the **L** command. It will display all ten stored N numbers in a format like that shown below. All digits and command letters will be shown. The storage location number (0-9) is shown first, followed by the complete dialing command and telephone number as originally entered.

Simply enter **ATL** and hit RETURN to display these numbers on your video screen or printer. An example of an **L** command listing is shown below:

```

0 T14082345678
1 T16125551212;
2 P9,T14089876543
3 T3738315,12101,16126313550
4 T6313551R
5
6 P9,4258513
7
8 X4&E1&E5&E13&E15DT16126313550
9 T12138880123

```

F.5 Configuration and Default Storage Commands

Store Configuration & S-Register Params. in Non-Volatile Memory &W

The MMH2834 can store configuration parameters and S-register values in its non-volatile read/write Random Access Memory (RAM) memory. The **&W** command does this, which prevents any reconfiguration from being lost on a power-down or Reset (ATZ) condition. **&W0** (or **AT&W**) causes the MMH2834 to store your customized AT command settings and S-register values in its nonvolatile RAM. **&W0** also sets the modem so that it reads your customized settings stored in nonvolatile RAM when powered down or reset. (The **&W0** command only changes the settings stored in nonvolatile RAM that you specifically intend to alter. All other default parameters are applicable.)

&W1 causes the MMH2834 not to store your customized settings to nonvolatile RAM so that, after powering down or resetting the modem, it reads the factory default settings stored in ROM.

Loading Factory Defaults &F

The **&F** command provides a choice between customized configuration settings in RAM and the factory default configuration settings in ROM. The **&F8** and **&F9** commands define the function of the **&F** command.

The MMH2834 is shipped from the factory with a pre-configured set of command and S-register default settings. This set of factory defaults can be recalled by issuing the **&F** command. In addition to being able to recall the factory-installed defaults, the **&F** command can also recall those defaults stored under **&W0**. This is done using the **&F9** command. If you have stored parameters with the **&W0** command and wish these settings to always be used as your defaults, you would enter **&F9&W0**. To return the **&F** command to read factory installed defaults, enter **&F8&W0**. **&F8** is the factory default.

Many datacomm programs, including *MultiExpress™* and *MultiExpress for Windows™*, issue the **&F** command automatically—the **&F9** command allows the user to select their own defaults. Note that the **&F8/&F9** commands should be used with **&W0**.

Modem Reset Z

The **Z** command can be used to reset the entire command mode buffer and the result is the same as if you had disconnected, and then reconnected power to the modem. When an **ATZ** command is executed, the state of the **&W** command determines where the default values originate. **&W0** defaults come from RAM and **&W1** defaults come from ROM.

Async/Sync Mode Switching &M

This command can be used to set the on-line mode to either synchronous or asynchronous. **AT&M0** will set the MMH2834 to Asynchronous mode, and all communications will be Asynchronous, in both On-line and Command modes. **AT&M1** causes the MMH2834 to communicate asynchronously when in Command mode and switch to synchronous mode while on-line. The modem defaults to **&M0** (asynchronous communications) on reset or power-up.

Synchronous Transmit Clock Select &X

The **&X** command selects the Synchronous Transmit Clock Source in conjunction with the MuxClock (**\$MUXCL**) command for the composite link. External clocking is the default condition. External clocking is when the DTE provides transmit clocking to the modem on pin 24 of the RS232C interface. **&X0** is the default setting which is internal clocking. Internal clocking is when the modem provides transmit clock to the DTE on pin 15 of the RS232C/V.24 interface. The **&X1** command selects External clocking. **&X2** enables Slave Clocking. The **&X2** Command causes the MMH2834 to generate the transmit clock timing (pin 15) from the receive clock (pin 17) from the DTE (therefore 15 and 17 are the same). In this mode (Slave Clocking), all timing is controlled by the receive clock.

F.6 Command Response (Result Code) Commands

Echo Command Mode Characters **E**

If the MMH2834 is connected to a full-duplex computer, it may be necessary for the modem to be configured to echo back characters entered while in the command mode in order for them to be displayed. The **E** command is used to configure the Command Mode echo, with **ATE0** disabling the echo and **ATE1** enabling the echo (default).

Result Codes Enable/Disable and No Response Answer **Q**

The **Q** command enables or disables Result Codes and the No Response Answer mode of operation. Result Codes may be disabled altogether in certain applications, such as computer-controlled auto dialing, using the **Q** command. **ATQ1** disables Result Code transmissions. **ATQ0** (or **ATQ**) enables Result Code transmission.

Regarding No Response Answer, you may want the answer mode handled without responses and echo turned off, but want the originate mode still intelligent. This is called the No Response Answer mode. **ATQ2** selects the No Response Answer mode. If you do not select any mode, the factory default setting (enable Result Codes) is automatically selected.

Result Codes (“Multi-Tech” or “Standard AT”) **&Q**

The MMH2834 gives you a choice between the Multi-Tech Result Codes and Result Codes that more closely match the standard AT command set responses. **AT&Q1** selects AT responses with no Reliable/Compression modifiers. With this command, the terse result code for *CONNECT 2400* is 10.

TERSE	VERBOSE
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5	CONNECT 1200
6	NO DIAL TONE
7	BUSY
8	NO ANSWER
10	CONNECT 2400
11	CONNECT 4800
12	CONNECT 9600
13	CONNECT 14400
19	CONNECT 19200
21	CONNECT 21600
24	CONNECT 24000
26	CONNECT 26400
28	CONNECT 28800

AT&Q0 selects **Multi-Tech responses** with Reliable/Compression modifiers. With this command, the terse result code for *CONNECT 2400* is 9.

TERSE	VERBOSE
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5*	CONNECT 1200
6	NO DIALTONE
7	BUSY
8	NO ANSWER
9*	CONNECT 2400
11*	CONNECT 4800
12*	CONNECT 9600
13*	CONNECT 14400
19*	CONNECT 19200
21*	CONNECT 21600
24*	CONNECT 24000
26*	CONNECT 26400
28*	CONNECT 28800

* When error correction is used, the word *RELIABLE* (verbose) or the letter *R* (terse) is added to these responses. When data compression is used, the word *COMPRESSED* (verbose) or the letter *C* (terse) is added to these responses

Result Codes (Verbose/Terse) V

The **V** command controls whether the MMH2834's result codes are displayed as word ("verbose") or single digit ("terse") messages.

For example, if after dialing, no carrier signal is detected, the resulting message can be displayed either as *NO CARRIER*, or as the digit 3.

Entering **ATV0** (or **ATV**) causes the MMH2834 to display the Result Codes as digits, while **ATV1** displays them as words. If you do not select a method, the factory default setting causes the modem to display Result Codes as words.

Result Codes (Basic and Extended) and Call Progress Selection X

The **X** Command is used to select one of two possible dialing methods ("dumb or "smart"), and to select various response combinations related to these methods. You can choose to have certain responses suppressed, or whether or not you want speed indications along with the *CONNECT* responses. You can also pick and choose certain responses in order to match up with "Standard AT" responses.

The MMH2834 provides Basic and Extended Result Code sets. The difference between the two is the Basic set provides one response (*CONNECT*) to indicate a connection, while the Extended set provides several responses for different speeds (*CONNECT*, *CONNECT 2400*, *CONNECT 4800*, *CONNECT 9600*, *CONNECT 14400*, *CONNECT 19200*, *CONNECT 21600*, etc.).

When the Extended set is chosen, you also have the option of matching them up with Standard AT 2400 response code sets, by including or not including the *BUSY* and/or *NO DIAL TONE* responses while excluding the *DIAL TONE* response. The **X** command is used to select which responses are provided.

Regarding the MMH2834's method of dialing, the MMH2834 can detect standard dial tones and busy signals. This capability ("smart dialing") allows the modem to wait for a dial tone, and when one is detected, to begin dialing immediately.

The MMH2834 also can detect a distant busy signal, if after dialing, it reaches a busy number. This is useful because it allows the modem to immediately abandon a call, rather than wait 45 seconds for a carrier signal that will never come.

The MMH2834 gives you a choice between the **wait-for-dial-tone** ("smart") method we just described, and **blind** ("dumb") **dialing**, where instead of detecting actual dial tones, the modem relies on timed pauses. When the wait-for-dial-tone method is chosen, the busy signal detection capability is also activated. The **X** command is also used to select which dialing method is used.

Five different **X** commands are available (**X0** through **X4**), with five different effects on the MMH2834's Result Codes.

X0 Provides the basic (short) result codes and provides "dumb" dial capabilities.

X1 Provides the extended result codes and provides "dumb" dial capabilities.

The remaining **X** commands affect Call Progress, and turn on Extended Result Codes.

X2 Looks for dial tone only and will not provide a busy response.

X3 Looks for busy only and not look for dial tone.

X4 Looks for dial tone and for busy.

The factory default setting is **X0**, which selects Basic Result Codes and the blind ("dumb") method of dialing.

F.7 Phone Line Conditioning Commands

Enable or Disable Recognition of Remote Digital Loop Signal &T

The MMH2834 has several self-test features (covered in Appendix G). The tests are activated with different U commands, such as **ATU1**, and so forth. The **&T** command is a phone line conditioning command that enables or disables the modem's ability to recognize the Remote Digital Loop (RDL) test signal. The **AT&T4** command lets the MMH2834 respond to a RDL signal, and places itself in digital loop. The **AT&T5** command causes the modem to ignore the RDL signal. The factory default is **&T5**.

Enable/Disable Trellis Coded Modulation #T

This command enables or disables the Trellis Coded Modulation of the MMH2834. There is usually no need to disable (turn-off) Trellis codings except under an unusual line condition called impulse noise. **AT#T0** turns Trellis coding off and **AT#T1** turns Trellis coding on (factory default).

Fallback Modes When On-Line #F

If line conditions deteriorate, the MMH2834 automatically drops its transmission speed ("fallback"). The **#F** command controls the different ways the MMH2834 falls back. During operation, if the error rate becomes too great, the modem performs a retrain. If after the retrain, the error rate is still too high for 28800 bps operation, the modem initiates a retrain at 4800 bps. If after the first retrain the modem returns on line at 28800 bps, the modem then starts a counter and a timer. If three retrains occur within a two minute period, the modem falls back to 4800 bps.

Entering **AT#F0** (or **AT#F**) allows no fallback when on-line. **AT#F1** allows the MMH2834 to fallback (based on the error rate or if three retrains have occurred within a two minute period) from 28.8K to 26.4K to 24K to 21.6K to 19.2K to 16.8K to 14.4K to 12K to 9.6K to 4.8K bps. The **AT#F2** command enables incremental fall back from 28.8K to 4.8K, but also enables incremental fall forward (from 4.8K to 28.8K) if the phone line improves. **AT#F2** is the factory default setting.

F.8 RS232C Interface Control Commands

Data Terminal Ready Control &D

Data Terminal Ready (DTR) on pin 20 of the RS232C interface is required in order for the MMH2834 to operate. A high DTR signal tells the modem that the device to which it is connected is active, or "ready" to communicate through the modem.

DTR has some other MMH2834 functions. DTR can be used to trigger a dialing sequence, called DTR Dialing. The condition of DTR can also be used to cause the modem to reset to its default parameters, just as if you had given the modem an ATZ command. To do this, enter the command **AT&D3** and hit RETURN. The modem will now reset itself whenever DTR is dropped from On to Off, and will also go on-hook (hang up) if it is on-line.

Entering **AT&D0** or **AT&D** causes the MMH2834 to ignore DTR. Entering **AT&D1** causes the modem to go on-hook (hang up) with loss of DTR. The modem enters Command mode when DTR goes high again. Auto-answer is disabled while DTR is low. Entering **AT&D2** causes the modem to go on hook with loss of DTR. The modem enters command mode when DTR goes high again.

F.9 Error Correction Commands

You can use AT commands to place your MMH2834 one of three V.42 (error correction) modes of operation.

V.42 Mode Select #L

The V.42 standard implements both MNP Class 3 & 4 and LAP-M error correction methods. The V.42 Mode Select command (**#L**) selects which type of error correction (MNP or LAP-M) your MMH2834 uses for transmissions. The various **#L** command options are as follows.

The **#L0** command allows a pair of modems to negotiate which V.42 mode (**MNP or LAP-M**) will be used in their transmissions.

Originate Mode

- a. If both modems have LAP-M capability, the modems use LAP-M mode.
- b. If one or both modems do not have LAP-M capability and both have MNP, the modems use the MNP mode.

Answer Mode

- a. The answering modem responds to either an MNP Link Request or LAP-M Originator Detection Pattern (ODP) signal depending on which the originating modem issues.

The **#L1** command sets your modem to MNP error correction and disables LAP-M. This command is for Originate mode only. In Answer mode, the modem still accepts MNP or LAP-M.

The **#L2** command sets your modem to LAP-M error correction, and disables MNP. This command is for Originate mode only. Answer mode still accepts MNP or LAP-M.

In the prior commands, the modems use a two phase process to establish a V.42 connection (detection to establish whether the remote modem is also error correcting, and then protocol establishment to determine parameters and to establish the error correction connection). If you know that the other modem is a V.42 error correcting modem, and you wish to use LAP-M, the **#L3** command disables the detection phase and goes directly to protocol establishment. Both modems must have **#L3** in effect.

Auto-Reliable Buffering \$A

In Auto-Reliable mode, the modem is given four seconds to establish a Reliable connection. After this four-second period, the modem drops to Normal mode.

Any data which is received during this period is typically discarded. The **\$A** command can be used to cause the modem to buffer (save) data that is received during this Auto-Reliable time-out period. This data will then be output by the modem after the *CONNECT* message.

AT\$A0 = Discard data received during auto-reliable time period.

AT\$A1 = Buffer data received during auto-reliable time period.

The factory default is **\$A0**.

Enable/Disable Auto-Reliable Fallback Character \$F

In Auto-Reliable mode, the modem is given four seconds to establish a Reliable connection. If a single CARRIAGE RETURN is received from the remote modem during this four second period, the Auto-Reliable modem assumes that the remote modem is not in Reliable mode and drops to Normal mode. The CARRIAGE RETURN is the only character which causes the modem to drop to Normal mode. Any other character will either be buffered or discarded.

The **\$F** command can be used to disable this fallback-to-Normal-due-to-CARRIAGE-RETURN feature.

The Auto-Reliable fallback character (**\$F**) and Auto Reliable buffering (**\$A**) commands can be used together to cause the modem to buffer all data received up until the CARRIAGE RETURN, and then drop to Normal mode. All data received will then be output following the *CONNECT* message.

AT\$F0 = Do not fall back to Normal if CARRIAGE RETURN received.

AT\$F1 = Fall back to Normal mode if CARRIAGE RETURN received.

The factory default is **\$F0**.

Retransmit Count \$R

Retransmit Count If errors are received during a Reliable connection, the modem re-sends the block of data which contained an error. With the **\$R0** command, if another error occurs, the block will be re-sent again. The modem counts the number of times that a data block is re-sent. If the same block of data is resent 12 times and still has not been received properly, the modem assumes that the transmission line is unsuitable for transmission, and abort the connection.

This retransmit counter is disabled by the **\$R1** command. When the retransmit counter is disabled, the modem keeps trying to send data and will not abort, no matter how many times the same block is resent.

AT\$R0 = Disconnect if retransmit count is exceeded.

AT\$R1 = Do not disconnect due to retransmits.

The factory default setting is **\$R0**.

V.42 Error Correction/300bps \$E

At 300 bps, error correction is not typically used. **\$E1** lets the MMH2834 function at 300 bps in either Normal (**&E0**), Auto-Reliable (**&E1**) or Reliable (**&E2**) mode. **\$E0**, which is the the MMH2834's default, disables 300 bps/V.42 error correction altogether.

F.10 Compression and Maximum Block Size Commands

Data Compression

The data compression (**&E14**) command enables data compression.

Maximum Block Size **&BS**

The maximum size of Reliable mode data blocks can be controlled with the **&BS** command. MNP 3 sends blocks of 1 to 64 characters. MNP 4 and 5 typically send blocks of 1 to 256 characters and LAP-M typically sends 128 characters. For MNP classes 4 and 5/LAP-M, reducing the block size to 64 characters may give a smoother flow of data and better throughput on noisy phone lines. Using smaller block sizes over good phone lines may cause a slight loss in throughput (speed).

AT&BS0 = Maximum transmit block size of 64 characters

AT&BS1 = Maximum transmit block size of 128 characters (LAP-M) 256 characters (MNP)

The factory default setting is **&BS1**.

F.11 Speed Conversion Commands

Speed conversion is a necessary part of data compression since data must be presented to the modem faster than it can handle data, if data compression is to be effective.

Speed conversion allows the MMH2834 to communicate at one speed over the phone line, and at another speed at the RS232C interface. The speed (also referred to as "data rate" or "baud rate") can be fixed at the RS232 interface independently of the baud rate of the on-line transmissions.

In addition to data compression, another popular application for speed conversion involves an auto-answer MMH2834 connected to a computer that does not have autobaud capability. This means that the computer must be set at a fixed baud rate, regardless of whether the modem is communicating over the phone line at 300, 1200, 2400, 9600, 14,400, 19,200, 24,000 or 28,800 bps. In this application, speed conversion allows the modem to match its speed to that of the calling modem, while at the same time communicating with the attached computer through its RS232C port at a fixed baud rate, which can be preselected at 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600 or 115,200 bps.

Speed Conversion **\$BA**

When using speed conversion, you must set the modem so that it does not adjust its speed at the RS232C serial port, even if the modem does adjust its data rate. To turn Speed Conversion ON, enter the command **AT\$BA0**.

To turn Speed Conversion OFF, enter **AT\$BA1** and hit RETURN. The modem will now match its RS232C speed to that of the computer, and will adjust its speed to any changes in the computer's speed in Originate mode, or to the speed of the originating modem in Answer mode. The speed at which the modem communicates over the phone line will always be the same as the speed at which it communicates via its RS232C serial port.

Modem Baud Rate **\$MB**

Modem Baud Rate The **\$MB** command presets the MMH2834's *transmission* baud rate for originate operations, (i.e., the speed of the modem's transmissions over the telephone lines when originating a call). With speed conversion, this transmission speed can be a different baud rate than the serial port speed.

When the MMH2834 receives (answers) a call from another modem, it automatically switches its phone line transmission speed to match the calling modem. However, if the MMH2834 originates a call to another modem that is unable to connect at the baud rate of the MMH2834, it automatically drops to a lower baud rate in an attempt to match the speed of that modem. For example, if the MMH2834 is set for 19,200 baud and calls another modem that has a top speed of 2400 baud, it drops to 2400 baud.

The command to set the Modem Baud Rate is **AT\$MBn**, where n can be 75 (in ITU-TSS V.23 mode) 300, 1200, 2400, 4800, 9600, 14,400, 19,200 or 28,800 as listed below:

AT\$MB75	=	CCITT V.23
AT\$MB300	=	300 bps
AT\$MB1200	=	1200 bps
AT\$MB2400	=	2400 bps
AT\$MB4800	=	4800 bps
AT\$MB9600	=	9600 bps
AT\$MB14400	=	14400 bps
AT\$MB19200	=	19200 bps
AT\$MB24000	=	24000 bps
AT\$MB28800	=	28800 bps

The factory default is 28800 bps.

Serial Port Baud Rate **\$SB**

The **\$SB** command presets the speed of the MMH2834's serial (RS232C) port, in both Originate and Answer modes. Speed conversion allows you to set this serial port baud rate at a fixed speed of up to 115,200 bps, regardless of the modem's transmission speed setting.

In order for this command to be effective, the modem's Speed Conversion feature must first be turned off with the **\$BA** command. When Baud Adjust is on, the MMH2834 automatically adjusts its serial port baud rate to match the speed of the computer or terminal it is connected to, as soon as it receives its first AT command. However, in many applications, such as automatic answer, the modem may not receive AT commands, in which case it is very useful to be able to preset the serial port baud rate with this **\$SB** command.

In addition to setting the MMH2834's serial port speed, this command also sets the speed at which the modem issues Command mode responses.

The MMH2834 will accept AT commands at any speed, regardless of the speed preset by the **\$SB** command. If the modem receives such a command at a speed that is different than the preset speed, the modem switches its serial port baud rate to match the new AT command speed, although the baud rate value stored by the **\$SB** command remains the same. This provides you with a convenient way to switch the serial port speed, and still make it easy to go back to the original speed automatically the next time the modem is powered up or reset with an **ATZ** command.

The command to set the Serial Port Baud Rate is **AT\$SBn**, where n can be 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600 or 115200 bps as listed below:

AT\$SB300	=	300 bps
AT\$SB1200	=	1200 bps
AT\$SB2400	=	2400 bps
AT\$SB4800	=	4800 bps
AT\$SB9600	=	9600 bps
AT\$SB19200	=	19,200 bps
AT\$SB38400	=	38,400 bps
AT\$SB57600	=	57,600 bps
AT\$SB115200	=	115,200 bps

The factory default is 115,200 bps.

*Some serial ports, particularly those in older PC-compatible computers, may limit the performance of a higher speed modem like the MMH2834. The limiting factor is a circuit called a Universal Asynchronous Receiver/Transmitter, or UART. All data from your modem flows through it. 8250, 16450, and 16550 are UARTs typically used in PC-compatible computers. The 8250 is unreliable above 9,600 bps and the 16450 is unreliable above 19,200 bps. The 16550 UART, however, is reliable to at least 115,200 bps. With V.42bis data compression enabled, the MMH2834 can achieve throughputs approaching 115.2K (depending on line quality and file content). If you presently do not have a 16550 UART in your PC, we recommend that it be replaced with a Multi-Tech high speed Intelligent Serial Interface (ISI) card. It comes in one, two and eight-port versions for DOS/Windows and UNIX systems, and includes a 32 K buffer that eliminates data loss even at high speeds. See your dealer for details.

F.12 Immediate Action Commands

Help Screens \$H

The Help command is designed to give you short explanations on how to use each MMH2834 command. The Help command can be quite useful if your manual is not handy and you are in the middle of a communications session. Although the explanations are quite abbreviated compared to those in this manual, they should prove to be helpful reminders when needed. At the time of this writing, we have three screens of Help information (Screen #1, #2 and #3), and more screens may be added in the future. The Help commands are structured so that you can call up one of three Help screens, as follows:

AT\$H1 = Help Screen #1

AT\$H2 = Help Screen #2

AT\$H3 = Help Screen #3

Inquiry for Product Code I

Some systems or software packages automatically check the "identification" of the modem with which they are communicating, by using the **I** command. This "read" command lets the software to determine the type of modem with which it is communicating.

When **ATI** or **ATI0** is entered, the MMH2834 responds with *247*. When **ATI1** is entered, the modem responds with a three-digit code indicating the firmware version number. When **ATI2** is entered, the modem responds with *MMH2834*.

Listing Current Operation Parameters L5, L7

The **L5** and **L7** commands list the current operating parameters of your modem. This information can be very useful when you are changing communications software or when you are changing modem default settings.

The command to list the MMH2834's current operating parameters is **ATL5** for the basic parameters. The **ATL7** command will list additional parameters on the MMH2834.

Listing S-Register Values L6

The **L6** command lists the current values stored in the modem's S-register. This information can be very useful if you wish to change S-register values. (Refer to Appendix E for more information on S-registers).

Listing On-Line Diagnostics **L8**

The **L8** command displays the current on-line *CONNECT* status status of the MMH2834. This display can be printed and used as a modem status report or as diagnostic information (such as when calling Tech Support). This report is given only when on-line. To activate this command first type **+++AT<CR>** (on-line escape command while maintaining command mode), then type **ATL8**. What then displays on your monitor is your modem's current on-line condition (e.g., Link Type, Line Speed, Serial Speed, Type of Error Correction/Data Compression, Number of past Retrans, etc.).

An example of **L8** listing is shown below:

```
ATL8
*****      ONLINE DIAGNOSTICS      *****
LINK TYPE                V.34
LINE SPEED                28800
SERIAL SPEED              115200
ERROR CNTRL/COMPRESS     LAPM COMPRESSED
FALL BACK/FORWARD        LOCALLY ENABLED
LINE TYPE                 DIAL UP
DATA FORMAT               ASYNCHRONOUS
LINE QUALITY              0010=EXCELLENT, 8=FAIR, 16=BAD
RECV. SIGNAL LEVEL        -016.5 dBM
TRANS SIGNAL LEVEL        -013 dBM
NUMBER OF RETRAINS        000
ROUND TRIP DELAY          00ms (MEANINGFUL IN V32 MODE ONLY)
```

Glossary

A

AC (Alternating Current): A power source whose signal crosses a reference voltage (usually called ground or zero). Alternating between a maximum and minimum voltage, AC may also be referred to as a bipolar signal. Contrast with DC.

ACK (ACKnowledgement code) (pronounced "ack"): A communications code sent from a receiving modem to a transmitting modem to indicate that it is ready to accept data. It is also used to acknowledge the error-free receipt of transmitted data. Contrast with NAK.

Address: A numbered location inside a computer. It's how the computer accesses its resources, like a video card, serial ports, memory, etc.

Alphanumeric: The basic character set which includes the letters A to Z (and a to z) and the digits 0 to 9.

Amplitude: The difference between the maximum and minimum voltages of a waveform expressed as a "peak-to-peak" voltage.

Amplifier: An active device within a circuit which increases the voltage level of all signals (desirable and undesirable).

Analog loopback: A modem diagnostic used to test either the local analog loop (the modem's internal circuitry) or the remote analog loop (the telephone line). The local analog loop test is accomplished by activating the self-test mode and tying the modem's modulator to its demodulator and examining the return stream of data at the PC or terminal it services. The remote analog loopback can only be activated on four-wire leased line connections with a remote modem capable of performing the same test.

Analog signal: A waveform which has amplitude, frequency and phase, and which takes on a range of values between its maximum and minimum points. Analog implies continuous movement from point A to point B, as opposed to discrete jumps. For example, sound is continuously varying air vibrations and is converted into analogous electrical signals to be carried on a telephone line.

Analog Transmission: One of two types of telecommunications which uses an analog signal as a carrier of voice, data, video, etc. An analog signal becomes a carrier when it is modulated by altering its phase, amplitude and frequency to correspond with the source signal. Compare with digital transmission.

ANSI (American National Standards Institute) (pronounced "ansy"): A U.S. standards organization supported by over 1000 companies and trade organizations. It is a non-profit, non-government group that is the U.S. member of the ISO (International Standards Organization).

ANSI character set: An 8-bit character set that contains 256 characters. The first 128 characters are alphanumeric punctuation and the second 128 contain math and foreign language symbols.

ASCII (American Standard Code for Information Interchange) (pronounced "askey"): A binary code for data that is used in communications and in many computers and terminals. The code is used to represent numbers, letters, punctuation and control characters. The basic ASCII code is a 7-bit character set which defines 128 possible characters. The extended ASCII file provides 255 characters.

Asynchronous Transmission: The transmission of data in which each character is a self-contained unit with its own start and stop bits. This is a common method of transmission between a computer and a modem. One character at a time, encoded into a series of electrical pulses, is transmitted or received. This the oldest method of data transfer. When it is used with error correcting software and data compression algorithms, along with the increase in maximum attainable speeds, it continues to be a viable alternative to synchronous transmission..

Auto Answer: A modem feature which enables the modem to go "off-hook" when it detects an incoming call.

Auto Dial: Some modems provide this feature for asynchronous dialing. This feature is a predefined macro that allows the user to enter the location of a phone number (i.e., N0 through N9) and have the modem go off hook, dial and establish the connection. With the auto dial feature, an asynchronous terminal can establish a dialing directory without running a communication software package.

B

Baud: Baud is rate, the signalling rate of a line, the switching speed, or the number of transitions (voltage or frequency changes) that are made per second. Transmission speeds are often expressed in baud, though bits per second is more accurate. The speed at which your computer talks to your modem.

BCC (Block Check Character): An error control method used in character-oriented or byte-synchronous protocols. Two 8-bit BCC's are used to create the CRC (Cyclic Redundancy Check) field of a synchronous data packet.

Bell 103: The U.S. modulation standard for 300 bps full-duplex transmission over dial-up lines.

Bell 212A: The U.S. modulation standard for 1200 bps full-duplex transmission over dial-up lines.

Binary: A numbering system based on two digits, 1 and 0 which is conducive to the two-state digital electronics used within computers. All input to a computer is encoded as a binary value. Binary also refers to a file format that uses 8-bit characters, to allow for control characters (i.e., all non-ASCII files).

BSC (Binary Synchronous Communications): Also called "bisync", this communications protocol was the first synchronous data format used by IBM. It is still in use, but is rapidly being replaced by IBM's newer Synchronous Data Link Control (SDLC). Bisync is a byte-synchronous protocol that has longer delays and more overhead than the bit-synchronous SDLC. It uses two synchronization characters to head every packet.

Bit (Binary digIT): A bit is the basis of the binary number system. It can take the value of 1 or 0. Bits are generally recognized as the electrical charge generated or stored by a computer that represent some portion of usable information.

Bit-synchronous transmission: A synchronous form of data transmission that focuses on a maximum packet size rather than the length of the characters the packet contains. SDLC is a bit-synchronous protocol.

Boot: To start or restart your PC. This term originates from the saying "to pull oneself up by the bootstraps".

Bps (bits per second): A unit to measure the speed at which data bits can be transmitted or received. Bps differs from baud when more than one bit is represented by a single cycle of the carrier.

Buffer: A temporary storage register or Random Access Memory (RAM) used in all aspects of data communications which prevents data from being lost due to differences in transmission speed. Keyboards, serial ports, muxes and printers are a few examples of the devices that contain buffers. A buffer allows one device to dump data at a high speed and for the lower-speed device to accept it at its own pace. In this way, the high-speed device can continue its work without having to wait for its data transfer to end. Buffers are a way of preventing potential data loss.

Bus: A common channel between hardware devices either internally between components in a computer, or externally between stations in a communications network.

Byte: The unit of information a computer can handle at one time. The most common understanding is that a byte consists of 8 binary digits (bits), because that's what computers (PCS) can handle. A byte holds the equivalent of a single character (such as the letter A).

C

Capacitor: An electronic device that stores an electrical charge. It comes in varying sizes for use in anything from power supplies to the tiny cells in dynamic RAM chips. When the device is powered down, its capacitors lose their charge.

Carrier signal: An analog signal with known frequency, amplitude and phase characteristics used as a transport facility for useful information. By knowing the original characteristics, a receiver can interpret any changes as modulations, and thereby recover the information.

CCITT (Consultative Committee for International Telephone and Telegraph): An advisory committee created and controlled by the United Nations and headquartered in Geneva whose purpose is to develop and to publish recommendations for worldwide standardization of telecommunications devices. Now known as the International Telecommunications Union (ITU-T), CCITT has developed modem standards that are adapted primarily by PTT (post, telephone and telegraph) organizations that operate telephone networks of countries outside of the U.S.

Character set: One of a number of coding schemes which uses binary digits to represent characters, numbers, punctuation, and/or control characters. Common character sets are ASCII, ANSI or EBCDIC.

Checksum: A control field found in synchronous data packets which contain the results of the error control algorithm used.

Chip: Also called integrated circuits (IC), they are squares or rectangles that contain from a few dozen to a few million electronic components.

Circuit: Any closed path through which electrical current can flow.

Circuit-switched Network: A technology used by the PSTN that allocates a pair of conductors for the exclusive use of one communication path. Circuit switching allows multiple conversations on one talk path only if the end-users multiplex the signals prior to transmission.

Circuit switching: The temporary connection of two or more communications channels using a fixed, non-shareable path through the network. Users have full use of the circuit until the connection is terminated.

Clock: A timing signal generated by an oscillating circuit which is used to synchronize data transmissions.

Command: An instruction that tells a computer to begin, continue or end a specific operation.

Command mode: One of two states of an intelligent (i.e. programmable) device. The mode in which commands can be issued to alter operating parameters.

CRC (Cyclic Redundancy Check): A field used in packetized data that contains two 8-bit BCCs (Block Check Characters) as the binary result of an algorithm performed on the data bits in the packet. A CRC is used for error detection by many synchronous protocols.

CTS (Clear To Send signal): With communications between modems, an RS-232 signal sent from the modem to the DTE that indicates it is ready to accept data. Contrast with RTS.

D

DC (Direct Current): This is usually understood to mean a constant voltage supply that fluctuates only a nominal amount. An analog or digital signal that may vary in voltage level, but it never crosses the reference voltage (usually called ground). Contrast with AC.

De facto standards: A de facto standard is one of two types of voluntary standards recognized by a given market. It is introduced by a single vendor and becomes a standard by its widespread use and acceptance by other vendors. AT&T's Bell 212A, IBM's Binary Synchronous Protocol or DEC's VT-100 terminal protocol are examples of de facto standards. Compare with de jure standards.

De jure standards: A de jure standard is one of two types of voluntary standards. It represents the collective consensus of the industry and users for a particular aspect of manufacturing. ITU-T's V and X standards (e.g. V.32 and X.25) are examples of de jure standards. Compare with de facto standards.

Decibel (dB): A unit of measurement for signal strength based on logarithmic increments. A decibel is a relative measurement that is derived from an initial reference level and a final observed level.

Default: This is preset value or option in software packages, or in hardware configuration, that is used unless you specify otherwise.

Device driver: Software that controls how a computer communicates with a device, such as a printer or mouse.

Digital signal: Digital devices, such as terminals and computers, transmit data as a series of electrical pulses which have discrete jumps rather than gradual changes.

Digital Transmission: A method of electronic information transmission common between computers and other digital devices. Analog signals are waveforms: a combination of many possible voltages. A computer's digital signal may be only "high" or "low" at any given time. Therefore, digital signals may be "cleaned up" (noise and distortion removed) and amplified during transmission.

DIP switch (pronounced "dip switch"): A set of tiny toggle switches, built into a DIP (dual in-line package), used for setting configurable parameters on a PCB (printed circuit board).

DPSK (Differential Phase Shift Keying): A common form of phase modulation used in modems. It does not require complex demodulation circuitry and is not susceptible to random phase changes in the transmitted waveform, thus reducing errors during transmission.

DSR (Data Set Ready): An RS232 signal sent from the modem to the computer or terminal indicating that it is able to accept data. Contrast with DTR.

DTE (Data Terminating Equipment): A term used to include any device in a network which generates, stores or displays user information. DTE is a telecommunications term which usually refers to PCs, terminals, printers, etc.

DTMF (Dual-Tone MultiFrequency): A generic push-button concept made popular by AT&T TouchTone.

DTR (Data Terminal Ready): An RS232 signal sent from the computer or terminal to the modem indicating that it is able to accept data.

E

EBCDIC (Extended Binary Coded Decimal Interexchange Code) (pronounced "eb suh dick"): An IBM character code used in its mainframe and midrange computers. It is an 8-bit code (256 combinations) that stores one alphanumeric character or two decimal digits within a byte. This code and ASCII are the most commonly used to represent data.

Echo: The reflection or duplication of a signal back toward its source. Echoing is useful when a terminal is transmitting data, in that the data can be echoed to the screen so the user can monitor what is being sent. Echoing is undesirable when it refers to the signal which results on a telephone line from impedance mismatches.

Echo cancellation: A high speed modem technique that isolates and filters out unwanted signals caused by echoes from the main transmitted signal. This allows full-duplex modems to send and receive on the same frequency carrier.

EIA (Electronics Industries Association): A membership organization founded in 1924 that includes manufacturers of electronic parts and systems. With over 1200 members, it sponsors shows and seminars and gives awards for outstanding contributions in electronics. It sets electronic interface standards, such as RS-232.

Environment: A computer configuration that includes the CPU model and system software (operating system, data communications and database systems). It may also include the programming language used. It sets the standards for the applications that run in it.

EPROM (Erasable Programmable Read Only Memory) (pronounced "eeprom"): A reusable PROM chip that holds its contents until erased under ultraviolet light.

Error correction: The process of detecting distorted data bits and requesting a retransmission or interpretation to correct the error. Errors are introduced by bad line conditions or external interface.

F

Fax (facsimile): Refers to the bit-mapped rendition of a graphics-oriented document (fax) or to the electronic transmission of the image over telephone lines (faxing). Fax transmission differs from data transmission in that the former is a bit-mapped approximation of a graphical document and, therefore, cannot be accurately interpreted according to any character code.

Firmware: A category of memory chips that hold their content without electrical power, they include ROM, PROM, EPROM and EEPROM technologies. Firmware becomes "hard software" when holding program code.

Flash Memory: A memory chip that holds its content without power, but must be erased in bulk. The term comes from its ability to be erased "in a flash". Flash memory is derived from EEPROM, but are less expensive and provide higher bit densities.

Flow control: The process of regulating the speed at which data enters or leaves a serial port. Software flow control is implemented by communications software or by the user sending predefined characters or packets which are recognized as "pause" and "resume" indicators. Hardware flow control is achieved by using the RTS (request to send) and the CTS (clear to send) control lines of the RS232 interface.

Footprint: The desk or floor surface that a piece of hardware occupies. Also referred to as "real estate".

Foreground: The application program currently running on and in control of the PC screen and keyboard. The area of the screen that occupies the active window. Compare with background.

Format:

1. The way text is set up on a page.
2. To prepare a disk for holding information. Formatting a disk can delete all information that was previously on it.
3. The way information is structured in a file, often specific to one application or protocol.

Frequency: A characteristic of an electrical or electronic signal which describes the periodic recurrence of cycles. Frequency is inversely proportional to the wavelength or pulse width of the signal (i.e., long wavelength signals have low frequencies and short wavelength signals yield high frequencies).

Full-duplex: A method of transmitting and receiving data simultaneously over a single pair of wires. Compare with Half-Duplex.

H

Half-Duplex: The transmission of data in both directions, but only one direction at a time. Compare with Full-Duplex.

Handshaking: A process that two modems go through at the time of call setup to establish synchronization over the data communications link. It is a synchronization and negotiation process accomplished by the exchange of predefined, mutually recognized control codes.

Hard Disk: A metal disk covered with magnetic recording material. Some can hold up to several hundred megabytes of information. Contrast with floppy disk.

Hardware: The equipment that makes up your computer system, including the keyboard, mouse, disk drives and monitor.

Hexadecimal: A base 16 numbering system used to represent binary values. Hex uses the numbers 0-9 and the letters A-F: usually notated by an "h" (e.g., "4CF h", read "four charley fox, hex"). The result is that one hex digit represents a 4-bit value.

Host: The computer that is designated as retaining information or processing power to service the needs of other computers or terminals. Mainframes and mid-range computers are hosts; however, with today's powerful microprocessors, PCs can also be configured to serve as hosts. Often, a PC on a LAN will be set up as a host to provide LAN access for remote users.

I

Initialize: To start anew and establish start-up parameters, typically involves clearing all or some part of the device's memory or disk space.

Interface: A common meeting ground supplied by hardware or software to facilitate a compatible connection and operation between two devices or programs. For example, when two PCs are connected, they use a common interface across the physical connectors, so that the signals being sent and received are accurately interpreted. With software, an interface is a module created to be "written to". That is, if two programs are written to the same interface, then they can be successfully linked together.

International Telecommunications Union (ITU): An advisory committee created and controlled by the United Nations and headquartered in Geneva whose purpose is to develop and to publish recommendations for worldwide standardization of telecommunications devices. Its standards bureau, ITU-T, was formerly known as the CCITT.

IRQ Level (Interrupt Request Level): The notification a processor receives when another portion of the computer's hardware requires its attention. IRQs are numbered so that the device issuing the IRQ can be identified, and so IRQs can be prioritized.

ITU-T (International Telecommunications Union - Telecommunications Standardization Sector): The primary international standards organization for wired public communications networks, formerly known as the CCITT.

K

Kilobit: One thousand bits. A unit of measure for digital data rates.

Kilobyte: One thousand bytes. A unit of measure for digital data rates. Not to be confused with "K", which stands for z^{10} bytes of storage space, either in memory or on disk. 1K of disk space is actually 1024 bytes, 16K is 65,536 bytes and 1M (meg) is 1,048,576 bytes.

L

Leased Line: A private, dedicated communications channel that connects two locations. This connection lasts for the duration of the subscription. Leased lines may be conditioned to improve line quality over that of dial-up lines.

Line Conditioning: An additional cost option offered by the telephone company for their leased, voice-grade lines. The service provides a careful balance of line enhancements to improve the frequency response and to reduce distortion.

LRC (Longitudinal Redundancy Check): Error checking method that generates a parity bit from a specified string of bits on a longitudinal track. In a row and column format such as on magnetic tape, LRC is often used with VRC, which creates a parity bit for each character.

M

Mainframe: A large, powerful computer used to centralize a data processing environment. It has hundreds of gigabytes of disk storage space. It uses a front end processor to connect directly to the communications channels that interconnect terminals and computers.

Megabyte: One million bytes when describing a data rate. 1M of disk space may actually mean 1,048,576 bytes.

Mid-range computer: A term coined by IBM referring to any of their Advanced Business Systems computers. This product line was originally called their mini-computers, but as the number of supported users approached mainframe capabilities, the term "mid-range" caught on.

Mnemonics: A term assigned to a complex idea, value, or list of information which is found to be representative of that information. Computer commands are almost entirely mnemonics. Mnemonics are used as memory aids for people.

Modem: A communications device that enables a computer to transmit information over a telephone line. It converts the computer's digital signals into analog signals to send over a telephone line and converts them back to digital signals at the receiving end. Modems can be internal and fit into an expansion slot, or external and connect to a serial port.

Modulation: The process of encoding information from one signal (called the source) into another (called the carrier) by modifying some characteristic(s) of the carrier. It is often used in telecommunications when one type of signal must be converted for transmission over an otherwise incompatible medium.

Multiplexer (mux): A device that merges several signals into one composite signal for transmission over a single medium or channel. A de-multiplexer (usually built into a mux) reverses the process at the receiving end.

N

NAK (Negative Acknowledgment): Communications code used to indicate that a message was not properly received, or that a terminal does not wish to transmit. Contrast with ACK.

Network: A group of computers connected by cables or other means and using software that enables them to share equipment, such as printers and disk drives to exchange information.

Node: Any point within a network which has been assigned an address.

Normal mode: In modem operation, refers to a mode of operation without error correction active.

O

Off-hook: The condition of a device which has accessed a phone line (with or without using the line). In modem use, this is equivalent to a telephone handset being picked up. Dialing and transmission are allowed, but incoming calls are not answered.

On-Hook: The condition of a device which has not accessed a phone line. In modem use, this is equivalent to a telephone handset that has not been picked up. In other words, it can receive an incoming call.

P

Parameter:

1. A "place holder" in a command which should be substituted with useful information.
2. The list of acceptable values for a given option or command. In UNIX, the generic command should be typed in as Stty/s 9600. Where "Stty" is the command, "s" is the speed switch, and "9600" where s=1200-115,200 bps.

Parity bit: An extra bit attached to each byte of synchronous data used to detect errors in transmission.

PCB (Printed Circuit Board): A flat board that holds chips and other electronic components. The board is "printed" with electrically conductive pathways between components. The main PCB in a system is called a motherboard and the smaller PCBs that plug into the slots in the motherboard are called daughter boards or cards.

PCMCIA (personal computer memory card international association): An organization of U.S. and Japanese companies set up to standardize memory cards and other architecture-independent expansion devices. These cards are typically used in laptop computers.

Phase: The timing of a signal based upon the starting point of each cycle in another signal. To be detected phase requires the comparing of two signals. If the cycle of two signals begin at the same point, they are said to be "in-phase". In-phase signals add, while out-of-phase signals tend to cancel each other.

Port: A location for input or output data exchange. Computers, muxes, etc. have ports for various purposes.

Program: A collection of computer instructions that tell the computer what to do.

PROM (Programmable Read Only Memory): (pronounced "prom") A permanent memory chip that can be programmed or filled by the customer after by the manufacturer has set initial values. Contrast with ROM.

Prompt: A request for information from the PC that provides required input or information.

Protocol: A set of rules that defines how computing devices communicate with each other. The rules governing the transmitting and receiving of data.

PSTN (Public Switched Telephone Network): A worldwide public voice telephone network that is used as a telecommunications medium for the transmission of voice, data and other information.

Pulse dialing: One of two methods of dialing a telephone, usually associated with rotary-dial phones. Compare with tone dialing.

Pulse-width: This pertains to a digital signal. Pulse width refers to the duration of one state between clocking signals. Pulse width roughly corresponds to an analog signal's wavelength.

Q

Queue: A set of activities that are waiting in chronological order for an action, such as printing, to be performed.

R

Rack: A frame or cabinet into which components are mounted. The industry standard rack is 19" wide and has variable depth and height.

Rackmount: A packaging style available for many types of electronic equipment which enables the installer to mount the equipment in an industry standardized enclosure. The rackmount equipment is fitted with brackets, rather than being packaged in its own enclosure. Rackmounting conserves disk or floor space (real estate) and often conserves power outlets.

RAM (Random Access Memory) (pronounced "ram"): A computer's primary workspace. All data must be stored in RAM (even for a short while), before software can use the processor to manipulate the data. Before a PC can do anything useful it must move programs from disk to RAM. When you turn it off, all information in RAM is lost.

RJ-11: An industry standard interface used for connecting a telephone to a modular wall outlet; comes in 4-and 6-wire packages.

RJ-45: An 8-wire modular connector for voice and data circuits.

RJ-48: An 8-wire modular connector for voice and data circuits.

ROM (Read Only Memory) (pronounced "rom"): A memory chip that permanently stores instructions and data. Its contents are created at the time it is manufactured and cannot be altered. ROM is used to store control routines in PCs and peripheral controllers. ROM is also used in the plug-in cartridges for printers and video games. A set of ROM chips contain the basic input/output system (BIOS).

RS232-C: An EIA standard for a serial interface between computers and peripheral devices (modem, mouse, etc.). It uses a 25-pin DB-25, or a 9-pin DB-9 connector. The RS-232 standard defines the purposes, electrical characteristics and timing of the signals for each of the 25 lines.

RTS (Request To Send signal): With communications between modems, an RS232 signal sent from the DTE to the modem requesting permission to transmit. Contrast with CTS.

S

Serial Port: The connector on a PC used to attach serial devices (those that need to receive data one bit after another), such as a mouse, a printer or a modem. This consists of a 9- or 25-pin connector that sends data in sequence (bit by bit). Serial ports are referred to as "COMx" ports, where x is 1 to 4 (i.e., COM1 through COM4). A serial port contains a conversion chip called a "UART" which translates between internal parallel and external serial formats.

Switched Line: In communications, a physical channel established by dynamically connecting one or more discreet segments. This connection lasts for the duration of the call after which each segment may be used as part of a different channel. Contrast with leased line.

Switched Network: A network in which a temporary connection is established from one point via one or more segments.

Synchronous Transmission: The transmission of data which involves sending a group of characters in a packet. This is a common method of transmission between computers on a network or between modems. One or more synchronous characters are transmitted to confirm clocking before each packet of data is transmitted. Compare to Asynchronous Transmission.

T

T1 Transmission: A standard transmission speed of 1.544M bps that may be used in its full bandwidth, or as narrower channels called "fractional T1" carriers.

Terminal: The screen and keyboard device used in a centralized computing environment for interactive data entry. Terminals have no "box", which is to say they have no file storage or processing capabilities.

Terminal emulation: This allows a PC to access a mainframe computer by generating and accepting data like a "dumb" terminal.

Threshold: A value or condition which, when reached, triggers an event.

Toggle: To alternate back and forth between two states.

Tone dialing: One of two methods of dialing a telephone, usually associated with Touch-Tone® (push button) phones. Compare with pulse dialing.

Transistor: A semiconductor device used to amplify a signal, or open and close a circuit. In digital computers, it functions as an electronic switch.

Twisted pair wiring: A type of cabling with one or more pairs of insulated wires wrapped around each other. An inexpensive wiring method used for LAN and telephone applications, also called UTP wiring.

U

UART (Universal Asynchronous Receiver/Transmitter) (pronounced "you art"): A chip that transmits and receives data on the serial port. It converts bytes into serial bits for transmission, and vice versa, and generates and strips the start and stop bits appended to each character.

UTP (unshielded twisted pair): Telephone-type wiring.

V

V.21: The ITU-T modulation standard for 300 bps, full-duplex transmission over dial-up lines.

V.22: The ITU-T modulation standard for 1200 bps, full-duplex transmission over a dial-up or 2-wire leased line. This is not common in North America.

V.22bis: The ITU-T modulation standard for 2400 bps, full-duplex transmission over a dial-up or 2-wire leased line.

V.23: The ITU-T modulation standard for 75/1200 bps, half-duplex transmission over dial-up lines. This is not common in North America.

V.24: The ITU-T hardware interface specification for interchange circuits between the DTE and DCE. Equivalent to the EIA/TIA RS-232 standard.

V.32: The ITU-T modulation standard for 9600 bps, full-duplex transmission over a dial-up or 2-wire leased line.

V.32bis: The ITU-T modulation standard for 14,400 bps, full-duplex transmission over a dial-up or 2-wire leased line.

V.32terbo: The AT&T modulation standard for 19,600 bps, full-duplex transmission over a dial-up or 2-wire leased line.

V.34: The ITU-T modulation standard for 28,800 bps, full-duplex transmission over a dial-up or 2-wire leased line.

V.35: The ITU-T hardware interface specification commonly used by DSU/CSUs and other high-speed devices.

W

WATS (Wide Area Telephone Service) (pronounced "watts"): A discounted long-distance calling plan that allows calls in or out. The popular 800 numbers are WATS lines in. The calls are charged to the holder of the 800 number at a discounted rate.

Workstation: Traditionally a workstation has been a dumb terminal connected to a host. With the advent of LANs and WANs, PCs that are connected to a LAN are now called workstations also, even though they are capable of independent processing. A workstation, then, is simply an input/display device through which a user accesses a resource.

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