

USING YOUR FAX/MODEM

Chapter 2 is an overview on using your FAX/MODEM. Topics include:

- * Communications software
- * Non-volatile memory
- * FAX/MODEM compatibility
- * Baud rate and connection speeds to other modems
- * Valid character formats
- * Leased-line operation

USING COMMUNICATIONS SOFTWARE

This document is a brief overview on general modem use. It is not intended to replace the product manual; rather it is meant to offer a quick route towards getting the fax/modem up and running.

To use your FAX/MODEM with a personal computer, you will need a communications or terminal emulation software program. The communications software program will make it easy to send instructions (in the form of commands) to your FAX/MODEM to have it perform various tasks, such as dialing a call, answering a call, or changing its operating characteristics.

Because your FAX/MODEM is compatible with the Hayes AT command set, it will work with virtually any communications software designed for your computer.

Your FAX/MODEM also supports V.42bis and MNP5 data compression, which requires the software to support hardware (CTS/RTS) flow control and software packages support flow control, including the following PC- and Macintosh-compatible software.

A PARTIAL LIST OF PC-COMPATIBLE SOFTWARE

Bitcom Deluxe	Carbon Copy Plus
Crosstalk XVI and Mark IV	HyperAccess
Microsoft Windows	Mirror II and III
MTEZ	ProComm Plus
Quick Link II	Qmodem SST
Remote 2 (Host)	Smartcom III
Telix	

A PARTIAL LIST OF MACINTOSH-COMPATIBLE SOFTWARE

Microphone II	Quick Link II
Red Ryder	Smartcom for Mac
STF	White Knight
Z Term	

SYNCHRONOUS OPERATION

Your FAX/MODEM also supports synchronous communications. If you will be performing synchronous communications, you will need special software that supports the synchronous port on your computer or terminal. If you do not have such software, refer to the computer manufacturer's instructions or contact the manufacturer for recommended software.

ACHIEVING MAXIMUM THROUGHPUT

Your internal FAX/MODEM a high-performance 16550A UART to achieve maximum possible throughput, especially with slower computers. To take advantage of this design, your communications software must support this chip. Recent releases of most major communications programs do support this chip.

SETTING UP YOUR COMMUNICATIONS SOFTWARE

The first time you use your communications software, you may be asked to select the "modem type" from a menu. If you don't see this FAX/MODEM listed by name on the menu, select Hayes Smartmodem 9600 or Hayes V-series V.42 (for the V.32 FAX/MODEM), or Hayes Ultra 14400 bps (for the V.32bis FAX/MODEM).

SPECIFYING MODEM OPTIONS

If your communications software program does not ask you to specify the type of modem you are using, you may be asked to enter certain setup information. In this case, enter the information specified in the Table 2-1. (If you did specify the type of modem, or if the software itself sets up an initialization string, then you should not modify the setup provided by the software.)

Table 2-1 Modem Options

FOR THIS SETUP OPTION...	ENTER THIS INFORMATION...
Initialization string (1)	AT &F &C1 &D2 <CR>
Dialing command	ATDT
Dialing command suffix	<CR>
Hangup command (2)	---+++---ATH0=1 <CR>
Auto-answer ON command	ATS0=1 <CR>
Wait for connection	45 (seconds)
Pause between redial	1 (second)
Auto-baud detect	ON
Drop DTR to hangup?	YES
Send init if CD high?	YES
Hardware flow control (RTS/CTS)?	ON
Dialing directory entries	All should be set to 57,600 bps.

(1) NOTE: Some software uses ! or ^M for carriage return. Also, you may want to add S95=44 to your initialization string. This will cause your FAX/MODEM to send more information back to your software (and in some cases, to your computer's monitor) about the type of connection your FAX/MODEM makes. See the description of Register S95 in Chapter 5 for details.

If you have a Macintosh, use only AT&F <CR>

(2) NOTE: - means pause. Use the pause character required by your software.

With this setup, all communications between your computer and FAX/MODEM will occur at 57,600 bps, independent of your FAX/MODEM's connection to the remote modem. Your FAX/MODEM will automatically negotiate the fastest speed possible with the remote modem.

In some cases, the delay that occurs during auto-negotiation may cause a problem. If you experience such a problem, type AT&Q6 from Command Mode and press the Enter key to disable auto-negotiation. To enable auto-negotiation again, type AT&Q5 from the Command Mode and press the Enter key.

START-UP SEQUENCE FOR EXTERNAL FAX/MODEMS

IMPORTANT: If you have an external FAX/MODEM, you should have the FAX/MODEM turned on before you start up your communications or fax software. If your FAX/MODEM is off when you start up the program, the FAX/MODEM will not receive the initialization string from the program and may not work properly.

An important example: This FAX/MODEM conforms to the Hayes standard for AT commands, which means that it defaults to the command settings &C0 and &D0. Many programs for PC-compatible computers, however, require that the FAX/MODEM be initialized with the commands &C1 and/or &D2; the programs therefore include these commands in the initialization. But if your FAX/MODEM is turned off when the program begins, the FAX/MODEM will not receive this critical string.

Another way of handling this situation is to store initialization commands in non-volatile memory, which is described on the next page.

DISABLING CALL WAITING

Some telephone companies offer a feature called "Call Waiting." This feature beeps you when you receive an incoming call while using the telephone line.

You may appreciate this beep, but your FAX/MODEM doesn't. In fact, this beep may disconnect your FAX/MODEM from the remote modem during data transmission. Therefore, you should turn off Call Waiting, if possible, before making your modem calls.

*70, turns off Call Waiting only for the duration of the next outgoing call. When the call is over, Call Waiting will go back into effect. If you are not sure whether *70, will turn off Call Waiting, check with your local telephone company.

IMPORTANT: Unfortunately, there is no way to disable Call Waiting for a call that you have received, so you may still have a problem due to Call Waiting when you are receiving a call. See the description of Register S10 on page 5-11 for help with this problem.

NON-VOLATILE MEMORY

When you turn on your FAX/MODEM or reset it, your FAX/MODEM loads the "active configuration profile" into non-volatile memory (NVRAM). The active configuration profile is a group of configuration settings, derived from the values of the FAX/MODEM's internal S-registers, that define how the FAX/MODEM will operate when it's turned on or reset. The active configuration or one of two user-defined profiles.

FACTORY CONFIGURATION PROFILE

The first time you turn on your FAX/MODEM, the factory configuration profile becomes the "active" configuration profile. This profile is a group of

standard operating parameters that will allow most users to begin sending and receiving data as soon as the FAX/MODEM is installed and the communications software is loaded. The factory configuration profile is stored in the FAX/MODEM's Read-Only Memory (ROM) and cannot be changed.

Page Quick Reference-8 in the Quick-Reference Guide shows the factory configuration profile.

If you change your FAX/MODEM's operating characteristics and want to return to the factory configuration profile type AT&F and press the Enter key. A copy of the factory configuration profile will be loaded into the active configuration profile.

If you want the factory configuration profile to be the active configuration profile the next time your turn on or reset your FAX/MODEM: Type AT&Y&F&W and press the Enter key. The factory settings will be written to configuration profile 0 in non-volatile memory.

CREATING USER-DEFINED CONFIGURATION PROFILES

For your convenience, your FAX/MODEM lets you store two sets of operating characteristics in non-volatile memory. If you use certain commands or characteristics over and over again, you should store them in the user-defined configuration profiles. Any command not stored will be set to match the factory default settings.

The following commands can be stored: Bn,En,Ln,Mn,Nn,P or T dial modifiers, Qn,Vn,Wn,Xn,Yn,&Cn,&Dn,&Gn,&Jn,&Kn,&Pn,&Qn,&Rn,&Sn,&T4,&T5, and &Xn. For information on these commands, refer to Chapter 4.

The following registers can have their values stored: S0,S2 through S12, S14 and S15, S18, S21 through S23, S25 through S41, S44, S46, S48 through S50, S82, S86, S91, and S95. For information on these registers, refer to Chapter 5.

You can also store telephone numbers using the &Z0, &Z1, &Z2, and &Z3 commands. For more information, refer to Chapter 4.

CREATING THE FIRST PROFILE

To create the first user-defined configuration profile:

Type the command you want to store in the first user-defined configuration profile and type the &W0 command as the last command in the command line. For example, suppose you want the first profile to store the following commands:

- * &C1--DCD follows the remote carrier signal.
- * L0--low speaker volume.
- * M2--keep the speaker always on.
- * S95=44--enable compression, carrier, and protocol responses.

Your command line would look like: AT&C1L0M2S95=44&W0

Press the Enter key. The commands are stored in configuration profile 0.

To have the FAX/MODEM use this profile, send the &Y0 command as described

under "Specifying the power-up profile," below.

CREATING THE SECOND PROFILE

To create a second user-defined configuration profile:

Type the commands you want to store in the second user-defined configuration profile and type the &W1 command as the last command in the command line.

Press the Enter key.

The commands are stored in configuration profile 1.

To have the FAX/MODEM use this profile, send the &Y1 command as described under "Specifying the power-up profile," below

SPECIFYING THE POWER-UP PROFILE

You can use the &Y command to have the FAX/MODEM load one of two stored profiles after it is turned on or reset via hardware. These profiles can come from location 0 or 1 in non-volatile memory.

To load the user-defined configuration profile stored with the &W0 command:

Type AT&Y0 and press the Enter key.

The FAX/MODEM will use the configuration profile stored in location 0 after it is turned on or reset via hardware.

To load the user-defined configuration profile stored with the &W1 command:

Type AT&Y1 and press the Enter key.

The FAX/MODEM will use the configuration profile stored in location 1 after it is turned on or reset via hardware.

VIEWING THE CONFIGURATION PROFILES

Using the &V command, you can view the active configuration profile, the two user-defined configuration profiles, and any stored telephone numbers.

Type AT&V.

Press the Enter key.

A screen similar to that shown in Figure 2-1 appears.

COMPATIBILITY

Table 2-4 shows the bit per second (bps) rate and data formats your FAX/MODEM can use.

TABLE 2-4 COMPATIBILITY

BAUD RATE (BPS)	DATA FORMAT	COMPATIBILITY
0-300	Asynchronous	CCITT V.21, Bell 103

1200	Asynchronous or Synchronous	CCITT V.22, Bell 212A
2400	Asynchronous or Synchronous	CCITT V.22bis
4800	Asynchronous or Synchronous	CCITT V.32 and V.32bis
7200	Asynchronous or Synchronous	CCITT V.32bis only
9600	Asynchronous or Synchronous	CCITT V.32 and V.32bis
12000	Asynchronous or Synchronous	CCITT V.32bis only
14400	Asynchronous or Synchronous	CCITT V.32bis only

The speed and compatibility (CCITT or Bell) used to exchange data with a remote system is governed by the N0 or N1 command in effect. The N0 command is described on page 2-16.

N0 COMMAND IN EFFECT

Use the N0 command if you want to accept only particular connections. When the N0 command is in effect, your FAX/MODEM will use the values of Register S37 and the B command, and sense the computer-to-fax/modem speed, to set the required speed and compatibility for this connection (see Table 2-5).

For example, if Register S37 is set to 0, the B1 command is in effect, and your FAX/MODEM senses the computer-to-fax/modem speed at 1200 bps, your FAX/MODEM will allow a Bell 212A connection at 1200 bps.

TABLE 2-5 N0 COMMAND IN EFFECT

S37 SETTING	"B" COMMAND IN EFFECT	SPEED COMPUTER-TO-FAX/MODEM SENSED	REQUIRED TELEPHONE LINE SPEED
0	0	< 600	V.21 300
0	0	1200	V.22 1200
0	--	2400	V.22bis 2400
0	--	4800	V.32bis 4800*
0	--	9600	V.32bis 9600*
0	0	Other	V.32bis 14400
0	1	<600	Bell 103 300
0	1	1200	Bell 212A 1200
1-3 (300)	0	--	V.21 300
5 (1200)	0	--	V.22bis 1200
6 (2400)	--	--	V.22bis 2400
1-3 (300)	1	--	Bell 103 300
5 (1200)	1	--	Bell 212A 1200
7 Reserved	--	--	Reserved
8 (4800)	--	--	V.32bis 4800*
9 (9400)	--	--	V.32bis 9600*
10 (12000)	--	--	V.32bis 12000
11 (14400)	--	--	V.32bis 14400
12 (7200)	--	--	V.32bis 7200

* If a V32 mode connects with your FAX/MODEM at 9600 or 4800 bps, the resulting line protocol will be V.32 9600 or 4800, respectively.

N1 COMMAND IN EFFECT

When the N1 command is in effect, your FAX/MODEM uses its automode detect capabilities to automatically set the FAX/MODEM to the fastest speed supported by both modems. It begins this "negotiation" at the fastest possible connection speed and decreases speed until a connection is established. This is called "auto-reliable" operation.

CHARACTER FORMAT

To communicate asynchronously with another modem, the character length and format of your system must match with that of the remote asynchronous system. Table 2-6 shows the valid character formats.

TABLE 2-6 CHARACTER FORMATS

PARITY	DATA LENGTH	STOP BITS	CHARACTER LENGTH
None	7	2	10
Odd	7	1	10
Even	7	1	10
None	8	1	10
Odd	8	1	11*
Even	8	1	11*

* 11-bit characters are sensed, but the parity bits are stripped off during data transmission in normal and error-correction modes. Direct mode does not strip off the parity bits.

The FAX/MODEM speed senses data with mark or space parity. However, the FAX/MODEM configures to different parities as follows:

DTE CONFIGURATION FAX/MODEM CONFIGURATION

7 mark	7 none
7 space	8 none
8 mark	8 none
8 space	8 even

LEASED-LINE OPERATION

You can use the &L1 command to configure your FAX/MODEM for use over a leased (private) telephone line. In leased-line applications, there is a FAX/MODEM at each end of the leased telephone line. One modem is configured to originate calls and the other is configured to automatically answer calls.

To perform asynchronous leased-line communications:

The person at the originating modem types AT&L1&D0S0=0 and presses the Enter key.

The person at the answering modem types AT&L1&D0S0=1 and presses the Enter key.

The person at the originating modem types ATX1D and presses the Enter key, while the person at the answering modem types ATA and presses the Enter key.

To perform synchronous leased-line communications:

Make sure you have stored a telephone number with the `&Zn=` command (refer to Chapter 4).

The person at the originating modem types `AT&Q2&L1&D0D0=0` and presses the Enter key.

The person at the answering modem types `AT&Q1&L1&D0S0=1` and presses the Enter key.

If you want to store these commands into the FAX/MODEM's nonvolatile memory, add the command `&W` or `&W1` (depending on the location where you want them stored) to the end of the above command lines for the originating and answering modems.

For an explanation of these commands, refer to Chapter 4.

OPERATING YOUR FAX/MODEM

Your FAX/MODEM is always in one of three operating modes, Command Mode, Data (or On-Line) Mode, or Fax Mode. Chapter 3 describes Command Mode and Data Mode and how to switch your FAX/MODEM between them. Operating your FAX/MODEM in Fax Mode is described in Chapter 9.

Normally, you won't need to switch between these modes during normal operation, since your communications software acts as a friendly interface to the FAX/MODEM.

OPERATING MODES

When used as a modem, your FAX/MODEM can be in either Command Mode and Data Mode.

COMMAND MODE--lets you send commands from your keyboard to your FAX/MODEM to perform a variety of functions.

DATA MODE--lets you exchange data across the telephone line with a remote modem. In Data Mode, your FAX/MODEM assumes everything it receives from your computer is data and sends it across the telephone line. Therefore, avoid sending a command (other than the escape sequence, described on page 3-3) to your FAX/MODEM while in Data Mode, because your FAX/MODEM will handle the keystrokes as data.

The following sections describe how to enter these modes.

ENTERING COMMAND MODE

Your FAX/MODEM automatically enters the Command Mode after:

- * You turn on your FAX/MODEM.
- * You lose the data connection with the remote modem.
- * The FAX/MODEM detects an ON-to-OFF transition on the Data Terminal Ready (DTR) circuit with the `&D1` command in effect. If this happens, your

FAX/MODEM returns to Command Mode without hanging up. To hang up the FAX/MODEM, send the H command or, if the &D2 command is in effect, have your software turn off DTR.

- * The FAX/MODEM detects an ON-to-OFF transition on the DTR circuit with the &D2 command in effect. If this happens, your FAX/MODEM hangs up, resets itself, loads the active configuration from nonvolatile memory, and returns to Command Mode.
- * The FAX/MODEM detects an ON-to-OFF transition on the DTR circuit with the &D3 command in effect. If this happens, your FAX/MODEM hangs up, resets itself, loads the active configuration from nonvolatile memory, and returns to Command Mode.
- * You touch any key on your computer keyboard while your FAX/MODEM is dialing. This will cause your FAX/MODEM to stop dialing, hang up, and return to Command Mode.

IMPORTANT: If you reset the FAX/MODEM while it's in Command Mode, it remains in Command Mode and any data connection with a remote modem is terminated.

ENTERING DATA MODE

Your FAX/MODEM automatically enters Data Mode after making a data connection with a remote modem. The two modems make the data connection using a process called "handshaking."

Modems accomplish handshaking by sending high-pitched tones across the telephone line. Normally you will hear these tones during the handshaking process. By default, the speaker will be turned off when the carrier signal is detected.

THE ESCAPE SEQUENCE FOR SWITCHING TO COMMAND MODE

After your FAX/MODEM makes a data connection with a remote modem, you can use the escape sequence to return to Command Mode without breaking the data connection. Refer to Faxback Doc. # 5216 for an explanation of the escape sequence.

- * You can now issue commands to perform such tasks as reading or changing register values, or hanging up the FAX/MODEM.
- * When you want to resume transmission, you can return to Data Mode and optionally perform a retrain sequence, or try to establish a reliable (MNP) connection:

>To return to Data Mode--type AT0 and press the Enter key. Your FAX/MODEM sends a CONNECT nnnn response (where nnnn indicates the speed of the connection) and returns to Data Mode.

>To return to Data Mode and initiate an equalizer retrain--type AT01 and press the Enter key. Your FAX/MODEM sends a CONNECT nnnn response, returns to Data Mode, and initiates an equalizer retrain.

A retain sequence causes the connected modems to test the telephone line and optimize their operation for transferring data over the telephone line. Use this command if the telephone line condition has deteriorated

during the connection. This command works for 2400 bps and faster connections.

>T enter a reliable connection--type AT\0 and press the Enter key. Your FAX/MODEM sends a CONNECT nnnn response and proceeds to exchange data error-free with the remote MNP/V.42/V42bis modem. (For the reliable link to succeed, the remote modem must also support MNP/V.42/V.42bis.)

IMPORTANT: If the &D2 command is in effect and you use the +++ characters to enter the Command Mode, an ON-to-OFF transition on the DTR interchange circuit has the same effect as sending the H (Hang Up) command.

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