

# DataLink<sup>TM</sup> *Express*

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## User's Manual



APPLIED ENGINEERING<sup>®</sup>

A DIVISION OF AE RESEARCH CORPORATION

v1.2

# Applied Engineering

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**DataLink<sup>TM</sup>**  
*Express*

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User's Manual





## **FCC Regulations**

The telephone company may need to know the following information about your modem:

- FCC I.D. Number: EYWDATALINKEXP.
- FCC Registration Number: IDS2LG-60464-MD-E. This assures them that the modem is FCC approved.
- The Manufacturer: Applied Engineering
- And the Model: DataLink Express

## **Federal Communications Commission Radio Frequency Interference Statement**

This equipment has been tested and was found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

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- Use a roof mounted antenna rather than rabbit ears or an antenna mounted in the attic, using 75ohm coaxial cable as a downlead rather than 300ohm twin lead type.
- Reposition the receiver's antenna. Also make sure the antenna wires are making good electrical contact.
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- Plug the equipment into an outlet on a circuit different from that from which the receiver is powered.
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# INTRODUCTION

**MANY** of you are first-time modem users who purchased the DataLink Express 2400 bps modem because of its attractive price, its many features, and/or because of Applied Engineering's good reputation. Whatever the reason, you're in for a treat. It comes with a five year warranty and the Technical Support Bulletin Board number giving you easy access to our support staff.

**ONCE** you've connected DataLink, you've got everything you need to take immediate advantage of it. The manual lists the AT (modem attention) commands and their functions. The included disks have various shareware and freeware communications programs for Apple II, Macintosh, Amiga and IBM/compatible computers along with on-disk documentation for each program to get you online immediately.

**DATALINK** also includes a reference card with an abbreviated list of AT commands for the DataLink firmware. You can place near your keyboard for a quick reminder of what the commands do.

**INSTRUCTIONS** in this manual will help you connect your DataLink quickly. The back of the manual includes a glossary of common modem terms and an index for quick reference.

**MNP** (Microcom Networking Protocol) is an error correcting protocol used by many bulletin board systems and services. If a BBS or service you use has MNP available, you'll want to purchase DataLink's optional MNP board that connects to the DataLink's circuit board. Call Applied Engineering Sales to order.

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Any comments or suggestions regarding this manual or any other *AE* manual, will be greatly appreciated both by *AE* and by others who use our products. Please address any comments or suggestions to:

**Applied Engineering**

P.O. Box 5100

Carrollton, Texas 75011

Attention: Manager, Technical Publications

## *Warning!*

Disconnect the phone line from your modem during electrical storms. Both your DataLink and your computer can sustain serious damage from a surge.

# CHAPTER ONE

## Getting Started

### **The Cable**

You should have either a Mini-8 cable or a DB-25 cable. These cables are available from Applied Engineering (214-241-6060) and from many computer dealers. Apple computers will require the Mini-8 (the same cable required by the ImageWriter). Most other computers will require the DB-25 cable. Apple //c computers require a #590-0554-A cable.

### **MNP Option**

If you have the optional MNP board and it is not already installed, install it now following the directions included with the board.

### **The Phone Line/Call Waiting**

If you plan to spend a lot of time on-line, you may want to consider getting a phone line devoted to modem use.

- ❖ **Important:** Call Waiting is not a viable option since the interrupt caused by an incoming call is likely to break the modem's transmission. If you currently have Call Waiting you can:
  - Cancel Call Waiting.
  - Ask your phone company if they provide a way for you to switch Call Waiting on and off.
  - Add Call Forwarding and have your calls transferred to another line while using the modem. Possibly a friend or neighbor will be willing to take your calls.
  - Use the modem late at night. Chances are, you won't be interrupted. Besides, the long-distance rates are usually cheaper.

## Making The Connections

### 1) Turn off power to your computer and the modem

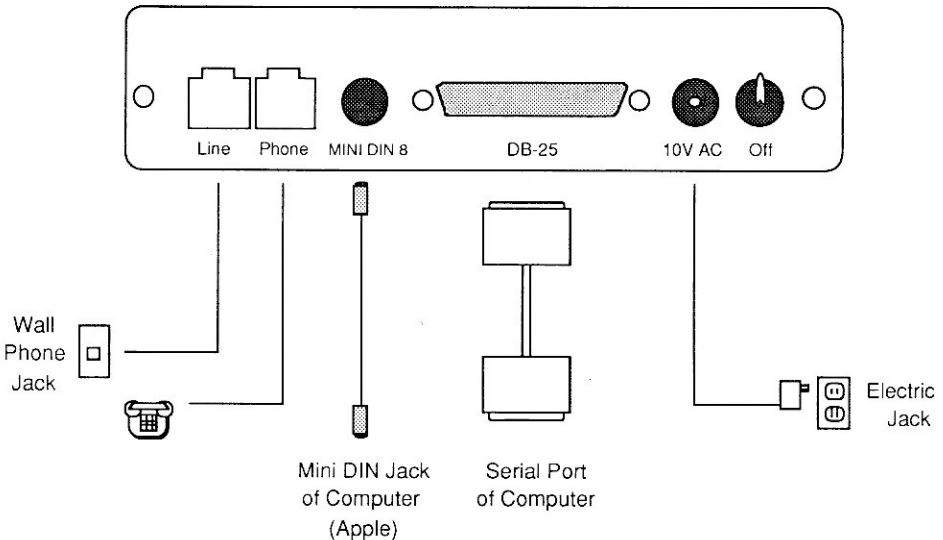
Leave the power off during the installation.

### 2) Find a location

Quite likely, your computer is on the other side of the room from the telephone jack. To remedy this, you may want to move your computer, have another jack installed near your computer, or run a longer phone cord from the phone jack to the computer. You can purchase a longer phone cord from a phone equipment dealer and from many supermarkets.

❖ *Note:* Connecting a phone to DataLink is optional.

DataLink requires a modular jack. If your phone is hard-wired or if you have a four-pronged phone jack, see your phone equipment dealer about adapting them to a modular jack.



### 3) Connect the modem to the computer

Attach one of the male connectors of the cable to the female connector on the back of the DataLink. This will be either the DB-25 connector or the Mini-8 connector. Attach the other end to your computer's serial port.



- ❖ *Note:* If you're using the DB-25 cable, tighten the screws on both ends of the cable.

#### **4) Connect the phone cord**

Plug one end of the phone line into the back of the modem in the left connector (Line) and the other end into the phone wall jack.

- ❖ *Note:* If you want to connect a phone, do so at this time. The phone connects to the right connector (Phone) on DataLink's back panel.

#### **5) Check the connection**

If you have connected a phone, lift the receiver. You should get a dial tone. If you don't, check the connections and listen again.

#### **6) Plug in the power cord**

The power cord plugs into the single prong connector on DataLink's back panel. Plug the other end into a 120 volt wall socket.

#### **7) Set your Serial Card's switches if needed.**

If your program requires particular settings for your serial card's interrupts, baud rate, nulls, etc., set your card accordingly.

**Installation is complete!**

### ***The Lights***

The lights on the front panel keep track of the modem's operation. Turn on the modem (flip the toggle switch in back to the up position) and turn on the computer. You should see at least two lights (MR--Modem Ready and PWR--Power) turn on. The HS--High Speed light and the LE--Line Engaged may also be on.



## DATA LINK EXPRESS™

ERR

MR

OH

HS

TD

LE

MNP

TR

CD

AA

RD

PWR

- ERR** The ERR (Error) light is intended to show errors detected by an MNP-5 protocol adapter board.
- MR** The MR (Modem Ready) indicator is lit when the modem is ready to communicate with the computer.
- OH** The OH (Off Hook) light is illuminated when DataLink is connected to the phone line.
- HS** The HS (High Speed) light is lit when DataLink is operating in 2400 bps mode. In 300 or 1200 bps mode the light is OFF.
- TD** The TD (Transmitting Data) light is used to indicate data transmitted by the computer to the DataLink. The data transmitted includes characters transmitted to the phone line or those sent to the DataLink.
- LE** The LE (Line Engaged) light is on when the DataLink phone line is being used. The only time the phone line is free to use is when the light is OFF. When the DataLink is not connected to a phone line, then this light will also be lit.
- MNP** The MNP (Micron Networking Protocol) light is used to indicate when the optional MNP adapter board is ready to use or is actually using MNP protocol. MNP is an error correcting protocol used by many bulletin boards and services. The option is available from Applied Engineering Sales (214-241-6060).
- TR** The TR (Terminal Ready) indicator is lit when the computer (terminal) is ready to communicate with the DataLink Express.
- CD** The CD (Carrier Detect) light indicates when the DataLink is generating a carrier detect signal. Carrier detect can be on when the DataLink is connected to another modem (using the AT&C1 command) or all the time (using the AT&C0 command).

- AA** The AA (Auto Answer) light is lit only when the DataLink is set to automatically answer the phone line when it rings.
- RD** The RD (Receiving Data) light is on when the computer receives data from DataLink.
- PWR** The PWR (Power) light is on when the power switch is turned ON (in the up position) and the DataLink is receiving power.

### ***What To Do Now***

Put away this manual and run a communications package that is compatible with your system. Use your favorite program or one of the public domain or shareware programs included with the DataLink Express.

- ❖ *Note:* The public domain and shareware programs included with your DataLink are not  $\text{Æ}$  programs. They were included to get you started without having to purchase separate software. However, our technical support representatives will not be able to help you with specifics about their use. If you have any questions concerning these programs, please refer to the authors listed within the programs.

If you decide to use one of the included shareware programs, please pay for the program as instructed.



# CHAPTER TWO

## AT Commands

This chapter describes the AT (Attention) commands for the DataLink Express. A Quick Reference Card is included with the DataLink package with a summary of the commands and their functions.

### **Addressing the Modem**

"AT," short for Attention, should prefix every direct command except Escape (+++) and Repeat Last Command (A/). The DataLink will recognize the AT prefix if both letters are in uppercase or if both letters are in lowercase. Do not, however, mix upper with lowercase.

**Yes** AT or at

**No** At or aT

Follow the AT prefix with the command or commands you want. You may have more than one command per line. For example: **ATDT241-6060** translated means "Attention DataLink, I want you to Tone Dial this number: 241-6060."

- ❖ *Note:* A string of commands can be up to 32 characters long. Any commands after the thirty-second character will be ignored. This will rarely, if ever, present a problem.

You must press the Return key to send the commands to the modem.

### **Command and On-Line State**

When the DataLink is accepting commands from you, it's in the Command State. In the On-Line State, it is talking to another computer. You may shift from the Command to the On-line state without breaking the connection by using the Escape (+++) and On-Line (O) commands described later in this section.

### **Deleting Commands**

Once you type the AT prefix, it cannot be deleted. However, you can use backspace to delete the other commands on the line before you press Return. If you decide that you don't want to address the DataLink, simply hit Return at the AT prompt. The card will respond with "OK".

## List of AT Commands

- ❖ *Note:* Those commands followed by "(factory)" are the factory default settings. When you reset the modem using the &F0 command, the factory settings are active. A list of the factory settings, follows the &F description.

<b>A</b>	<b>Manual answer</b>
<b>A /</b>	<b>Repeat last command (no carriage return required)</b>
<b>AT</b>	<b>Attention—required prefix for all commands except "+++" and "A/"</b>
<b>B</b>	<b>Bell/CCITT @ 1200 bps</b>
<b>D</b>	<b>Dial number following. Can include the following commands:</b> ex: ATDT (999) 999-9999 -- means dial the following number using touch tone <ul style="list-style-type: none"><li><b>L</b> Redial last number (w/ MNP-5 option only)</li><li><b>P</b> Pulse dial (factory)</li><li><b>R</b> Reverse to answer mode after dialing</li><li><b>S=x</b> Dial stored number (x= 0 {factory}, 1, 2, or 3) (see &amp;Zx=s)</li><li><b>T</b> Touch tone dial</li><li><b>W</b> Wait for dial tone before dialing</li><li><b>@</b> Wait for quiet before dialing</li><li><b>,</b> Pause during dial</li><li><b>!</b> Flash</li><li><b>;</b> Return to command mode after dial</li></ul>
<b>D/n</b>	<b>Dial stored number. Similar to DS=n</b>
<b>E0</b>	<b>No Echo in command state</b>
<b>E1</b>	<b>Echo in command state (factory)</b>
<b>H0</b>	<b>Hang up (factory)</b>
<b>H1</b>	<b>Pick up line</b>
<b>In</b>	<b>(n=0-4) Interrogate chip for product code, ROM checksum, or manufacturer's ID</b>
<b>L0/L1</b>	<b>Volume Lo</b>
<b>L2</b>	<b>Volume Medium (factory)</b>
<b>L3</b>	<b>Volume High</b>
<b>M0</b>	<b>Monitor speaker always OFF</b>
<b>M1</b>	<b>Monitor speaker ON until carrier detected (factory)</b>
<b>M2</b>	<b>Monitor speaker always ON</b>

O	On-line state from command state
Q0	Result codes sent (factory)
Q1	No result codes sent (Quiet)
Sr=n	Set S register r to values n (r=0-27, n=0-255)
Sr?	Read S register r (r=0-27)
V0	Non-verbal (numeric) result codes
V1	Verbal result codes (factory)
Xn	Enable extended result code (n=0-4 factory).
Y0	Long space disconnect enabled (factory)
Y1	Long space disconnect disabled
Z0	Resets the DL with configuration 0
Z1	Resets the DL with configuration 1
+++	Escape code (default value). Pause one second before and after
&C0	Data Carrier Detect always on (factory)
&C1	Data Carrier Detect on after detect
&Dn	Data Terminal Ready (n=0 [factory], 1, 2, or 3)
&F0	Restore Hayes factory settings
&F1	Restore Microcom factory settings (MNP)
&F2	Auto-reliable configuration (MNP)
&G0	Guard tone off (factory)
&G1	550 Hz guard tone
&G1	1800 Hz guard tone
&P0	Pulse Dial mode US
&P1	Pulse Dial mode UK
&R0	Disable RTS-CTS (factory)
&R1	Enable RTS-CTS
&S0	DSR Override On (factory)
&S1	DSR Override Normal
&Tn	Test Mode (first set test time with S18=n)
	0 Terminate Test
	1 Local Analog Loopback Test L3
	3 Local Digital Loopback Test
	4 Grant Remote Digital Loopback Test
	5 Deny Remote Digital Loopback Test
	6 Remote Digital Loopback Test L2
	7 Remote Digital Loopback Test w/Self Test

## 8 Local Analog Loopback Test w/Self Test

**&V** View Profile (shows configurations)

**&Wn** Write Current Config to Non-Volatile Memory (n=0 or 1)

**&Yn** Default Configuration Profile (n=0 [factory] or 1)

**&Zx=s** Store to position "x" phone # "s"

### Definitions of Commands

#### **A/**

#### **Repeating the last command**

A/ will repeat the last command entered. It is particularly useful for redialing numbers. The A/ command does not need the AT prefix nor does it need a carriage return. A/ is a solo command; you cannot use any other command on the same line.

#### **A**

#### **Manual Answer**

The Command "A" allows you to manually tell the computer to answer the phone. Using this command overrides the Number of Rings Before Answering setting and the Answer Off setting.

This command could be used to switch between talking to a person and talking to their computer. Whoever called initially will type the ATD command and press Return. The other person types the ATA command and presses Return. If a connection is made, DataLink should respond with "CONNECT." If no connection is made, the DataLink will hang up, send a NO CONNECT result, and return to the Command Mode.

#### **B**

#### **Bell/CCITT Answer**

DataLink supports both Bell and CCITT standards. At 2400 bps, CCITT is selected. At 300 or 1200 bps, either standard can be chosen.

**B0**--CCITT v.22 standard at 300 or 1200 bps.

**B1**--Bell 212A standard at 300 or 1200 bps (factory).



## D *Dial*

The "D" command tells the DataLink to dial a number. The D command should be followed by the number you want to dial. Ex: **AT D 241-6060**. (The spaces and hyphen are included for legibility. They do not affect the numbers dialed.) The characters which can be used for dialing are **0-9, A, B, C, D, #, and \***.

Other commands which directly affect the dial command:

- P** Pulse dial
- R** Reverse to answer mode after dialing
- S=x** Dial stored number 0 (factory) -3 (see &Zx=s)
- T** Touch tone dial
- W** Wait for dial tone before dialing
- @** Wait for quiet before dialing
- ,** Pause during dial
- !** Flash
- ;** Return to command mode after dial

## E *Echo*

"E" controls whether or not the data you type in while in the command mode will appear on the screen.

**E0**--turns Echo off; the data you enter won't appear on the screen.

**E or E1**--turn Echo on; data does appear on the screen (factory).

## H *Hang Up*

"H" is the command that controls picking up the line and disconnecting.

**H or H0**--disconnects modem from phone line.

**H1**--connects modem to phone line.

## I *Interrogate*

"I" accesses the DL chip and tests the ROM or reads its product code or manufacturer's number. This code may be required by some communications software when looking for a Hayes-compatible command from your DataLink.

**I or I0**--displays product code. The product code will appear as a three digit product code either to the screen or to the program that requires it. The first two digits are the product code. The last digit is the revision number.

**I1**--adds up all the ROM's bytes (checksum) and displays the result. The correct checksum is 000. If your result is different, a bit may have been destroyed.

**I2**--another checksum test that adds up the ROM's bytes and compares that number with the correct number stored in its own memory.

**I3**--the DL-M chip manufacturer's ID.

**I4**--Applied Engineering's DataLink ID.

## L

### *Volume Control*

The DataLink volume is controlled with the L command as follows:

**L0 or L1**--Low volume.

**L2**--Medium volume (factory).

**L3**--High volume.

## M

### *Audio Monitor*

The "M" command turns the speaker on or off.

**M0**--turns the speaker off.

**M or M1**--turns the speaker on until a carrier is detected. When a carrier is detected, the DL sends the message CONNECT to the screen and shuts off the speaker (factory).

**M2**--turns the speaker on. This will allow you to monitor the call after the CONNECT message is sent.

**M3**--turns the speaker on after dialing until carrier detected. With this setting, you can monitor the connect procedure of the DataLink.

## O

### *On-Line*

The "O" command tells the DataLink to go back on-line from the command state. This is useful for switching from verbal communication to data communication.

**O or O0**--(factory) returns DL to on-line state.

**O1**--returns DL to on-line state and sends a retrain sequence.

## P

### *Pulse Dial*

"P" informs the DataLink to pulse dial. If you enter ATP followed by a carriage return, the DL will continue to pulse dial until further notice. You may switch between pulse and tone dialing in the middle of a dial command by entering the P and T commands within the numbers you are dialing. Ex:

```
AT DT 1 (214) P 844-6611
```

## Q

### Quiet

The "Q" command determines whether or not the DataLink will send the result codes.

**Q or Q0**--(factory) tells DataLink to send the result codes. (See the Result Code Table following the ATV command description.)

**Q1**--"quiets" the result codes.

## R

### Reverse Mode

"R" instructs the DL to go back to the answer mode after the telephone number is dialed. You may want to use this when calling an originate only modem. Put the "R" at the end of the telephone number.

## S=x

### Dial Stored Number

Used in conjunction with the dial command, "D," the S=x command will dial one of the numbers stored in position 0 (factory) -3. These are the numbers written to non-volatile memory with the **&Zx=s** command.

For example, to dial a number stored in position 2, you would enter **ATDS=2**.

- ❖ *Note:* The other dial commands (eg: P, T, W, etc.) must be placed within the saved string; you can't, for example, use the command **ATDTS=2**. This command would result in the number stored at S0, not S2, to be dialed using tone dialing.

## Sr?

### Read S Register

"Sr?" tells the DL to read the content of S register 0-27 where "r" is equal to the register number. The content of the S register called upon is sent to the computer or terminal as a decimal number ranging from 0-255. Register reading is described in detail in the following chapter.

## Sr=n

### Set Register

"Sr=n" tells DataLink to set the register (r) to a particular value (n). The value of the register (n) can range from 0-255. Refer to the "Register Settings" chapter.

# T

## Touch Tones

"T" instructs DataLink to use touch tones to dial phone numbers. Touch tones are required to use many long distance services. If you enter "ATT" followed by a carriage return, all phone numbers following (preceded by the ATD command) will be touch tone until further notice.

- ❖ *Reminder:* You can use touch tones and pulse tones within the same dial command.

# V

## Verbal/Non-Verbal

The "V" command informs the computer whether you want the result codes to be sent as words or as single numbers.

**V or V0--** result codes sent as numbers (non-verbal).

**V1--(factory)** result codes sent as words (verbal).

## Result Codes

When you send a command to the DL, it will answer with a result code unless told not to (**ATQ**). The result Code can be enabled or disabled, and it may appear as a word (**ATVI**) or a single digit (**ATV0**).

When enabled, the possible responses follow:

<b>Digit Code</b>	<b>Word Code</b>	<b>Description</b>
0	<b>OK</b>	The command line was executed without error.
1	<b>CONNECT</b>	Carrier detected at 300 baud.
2	<b>RING</b>	Ringing signal detected on phone line.
3	<b>NO CARRIER</b>	Carrier has been lost or was never found.
4	<b>ERROR</b>	The command line was not executed due to incorrect input. This could be the result of commands that the DataLink does not recognize or of too many characters (>32).
5	<b>CONNECT 1200</b>	A carrier has been detected at 1200 baud.
6	<b>NO DIALTONE</b>	No dial tone could be found.
7	<b>BUSY</b>	A busy signal was detected.
8	<b>NO ANSWER</b>	No silence detected with @ in dial.
10	<b>CONNECT 2400</b>	Carrier detected at 2400 baud.

## **X**

### **Enable Extended Result Code**

The ATX command allows the DataLink to display different combinations of the result codes as follows:

**X0**--Enable features of result codes 0-4

**X1**--Enable features of result codes 0-5, 10

**X2**--Enable features of result codes 0-6, 10

**X3**--Enable features of result codes 0-5, 7, 10

**X4**--Enable features of result codes 0-7, 10

- ❖ *Note:* If you want the modem to dial without waiting for a dialtone (called, "blind dialing"), you need to use the ATX1 setting.

## **Y**

### **Long Space Disconnect**

With Long Space Disconnect enabled, the DataLink will disconnect if it receives no signals from the host computer for 1.6 seconds or longer.

**Y0**--Enabled; will disconnect (factory).

**Y1**--Disabled; won't disconnect.

## **Z**

### **Reset DataLink with Stored Profile**

This command will reset the DL and then use the 0 or 1 configuration profile. The profiles are written to non-volatile memory with the &W command.

- ❖ *Note:* See the &W command for information about writing the configuration profile. See the &V command for viewing the profiles. See &Y for setting the default profile.

**Z** or **Z0**--resets the DL and uses configuration profile 0.

**Z1**--resets the DL and uses configuration 1.

## **, (comma)**

### **Pause**

The "," makes the DataLink pause during dialing. Use this to wait for a second dial tone when placing a call through a PBX. Use more commas to increase the pause time. Register S8 controls the length of the pause.

## **! (exclamation point)**

### **Flash**

Causes the DataLink to hangup for 1/2 second and then reconnect. Useful for PBX transfer call.

## **;** (semicolon)

### **Return to Command State After Dialing**

The ";" forces the DataLink to go back into the command state from the on-line state after dialing a number. The ";" command should be entered after the number to be dialed. It will not disconnect the link.

## **+++**

### **Return to Command State**

"+++" makes the DataLink return to the command state from the online state. The command does not use the AT prefix nor does it require a carriage return. However, the command must be preceded and followed by a one second pause. The pauses prevent "+++" from being excluded as transmittable data.

## **&C**

### **Data Carrier Detect**

**&C0**--DCD always on and the state of the data carrier from the remote modem is ignored.

**&C1**--(factory) DCD tracks data carrier from the remote modem; DCD is on when data carrier is detected.

## **&D**

### **Data Terminal Ready**

**&D0**--(factory) DataLink ignores DTR.

**&D1**--DataLink enters the command state when DTR goes from on to off.

**&D2**--DataLink hangs up, enters command state, and disables auto-answer when DTR makes an on-to-off transition. (Many programs use this method to hangup the phone.)

**&D3**--Modem resets to the default profile (see **&Y**) and enters command state when DTR makes on-to-off transition.

## **&F**

### **Restore Factory Settings**

Entering this command resets the DataLink to one of three ROM settings. Any settings you have altered are returned to the factory setting you choose.

**&F0**--Restore Hayes factory settings

**&F1**--Restore Microcom factory settings (MNP)

**&F2**--Restore Sierra factory settings (MNP)

**Hayes Registers** -- &F0.

❖ *Note:* &F1 and &F2 affect MNP settings only. Refer to the MNP section for default register settings S36-S41.

S0	0	disable auto-answer
S1	0	Ring count
S2	43	Escape code character '+'
S3	13	Carriage return
S4	10	Line feed
S5	8	Backspace
S6	2	Wait for dial tone
S7	30	Wait for character
S8	2	Pause for ';' dial
S9	6	Carrier detect response time
S10	14	Lost carrier to hang-up delay
S11	75	DTMF time (not Hayes)
S12	50	Escape code guard time
S14	0AAH	E1, Q0, V1, no dumb, Pulse dial, Originate
S16	80H	Enable auto-retrain
S18	0	Test timer
S21	00H	&R0, &D0, &C0, &S0, Y0
S22	76H	L2, M1, X4, &P0
S23	7	2400 bps, Even, &G0
S25	5	Delay to DTR
S26	1	RTS/CTS Delay
S27	40H	&M0, &L0, &X0, B1
S28-35		<i>Reserved</i>
S36-41		<i>See the MNP section</i>

## &G

### **Guard Tone Value**

Guard tones are not required in the United States. However, you can set them with the &G command.

**&G0**--(factory) Guard Tone Off.

**&G1**--550 Hz guard tone.

**&G2**--1800 Hz guard tone.

## &P

### **Pulse Dial Ratio**

This setting is used to determine the off-hook to on-hook interval used with pulse dialing.

**&P0**--(factory) The common setting in the US. Gives a ratio of 39/61.

**&P1**--Common setting for UK. Gives a ratio of 33/67.

## **&R** **RTS/CTS**

(Request To Send/Clear To Send) Clear To Send means that the DataLink is ready to receive data from your computer (the host) to send to over the telephone line.

**&R0**--Disable RTS-CTS (factory).

**&R1**--Enable RTS-CTS.

## **&S** **DSR Override**

(Data Set Ready) DSR means that the DataLink is connected to the host or another computer and is ready to communicate.

**&S0**--DSR always on (factory).

**&S1**--on when the DataLink is connected to a communication channel and is ready.

## **&T** **Test Mode**

Several things may be responsible for a bad connection. It could be the modem you are connected to, the line in between your DL and the other modem, how the DataLink is installed, or the DataLink itself. The following tests will help you pin-point the problem.

- 1) Before running any of the following tests, you'll want to check the connections to your DL. Make sure the DL is properly installed and the lines are attached to the proper connectors.
  - 2) Get into the terminal mode.
  - 3) Use the AT&F command to return the DataLink to its original (factory) settings.
  - 4) Set the time length of the test with the S18 register. (The default is 0 seconds.) AT S18=20 will give you a test time of 20 seconds.
  - 5) &T1 and &T8 will work only if &M0 and \N0 or \N1 are selected.
  - 6) Run the &T8 test first and then use the other tests, &T1, &T3, &T6, &T7, &T8, to test the DL even further. Refer to the descriptions below to check the results of each test.
- ❖ *Note:* To run the tests labeled "Remote," your DataLink must be connected to another modem.

**&T0**--Terminate test

This command lets you end the test before the set time to terminate (S18) is reached.

**&T1**--Local Analog Loopback Test

This test will check the operation of the DataLink's connection to your .computer.



**&T3--Local Digital Loopback Test**

This test will check the operation of the phone circuit and the remote modem. Start the test by establishing a connection with a remote modem. Enter the &T3 command from the command state. The user of the remote modem will then need to type in a few lines. If the remote user reports that the lines typed were returned as entered, the phone lines and remote modem are working properly.

**&T4--Grant Remote Digital Loopback Test (factory)** This command tells the DataLink to accept the request from a remote modem for the remote digital loopback test.

**&T5--Deny Remote Digital Loopback Test**

This command tells DataLink to refuse the request from a remote modem for a remote digital loopback test.

**&T6--Remote Digital Loopback Test**

Checks the operation of the DataLink and the remote modem, the connection of the DataLink to your computer, and the telephone circuit. To run this test, establish a connection to another modem, enter the command state, and enter AT&T6. Type something into the keyboard. What you type will be sent to the remote modem (without displaying on the remote screen) and then echoed back to you.

If what you receive is what you sent, all is operating properly. If not, run the various other tests to help isolate the problem.

- ❖ *Note:* If the remote modem is not Hayes compatible or is set to &T5, you will not be able to run this test.

**&T7--Remote Digital Loopback Test w/Self Test**

Same as &T6 with the addition of the self-test; ie: you don't have to type in characters to be echoed back. At the end of the this test, a three digit code will be displayed. 000 = no errors; all aspects of the connection are functioning as they should. 021 = 21 errors. If you receive errors, run the other tests to help isolate the problem.

- ❖ *Note:* If the remote modem is not Hayes compatible or is set to &T5, you will not be able to run this test.

**&T8--Local Analog Loopback Test w/self test**

This command tests the DataLink's transmit and receive circuits. At the end of the test, a three digit code will be displayed representing the number of errors encountered. 000 = no errors. 015 = 15 errors.

**&V****View Profile**

Use this command on a line by itself.

The View Profile command will display the current DataLink settings as well as the two stored user profiles (see **&W**) and stored telephone numbers (see **&Z**).

## **&W**

### **Write Current Configuration**

When you have the DataLink configured as you want it, you can save the settings to non-volatile memory so the next time you turn on the DataLink, your preferred setting will already be loaded for you.

The DataLink allows you to store two different configurations.

**&W or &W0**--writes the storable settings to non-volatile memory in the first of 2 positions. When you turn on the DataLink, it will use the "0" configuration until told to do otherwise using the AT&Y command.

**&W1**--Writes the storable settings to the second position.

The storable settings include:

`\A %A B \C &C \D &D E \E %E \G &G \I \J \K \L &L M &M \N P  
&P Q \Q \R &R T \T &T4 &T5 V \V X \X S0 S18 S25 S26`

Note that if the DataLink speed is 110 bps, a speed of 300 bps is saved.

## **&Y**

### **Default Configuration Profile**

This command lets you set the configuration profile (written with the **&W** command) that the DataLink will use at startup.

**&Y or &Y0**--DataLink will use configuration profile 0 at startup (default).

**&Y1**--DataLink will use configuration 1 at startup.

## **&Zx=s**

### **Store Phone Number**

DataLink can hold up to four telephone numbers (locations 0 through 3) in non-volatile memory. This means that the numbers you enter using this command will still be in memory when you turn your computer on the next time. Each phone number can be up to 36 characters.

"x" is equal to the position (0, 1, 2, or 3) to which you want to store the number. "s" is equal to the phone number itself.

For example, `&Z2=5551234` would store the phone number, 555-1234, in the third position (2).

Add any dial commands, such as T, P, W, etc., into this saved string.

- ❖ *Note:* The `&Zx=s` command is the same as the `\Pn` command. Numbers entered with the `\Pn` command and the `&Zn=s` use the same space so any numbers you enter with one command will replace the numbers in the same position (0-3) you've entered with the other command.

# CHAPTER THREE

## MNP-5

This chapter describes what MNP is and details the AT commands available with MNP-5. If you have not purchased the MNP-5 option for the DataLink Express, you may want to read about what you're missing.

### **About MNP-5**

MNP stands for Microcom Networking Protocol. MNP-5 is an error checking and error correcting protocol with data compression. When supported by your modem and the system you're calling, it provides accelerated, error-free communication. Errors are detected by cyclic redundancy checks. Error correction involves automatic retransmission of incorrect data. Data compression involves translating data into a more efficient form so that there is less to send.

- ❖ *Note:* If you have problems connecting with a remote computer, the remote system may not support MNP and time out while the DataLink Express is checking for MNP compatibility. Try turning off the MNP option using the \N1 command. (While in command mode, enter **AT\N1** to toggle MNP off, **AT\N3** to turn MNP auto-reliable mode on.)

Although it would seem that error detection/correction and compression would slow down the transmission rate, transmission is actually accelerated by means of synchronous framing techniques, optimized data phase, and adaptive packet assembly.

- ☛ "Synchronous Framing" means that the start/stop bits for each character are removed before transmittal. This results in a 20% increase in throughput speed. Class 3 uses synchronous framing.
- ☛ "Optimized Data Phase" is a protocol header that uses less bytes per data packet than other protocol headers.
- ☛ "Adaptive Packet Assembly" readjusts the amount of data per packet according to the quality of the connection. The packet size is increased when there is a good connection with fewer resends and the packet size is decreased when the line is bad and resends are more frequent.

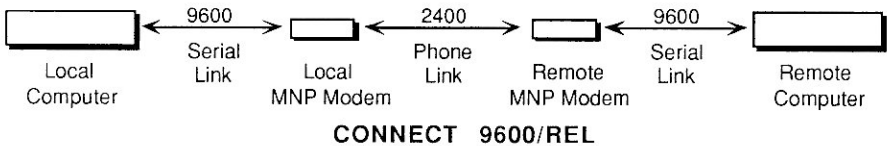
If the system to which you are connected supports MNP-2, MNP-3, or MNP-4, but not MNP-5, the MNP-5 option will shift down to the highest available protocol.

- ❑ MNP-2 is for asynchronous connections. It uses standard asynchronous framing techniques. While the data will be transmitted error-free, the throughput rate will be slower due to the protocol's overhead.
- ❑ MNP-3 is for synchronous connections and uses the synchronous framing technique described earlier. MNP-3 will show about a 20% increase in throughput speed making the effective rate of the DL-X about 2600 bps.
- ❑ MNP-4 is for synchronous connections and uses the Synchronous Framing technique as well as the Optimized Data Phase and Adaptive Packet Assembly techniques described earlier. With MNP-4 active, the throughput speed of the DataLink Express can increase from 2400 bps to 2850 bps.
- ❑ MNP-5 is for synchronous connections and adds Data Compression to MNP-4's Synchronous Framing, Optimized Data Phase and Adaptive Packet Assembly techniques. Data Compression increases the effective throughput speed from 3000 to 4800 bps. The actual speed depends upon how much the information you are sending can be compressed.

### Flow Control

Your computer can send data to the DataLink at 9600 baud which is faster than the DataLink Express (2400) can send it out the phone line. However, MNP-5 compresses the data and uses an 8K hardware buffer to store the data until it can send it. When this buffer is full, the DL-X sends a CTS command to temporarily stop data coming from the computer. When the modem is ready to receive again, it changes the CTS. This technique ensures that no data is lost while maximizing transfer efficiency.

Setting the computer baud rate to 9600 with DL-X's MNP flow control active (**\Q2**) has an overall effect of accelerating the transmission rate. When the computer baud rate is 9600 with MNP-5 active, you'll get a "CONNECT 9600/REL" message when connected with an MNP remote computer. The telephone link is at 2400 bps with MNP-5 and the host link is at 9600.



# Attention!

## Return Merchandise Sheet

(Remove from Manual and Save)

In order to obtain the maximum benefits from your investment, please read your user manual first to fully understand your product's capabilities. If you feel you still need technical assistance or suspect you have a defective product, please contact the dealer from whom you purchased the card. If you are experiencing difficulties with one particular program, contact the program's author or publisher.

In the event that the dealer or the software publisher's support personnel cannot answer your question, call Applied Engineering Technical Support. Please provide Technical Support with the following information:

- ◇ The Applied Engineering product related to your question and its revision number
- ◇ The original and current memory configuration of the card (if applicable)
- ◇ The model and revision of your computer
- ◇ What peripherals are being used and what cards are in each slot
- ◇ The name, version, and revision level of the software with which you are experiencing problems
- ◇ The results of any test programs, diagnostics, or troubleshooting done by you, your dealer, or your software publisher's support department

If an AE technician determines that the product needs to be returned, you will receive a Return Material Authorization (RMA) number. Once the RMA# has been issued, please complete the form on the back of this page and send it along with the defective product and a copy of your original invoice to:

**RMA# \_\_\_\_\_**  
**Applied Engineering**  
**Technical Support**  
**3210 Belt Line Road, Suite 154**  
**Dallas, TX 75234**

The returned product may be subject to a service charge if:

- 1) it is sent to technical support without an invoice,
- 2) our test results show that the product is not defective,
- 3) the product is not in its original AE memory configuration.

**Applied Engineering**  
**Technical Support**  
**Voice Lines-**

**Mac/Amiga (214) 241-6084**

**Apple II (214) 241-6069**

9 AM to 12:30 PM & 1:35 PM to 5 PM(CST) Monday through Friday

**Bulletin Board System - (214) 241-6677**

300/1200/2400 baud 8 Bit, No Parity, Full Duplex, MNP-5

24 Hours, 7 Days a Week

# Return Form

Return Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Daytime Phone:

\_\_\_\_\_

RMA# \_\_\_\_\_  
Applied Engineering  
Technical Support  
3210 Belt Line Road, Suite 154  
Dallas, TX 75234

↑ cut out and tape or glue to package

## Computer Model

- Amiga \_\_\_\_\_
- Apple II \_\_\_\_\_ IIGS ROM # \_\_\_\_\_
- Macintosh \_\_\_\_\_
- Other \_\_\_\_\_

## Peripherals:

- Monitor \_\_\_\_\_
- Printer \_\_\_\_\_
- Modem \_\_\_\_\_
- Cards & Slot Positions

\_\_\_\_\_  
\_\_\_\_\_

## Symptoms:

\_\_\_\_\_  
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## Description of Software (system, application, version, enhancements, etc.):

\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Steps to Duplicate Problem:(IIGS users include slot settings)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Applied Engineering Product Registration Card

Applied Engineering congratulates you on your purchase of one of our enhancement products. With proper installation and care, your AE enhancement product will provide you with years of trouble-free operation.

So that we may handle your product for any service needs or upgrade offers, please:

- 1) Complete this side of your Registration Card.
- 2) Attach your invoice or bill of sale to the upper portion.
- 3) Keep the top portion for your records.
- 4) Return the bottom portion to Applied Engineering. (Requires postcard stamp.)

AE Product \_\_\_\_\_


Serial Number (if applicable) \_\_\_\_\_ Date of Purchase \_\_\_\_\_

Dealer's Name and Address \_\_\_\_\_

Applied Engineering  
P.O. Box 5100  
Carrollton, TX 75011

**Sales** - (214) 241-6060

**Tech Support** - Voice - Mac/Amiga (214) 241-6084 / Apple II (214) 241-6069  
BBS (214) 241-6677

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# Applied Engineering Product Registration Card

To our valued customer-  
Please complete and mail as soon as possible.

AE Product Name \_\_\_\_\_

Serial Number (if applicable) \_\_\_\_\_ Date of Purchase \_\_\_\_\_

Your Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Zip \_\_\_\_\_ Telephone: Home ( ) \_\_\_\_\_ - \_\_\_\_\_ Business ( ) \_\_\_\_\_ - \_\_\_\_\_

Computer Model \_\_\_\_\_ Other Computers \_\_\_\_\_

Purchased From \_\_\_\_\_

Address \_\_\_\_\_

**Important:** Proof of purchase is required when requesting service under warranty.  
See the warranty procedure for additional information.

## Applied Engineering Limited Warranty

Your new Applied Engineering enhancement product is warranted to the original retail purchaser only. The warranty on your product is detailed in your User's Manual Warranty and Disclaimer page.

### Warranty Procedure


Your Product Registration Card should be filled out and mailed to Applied Engineering as soon as possible after the original purchase date. Keep the owner's portion together with your invoice or Bill of Sale for Warranty service (also applies to upgrade offers).

Should you experience a problem requiring technical assistance, please contact our Technical Service Department. See the included Return Merchandise Sheet for more information about the returns procedure.

In the event that warranty service is required, send your product together with your invoice or Bill of Sale (legible photocopy acceptable) along with your completed return form.

**Important:** To avoid a handling charge, your invoice or Bill of Sale must accompany any product returned for warranty service. Out-of-warranty repair will be subject to a handling charge and/or a service charge.

Ship your equipment in its original carton or equivalent, fully insured and prepaid. Please include (on the return form) a complete description of the equipment used and the problems experienced. If you do not have a return form, provide a complete description of your equipment (computer model, installed peripherals, etc.) and the problems (including software used when problem encountered) in a letter to be shipped with the returned product.

Detach Here 

Attach  
Stamp  
Here

**Applied Engineering**  
**P.O. Box 5100**  
**Carrollton, TX 75011**



## **MNP AT Commands**

The following list of MNP AT commands are functional once the MNP-5 board is installed. The **&F2** command returns the MNP settings to the auto-reliable default settings. (Refer to the **&F** command description for a list of the default settings.)

<b>%An</b>	<b>Set auto-reliable fallback character</b>
<b>%C0</b>	<b>Disable MNP-5</b>
<b>%C1</b>	<b>Enable MNP-5</b>
<b>%R</b>	<b>Display S Registers</b>
<b>%V</b>	<b>Display firmware version number (same as I3)</b>
<b>&amp;F1</b>	<b>Restore Microcom factory settings</b>
<b>&amp;F2</b>	<b>Auto-reliable configuration</b>
<b>\A0</b>	<b>64 characters max MNP block</b>
<b>\A1</b>	<b>128 character max MNP block</b>
<b>\A2</b>	<b>192 characters max MNP block</b>
<b>\A3</b>	<b>256 characters max MNP block</b>
<b>\Bn</b>	<b>Duration of Break Signal (n x 100 msec)</b>
<b>\C0</b>	<b>Data not buffered</b>
<b>\C1</b>	<b>Data buffered</b>
<b>\C2</b>	<b>Data not buffered. %An char. sets to normal mode</b>
<b>\E0</b>	<b>Echo data in normal mode</b>
<b>\E1</b>	<b>Don't echo data in normal mode</b>
<b>\F</b>	<b>Read stored numbers</b>
<b>\G0</b>	<b>No flow control.</b>
<b>\G1</b>	<b>XON/XOFF flow control\Jn</b>
<b>\J0</b>	<b>Interface Speed Adjust</b>
<b>\J1</b>	<b>Change serial port speed to bps rate</b>
<b>\K0</b>	<b>Break signal from computer is ignored.</b>
<b>\K1</b>	<b>Buffer is emptied and Break signal is sent to remote DTE.</b>
<b>\K2</b>	<b>Send Break signal to remote DTE before transmitting data.</b>
<b>\K3</b>	<b>Send Break signal to remote DTE after transmitting data.</b>
<b>\N0</b>	<b>Normal mode (non MNP, buffered)</b>
<b>\N1</b>	<b>Direct mode (non MNP, non buffered)</b>
<b>\N2</b>	<b>Reliable mode (MNP)</b>
<b>\N3</b>	<b>Auto-reliable mode (MNP if possible, otherwise, normal)</b>
<b>\Pn</b>	<b>Store phone number</b>
<b>\Q0</b>	<b>Disable flow control.</b>

\Q1 XON/XOFF bidirectional flow control  
\Q2 CTS unidirectional flow control  
\Q3 CTS/RTS bidirectional flow control  
\S Read DL status  
\T0 Disable the inactivity timer.  
\Tn n= number of minutes (limit 90).  
\V0 Use standard Hayes result codes.  
\V1 Use Microcom connect messages, in normal or MNP context.  
\X0 If XON/XOFF disabled, characters passed through  
\X1 XON/XOFF characters always passed through  
\Y Switch to reliable while connected  
\Z Switch To Normal  
D/n , Dial stored number "n"  
DL Dial last number

## **Definitions of MNP Commands**

### **%An**

#### **Auto-Reliable Fallback Character**

The %An command lets you choose which character MNP will recognize as the fallback character when in answer mode and when option \C2 (data not buffered) is selected.

### **%Cn**

#### **Enable/Disable Class 5**

Use this command to turn MNP-5 on and off. MNP 2, 3, and 4 will still be active.

**%C0**--Disable MNP-5

**%C1**--Enable MNP-5

### **%R**

#### **Display S Registers**

This command displays registers S0 to S41 in hex and decimal format. "0" denotes a non-existent register (S17 for example).

*Sample:*

REG	DEC	HEX	REG	DEC	HEX	REG	DEC	HEX	REG	HEX	DEC
S00	000	00H	S01	000	00H	S02	043	2BH	S03	013	0DH
S04	010	0AH	...								

### **%V**

#### **Display Firmware Version Number**

This command is the same as the **ATI3** command. It displays the firmware version number.

### **&Fn**

#### **Restore Factory Settings**

**&F0**--Restore Hayes Factory Settings

**&F1**--Restore Microcom Factory Settings

**&F2**--Auto-reliable configuration

- ❖ *Note:* &F1 and &F2 do not affect register settings S0 through S35. For a list of the Hayes factory settings, refer to the &F command in Ch. 2.

#### **Hayes MNP Registers -- F0 (MNP off)**

S36	01H	\N1 (direct mode connection)
S37	00H	N/A
S38	00H	\J0 (restore DTE speed), \V0 (Hayes results)
S39	00H	N/A
S40	00H	N/A
S41	00H	N/A

### **Microcom MNP Registers -- F1**

S36	01H	\N1, \G0, \X0, \Q0
S37	00H	%A0
S38	24H	\C0, \J1, \E0, \V0, \R1, \I0
S39	00H	\T0
S40	A3H	\A3, \L0, \D0, \K5
S41	01H	%C1, &C0 (if MNP EQU 1)
	00H	%C0, &C0 (if MNP EQU 0)

### **Auto-reliable MNP Registers**

S36	47H	\N3, \G1, \X0, \Q1
S37	0DH	%A13
S38	32H	\C2, \J0, \E0, \V1, \R1, \I0
S39	00H	\T0
S40	A3H	\A3, \L0, \D0, \K5
S41	01H	%C1, &C0 (if MNP EQU 1)
	00H	%C0, &C0 (if MNP EQU 0)

## **\An**

### **Maximum MNP Block Size**

This command limits the maximum allowable block size. The block size limit can be set to any of 4 settings in 64 character increments.

\A0--64 characters max/block

\A1--128 character max/block

\A2--192 characters max/block

\A3--256 characters max/block

## **\Bn**

### **Send Break Signal**

\Bn sends a break signal to the remote modem. "n" determines the duration of the break signal in 100 msec increments. (AT\b4 sends a 400 msec break.)

## **\Cn**

### **Auto-Reliable Buffer**

A connection may take a while to establish if the remote modem doesn't support MNP or if the line is extremely noisy. Set the DL to buffer or ignore data sent from the remote modem while it is trying to establish a reliable connection. The DataLink will try to make a reliable connection for 4 seconds before activating the \Cn command.

For the \Cn command to be in effect, the following conditions must be met:

- 1) The DataLink must be in ANSWER mode.
- 2) &M0 (async mode) must be selected.

- 3) &N3 (auto-reliable) must be selected.

**\C0**--Data is not buffered. If the remote modem is a not an MNP modem, data sent during the 4 second wait period is lost.

**\C1**--Data buffered. If 200 characters buffered, switch to normal mode and pass data to the computer. If SYN detected, switch to reliable mode.

**\C2**--Data not buffered. If character defined by %A received, switch to normal mode, pass the character to the computer.

## **\En**

### **Data Echo in Normal Mode**

Determine whether the DL echoes data sent by the local terminal. The data mode must be NORMAL (see \N). If it is not, echo is disabled.

**\E0**--Don't echo data sent by computer in normal data mode.

**\E1**--Echo data sent by computer in normal data mode.

## **\F**

### **Read Stored Numbers**

This command displays the four numbers stored with the **\Pn** command. The \F command is a subset of the **&V** command.

## **\Gn**

### **Modem Port Flow Connection**

This command sets the type of flow control to pace the data received from the remote modem. Like with the \En command, the DL must be in NORMAL data mode (see \N).

**\G0**--No flow control.

**\G1**--XON/XOFF flow control

## **\Jn**

### **Interface Speed Adjust**

Use the \Jn command while connected to change the speed of the serial port. In Direct Mode (**\N1**) the \J0 setting is ignored. It behaves as if \J1 is set.

Once you've changed the setting using the \J1 command, you won't be able to switch back to the higher serial port bps rate.

- ❖ *Note:* If you use the \J1 command, you'll need to set your software's bps rate accordingly. Otherwise, you will be transmitting garbage.

**\J0**--Don't change the serial port speed.

**\J1**--Change the serial port speed to match the bps rate of the connection.

## **\Kn**

### **Break Control**

The **\Kn** command determines how the DataLink reacts when it receives a break signal.

**\K0**--Break signal from computer is ignored.

**\K1**--Buffer is emptied and Break signal is sent to remote DTE.

**\K2**--Send Break signal to remote DTE before transmitting data.

**\K3**--Send Break signal to remote DTE after transmitting data

## **\Nn**

### **Operating Mode**

Use the **\Nn** command to control the type of connection.

**\N0**--Normal mode (non MNP, buffered). The computer communicates with the DataLink Express using MNP buffering but the DL-X communicates to the remote without using MNP. This mode gives you accelerated transfer speed between computer and DataLink but no MNP error-free transmission between DataLink and remote.

**\N1**--Direct mode (non MNP, non buffered). The computer, the DL-X and the remote all communicate at the same rate. Use this mode when your software doesn't support flow control.

**\N2**--Reliable mode (MNP) use this when you know the remote computer has MNP. The computer, DataLink and remote will all use MNP. If the DL-X cannot establish an MNP connection with the remote, it hangs up.

**\N3**--Auto-reliable mode. This mode tries to connect using MNP. If the remote does not support MNP, the DL-X falls back to normal mode.

- ❖ *Note:* While in Reliable mode, only one computer at a time can enter into the command mode.

## **\Pn**

### **Store Phone Number**

This is Microcom's equivalent to **&Zn=s**.

Store a phone number (up to 36 characters) in position 0, 1, 2, or 3. Do not, however, use the equal sign. Type **AT\P** followed by the position number (0-3) followed by the phone number. For example, **AT\P112142416060**.

Add any dial commands, such as **T**, **P**, **W**, etc., into this saved string.

- ❖ *Note:* Numbers entered with the **\Pn** command and the **&Zn=s** use the same space so any numbers you enter with one command will replace the numbers in the same position (0-3) you've entered with the other command.

## **\Qn** **Flow Control**

Use the \Qn command to determine how the computer port data flow is handled. Flow Control lets the modem and computer tell each other how fast data should be transmitted between them.

Your computer can send data to the DataLink at 9600 baud which is faster than the DL can send it out the phone line. However, MNP-5 compresses the data and uses an 8K hardware buffer to store the data until it can send it. When the buffer is full, the DL-X sends a CTS command to temporarily stop data from the computer. When the modem is ready to receive again, it changes the CTS. This technique ensures that no data is lost while maximizing transfer efficiency.

Setting the computer baud to 9600 with DL-X's MNP flow control active (\Q2) has an overall effect of accelerating the transmission rate.

**\Q0**--Disable computer flow control.

**\Q1**--XON/XOFF bidirectional flow control. The DataLink can tell the computer or the computer can tell the DataLink to stop sending by transmitting an XOFF character. The DataLink or computer is told to resume with an XON character.

**\Q2**--CTS unidirectional flow control. The DataLink uses the CTS line to control the data coming from the computer. The computer cannot control the data coming from the DataLink.

**\Q3**--CTS/RTS bidirectional flow control. The DataLink uses the CTS/RTS lines to control both the data coming from the computer and the data coming from the DL.

## **\S** **Read DL Status**

The \S command will give you a complete listing of the current DL status as well as a list of the AT commands used to get the different settings. For example, next to the AUTO ANSWER listing you'll see ON or OFF and AT\$0=(1-255) or AT\$0=000.

*Sample:*

```
DIRECT    000:12:43
LAST DIAL (999)999-9999

MODEM BPS      2400      AT
MODEM MODE     DIR       AT\N1
MODEM FLOW     NONE      AT\G0
AUTO ANS.     OFF       AT$0=000
```

*Notes:*

- 1) The first line displays the type of connection: IDLE (offline), DIRECT, NORMAL, RELIABLE MNP4 (data compression disabled), RELIABLE MNP-5 (data compression enabled).

- 2) The LAST DIAL number is saved in RAM and is consequently lost at power down.
- 3) The time displayed on the first line is the time elapsed for the current connection if the DL is currently online or it's the elapsed time of the last connection.

## **\Tn**

### **Inactivity Timer**

Use the \Tn command to set how many minutes the DL waits before hanging up when it has neither sent nor received data in NORMAL or RELIABLE connections. If you have established a reliable (MNP) connection, the modem will drop to normal connection when the timer runs out. The next time the timer runs out, carrier will be dropped.

**\T0**--Disable the inactivity timer.

**\Tn**--n= number of minutes (limit 90).

## **\Vn**

### **MNP Result Form**

Select the form in which you want the CONNECT message displayed.

**\V0**--Use standard Hayes result codes.

**\V1**--Use Microcom connect messages, in normal or MNP context.

#### *MNP Connection:*

<u>Speed</u>	<u>Long Form</u>	<u>Short Form</u>
300	CONNECT 0300/REL	20
1200	CONNECT 1200/REL	22
2400	CONNECT 2400/REL	23
4800	CONNECT 4800/REL	24
9600	CONNECT 9600/REL	25

#### *Normal Connection:*

<u>Speed</u>	<u>Long Form</u>	<u>Short Form</u>
300	CONNECT	1
1200	CONNECT 1200	5
2400	CONNECT 2400	10
4800	CONNECT 4800	11
9600	CONNECT 9600	12



## \Xn

### **XON/XOFF Pass Through**

Control whether or not XON/XOFF characters are passed from the DL to the computer or from the computer to the DL. You can send this command while online. It will take affect when going back to data mode (ATO).

**\X0**--If XON/XOFF flow control is disabled, the XON/XOFF characters are always passed through the as regular data. If \Q1 (XON/XOFF computer flow control) is enabled, XON/XOFF characters received from the computer are not sent to the remote system. If \G1 (modem flow control) is selected, XON/XOFF received from the remote system is not sent to the computer.

**\X1**-- XON/XOFF characters are always passed through in both directions (from computer to remote system and from remote system to computer). Action is taken if flow control is enabled (\Q for DTE flow control or \G for line control in normal mode).

## \Y

### **Switch To Reliable**

Both modems, yours and the remote, can send this command simultaneously *while connected* to switch from Normal or Direct mode (non-MNP) to Reliable mode (MNP).

Both modems need to enter into the command mode (+++ - no carriage return) then enter **AT\Y**. The DataLink will then try to switch from Normal to Auto-Reliable mode.

If the remote computer is MNP compatible and sends the **AT\Y** command *within about plus or minus five seconds* of your computer sending **AT\Y**, you'll get the CONNECT (baud)/REL result (assuming you have the verbal MNP result codes active {\Q0, \V1}).

If the mode cannot be changed, the DataLink will quit trying and return a CONNECT (baud) without the /REL code.

If the modems already have a reliable connection, the modem immediately returns the CONNECT (baud)/REL result.

## \Z

### **Switch To Normal**

Use this command *while connected* to switch from Reliable mode (MNP) to Normal mode (non-MNP). With the \Z command, it doesn't matter whether your modem originated or answered the call. Only one modem needs to send the **AT\Z** command.

- ❖ *Note:* While in Reliable mode, only one computer at a time can enter into the command mode.

Enter into the command mode (+++ - no carriage return) then enter **AT\Z**. The DataLink will then try to switch from Auto-Reliable to Normal mode. You'll get the CONNECT (baud) result (assuming you have the verbal results active (**\Q0, \V1**)).

## **D/n**

### ***Dial Stored Number***

Like the **ATDS=n** command, the D/n command dials numbers that were saved to positions 0, 1, 2, or 3 with either the **AT&Zx=s** command or the **AT\Pn** command.

The "n" must be between 0 and 3 and must also be the last character in the command line, otherwise "ERROR" is returned. ATD/ is the same as ATD/0.

## **DL**

### ***Dial Last Number***

This command tells the modem to dial the last number stored in RAM. You can view the last number dialed using the **AT\S** command. Because it is a RAM based number, the number is lost after a power-down.

The "L" must directly follow the "D". Any letters following the L are ignored.

# CHAPTER FOUR

## Register Settings

This chapter is designed for those **programmers** interested in changing the register settings of the DataLink modem. The modem takes its settings from registers S0 through S27 located on the modem chip.

To read the current setting of a register, enter

**ATSr?**

while in terminal mode, where *r* is equal to the register number you want to read. For example, to read the current setting of register 8 (pause time), you would enter **^A** and then **T** and then **ATS8?**

The DataLink will respond by putting the current unit on the screen (ex. 002) followed by OK.

To change a register setting, enter:

**ATSr=n**

while in terminal mode, where *r* is equal to the register number and *n* is equal to the new value you want to assign to it. For example, to set the pause time to five seconds, you would enter **^A** and then **T** and then **ATS8=5**

Each register must have a value from 0 to 255. Each of the registers and their functions are listed below. A list with abbreviated explanations is included on the Quick Reference Card.

## S-Register Summary

<b>Reg.</b>	<b>Range</b>	<b>Units</b>	<b>Function</b>
S0	0-255	Rings	Number of rings before answer
S1	0-255	Rings	Ring counter
S2	0-127	ASCII	Escape sequence character
S3	0-127	ASCII	Carriage return character
S4	0-127	ASCII	Line feed character
S5	0-32, 127	ASCII	Back space character
S6	2-255	Seconds	Wait time before blind dialing
S7	1-55	Seconds	Wait time for dial tone and carrier
S8	0-255	Seconds	Pause time for comma
S9	1-255	1/10 sec	Carrier detect response time
S10	1-255	1/10 sec	Time for carrier loss to hang up
S11	50-255	msec	Tone duration and spacing
S12	20-255	1/50 sec	Escape sequence guard time
S13-15			Reserved
S16			Reserved
S17			Reserved
S18	0-255	Seconds	Testing time for &Tn commands
S19-27			Reserved

### **S0** *Auto Answer*

<u>Default</u>	<u>Range</u>	<u>Units</u>
1	0-255	rings

You can tell the DataLink to answer the phone after a set number of rings (from 1 to 255). Setting the register value to 0 tells the DataLink not to answer. Incoming calls must then be answered manually using the ATA command.

### **S1 Ring Count**

<u>Default</u>	<u>Range</u>	<u>Units</u>
0	0-255	rings

The number of rings are counted by this register. It resets to 0 if no rings are detected eight seconds after the last ring. S0 (Auto Answer) must be set to 1 or greater for S1 to function.

### **S2 Escape Character**

<u>Default</u>	<u>Range</u>	<u>Units</u>
43+	0-127	ASCII

You can change the escape character from this register. The default is the plus sign (+). The value must be between 0 and 127 to enable the escape code to work. Values greater than 127 will be accepted but this will disable the escape code. If the escape code is disabled, the carrier must disconnect or the DTR must be set high.

- ❖ *Note:* The new escape code character must still be entered three times with a one second pause before and after before the computer will take it as an escape command.

### **S3 Carriage Return value**

<u>Default</u>	<u>Range</u>	<u>Units</u>
13<CR>	0-255	ASCII

S3 contains the ASCII value for the carriage return. Thirteen is standard. This affects both the character used to end a command line as well as the character you receive following a modem response. The setting should be 13 unless you are using non-standard equipment.

### **S4 Line Feed value**

<u>Default</u>	<u>Range</u>	<u>Units</u>
10<LF>	0-127	ASCII

This register holds the ASCII character value of the line feed. You can set the value to 0 if you do not want or need a line feed but you cannot completely disable it.

### S5 *Backspace value*

<u>Default</u>	<u>Range</u>	<u>Units</u>
8	0-32, 127	ASCII

S5 is the register containing the ASCII value for the backspace character. This character is the backspace key as well as the character echoed to move the cursor back one position. When the backspace key is pressed, the cursor moves back one space, types a blank space (which deletes the present character and puts a space in its place), and then moves back one space. This is actually three moves which takes longer than other key strokes. Therefore, the backspace may not function properly with the repeat key. The range value can be set anywhere from 0-32 or at 127. Values 33-126 are printable ASCII character values and cannot be used for the backspace character value.

### S6 *Wait Before Blind Dialing*

<u>Default</u>	<u>Range</u>	<u>Units</u>
2	2-255	seconds

Register S6 controls how long the modem will wait before blind dialing. (Blind dialing is dialing without listening for a dial tone.) Use ATX1 to set the modem for blind dialing. If you set the time for less than two seconds, the modem will default to the minimum, two seconds. You may need to set the value greater than two seconds if, for some reason, you have trouble getting a dial tone right away.

### S7 *Wait For Carrier*

<u>Default</u>	<u>Range</u>	<u>Units</u>
30	1-255	seconds

S7 allots the amount of time to wait for a carrier after the number has been dialed. If contact is made with a carrier, the modem sends the message (result code) "CONNECT" and puts the computer on-line. If there is no answer from the number you have dialed, the modem will tell you "NO CARRIER" and will leave you in the command state.

### S8 *Pause time*

<u>Default</u>	<u>Range</u>	<u>Units</u>
2	0-255	seconds

S8 sets the amount of time for the pause command (,). Two seconds is usually enough, but if you need more time, you may either increase the value of the S8 register or simply add more commas to the command line.

**S9 Wait To Accept**

<u>Default</u>	<u>Range</u>	<u>Units</u>
6	0-255	1/10 sec

S9 determines how long (in tenths of seconds) the modem will wait after detecting a carrier's signal to accept the signal. This prevents the modem from mistaking other signals, such as rings, busy signals, and voices, as carrier signals. The higher the setting, the less chance the modem has of mistaking a signal. The default is 600 milliseconds.

**S10 Wait Before Disconnect**

<u>Default</u>	<u>Range</u>	<u>Units</u>
14	0-255	100 msec

S10 controls the amount of time (in tenths of seconds) the modem waits between losing a signal and disconnecting. This allows the carrier to disappear and return without ending the connection.

**S11 Dial Speed**

<u>Default</u>	<u>Range</u>	<u>Units</u>
95	50-255	msec

S11 controls the dial speed by setting the amount of time between touch tones.

**S12 Escape Code Guard Time**

<u>Default</u>	<u>Range</u>	<u>Units</u>
50	0-255 (2400)	20 msec

S12 sets the escape code guard time--the time you must pause before and after entering the escape command (+++) before the modem will recognize it as an escape command. The total time is one second.

**S13 Bit Mapped**

Bit 0	Undefined. Can be set equal to 0 or 1
Bit 1	1 Extended result code selected
Bit 2	0 Parity Disabled 1 Parity Enabled
Bit 3	0 Odd Parity 1 Even Parity
Bit 4	0 7 Data Bits 1 8 Data Bits
Bit 5	Undefined
Bit 6	Buffer Overflow Flag (causes ERROR result code to be sent)
Bit 7	0 8th Data Bit Set to Space (if Bit 4=1) 1 8th Data Bit Set to Mark (if Bit 4=1)

**S14 Bit Mapped**

Bit 0	1 Auto Answer Enabled
Bit 1	0 Local Echo Disabled 1 Local Echo Enabled
Bit 2	0 Result Codes Enabled 1 Result Codes Disabled.
Bit 3	0 Result Codes Sent As Digits 1 Result Codes Sent As Words
Bit 4	0 Enable Command Recognition
Bit 5	0 Touch Tone Dial 1 Pulse Dial
Bit 6	Bit 7
0	0 Speaker Always On
0	1 Speaker Always Off
1	0 Speaker On Until Carrier
1	1 Invalid

**S15 Bit Mapped**

Bit 0	Same function as Bit 4
Bit 1	Same function as Bit 5
Bit 2	0 Answer Mode 1 Originate Mode
Bit 3	1 Full Duplex
Bit 4	Bit 5
0	0 Invalid
0	1 invalid
1	0 300 bps
1	1 1200 bps
Bit 6	0 Carrier Off 1 Carrier On
Bit 7	Undefined

**S16 Reserved****S17 Reserved**



### S18 **Testing Timer**

<u>Default</u>	<u>Range</u>	<u>Units</u>
0	0-255	seconds

S18 controls the duration of the various tests run with the AT&T command (see the "AT Commands" chapter for a description of the tests). You'll need to assign the register a number depending upon how thoroughly you want to test the modem. Leaving this register at the factory setting (0) will not test the modem at all.

### S19-S27 **Reserved**

### MNP Register Settings

In addition to the settings listed above, these registers control the MNP options.

### S36 **Break/Flow/Selection Controls**

Bit 1,0	Set Operating Mode
0 - \N0	normal
1 - \N1	direct (factory)
2 - \N2	reliable
3 - \N3	auto-reliable
Bit 2	Flow Control
0 - \G0	flow control disabled (factory)
1 - \G1	XON/XOFF flow control enabled
Bit 3	XON/XOFF Pass Through
\X0	no pass through (factory)
\X1	pass through enabled
Bit 5, 4	Status of the Connection
0 - normal	
1 - direct	
2 - MNP-4 reliable	
3 - MNP-5 data compression	
Bit 7,6	DTE Flow Control
0 - \Q0	no flow control
1 - \Q1	XON/XOFF control
2 - \Q2	CTS unidirectional control
3 - \Q3	RTS/CTS bidirectional control

### **S37 Auto-Reliable Fallback Character**

Bit 7-0

%An where n is between 0 and 127. n will be recognized as the fallback character in auto-reliable (\N3) mode. The default (factory) is 0.

### **S38 Miscellaneous Options**

- Bit 1,0 Set Auto-Reliable Buffer
- 0 - \C0 no buffer (factory)
  - 1 - \C1 buffer data for 4 seconds
  - 2 - \C2 no buffer, switch to normal when fallback character (%An) received
  - 3 - \C3 unused
- Bit 2 BPS Adjust
- 0 - \J0 disable bps adjust
  - 1 - \J1 enable bps adjust (factory)
- Bit 3 Set Data Mode Echo
- 0 - E0 don't echo in data mode
  - 1 - E1 echo in data mode if not reliable
- Bit 4 Set MNP Result Code
- 0 - V0 disable MNP result code (factory)
  - 1 - V1 enable MNP results
- Bit 5 reserved
- Bit 6 reserved
- Bit 7 unused

### **S39 Inactivity Timer**

Measure between 0 and 5 minutes inclusive of inactivity. Default value is 0. Controlled with \Tn.

### **S40 Miscellaneous Options**

- Bits 1,0 Maximum MNP Block Size
- 0 - \A0 max. = 64 char. (factory)
  - 1 - \A1 max. = 128 char.
  - 2 - \A2 max. = 192 char.
  - 3 - \A3 max. = 256 char.
- Bit 2 reserved
- Bits 7-3 reserved

### **S41 Miscellaneous Options**

- Bit 0 Enable/Disable MNP-5
- 0 - %C0 disable MNP-5
  - 1 - %C1 enable MNP-5
- Bit7-1 reserved

# APPENDIX A

## Trouble Shooting

If you don't get a dial tone from your phone or from the modem, try the following:

- Plug the phone directly into the wall to make sure it is working.
- If you are using an early style touch tone phone and it is not working, it may be because the plug does not match the new standards. Try using a "Y" connector to reverse the polarity. (You can find a "Y" connector at most telephone stores and at Radio Shack).
- Try a different cable. The one you are using could be bad.
- Make sure you are in either smart mode or terminal mode.
- Run the various tests detailed in the chapter "DataLink AT Commands" under the &T command.

If random characters and symbols are appearing on your screen, it could be due to:

**Someone else on the same line.** If someone on your end or the host computer's end picks up the phone while you are in the communications mode, it will result in random characters on the screen.

**Different baud rates.** You may need to make a voice call to the person or information service on the other end to see if your baud rates are compatible.

**Different parity settings.** Try changing them until the trash goes away.

**Different duplex settings.** Once again, check with those in charge of the computer at the other end and adjust accordingly.

**Loose phone cord.** This will rarely be the problem, but it does happen.

**Phone off the hook.** If the phone is not seated firmly, the connection will be weak.

If you have other problems *that are not addressed in this manual*, our Technical Support staff is ready to help you. Refer to the "Getting Help" section in the back of this manual.

# APPENDIX B

## The Jumpers

We have included jumpers on the modem board to enable you to customize some of the signals from the modem. The most common case in which you would modify the signals is to run Bulletin Board System software.

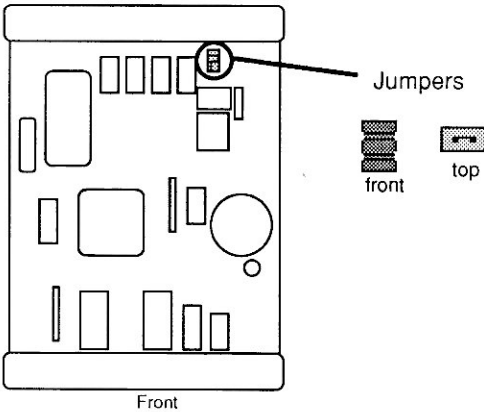
By moving the jumpers from one setup to another, you can alter the signals to match the requirements of your BBS package. Your BBS program should tell you the setting it requires.

To change the jumpers from the standard setting, follow these steps:

- 1) Disconnect the modem
- 2) Remove the four screws on back of the modem
- 3) Slide the top of the box toward the back and off.

Do not separate circuit board from bottom of case, simply remove the top cover.

The jumpers are the black plastic rectangles located toward the back right of the card.



The signals available are shown following:

Normal DCD & DSR mode	Reversed DCD & DSR Mode
DCD & DSR Follow Modem (as shipped)	Reversed DCD & DSR
DCD Always Active DSR Follows Modem	DCD Always Active DSR Follows Modem
DSR Always Active DCD Follows Modem	DSR Always Active DCD Follows Modem

Use this setting with any Apple Super Serial Card compatible card and with //e and //c

# APPENDIX C

## Getting Help

If you have a technical question relating to your DataLink that is not covered in the manual, please contact the dealer from whom you purchased the card. If you are experiencing difficulties with one particular program, contact the program's author or publisher.

In the event that the dealer or the publisher's support personnel cannot answer your question, call Applied Engineering Technical Support. The support representatives are experienced in the applications and uses of Applied Engineering products, but in order to provide a quick and effective answer to your question, they will need to know as much as possible about the hardware and software specifically related to your question. Please provide the technical support representative with the following information:

- ◇ The Applied Engineering product related to your question and its revision number.
- ◇ The model and revision of your computer.
- ◇ What peripherals are being used and what cards are in each slot.
- ◇ The name, version, and revision level of the software with which you are experiencing problems.
- ◇ The results of any test programs, diagnostics, or troubleshooting done by you, your dealer, or your software publisher's support department.

### **Applied Engineering**

Technical Support

**Apple II - (214) 241-6069**

**Mac & Amiga - (214) 241-6084**

9 AM to 12:30 PM & 1:35 PM to 5 PM(CST)

Monday Through Friday

Bulletin Board System

**(214) 241-6677**

(Please call only the numbers above for technical support. Our sales office cannot transfer calls to the support lines.)

## **Returning a Product**

### **Include**

If your product needs to be returned, the technical support representative will give you a Return Material Authorization (RMA) number.

- Record the RMA number for your own records.

- Write the RMA number on the outside of the package you send to us.
- Write the RMA number at the top of the return form included with your product package.

Fill out the Return Form on back of the notice marked "Attention!" A correctly completed form will greatly reduce the time it takes to process and return your product.

Attach a copy of your original invoice to the return form.

- ❖ **Warning:** If you don't include an invoice, products will be treated as out of warranty products and will be returned to you C.O.D. for the amount of the service charge.

### When You Ship

If you don't have the original packing material, wrap the board in anti-static material (preferably the anti-static bag in which the card was originally shipped; however, aluminum foil will work fine). Pack it in a sturdy box cushioned with wadded papers (i.e. used computer paper or newspaper).

- ❖ **Warning:** If your product is damaged due to inadequate packing, your warranty will be void.

Include the return form and invoice.

Send the package, shipping prepaid, to:

**RMA# \_\_?\_\_**  
**Applied Engineering**  
**Technical Support**  
**3210 Belt Line Road, Suite 154**  
**Dallas TX 75234**

You should insure your package. AE will not assume any responsibility for inadequate packing or loss or damage during shipping.

### When We Receive

Our service department will use your completed form in an attempt to duplicate the problem.

If it is determined that your product is defective due to a manufacturing defect, your card will be repaired or replaced at AE's option.

Any misuse, abuse, or non-AE authorized alteration, modification, and/or repair to the Applied Engineering product will void the warranty. This warranty will also be void if you use the AE product for any purpose other than its intended use.

Your product will be fully tested before it is shipped back to you, transportation prepaid, via UPS regular delivery.

Once your product is received by Technical Support, it will be processed and delivered to our shipping department as quickly as possible.



# Glossary

**Attention** - Also known as Break. This is a special signal that is required by some mainframes and mini-computers as a sort of RESET command for remote operation. What this signal does varies from doing nothing to logging you off. You may see this signal referred to as the PA-1 or Program Attention - 1 signal.

**Baud** - Baud is (1) a unit of signaling speed derived from the duration of the shortest code element. Speed in baud is the number of code elements per second. (2) a unit of signaling speed equal to the number of discrete conditions or signal events per second.

For practical purposes it is used interchangeably with "bits per second;" that is, a baud is equal to one signal element per second. There are 8 bits to a byte (or character) so 300 bits per second (i.e. 300 Baud) is a data transfer rate of roughly 30 characters per second accounting for character overhead. Both ends of any computer connection must be sending and receiving at the same baud rate. Telephone lines can typically support 300, 1200, or 2400 baud depending on the capabilities of the modem in use. Most people can read fast enough to keep up with 300 baud. Higher baud rates are more efficient for long distance file transfers provided that the information service to which you are attached does not charge a high price for using the higher rates.

**Boot** - This is the process of starting up a disk device.

**Break** - See Attention.

**Carrier** - This is a constant tone broadcast over the telephone line by modems in order to act as a reference tone for data communications. When you dial another computer you (and many modems) can listen to the line for a whistle (the carrier signal) to recognize that another computer is on the line. Sometimes you can hear the tone shift pitches from high to low or from low to high as it changes baud rates to match your baud rate setting.

**Download** - This is the process of transferring a file from a host computer to your computer. You download a file from another computer to your disk. See also: Upload.

**DTR** - This stands for DATA TERMINAL READY. It is the name of one of the control signals that the computer can send to the DataLink and many other modems to cause the modem to hang up the phone under program control.

**Duplex** - Normally a host computer will transmit back to you every character you type. This is where the display of your typed characters comes from. This mode of operation is known as full duplex. Half duplex means that characters you type are not only transmitted to the host, but are also displayed locally to the screen as opposed to the characters being sent from the host. If you find that you either get no characters displayed when you type, or you get double characters when you type, change the duplex setting.

**Modem** - A modem is a computer accessory for converting digital data signals from a computer into tones that can be sent over telephone lines and back again. Modem stands for MOdulator/DEModulator.

**Terminal Emulation** - With Terminal Emulation your computer will appear to the host computer to be a different computer terminal. This is useful when the host computer uses software that takes advantage of particular screen formatting features of other terminals.

**Upload** - This is the process of transferring a file from your computer to a host computer. You upload a file from your disk to another computer. See also: Download.

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