Congratulations on purchasing the most sophisticated modem available. Your modem combines advanced technology with state-of-the-art features to bring you the modern advanced communications device available today!

This modem provides the following features.

■ **Modem Capabilities**
- □ K56Flex, V.90, 56000bps, 33600bps, 31200bps
- □ ITU-T V.34, V.32bis, V.32, V.23, V.22bis, V.22, V.21, Bell 212A, and 103
- □ V.42LAPM and MNP 2-4, and MNP 10 error correction
- □ V.42bis and MNP 5 data compression

■ **Fax Capabilities**
- □ ITU-T V.33, V.17, V.29, V.27ter, and V.21 Channel 2, 300 to 14400bps.
- □ TIA/EIA 578 Class 1 Fax

■ **Voice Capabilities**
- □ Concurrent DTMF and tone detection
- □ Remote or local telephone answering machine/ voice mail control
- □ Enhanced ADPCM compression/decompression
- □ Record/playback via handset or mic/speaker

■ **Caller ID**

■ **Speakerphone Capabilities**
- □ Full-duplex speakerphone (acoustic and line echo cancellation)
- □ Microphone gain and muting
- □ Speaker volume control and muting
- □ Room Monitor

■ **ASVD (Analog simultaneous voice and data) or AudioSpan (simultaneous audio/voice and data)**
- □ ITU-T V.61 modulation (4.8 kbps data plus audio)
- □ Handset, headset, or half-duplex speakerphone

■ **Voice View Protocol Support**
- □ Voice mode (local handset and FDSP)
- □ Voice View data mode (V.17,V.29,V.27ter,and V.21 ch2)

■ **Video Ready Modem**
- □ Follows H.324, V.80,V.70 DSVD standard

Table of Contents

Chapter 1 Installing the modem

This installation guide provides detailed instructions for installing your modem with computer or terminal.

1.1 Checking your components

Unpack your components and make sure you have the following items:

- The modem
- A modular telephone cable to connect your modem to the telephone line
- Power adapter
- This installation guide and user's manual
- Communication software and manual (option)
- You will also need an available RS-232 serial port on the personal computer and a properly configured RS-232C interface cable.
- Microphone (option)
- Stereo audio cable (option)
- A driver disk for Windows 95, Windows NT3.51, Windows NT 4.0

When you open your package, make sure all of the above items are included and not damaged. If you see that any components are damaged, please notify your dealer immediately.

1.2 What else you need

To complete your data communication system, you will need the following items:

- Some type of communication software, if not included.
- An optional telephone set (you do not need to use a telephone with your modem).

1.3 Installing the modem

Your modem fits neatly under most standard desk-top telephone. You should place your modem near a 110 or 220 VAC power source (such as a wall outlet). The distance between the modem and your computer, terminal, or printer is determined by the length of your RS-232-C cable.

Be sure you can clearly see the panel LEDs, reach the ON/OFF switch on the back panel, and hear the built-in speaker when you dial calls or the speakerphone is in use.

1.4 Prerequisites

When connecting your modem to a computer, you will need:

- An available RS-232-C serial port.

- An RS-232-C cable with at least one male connector for connecting to your modem; Your computer's requirements determine the gender of the connector on the other end.
- Software that lets the modem communicates with your computer.

If you lack any of these items, refer to your computer reference manual or contact your computer dealer. If your computer does not have an RS-232C DB25 connector, obtain an adapter cable from your computer dealer.

1.5 Connecting to a computer or terminal

Use the following procedure to connect your modem to a computer or terminal.

1. Plug the male DB-25 connector on your RS-232C cable into the RS-232 connector on the back of the modem (see Figure 1-1).

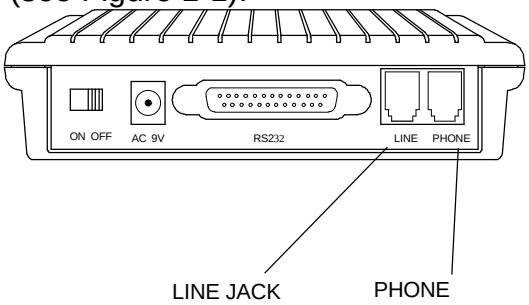


Figure 1-1. Back of modem

2. Plug the other end of the cable into the appropriate RS-232C connector on your computer or terminal. If you need assistance, refer to the manual that accompanied your equipment or contact your computer dealer.

3. After making the connection, check your computer or terminal requirements for the Carrier Detect and Data Terminal Ready signals. The &C command affects the Carrier Detect signal, and &D command affects the Data Terminal Ready signal. Refer to Chapter 5 List of modem commands.

1.6 Connecting to the telephone line

Use the following procedure to connect your modem to the telephone line:

1. Make sure you have an RJ-11 telephone jack. If you need a modular jack, either obtain a telephone adapter from a telephone or electronics store and follow the installation instructions provided with the adapter, or have your local telephone company replace your existing telephone jack with a modular-type jack and your existing telephone cord with a modular cord.
2. Unplug your telephone's cable from the wall jack.
3. Take one end of the modular telephone cable supplied with your modem and plug into the LINE jack on the back of the modem (see Figure 1-1).
4. Plug the other end of the telephone cord into the telephone jack on the wall.

1.7 Connecting to your telephone

Your modem is so convenient. It provides a second modular telephone jack that lets you connect your telephone to the same telephone line the modem is using. This lets you manually dial data calls or make voice calls when you are not using your modem.

Use the following procedure to connect your telephone to your modem:

1. Connect the telephone's modular cord into the **PHONE** jack on the back of your modem (see figure 1-1).
2. Lift your telephone's handset and listen for a dial tone.

1.8 Connecting to an AC outlet

Use the following procedure to connect your modem to an AC outlet:

1. Insert the supplied power cable into the round AC-IN connector next to the POWER switch on the back of the modem (see figure 1-1).
2. Plug the end with the power pack into either a 110 or 220 VAC outlet.
3. Turn the POWER switch to ON position, then the MR LED goes on.
4. Turn on the computer or terminal connected to the modem.

1.9 Using a external MIC and speaker[1]

If you want to use an external MIC or speaker instead of using the built-in speaker, you need to insert your external MIC or speaker cable into the round MIC or speaker connector. After you've inserted the external MIC or speaker, the default built-in speaker will be disabled.

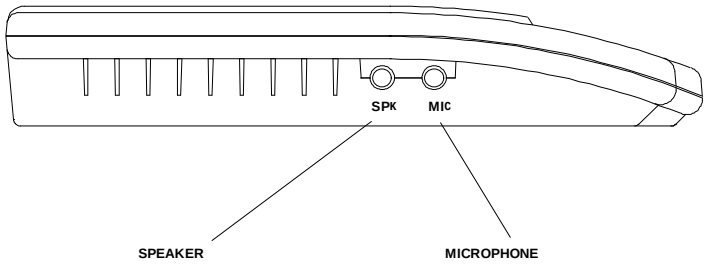


Figure 1-2 Side view of the modem

1.10 Verifying your connection

Before proceeding, make sure your connection matches the one shown in Figure 1-3.

[1] If you modem is shipped without speakerphone function, the MIC and speaker will not work in your system. You can record and playback your voice messages via the handset.

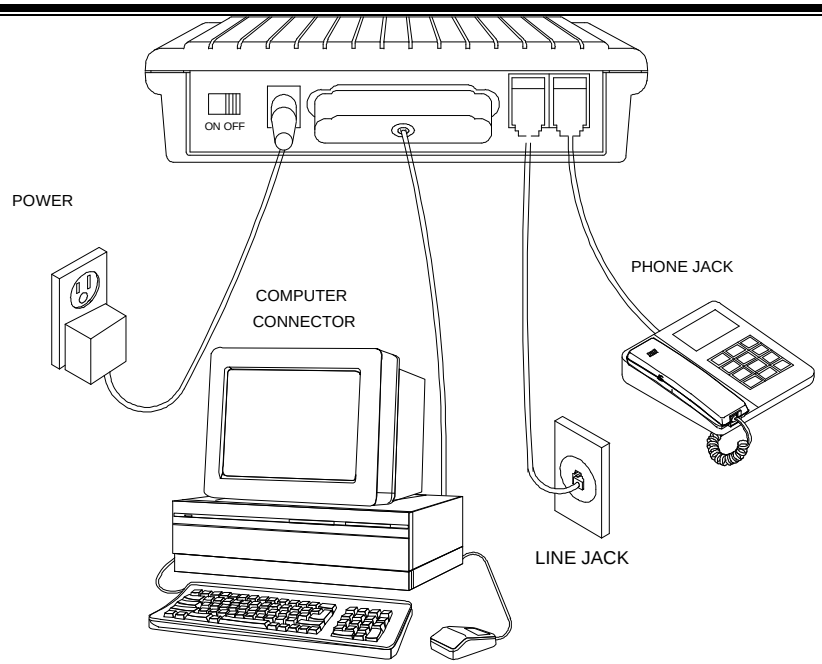


Figure 1-3. Completed modem installation

If you connected the modem to a computer, place the computer into terminal mode and complete the configuration information required by the software. Refer to your software manual to find out which commands to use.

Then use the following procedure to verify your modem connections:

1. Type AT and press the Enter key. The RD and TD LEDs flash on the modem front panel. If your system is operating properly, your modem sends an OK response to your computer screen and wait for your next command.

If the LEDs did not FLASH, or if you did not receive a response, make sure your computer is sending commands to your modem at a speed of 300, 1200, 2400, 9600, 19200, 38400, 57600 or 115200bps. If this does not solve your problem, contact your computer dealer.

2. Use your communication software to prepare your computer to dial a call. Then type ATD x phone number, where x is either T for Touch-Tone dialing or P for Pulse dialing and phone number is the telephone number that your modem is using

For example, if your modem is connected to the telephone line 555-2121 and Touch-Tone dialing is supported in your calling area, type ATDT 555 2121

3. Press the Enter key. You should receive a BUSY response and you should hear the busy signal through the modem speaker because the modem is calling itself.

Your modem is now ready for operation. Refer to the manual that came with your communication software to begin communication. If you will be communicating directly with your modem, or if you want to find out more about the modem's operation, proceed to use's manual.

- If you want to turn off your modem, set the POWER switch on the back of the modem to the OFF position.

1.11 Modem LEDs

The modem has 9 front panel LEDs, which keep you constantly informed of the modem's status. Figure 1-4 shows the LEDs.

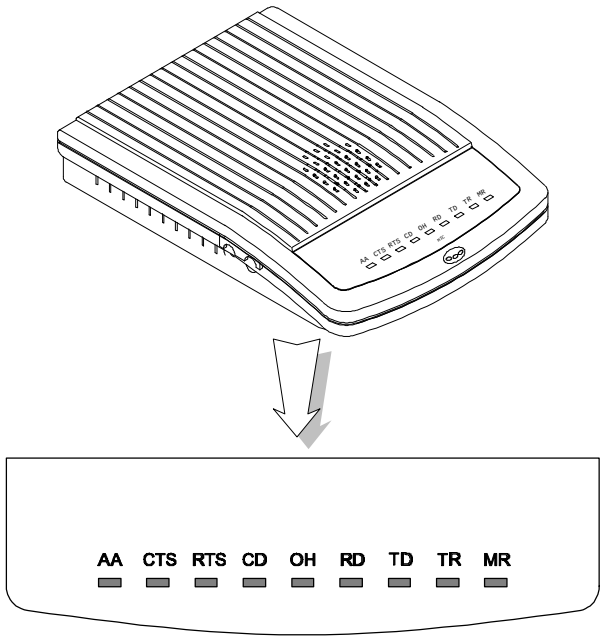


Figure 1-4. Top panel of modem

LED	Meaning
AA	**A**uto-**A**nswer LED. This LED goes ON when the modem is set up to auto-answer incoming calls
CTS	**CTS** is the **C**lear **T**o **S**end LED. This LED goes ON when your modem sends your computer the CTS signal, indicating that the computer can begin transmitting data.
RTS	**RTS** is the **R**equest **T**o **S**end LED. This LED goes ON when your modem receives from your computer, indicating that the computer wants to transmit data.
CD	**CD** is the **C**arrier **D**etect LED. This LED goes ON when the modem detects a remote modem's carrier signal.
OH	**OH** LED is the **O**ff **H**ook. This LED goes ON when the modem is off-hook (using the telephone line).
RD	**RD** is the **R**eceive **D**ata LED. This LED blinks each time your computer receives data from your modem. When data is received at a fast rate, the LED may appear to be ON.
TD	**TD** is the **T**ransmit **D**ata LED. This LED blinks each time data is being transmitted from your computer's serial port to your modem. When data is being transmitted as fast data rates, this LED may appear to be ON.

LED	Meaning
TR	**TR** is the **D**ata **T**erminal **R**eady LED. This LED goes ON when the modem is receiving a Data Terminal Ready (DTR) signal from your computer. Your computer sends this sign al when the computer is ready to send or receive data (DTR is ON). This LED does not work with Macintosh, which uses the DTR signal for hardware flow control purposes.
MR	**MR** is the **M**odem **R**eady LED, This LED goes ON when your modem is connected to an AC outlet and turned on.

Chapter 2 Typing commands and receiving responses

Chapter 2 describes the format to use when typing modem commands. Chapter 2 also describes the responses that your modem sends to your computer screen when you execute, or try to execute, modem commands.

If you will be using a communication software program to make data calls, you will probably not need to type commands, because your software program will handle these tasks for you. Similarly, you will probably not see the responses because your software program may intercept them.

However, if you perform data activities directly with your modem, you will find the format for typing modem commands and modem response helpful.

2.1 Typing a command

Using commands, you can have your modem perform a variety of activities, such as dialing or answering a data call or sending a fax. In order to send commands to your modem, You must type a command line while your modem is in command mode.

2.2 To type a command line

1. Type **AT.** These characters must precede every command line. (except when you type the A/ command, described on page 31)
2. Type the commands you want your modem to execute. A command line can contain up to 40 characters.
3. Press the Enter key. The modem will then execute the commands on the command line.

2.3 Correcting a typing mistake

If you make a mistake while typing a command, press the Backspace key to delete the error. You can delete every command except **AT**.

2.4 Readability

To make a command line easy to read, you can insert spaces parentheses, hyphens, and other punctuation in your command line. For example:

AT M3 DT 9, 1(818)555-1234

Your modem ignores spaces and punctuation when executing a command line, but these characters apply to the 40 characters limit.

2.5 Typing more than 40 characters

If you want to type more than 40 characters on a command line, type a regular command line (up to 40 characters long) and end it with a semicolon as the last character. When you press Enter, your modem executes the commands and returns to command mode, so you can type your next command line.

2.6 Omitting a parameter

Some commands require a numeric parameter such as 0,1, or 2. For example, the **Q** command determines whether your modem sends a modem response after executing a modem command line:

Q0 tells the modem to send responses.
Q1 tells the modem not to send response.

If you type **ATQ** and press the Enter key without typing a parameter of **0** or **1** after the **Q**, it's like typing **Q0** and the modem will send modem responses.

2.7 Repeating a command line

For your convenience, the last command line you execute remains stored in the modem's memory until you type a new command line and press the Enter key. If you want to re-execute the last command, type **A/.**

When you want to use the **A/** command, you don't need to preface it with the AT characters or end it by pressing the Enter key. Just type **A/** to have your modem automatically re execute the last command line.

The **A/** command is particularly useful when you want your modem to re-execute a lengthy command line or redial a number that was busy.

You can continue using **A/** to automatically re-execute the last command line until you type a new command line that begins with AT or reset your modem, or until your modem loses power.

2.8 Modem responses

When you send a command to your modem, it sends a response to your computer. For example, if you send a modem command to your modem, the modem should respond with **OK**. You may never see these responses, however because certain communication software will intercept them before they can be displayed on your computer screen.

This section describes the modem responses returned by the modem when you communicate directly with the modem. If you will be using a communication software

program to make data calls, you may not see these responses because your software program will probably intercept the responses.
Response sets

Modem responses can come from one of five response sets. These response sets are designed **X0**, **X1**, **X2**, **X3**, and **X4.**

The response sets determine which modem responses are sent by the modem. They also define certain dialing characteristics and how the modem handles dial tones and busy signals, as described in the following sections.

2.9 Word or numeric responses

Modem responses can appear as words or numbers. Your modem is set up to return word responses. Word responses are followed by a carriage return and line feed.
If your modem is operating under an application that handles character strings inefficiently or cannot handle them at all, you can use the **V0** command to switch to numeric modem responses. Numeric responses are followed by a carriage return only.

If you do not want to receive modem responses at all, you can use **Q1** command to disable them. You may want to disable responses entirely if your modem is connected to a printer and you do not want the modem responses printed.

2.9.1 X0 response set

The **X0** response set consists of the first five responses in Table 2-1. with this response set, you receive the **CONNECT** response for all connections, regardless of the speed at which they're made.

When you send a Dial command line with this response set in effect, the modem will wait two seconds after receiving your Dial command, then automatically dial the telephone number whether or not a dial tone is present This is known as "blind dialing." You may want to use blind dialing if you will be using the modem in an area that has an irregular or weak dial tone that your modem cannot always detect.

2.9.2 X1 response set

The X1 response set consists of the all responses in Table 2-1, except **NO DIALTONE, BUSY** and **NO ANSWER.** When you send a Dial command with this response set in effect, your modem will blind dial call.

2.9.3 X2 response set

The X2 response set consists of all responses in Table 2-1, except **BUSY** and **NO ANSWER**.

When you send a Dial command with this response set in effect, your modem will listen for a dial tone before dialing. If it does not detect a dial tone within five seconds, it hangs up and returns the **NO DIALTONE** response.

2.9.4 X3 response set

The **X3** response set consists of all responses in Table 2-1, except **NO DIALTONE.**

When this response set is in effect and you send a Dial command to your modem, your modem will blind dial the call. If the telephone number dialed is busy, your modem will send the **BUSY** response.

2.9.5 X4 response set

The **X4** response set is the factory-default response set. It consists of the all responses in Table 2-1. This response set allows the modem to detect a dial tone and also a busy signal.

2.10 Correction & compression responses

If your modem supports the MNP and V.42/V.42bis error-correction and data-compression protocols, you can use the Wn command to enable the extended responses shown in Table 2-1.

- The **W** command that enables negotiation progress responses is not the same command as the **W** dialing modifier used in dial command lines.

The default setting, **W0,** disables extended responses. With **W0**, all **CONNECT** responses report the DTE speed.

To receive the **CARRIER** and **PROTOCOL** responses in Table 2-1, send the W1 command. When this command is in effect, the **CONNECT** response will show the DTE speed.

If you want the **CONNECT** response to show the DCE speed rather than the DTE speed, send **W2** command. With this command, extended responses will be disabled.

Modems that support the MNP and V.42/V.42bis error-correction and data-compression protocol can also use the **\V1** command to append **/ARQ** to the end of all **CONNECT** responses when your modem makes an error-correction data connection with a remote modem.

If you do not want **/ARQ** appended to the end of **CONNECT** responses when an error-correction data connection is made, send the **\V0** command.

Table 2-1. Modem responses

Word Response	Number Response	Meaning
OK	00	Modem successfully executed a command line.
CONNECT	01	If X0 is in effect, modem made a data connection at 0-300,1200, 2400, 9600, 19200bps, Otherwise modem made a data connection at 0-300 bps.
RING	02	Modem detected an incoming ring.
NO CARRIER	03	Remote carrier signal not detected.
ERROR	04	You typed an invalid command line, a checksum error occurred, or your command line is too long.
CONNECT 1200	05	Modem made a 1200bps data connection.
NO DIALTONE	06	Modem has not detected a dial tone. (this response is enabled when X2, X4 or the W dial modifier is in effect.
BUSY	07	Modem detected a busy signal. (this response is enabled when X3 or X4 is in effect.
NO ANSWER	08	Modem did not detect silence when dialing a command line containing the @ dial modifier.
CONNECT 600	09	Modem made a data connection at 600bps. *
CONNECT 2400	10	Modem made a data connection at 2400bps. *
CONNECT 4800	11	Modem made a data connection at 4800bps. *
CONNECT 9600	12	Modem made a data connection at 9600bps. *
CONNECT 7200	13	Modem made a data connection at 7200bps. *
CONNECT 12000	14	Modem made a data connection at 12000bps. *
CONNECT 14400	15	Modem made a data connection at 14400bps. *
CONNECT 19200	16	Modem made a data connection at 19200bps. *
CONNECT 38400	17	Modem made a data connection at 38400bps. *
CONNECT 57600	18	Modem made a data connection at 57600bps. *

CONNECT 115200	19	Modem made a data connection at 115.2kbps. *

Word Response	Number Response	Meaning
CONNECT 75TX/1200RX	22	Modem made a data connection at 75bps transmit and 1200bps receive. *
CONNECT 1200TX/75RX	23	Modem made a data connection at 1200bps *transmit and 75bps receive.
DELAYED	24	Modem return this result code when a call fails to connect and the number dialed is considered "delayed" due to country blacklisting requirement.
BLACKLISTED	32	Modem return this result code when a call fails to connect and the number dialed is considered "blacklisted".
FAX	33	Modem connection is established in fax mode
DATA	35	Modem connection is established in data mode.
CARRIER 300	40	Carrier detected at 300bps. **
CARRIER 1200/75	44	Carrier - transmit 1200bps, receive 75bps. **
CARRIER 75/1200	45	Carrier - transmit 75bps, receive 1200bps. **
CARRIER 1200	46	Carrier detected at 1200bps. **
CARRIER 2400	47	Carrier detected at 2400bps. **
CARRIER 4800	48	Carrier detected at 4800bps. **
CARRIER 7200	49	Carrier detected at 7200bps. **
CARRIER 9600	50	Carrier detected at 9600bps. **
CARRIER 12000	51	Carrier detected at 12000bps. **
CARRIER 14400	52	Carrier detected at 14400bps. **
CARRIER 16800	53	Carrier detected at 16800bps. **
CARRIER 19200	54	Carrier detected at 19200bps. **
CARRIER 21600	55	Carrier detected at 21600bps. **
CARRIER 24000	56	Carrier detected at 24000bps. **
CARRIER 26400	57	Carrier detected at 26400bps. **
CARRIER 28800	58	Carrier detected at 28800bps. **
CONNECT 16800	59	Modem made a data connection at 16800bps.
CONNECT 21600	61	Modem made a data connection at 21600bps.
CONNECT 24000	62	Modem made a data connection at 24000bps.
CONNECT 26400	63	Modem made a data connection at 26400bps.
CONNECT 28800	64	Modem made a data connection at 28800bps.

Word Response	Number Response	Meaning
COMPRESSION: CLASS 5	66	MNP compression negotiated.**
COMPRESSION: V.42BIS	67	V.42bis compression negotiated.**
COMPRESSION: NONE	69	No compression negotiated. **
PROTOCOL: NONE	70	Asynchronous operation. **
PROTOCOL: LAPM	77	V.42 LAPM. **
CARRIER 31200	78	Carrier detected at 31200bps. **
CARRIER 33600	79	Carrier detected at 33600bps. **
PROTOCOL: ALT	80	MNP negotiated. **
CONNECT 33600	84	Modem made a data connection at 33600bps.
CONNECT 31200	91	Modem made a data connection at 31200bps.
CARRIER 32000	150	Carrier detected at 32000bps.
CARRIER 34000	151	Carrier detected at 34000bps.
CARRIER 36000	152	Carrier detected at 36000bps.
CARRIER 38000	153	Carrier detected at 38000bps.
CARRIER 40000	154	Carrier detected at 40000bps.
CARRIER 42000	155	Carrier detected at 42000bps.
CARRIER 44000	156	Carrier detected at 44000bps.
CARRIER 46000	157	Carrier detected at 46000bps.
CARRIER 48000	158	Carrier detected at 48000bps.
CARRIER 50000	159	Carrier detected at 50000bps.
CARRIER 52000	160	Carrier detected at 52000bps.
CARRIER 54000	161	Carrier detected at 54000bps.
CARRIER 56000	162	Carrier detected at 56000bps.
CONNECT 32000	165	Modem made a data connection at 32000bps.
CONNECT 34000	166	Modem made a data connection at 34000bps.
CONNECT 36000	167	Modem made a data connection at 36000bps.
CONNECT 38000	168	Modem made a data connection at 38000bps.
CONNECT 40000	169	Modem made a data connection at 40000bps.
CONNECT 42000	170	Modem made a data connection at 42000bps.

Word Response	Number Response	Meaning
CONNECT 44000	171	Modem made a data connection at 44000bps.
CONNECT 46000	172	Modem made a data connection at 46000bps.
CONNECT 48000	173	Modem made a data connection at 48000bps.
CONNECT 50000	174	Modem made a data connection at 50000bps.
CONNECT 52000	175	Modem made a data connection at 52000bps.
CONNECT 54000	176	Modem made a data connection at 54000bps.
CONNECT 56000	177	Modem made a data connection at 56000bps.

* These response are displayed when the W0 or W1 command is in effect.

** These responses are displayed when the W1 command is in effect

Chapter 3 Using configuration profiles

Your modem is preset so that you can begin transferring data files as soon as you install the modem and load your communication software.

If you dialing and answering requirements do not match the modem's default configuration profile, you can create your own profiles and store them safely in your modem's nonvolatile memory. The profiles will be saved, even when you turn off your modem. When you need to use a certain profile, send the appropriate command.

You can save two custom configuration profiles in your modem's nonvolatile memory. You save profiles using &Wn command. The n can be the number 0 or 1, which corresponds to the location in nonvolatile memory where you want the profile stored.

Using the &Wn command, you can store the following commands (refer to Chapter 5 for description of these commands):

B1, T, E1, F0, L2, M1, Q0, V1, X4, Y0, &C0, &D0, &G0, &J0, &K3, &L0, &P0, \A3, \B2, %C1, \N3 .....

You can also store the following register values (refer to Chapter 6 for a description of these registers):

S0=0, S2=43, S6=2, S7=30, S8=2, S9=6, S10=14, S11=95, S12=50, S18=0, S25=5 ...

3.1 Storing a profile

The following example shows how you can store a profile. Assume that you want to save the following commands in profile 0:

X1 E0 &C1 &D0 &M0 S0=3

To do so :

1. Type **AT**
2. Type the commands shown above
3. Type the **&W0** command as the last command on the command line to save these commands as user Profile 0.
4. Press the Enter key. This custom configuration profile is now saved under user Profile 0.

3.2 Recalling a profile

After you store a custom configuration profile, you can recall it using the **AT&Yn** command. For example, to recall profile 0 :

Type **AT&Y0**

1. Press the Enter key. The next time you turn on or reset your modem, it will drive its operating characteristics from Profile 0.
2. To recall Profile 1 instead of Profile 0, type **AT&Y1** instead of **AT&Y0**.

3.3 Reset and recalling profile

If you prefer, you can use ATZn command to reset the modem and load a stored configuration profile : For example, to reset your modem and recall Profile 0 :

1. Type **ATZ0**
2. Press the Enter key.

Returning to the default profile

1. To return to the factory default profile 0:
2. Type **AT&F0**

Press the Enter key. Your modem returns to basic asynchronous operation, which is the profile in effect when you received your modem. The following table lists the modem's default profile.

Setting	Default	Obtained from Memory
Auto-answer	Disable	Yes
Backspace character	08	No
Bell / CCITT compatibility at 1200 bps	Bell 212A	Yes
Busy signal detect	Enabled	Yes
Carriage return character	13	No
Line feed character	10	No
Communication rate	57600bps	Yes
Data Set Ready option	Always	Yes
Data Terminal Ready option	DTR hang up	Yes
Data Terminal Ready pulse width	0.5 seconds	Yes
Echo	On	Yes
Escape character definition	43 (+++)	Yes
Guard tones	Disabled	Yes
Long space disconnect	Disabled	Yes
Parity	None	Yes
Pulse make/break ratio	39/61 (US setting)	Yes
Responses	Word	Yes
Response enabled	All	Yes
RTS-to-CTS delay	50 milliseconds	Yes

Setting	Default	Obtained from Memory
Speaker status	On, but off when carrier detected	Yes
Speaker volume	Medium	Yes
Test timer setting	0 second	Yes
Wait for carrier after dialing	50 seconds	Yes
Wait for dial tone	2 seconds	No
Wait for dial tone before dialing	Enabled	Yes

Chapter 4 Error correction and data compression

Your modem supports sophisticated MNP 1- 4 and V.42 error- correcting protocols. These protocols ensure the transmission of error-free data – even over noisy, error- prone telephone lines. Your modem also supports the V.42bis and MNP 5 data-compression protocols, which maximizes data throughput and significantly reduces the time needed to exchange data.

4.1 Error-correction protocols

Your modem includes two error-correction protocols:

- MNP level 1 through 4
- CCITT V.42

When these protocols are used, the two modems perform calculations on each "packet" of data being exchanged and compare their values. If the values do not match, the receiving modem requests the sending modem to re transmit the packet.

MNP is an acronym for **M**icrocom **N**etworking **P**rotocol. MNP detects and corrects errors that occur when data is exchanged between two systems. Errors can result from telephone- line noise and other signal distortions.

4.2 V.42

V.42bis the accepted international standard for error correction, ratified by ITU-T in January 1990. It is generally felt that the handshake and protocol establishment process of V.42 is superior to that MNP 4. Therefore, it will provide better initial connections on poor quality telephone lines.

Moreover, while the effective data speed of V.42 and MNP 4 are almost identical over noise-free telephone lines, V.42 provides significantly better performance than the ITU-T-specified MNP4 over noisy telephone lines.

4.3 Configuring for auto-reliable operation

Auto-reliable operation is the modem's default configuration, so if you haven't given the modem any **\N** commands, it should already be in auto-reliable mode.

Auto-reliable mode lets your modem communicate with both MNP/V.42/V.42bis modems and modems that do not use MNP/V.42/V.42bis :

1. Type **AT\N3%C3 (Factory Setting)**
2. Press the Enter key. Your modem responds with OK. When your modem originates or answers calls, it will try to make a V.42bis/V.42 connection. If either or both fail, your modem will try to make an MNP connection. If that fails, your modem will try to make a normal connection that does not use error correction.

4.4 Configuring for reliable operation

To communicate with remote MNP modems only:

1. Type **AT\N5**
2. Press the Enter key. Your modem responds with OK. When your modem originates or answers calls, it will try to make an MNP connection. If that fails, your modem will hang up and return to command mode.

To communicate with remote V.42 modems only:

1. Type **AT\N4**
2. Press the Enter key. Your modem responds with OK. When your modem originates or answers calls, it will try to make a V.42/V.42bis connection. If that fails, your modem will hang up and return to command mode.

4.5 Turning off error-correction

To turn off the MNP/V.42 error correction and communicate with non-MNP/V.42 modems:

1. Type **AT\N0** and press the Enter key to return to standard operation with buffering. or **AT\N1** and press the Enter key to return to standard operation without buffering.
2. Your modem responds with **OK**.

4.6 MNP5 and V.42bis data-compression

There are two major data-compression protocols used in data communications, MNP5 and V.42bis. MNP5 was the first data-compression protocol to be developed and provides a data-compression ratio of 2:1.

In January 1990, ITU-T ratified the V.42bis data-compression protocol as the international standard. V.42bis performs significantly better than MNP5, providing a data-compression ratio of approximately 3:1 – and in some case, up to 4:1.

By supporting both types of data-compression protocols, your modem can communicate with the installed base of MNP5 and V.42bis modems and modems.

To communicate with remote MNP5 modems **only**

1. Type **AT%C1**
2. Press the Enter key. Your modem responds with OK. When your modem originates or answers calls, it will try to make an MNP5 connection. If that falls, your modem will hang up and return to command mode.

To turn off V.42bis and MNP5 data compression:

1. Type **AT%C0 ;** Press the Enter key. Your modem responds with **OK**.

Chapter 5 List of modem commands

Chapter 5 describes the modem commands available to your modem. If you will be using a data communication software program to send and receive files, you will probably not need to use these commands, because your software program will handle these tasks for you. However, if you want to bypass your communication software program and perform modem tasks directly with your modem, you will find the commands described in this chapter helpful.

Standard modem commands begin at Table 5-1. MNP/V.42/V.42bis commands begin on page 38. If a command requires parameters such as 0 and 1, the parameter is identified as n in the left column and described in the right column in the following tables.

- Remember that each command, except for +++ and A/, is prefaced by AT and executed when you press the Enter key. To review the format used to send modem commands, refer to Chapter 2.

Please refer to Chapter 4 for more information on **MNP/V.42/V.42bis** error correction and data compression protocols.

Table 5-1. Standard modem commands

Modem Commands	Description
+ + +	**Keep data connection and move from data mode to command mode** When your modem enters the data mode, typing +++ allows it to escape to the command mode while preserving the connection to remote modem.
A	**Answer command** Force the modem to go off-hook in answer mode without waiting for a ring. Use this command to manually answer an incoming call.
A/	**Re-execute last command** Repeat the last command line it executed. Not preceded with AT nor followed by pressing the Enter key. This command is useful when you want the modem to redial a telephone number that was busy. The last command line executed stays in the modem's memory until power is turned off or the modem is reset. Either action invalidates the A/ command, because there is no command in memory to execute.
Bn	**Protocol for 300 or 1200bps operation** 0 ITU-T V.21 or V.22 mode when modem is operating at 300 or 1200bps 1 Bell 103 or 212A mode when modem is operating at 300 or 1200bps (default)

Modem Commands	Description
Cn	1 Return OK message.
D	**Dial command** Puts the modem into the originate mode, allowing it to automatically dial a telephone number. The telephone number to be dialed, the symbols # and * and the dial modifiers P, R, S=n, T, W, @, !, ; and, can follow the D command. Example : ATDT (818) 555-1212
En	**Echo characters in command mode** Determines whether the modem echoes to your computer screen the keyboard commands you type during command mode 0 Do not echo commands 1 Echo commands(default)
Hn	**Hook switch** 0 Go on-hook(hang up modem) 1 Go off-hook
I	0 Report product code 1 Compute and report checksum 2 Compute checksum and report result of comparison to pressured checksum 3 Report firmware revision, model, and interface type 4 Report response programmed by an OEM 5 Report the country code parameter 6 Report modem data pump model and code revision 7 Reports the DAA code (world-class models only)
Ln	**Speaker volume** 0 Low 1 Low 2 Medium(default) 3 High
Mn	**Speaker status** 0 Speaker always off 1 Speaker on until carrier is detected(default) 2 Speaker always on 3 Speaker is off when receiving carrier and during dialing, but on during answering.
Nn	**DCE data rate** 0 When originating or answering call, handshake only at the communication standard specified by S37. 1 When originating or answering call, handshake only at the communication standard specified by S37. During handshake, modem may fallback to a lower speed (default)

Modem Commands	Description
On	**RETURN to data mode after using escape characters to switch to command node** 0 Return to data mode 1 Perform equalizer retrain sequence, then return to data mode. A retrain causes the modem to optimize its operating characteristics to obtain the best data transmission. This command works at speeds of 2400bps or faster.
Qn	**Modem responses** Determines whether the modem returns responses after you execute, or try to execute, a modem command. Modem responses are described in Chapter 2. 0 Send responses to local computer (default) 1 Do not send response
P	**Set Pulse Dial Default** This command forces pulse dialing until the next T dial modifier or T command is received. Sets S14 bit 5. As soon as a dial command is executed which explicitly specifies the dialing mode for that particular call (e.g., ATDT…), this command is overridden so that all future dialing will be tone dialed.
Sn?	**Display the value of Register n** Refer to Chapter 6 for more information. Example: **ATS0?** Requests the modem to display the value of Register S0, the auto-answer register.
Sn=v	**Change the value of Register n to v** Refer to Chapter 6 for more information Example : **ATS0=2** Changes the value of the auto-answer register (**S0**) to 2.
T	**Set Tone Dial Default** This command forces DTMF dialing until the next P dial modifier or P command is received. The modem will set an S-Register bit to indicate that all subsequent dialing should be conducted in tone mode.
Vn	**Response format** If modem responses are enabled (Q0 in effect), determines whether the responses are shown in numeric or word format. 0 Numeric response format 1 Word response format (default)

Modem Commands	Description
Wn	**Negotiation process responses** Responses that report the carrier speed of the remote modem, the error-correction protocol used, and the data compression method used(if any). Modem responses are described in Chapter 2. 0 CONNECT responses show DTE speed, and disable all extended responses. (default) 1 CONNECT responses show DTE speed, and enable CARRIER and PROTOCOL extended responses. 2 CONNECT responses show DCE speed, and disable all extended responses.
Xn	**Response set** Determines the response set used. 0 Modem ignores dialtone and busy signal; enables responses 0-4. 1 Modem ignores dialtone and busy signal; enables all responses except 6,7,and 8. 2 Modem ignores busy signal; enables all responses except 7 and 8. 3 Modem ignores dialtone and busy signal; enables all responses except 6 and 8. 4 Modem recognizes dialtone and busy signal; enables all responses. (default)
Yn	**Long space disconnect** 0 Disable long space disconnect (default) 1 Enable long space disconnect
Zn	**Reset** Resets the modem and loads one of two configuration profiles stored with the &Wn command. Refer to Chapter 3 for more information. 0 Reset and retrieve configuration from profile 0 1 Reset and retrieve configuration from profile 1
&Cn	**Carrier Detect signal status** Controls the Data Carrier Detect (DCD) signal. 0 Forced on continuously 1 Follows status of remote carrier signal (default)
&Dn	**Data Terminal Ready signal status** Determines how your modem reacts to Data Terminal Ready (DTR) signal 0 Determines how modem responds to the DTR signal 1 Modem enters command mode when DTR goes off 2 Modem goes on-hook and returns to command mode when DTR goes off; auto-answer is disabled if DTR is off (default) 3 Modem resets when DTR goes off

Modem Commands	Description
&Fn	**Fetch the factory default** 0 Fetch the factory configuration 0 1 Fetch the factory configuration 1
&Gn	**Guard tones** Guard tones are used internationally, but are not used in the USA. 0 Disabled (default) 1 Generate 550Hz guard tone 2 Generate 1800Hz guard tone
&Jn	**Telephone Jack Control** This command is only included for compatibility and performs no function except to load the S-Register. 0 &J0 command 1 &J1 command
&Kn	**Flow control** This command can be used to control the flow of data between your modem and computer. Flow control is necessary when the speed between your computer and modem is different than the speed between your modem and the remote modem. 0 Disable flow control. 1 Reserved 2 Reserved 3 Enable hardware (RTS/CTS) flow control (default). 4 Enable software (XON/XOFF) flow control. 5 Enable transparent software flow control (XON/XOFF) 6 Enable both hardware and software flow control (default for fax mode and voice mode)
&Ln	**Telephone line type** 0 Switched dial-up telephone line (default)
&Mn	0 Select direct asynchronous mode
&Pn	**Pulse make/break ratio** 0 39/61 ratio at 10 pulses per second (default) 1 33/67 ratio at 10 pulses per second 2 39/61 ratio at 20 pulses per second 3 33/67 ratio at 20 pulses per second
&Qn	0 Select direct asynchronous mode 1 Reserved 2 Reserved 3 Reserved 4 Reserved 5 Modem negotiates an error corrected link 6 Select asynchronous operation in normal mode

Modem Commands	Description
&Rn	**Clear to send signal status** Controls the Clear To Send (CTS) signal during synchronous operation. During asynchronous command and Data Modes, CTS is always ON. 0 CTS signal tracks the Request To Send (RTS) signal (default) 1 Modem ignores RTS and keeps CTS active continuously, regardless of RTS status.
&Sn	**Data Set Ready signal status** 0 DSR signal always ON (default) 1 DSR signal is ON during handshaking and OFF in test or idle mode. DSR is OFF when the remote carrier signal is lost
&Tn	0 Terminate any test in progress 1 Initiate local analog loopback 2 Returns ERROR result code 3 Initiate local digital loopback 4 Allow remote digital loopback 5 Disallow remote digital loopback request 6 Request an RDL without self-test 7 Request an RDL with self-test 8 Initiate local analog loop with self-test
&V	**View any stored configuration profiles** 1 Display connection statistics
&Wn	**Write S register values to one of two profiles** The following commands and registers can be stored in nonvolatile memory : Commands: **Bn, Cn, En, Ln, Mn, Qn, Vn, Yn, Xn, &Cn, &Dn, &Gn, &Ln, &Pn.....** Register : **S0, S2, S6, S7, S8, S9, S10, S11, S12, S18, S25, S26, S37** 0 Write S register values to profile 0 1 Write S register values to profile 1
&Yn	**Select stored profile on power-up reset** This command tells the modem which profile to use the next time the modem is turned on or reset. 0 Load Profile 0 (default) 1 Load Profile 1
&Zn=Ax	**Stored up four telephone numbers in nonvolatile memory** **n** is the memory location (0-3) **A** is T(for touch tone) or P (for pulse) **x** is the phone number to be stored To dial a stored number, use the **ATDS=n** command Example : AT &Z0=T 1 818 555 2121

	stores in memory position 0 the telephone number 1 818 555 2121, which will be Touch Tone (T) dialed.

Table 5-2. MNP/V.42/V.42bis commands

MNP/ V.42/V.42bis Commands	Description
%Cn	**Enable/disable MNP Class 5 data compression** 0 Disable data compression 1 Enable MNP 5 data compression 2 Enable V.42bis data compression 3 Enable both V.42bis and MNP 5 data compression. (default)
%En	**Line Quality Monitor and Auto-retrain or Fallback/Fall Forward** This command determines whether your modem retrains automatically and resynchronizes the flow of data if it detect telephone-line problems that could adversely affect data. 0 Disable auto-retrain 1 Enable line quality monitor and auto-retrain 2 Enable line quality monitor and fallback/ fall forward. (default)
%L	Return received line signal level
%Q	Report the line signal quality
%7	Plug and Play serial number
%8	Plug and Play vendor ID and product number
\Bn	**Send break to remote system** Equivalent to pressing the Break key on a host keyboard. For standard (non-MNP) or V.42 connections, type a number from 1 to 9 after this command to indicate how long the modem is to provide the break signal. The number will be multiplied by 100 milliseconds and the break signal provided for that duration. Default is 0, which sends a break of 300 milliseconds. Ref. "**\Kn**", defines how your modem treats breaks.
\Gn	**Modem port flow control** Controls the modem's DCE flow control feature 0 Turn off port flow control(default) 1 Turn on XON/XOFF port flow control. Use this setting if the modem is receiving data from the remote system faster than it can process
\Kn	**Set break control** Determines the action performed by the modem when it receives a break from the DTE port or the modem port. The action taken by your modem depends on the mode that the modem is in, as shown in the following tables. Default is 5.

In Data Mode; if reliable mode, send break to the remote system

\K0,\K2,\K4	Enter Command Mode, don't send break to remote modem
\K1	Modem clears modem and terminal buffers, and sends break to remote system
\K3	Modem does not clear terminal and modem buffers, and sends break to remote modem
\K5	Modem sends break to remote modem in sequence with any transmitted data

In Command Mode; if reliable mode, send break to the remote system

\K0 or \K1	Modem clears modem and terminal buffers, and sends break to remote system
\K2 or \K3	Modem does not clear terminal and modem buffers, and sends break to remote modem
\K4 or \K5	Modem sends break to remote modem in sequence with any transmitted data

In Data Mode; if break is received at modem port, send it to serial port

\K0 or \K1	Modem clears modem and terminal buffers, and sends break to remote system
\K2 or \K3	Modem does not clear terminal and modem buffers, and sends break to remote modem
\K4 or \K5	Modem sends break to remote modem in sequence with any transmitted data

MNP/ V.42/V.42bis Commands	**Description**
\Nn	**Set operating mode** Selects the type of asynchronous data connection the modem will try to establish. A modem that uses V.42 can not communicate with one using MNP, since the two error correction protocols are different. However, this command ensures that your modem will be can automatically communicate with modems that use V.42bis, MNP, or no error-correction protocol. 0 Normal mode 1 Direct mode 2 reliable mode 3 V.42 auto-reliable mode(default) 4 V.42 reliable mode 5 MNP reliable mode
\Vn	0 Disable single line connect message 1 Enable single line connect message

Table 5-3. MNP 10 commands

MNP 10 Commands	Description
-Kn	**MNP extended service** This command enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection. 0 Disables V.42 LAPM to MNP 10 conversion. (default) 1 Enables V.42 LAPM to MNP 10 conversion 2 Enables V.42 LAPM to MNP 10 conversion; inhibits MNP extended services initiation during V.42 LAPM answer mode detection phase
-SEC=n	0 Disable MNP 10EC 1 Enable MNP 10EC and set transmit level <tx level> 0 to 30 (0 dBm to -30 dBm)

Chapter 6 List of modem S-register

Your modem has S-registers that affect various operating characteristics, let you obtain information about the modem, and let you test the modem. Each S-Register has a factory-set value, which you can read or change to fit your particular requirements. Chapter 6 explains how to read and change S-Register repeatedly. A sequential list of S-Register is also provided.

6.1 Reading an S-Register value

To read the current value of an S-Register :

1. Type **ATSr?** from the command mode, where **r** is an S-Register number.
2. Press the Enter key. The modem responds with decimal value of the S-Register , in three-digit form, followed by **OK.**

To read values from more than one S-Register :

1. Type **ATSr?Sr?** from the command mode and press the Enter key. For example, to read the value of Register **S0** (auto-answer after the number of rings specified by this S-Register value) and **S1**(count the number of incoming rings), type **ATS0?S1?** from the command mode.
2. Press the Enter key. The modem displays the first S-Register value, a carriage return, the next S- Register value, a carriage return, and **OK**(or **0**).

6.2 Changing an S-Register value

To change an S-Register value, use the Sr=n command, where r is an S-Register number and n is the new value you want to assign to the S-Register. For example, to have the modem auto-answer incoming calls after the third ring:

Type **ATS0=3** from the command mode.

1. Press the Enter key. The modem responds with **OK** or **0** to show it has executed your command and changed the S-Register value. The value remains in effect until the modem is turned off and on, or reset. The modem then revert to its default S-Register values (in this case, Register **S0** returns to a value of 0, disabling auto answer).

6.3 S-Register descriptions

Table 6-1 summarizes the modem S-Register, their default values, and their functions.

Table 6-1 S-Register description

S-Register	Range	Default	Description
S0	0-255 rings	0	**Auto-answer** Assigning a value from 1 to 255 in Register S0 tells the modem how many rings must occur before it can auto-answers calls. The default, 0, turns off the auto-answer feature.
S1	0-255 rings	0	**Count incoming rings** Register **S1** counts the number of incoming rings when your telephone line rings. When this value equals the value in Register **S0**, the modem auto-answer calls. This S-Register resets approximately 8 seconds after the last ring.
S2	0-255, ASCII	43 (+)	**Escape character value** Register **S2** sets the ASCII value of escape characters, that switch the modem from data mode to command mode without losing the connection to the remote modem. Values greater than 127 disable the escape feature, preventing a return to the command mode. To return to command mode with the escape characters disabled, the remote modem must hang up or an ON-to-OFF transition of the DTR interface signal must occur with **&D1, &D2** or **&D3** in effect.
S3	0-127, ASCII	13 (Carriage Return)	**Carriage return character** Register **S3** sets the ASCII value of the carriage return (end-of-line) character, This is the character used to end the command line(and have the modem execute the line) and also the character that follows modem responses.
S4	0-127, ASCII	10 (Line Feed)	**Line feed character** Register **S4** sets the ASCII value of the line feed character. The modem sends this character after a carriage return only when word responses are sent (**V1** command in effect). If a line feed characters is not wanted, change this register value to a null character.

S-Register	Range	Default	Description
S5	0-32 , ASCII	8 (Backspace)	**Backspace character.** Register **S5** sets the ASCII value of the backspace character is the one created by passing the Backspace key and the character echoed to move the cursor to the left. To change this value, assign an ASCII value between 0 and 32 or greater than 127. Do not use values between 33 and 126 since they correspond to printable ASCII characters.
S6	4-255 seconds	4	**Dial tone wait time** Register **S6** determines how long the modem waits before dialing the first digit in Dial command line. This feature is convenient when it takes longer than two seconds to obtain a dial tone.
S7	1-255 seconds	50	**Carrier wait time** Register **S7** tells the modem how many seconds to wait for a remote modem's carrier signal before hanging up. The S7 value can be increased if the modem does not detect a carrier within the specified time. If the modem detects a remote carrier signal within the specified time, it sends a **CONNECT** response and enter data mode. If it does not detect a remote carrier within the specified time, it sends **NO CARRIER** , hangs up, and remains in command mode.
S8	0-255 seconds	2	**Comma pause time for dial delay** Register S9 tells the modem how many seconds to pause for each comma (,) in a Dial command line. The comma is used when dialing through a PBX or other special telephone service to wait for an outside telephone line.
S9	1-255 tenths of a second	6	**Carrier detect response time** Register S9 tells the modem how long the remote modem's carrier signal must be present so the modem does not mistake the signal for a busy signal, ring, or voice. The default setting requires the modem to the carrier signal for at least 0.6 seconds before recognizing it. Increasing the time in this S-Register reduces the chances that the modem will mistake noise such as a busy

			signal or voice foe carrier signal.

S-Register	Range	Default	Description
S10	1-255 tenths of a second	14	**Carrier loss time** Register S10 sets the time between the loss of a remote modem's carrier signal and when the modem disconnects. This allows the remote modem's carrier signal to momentarily disappear from the telephone line without the modem disconnecting.
S11	50-255 ms	95	**Touch-Tone speed** Register S11 controls the speed of the Touch-Tone (DTMF) dialing. Increasing this value to 255 slows the dialing rate to 1.9 digits per second. Do not select a value less than 50 milliseconds. (Register S11 does not effect pulse dialing, which is fixed at 10 pulses per second.)
S12	0-255 1/50 seconds	50	**Escape character guard time** Register S12 controls the time delay required before and after typing the escape characters. The default setting, 50, equals one second. To reduce the chance that transmitted data is mistaken for escape characters, the S12 value can be increased, but this makes using the escape characters time-consuming. If a small value is used, it may be hard to type the three escape characters fast enough, especially if the guard time is less than the time needed to send 1 character at the current transmission speed. If S12=0, there will be no time requirement for typing escape characters.

S-Register	Range	Default	Description
S14			**General Bit Mapped Options Status** Bit 0 ¡ This bit is ignored. Bit 1 ¡ Command echo (En) 0= Disabled (E0) 1= Enabled (E1) (Default) Bit 2 ¡ Quiet mode (Qn) 0= Send result codes (Q0)(Default) 1= do not send result code (Q1) Bit 3 ¡ Result codes(Vn) 0= Numeric 1= Verbose (V1) (Default) Bit 5 ¡ Tone(T)/Pulse(P) 0= Tone(T) (Default) 1= /Pulse(P) Bit 7 ¡ Originate/Answer 0= Answer 1= Originate (Default)
S16			**General Bit Mapped Test Options Status** Bit 0 ¡ Local analog loopback 0= Disabled (Default) 1= Enabled (&T1) Bit 2 ¡ Local digital loopback 0= Disable(Default) 1= Enable(&T3) Bit 3 ¡ Remote digital loopback (RDL) status 0= Modem not in RDL(Default) 1= RDL in progress Bit 4 ¡ RDL required(AT&T6) 0= RDL not requested(Default) 1= RDL requested Bit 5 ¡ RDL with self test 0= Disabled (Default) 1= Enabled(&T7) Bit 6 ¡ Local analog loopback (LAL)with self test 0= Disabled (Default) 1= Enabled(&T8) Bit 7 ¡ Not used

S-Register	Range	Default	Description
S18	0-255 seconds	0	**Test Timer** Register S18 sets the amount of time for modem tests. The tests can run from 1 to 255 seconds, depending on the value in S18. The factory setting turns off the timer. If the command &T0 is used to end the modem tests, the value of S18 can be set to 0 to turn off the test timer.
S19	Bit Mapped	0, hex	**AutoSync Bit Mapped Options** Defines the options for AutoSync operation . S19 must be set to the desired value before &Q4 is issued.
			Bit 1 **BSC/HDLC format select** 0 = BSC selected (default) 1 = HDLC selected Bit 2 **Address detection enable/disable** 0 = Disabled (default) 1 = Enabled Bit 3 **NRZI/NZI coding select** 0 = NRZI (default) 1 = NZI Bit 4 **Idle indictor select** 0 = Mark idle (default) 1 = Flag or sync idle
S20	0 - 255	0	**AutoSync HDLC Address or BSC Sync Character** S-Register S20 defines the HDLC address or BSC Sync Character for AutoSync operation. S20 must be set to the desired value before &Q4 is issued.

S-Register	Range	Default	Description
S21		4	**24/General Bit Mapped Options Status** Indicates the status of command options. Bit 0 ¡ Set by &Jn command but ignored otherwise. Bit 2 ¡ CTS behavior(&Rn) 0= CTS tracks RTS (&R0) 1= CTS always on (&R1) (Default) Bit 3-4 ¡ DTR behavior(&Dn) 0= &D0 selected (Default) . 1= &D1 selected . 2= &D2 selected 3= &D3 selected Bit 5 ¡ RLSD(DCD) behavior(&Cn) 0= &C0 selected (Default) . 1= &C1 selected Bit 6 ¡ DSR behavior(&Sn) 0= &S0 selected (Default) . 1= &S1 selected Bit 7 ¡ Long space disconnect(Yn) 0= Y0 (Default) . 1= Y1
S22	117	117	**Speaker/Results Bit Mapped Options Status** Indicates the status of command options Bits 0-1 ¡ Speaker volume (Ln) 0= Off(L0) 1=Low(Default) 2=Medium(L2) 3=High(L3) Bits 2-3 ¡ Speaker control (Mn) 0= Disabled(M0) 1=Off on carrier(Default) 2=Always on(L2) 3=On during handshake(L3) Bits 4-6 ¡ Limit result codes (Xn) 0= X0 4= X1 5= X2 6= X3 7= X4(Default.)

S-Register	Range	Default	Description
S23		62	**General Bit Mapped Options Status** Indicates the status of command options Bits 1 ¡ Grant RDL 0=RDL not allowed (&T5) (Default) 1=RDL allowed(&T4) Bits 1-3 ¡ DTE Rate 0= 0-300 bps 1= 600 bps 2= 1200 bps 3= 2400 bps 4= 4800 bps 5= 9600 bps 6= 19200 bps 7=38400 bps or higher (Default) Bits 4-5 ¡ Assumed DTE parity 0= even 1= not used 2= odd 3= none (Default) Bits 6-7 ¡ Guard tone (&Gn) 0= None(&G0) (Default) 1= None (&G1) 2= 1800 Hz (&G2)
S25	0-255 1/100 seconds	5	**DTR delay** Register S25 determines how long the modem waits to hang up after the Data Terminal Ready signal goes from ON to OFF, if &D2 is in effect.
S26	0-255 1/100 seconds	1	**RTS/CTS delay** Register S26 determines how long the modem waits after the Request to Send signal goes from ON to OFF before asserting the Clear to Send signal.

S-Register	Range	Default	Description
S27		73	**Bit Mapped Options Status** Indicates the status of command options Bits 0,1,3 Synchronous /asynchronous selection (&Mn/&Qn) 3 1 0 0 0 0 = &M0 or &Q0 0 0 1 = &M1 or &Q1 0 1 0 = &M2 or &Q2 0 1 1 = &M3 or &Q3 1 0 0 = &Q4 1 0 1 = &Q5 (Default) 1 1 0 = &Q6 Bit 2 Leased line control (&Ln) 0 = Dial up line (&L0)(Deault) Bits 4-5 Internal clock select (&Xn) 0=Internal clock (&X0) (Default) 1 = External clock (&X1) 2 = Slave clock (&X2) Bit 6 CCITT/Bell mode select (Bn) 0 = CCITT mode (B0) 1 = Bell mode (B1) (Default)
S28		0	**Bit Mapped Options Status** Bits 3-4 Plus dialing (&Pn) 0 = 39%~61% make/break ratio at 10 pluses per second (&P0) 1 = 33%~67% make/break ratio at 10 pluses per second (&P1) 2 = 39%~61%

S-Register	Range	Default	Description
			make/break ratio at 20 pluses per second (&P2) 3 = 33%~67% make/break ratio at 20 pluses per second (&P3) Bits 6-7 MNP Link Negotiation Speed (*Hn) 0 = Link negotiation at highest speed (*H0) (Default) 1 = Link negotiation at 1200 bps (*H1) 2 = Link negotiation at 4800 bps (*H2)
S29	0-255 10 ms interval	70	**Flash Dial modifier Time** Sets the length of time, in units of 10 ms , that the modem will go on-hook when it encounters the flash (!) dial modifier in the dial string. The time can be limited as it is a country dependent parameter.

S-Register	Range	Default	Description
S30	0-255 tens of seconds	0 (disable)	**Disconnect Inactivity Timer** Sets the length of time , in tens of seconds, that the modem will stay online before disconnecting when no data is sent or will reset the timer. The timer is inoperative in synchronous mode.
S31		194	**BIT Mapped Options Status** Bit 0 ¡ Single line connect message enable/disable(\Vn) 0=Message controlled by S95, Wn and Vn (\V0)(Default) 1= Single line connect message (\V1) Bit 1 ¡ Auto line speed detection (Nn) 0= Disabled (N0) 1= Enabled (N1) (Default) Bits 2-3 ¡ Error correction progress messages (Wn) 0= DTE speed only (W0) (Default) 1= Full reporting (W1) 2= DCE speed only (W2) Bits 4-5 ¡ Caller ID(#CID) 0=Caller ID disabled (#CID=0) (Default) 1=Short (formatted) Caller ID enabled (#CID=1) 2=Long (unformatted) Caller ID enabled (#CID=1) Bits 6-7 ¡ Reserved
S32	0 - 255	11, hex	**Sets the value of the XON character**
S33	0 - 255	13, hex	**Sets the value of the XOFF character**

S-Register	Range	Default	Description
S36	Bit Mapped Bit 0-2	07, hex	**LAPM Failure Control** This value indicates what should happen upon a LAPM failure. 0 Modem disconnect. 1 Modem stays on-line and direct mode connection is established. 3 Modem stays on-line and a normal mode connection is established. 4 An MNP connection is attempted and if it fail, the modem disconnects. 5 An MNP connection is attempted and if it fails a direct mode connection is established. 7 An MNP connection is attempted and if it fails a normal mode connection is established. (Default)
S37	Bit Mapped		**Desired Line Connection Speed** Register S37 is bit-mapped and provides the following functions. 0 Attempt automode connection. If N0 is active, connection is attempted at the most recently sensed DTE speed. If N1 is active ,connection is attempted at the highest possible speed. (Default) 1-3 Attempt a 300 bps connection 5 Attempt a V.22 1200 bps connection 6 Attempt a V.22bis 2400 bps connection 7 Attempt a V.23 connection 8 Attempt a V.32bis 4800 bps connection 9 Attempt a V.32bis 9600 bps connection 10 Attempt a V.32bis 12000 bps connection 11 Attempt a V.32bis 14400 bps connection 12 Attempt a V.32bis 7200 bps connection

S-Register	Range	Default	Description
S38	0-255 seconds	20	**Delay Before Forced Hang Up** This register specifies the delay between the modem's receipt of the H command to disconnect (or ON-to-OFF transition of DTR if the modem is programmed to follow the signal), and the disconnect operation. Applicable to error-correction connection only. This register can be used to ensure that data in the modem buffer is sent before the modem disconnects. If S38 is set to a value between 0 and 254, the modem will wait that number of seconds for the remote modem to acknowledge all data in the modem buffer before disconnecting. If time expires before all data is sent, the NO CARRIER result code will be issued to indicated that data has been lost. If all data is transmitted prior to time-out, the response to the H0 command will be OK. If S38 is set to 255, the modem does not time-out and continues to attempt to deliver data in the buffer until the connection is lost or the data is delivered.
S39		3	**Flow Control Bit Mapped Options Status** Indicates the status of command options. Bit 0-2 Status of command options 0= No flow control 3= RTS/CTS (&K3) (Default.) 4= XON/XOFF (&K4) 5= Transparent XON (&K5) 6= Both methods (&K6)

S-Register	Range	Default	Description
S40		105 (Non-NP 10 models) 107 (MNP 10 models)	**General Bit Mapped Options Status**
		Bit 0-1 **MNP Extended Services (-Kn)** 0= Disable extended services (-K0) (Default for non-MNP 10 models.) 1= Enable extended services (-K1) (Default for MNP 10 models.) 2= Enable extended services (-K2) Bit 2 **Power Level Adjustment for Cellular Use** ()Mn) 0= Auto-adjustment ()M0) (Default) 1= Force adjustment ()M1) Bits 3-5 **Break Handling** (\Kn) 0= \K0 1= \K1 2= \K2 3= \K3 4= \K4 5= \K5 (Default) Bits 6-7 **MNP Block Size** (\An) 0= 64 chars (\A0) 1= 128 chars (\A1) (Default) 2= 192 chars (\A2) 3= 256 chars (\A3)	

S-Register	Range	Default	Description
S41		**3**	**General Bit Mapped Options Status** Indicates the status of command options
			Bit 0-1 **Compression selection (%Cn)** 0= Disabled (%C0) 1= MNP 5(%C1) 2= V.42 bis (%C2) 3= MNP 5 and V.42 bis (%C3) (Default) Bit 2,6 **Auto retrain and fallback/fall forward (%En)** Bit 6 Bit 2 0 0 = Retrain and fallback/fall forward disabled (%E0) (Default) 0 1 = Retrain enabled (%E1) 1 0 = Fallback/fall forward enabled (%E2) Bit 4 **Block mode control** (\Ln) 0= Stream mode (\L0) (Default) 1= Block mode (\L1) Bit 7 **Enable fallback to V.22bis/V.22** (-Qn) 0= Disabled (-Qn) 1= Enable (-Q1) (Default)
S46		**138**	**Data Compression Control** Control selection of compression. The following actions are executed for the given values: **S46=136** Execute error correction protocol with no compression **S46=138** Execute error correction protocol with compression (Default)

S-Register	Range	Default	Description
S48		**7**	**V.42 Negotiation Action** The V.42 negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and negotiation is unnecessary, this process can be bypassed if so desired. **S48=0** Disable negotiation; bypass the detection and negotiation phases; and proceed with LAPM. **S48=7** Enable negotiation.(Default) **S48=128** Disable negotiation; bypass the detection and negotiation phases; and proceed at once with the fallback action specified in S36. Can be used to force MNP.
S82		**128**	**Break Handling Options** S82 is for compatability purposes only, changing this register will not have any affect.
S91	0-15dBm	**10**	**PSTN Transmit Attenuation Level** Sets the transmit attenuation level from 0 to 15 dBm for the PSTN mode, resulting in a transmit level from 0 to -15dBm, in some countries, the transmit level may not be changed and there are checks to prevent transmit attenuation level change using ConfigurACE.
S92	0-15dBm	**10**	**Fax Transmit Attenuation Level** Sets the transmit attenuation level from 0 to 15dBm for the fax mode, resulting in a transmit level from 0 to -15 dBm. In some countries, the transmit level may not be changed and there are checks to prevent

S-Register	Range	Default	Description
			transmit attenuation level change using Configure.

S-Register	Range	Default	Description	
S86	0-255 seconds		**Call Failure Reason Code** When the modem issues a NO CARRIER result code, a value is written to this S-Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The cause codes are:	
			S86=0	Normal disconnect, no error occurred.
			S86=4	Loss of carrier.
			S86=5	V.42 negotiation failed to detect an error- correction modem at the other end.
			S86=9	The modems could not find a common protocol.
			S86=12	Normal disconnect initialed by the remote modem.
			S86=13	Remote modem does not respond after 10 re-transmissions of the same message.
			S86=14	Protocol violation.
S95	Bit Mapped	**0**	Register **S95** is bit-mapped. A bit set to 1 in this register enables the corresponding response, regardless of the **W** command in effect.	

S-Register	Range	Default	Description
		Bit 0 **CONNECT** response shows DCE speed, not DTE speed Bit 1 Append **/ARQ** to **CONNECT** word responses when an error-correction connection is made Bit 2 Enable **CARRIER nnnn** response Bit 3 Enable **PROTOCOL nnnn** response Bit 5 Enable **COMPRESSION** response	
S201	0-63	**58**	**Cellular Transmit Level** This bits in this register are set by the @Mn and: En commands to support cellular connections.
		Bit 0-4 Initial Cellular Power Level Setting (@Mn; default = @M0) Bit 5 Compromise Equalizer Enable Command(:En;default=E1)	

Chapter 7 Hardware Quick Installation Guide

Before you begin installing your modem, run the following tests first:

Identify an available COM port address and IRQ (interrupt) for your modem.
Do you have either a sound card, a network card, a scanner card, or a bus mouse? If you do so, find out their IRQ settings from your computer dealer or from the hardware manuals.

7.1 FOR WINDOWS 95

- **Add a COM Port**

1. Please choose **START** then **Settings**, then **Control Panel**. In Control Panel, double click on **Add New Hardware**. In the "**Add New Hardware Wizard**" Click on "**Next >**" button. It will then ask you if you want Windows 95 to search for New Hardware, click on **YES**, and then the "**Next >**" button. Read the Warning, and if you agree, click on "**Next >**". Now wait for the Wizard to complete its inspection of your system configuration. You can click on "**Details**" and if all is correct, then click on "**Finish**" button. Then when it asks, click on "**Yes**" to reboot your computer.

2. Now go to **START**, then **SETTINGS**, then **Control Panel**. Double Click on **System**. Then click on the **Device Manager** TAB. Double Click on "**Ports (COM & LPT)**". Whatever COM ports show up, you cannot use for the modem, unless you disable them first in the BIOS of you COMPUTER, ON the Motherboard or on your I/O Card. If you choose to disable one of your current ports to put the modem in, then rerun this test to make sure that it was actually disabled correctly.

3. You can now continue to **OPTION 1** of this section.

■ **Refer to Chapter 8 to continue the installation of the modem**

7.2 FOR WINDOWS 3.1x or DOS

Turn your computer on and go to the "C" prompt (C:\>).

If you have MS-DOS 6.0, or higher, or MS-Windows 3.1x, type MSD (Microsoft Diagnostic) at "C" prompt. This will not work if you only have Windows 95, (see above section).

MSD is going to give you information on your computer system. Look and see if you can locate an entry call "COM Port." There should be a number right next to that entry identifying the number of COM ports you have. Write the number down on a piece of paper.

Press "C" to go into the COM Port screen.

Write the port addresses for each COM Port down. Regardless of what MSD says, "03F8" is COM1, "02F8" is COM2, "03E8" is COM3, and "02E8" is COM4. If it has "02E8" under COM3, don't worry about it. It just means you skipped a COM Port, this is very common. You only have to go by the port addresses.

OPTION 1

If you only have "03F8" in the COM Port screen and do not have any sound card, network adapter, scanner card, bus mouse, or other device using IRQ3, set your modem's switches or jumpers to COM2 IRQ3 according to the user's manual that cames with your modem (both COM and IRQ must be set). If you only have "02F8" for COM port, set your modem to COM1 IRQ4, again following the directions of your Modem User's manual.

OPTION 2

If you have both "03F8" and "02F8" and do not have any sound, network, scanner card, bus mouse, or other device using IRQ5, set your modem to COM3 IRQ5.

OPTION 3

If you have "03F8" and also have "02E8" and you do not have any sound, network, scanner card, bus mouse, or other devices using IRQ5, set your modem to COM2 IRQ5.

OPTION 4

If you have "03F8" and also have "02E8" and you do have another device using IRQ5, please consult your "Multi I/O Card User's Manual" and have COM4 "02E8" IRQ3 disabled. This "Multi I/O Card User's Manual" ought to come with your computer system. Check with your computer dealer if you can't find one in the package. Set your modem to COM2 IRQ3 after COM4 IRQ3 is disabled on the I/O card.

OPTION 5

If you have both "03F8" and "02F8" and you do have another device using IRQ5 while you don't have any external device connected to COM2 "02F8", have COM2 "02F8" IRQ3 on your I/O card disabled. Set your modem to COM2 IRQ3 after COM2 IRQ3 has been disabled on your I/O card.

OPTION 6 (depends on your system's multi-I/O card)

If you have both "03F8" and "02F8" and do have another device using IRQ5 while there is an external device connected to COM2 "02F8" and a serial mouse is connected to COM1 "03F8," you can try to put your modem on COM4 IRQ3. However, this is not always guaranteed to work. It is our experience that whether or not this kind of setting works or not depends a lot on the multi-I/O card itself. Sometimes the I/O card does not like to share IRQ (IRQ3 in this case) with another device. Sometimes this setting will work for a while and suddenly stopped working. Sometimes it will work flawlessly. The PC Bus architecture was not designed to share IRQ's.

OPTION 7

If you have a setting that matches Option 6 above and Option 6 does not work on your system, you can try to move the device that's using IRQ5 to an unused IRQ and set your modem to COM3 IRQ5. If the device that's using IRQ5 does not support other IRQ's, you have ran out of available IRQ. Consult your local dealer or a consultant to see if they can give you some advice. You must also realize that if your system is fully loaded with no available COM Port or IRQ, another device must be sacrificed (disabled) to make room for the fax modem.

When you find the COM Port and IRQ setting for your modem, set the modem according to the instructions in your Fax Modem User's manual. Turn your computer off, unplug the power cord, remove the cover to your computer, locate an available expansion slot on the motherboard, remove the screw that's holding the slot cover if there is one, and carefully slide the modem into the slot completely. Secure the modem in the slot with the screw. Connect your DEDICATED phone wire to the fax/modem's "LINE" jack. You may want to install the software that came with the package and test the modem before you put the computer cover back. But be careful not to touch any system components with the power cord plugged into the wall socket.

NOTE*:* **Windows 3.1x Systems (COM Port Packing)**

If you are skipping COM3, and you are installing any Windows based communications software, you will need to add the following two lines to your SYSTEM.INI file's [386Enh] section:

Example: **COM3IRQ=-1**
COM3BASE=03E8

This applies in general to any skipped COM Port, where 'x' is the Port Number skipped.

COMxIRQ=-1
COMxBASE= {note the appropriate port address}

Port Addresses

COM1 = 03F8 **COM2 = 02F8**
COM3 = 03E8 **COM4 = 02E8**

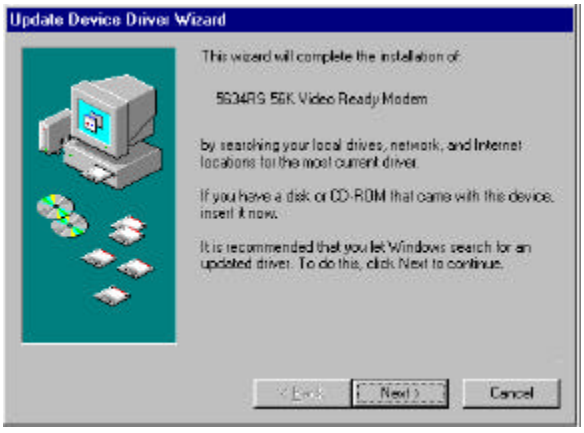
Chapter 8 Windows 95 Modem Driver Installation

After following the directions in our Hardware Conflict Resolution Guide, please follow these procedures to install the driver:

8.1 Install the Modem to Windows 95

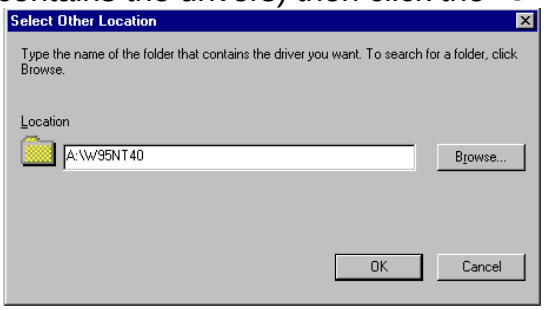
1. Boot the system from Windows 95. Windows will auto-detect the existence of the modem.

2. Now Windows will begin the "**Update Device Driver Wizard**". Click on the "**Next**" Button.

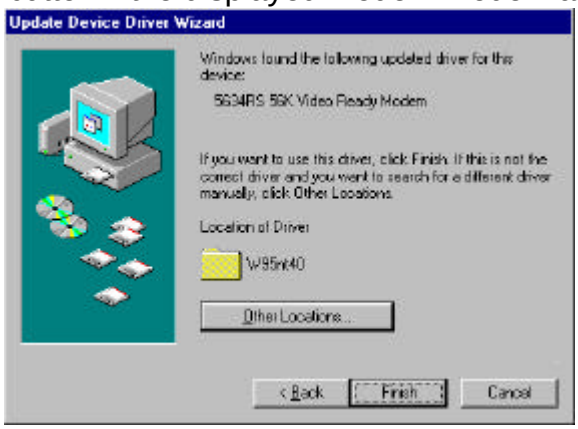


3. Click on the "**Other Locations..**" button to indicate the right path of the driver.

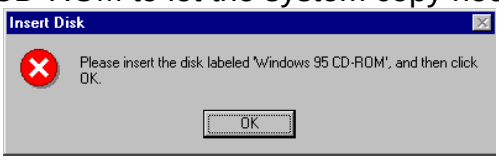
4. Type the name of the driver path (ie **A:\W95NT40)** or you can browse the folders to indicate the path that contains the drivers) then click the "**OK"** button.



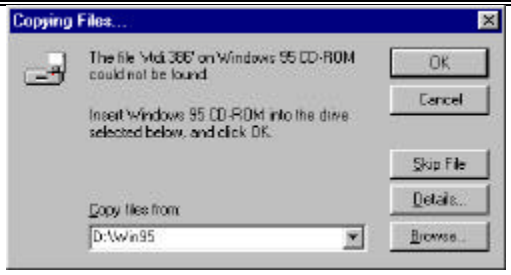
5. Click on the "**Finish**" button if the displayed modem model name fits yours.



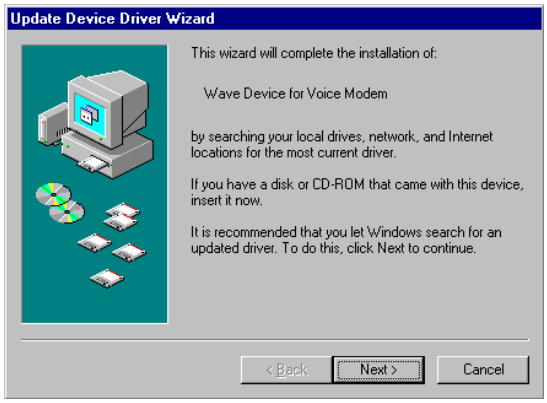
6. Insert the Windows 95 CD-ROM to let the system copy necessary files for the modem.



7. Indicate the right path for the CD-ROM (i.e. **D:\Win95**) or you can browse other folders that contain the OSR2 source files.

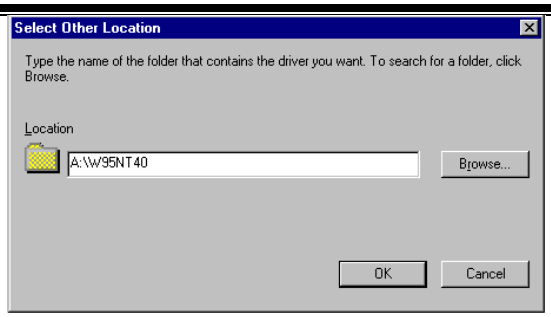


8. After completed to copy the modem driver, the "**Update Device Driver Wizard**" will continue to complete the installation the "**Wave Device for the Voice Modem**" for modem. Click on the "**Next**" button.

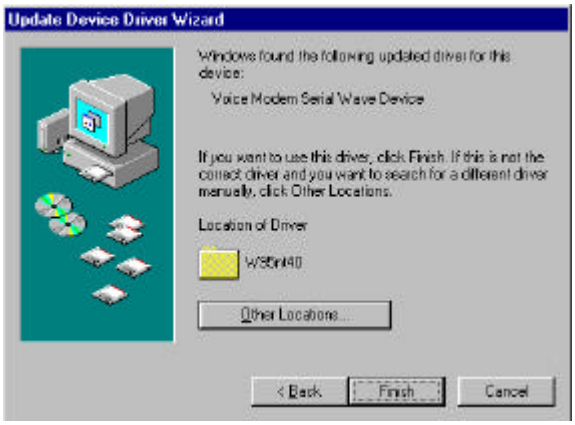


9. Click on the "**Other Locations…**" button if the wave driver and the modem are in the same directory.

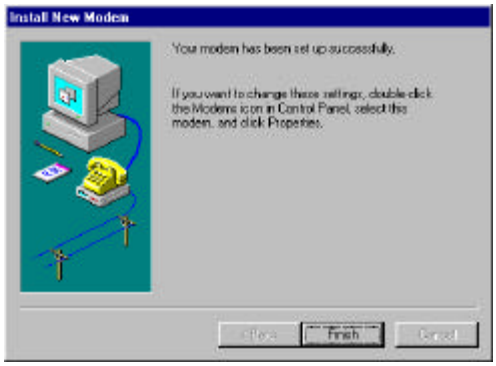
10. Type the name of the driver path (ie **A:\W95NT40)** or you can browse the folders to indicate the path that contains the drivers) then click the "**OK"** button.



11. Click on the "**Finish**" button.



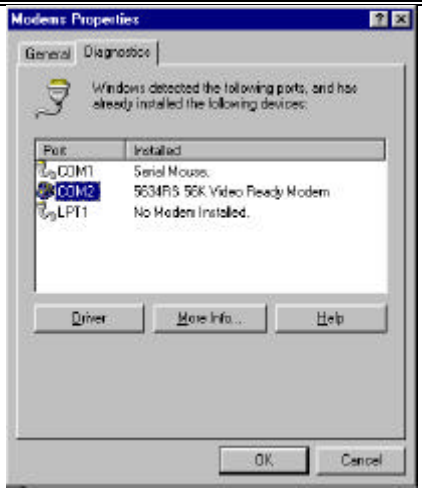
12. Now you've completed to install the drivers for the modem.



8.2 Testing the installation of the modem

1. Double click the "**Modem"** icon in the "**Control Panel"**. Choose "**Diagnostics**".

2. Choose "**COM2 5634RCS 56K Video Ready Modem**" and click on the "**More Info**.." button.



3. When the screen shows correct information above the modem, it means the modem can work properly under your system.

8.3 Manually Install the Modem

1. Click on the "**Modem**" icon twice to begin configuring its setting. Choose "**Don't detect my modem; I will select it from a list.**", then click on "**Have disk**".
2. Indicate the driver path such as "**A:\win95**" for Windows, then click on "**Next**" button.
3. After installing the new Windows 95 driver for your modem. It comes with a list of modem models: "**5634RCS 56K Video Ready Modem, …**". Select the model that fits yours.
4. Window now will ask you to insert the **Windows 95 CD** disk to copy necessary driver files to the Windows 95 system.
5. After Windows has auto detected your hardware COM port setting, it will show the suggesting COM port. You can select the port such as "**Communication Port [COM2]**".
6. After querying the new COM port, it should come up your modem type.
7. Click on "**Finish**". Shut down the computer.
8. When you reboot your system, you'll be ready for using your modem.

A FCC Compliance

Appendix A provides compliance information about your modem.

A.1 FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures :

- Reorient of relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

This unit was tested with shielded cables on the peripheral devices. Shielded cables must be used with the unit to insure compliance. This statement can be deleted if unit was not tested with shielded cables.

The manufacture is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two condition:(1) This device may not cause harmful interference, and (2) This device must accept any interference that may cause undesired operation.

A.2 FCC Requirement

This equipment complies with Part 68 of the FCC Rules. On the base unit of this equipment is a label that contains, among other information, the FCC Registration Number and Ringer Equivalence Number(REN) for this equipment. If requested, this information must be given to telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring when your telephone number is called. In most, but not all area, the sum of the REN's of all devices connected to one line should not exceed five(5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

If your equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complain with the FCC. Your telephone company may make changes in its facilities, equipments, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

The equipment may not be used on coin service by the telephone company. Connection to party lines is subject to state tariffs.

This modem does support "Fax Branding" function. Please refer the manual of communication software for instruction.

B Recommended Initialization Strings

This section provides recommended initialization strings for various conditions for those models that are included in this manual. Please be advised that these recommended initial strings were produced by our technicians for general usage only. If you want your modem to perform specific operations, it is your responsibility to find out what the software packages or the on-line service requires and go over this manual to find the necessary commands to enable or disable features on the modem. If you are unable to find a proper initialization string for your modem, please have the software company or the service provider contact us. We will try to work out a recommended initialization string for you. Thank you.

A recommended initialization string for general purpose data communications:

5634RS **AT&F&C1&D2&K3\N3%C3**

Recommended initialization to turn off error-correction, data-compression and flow-control as required by many of the banking software. Some software also requires numeric response instead of word response.

5634RCS **AT&F%C0\N0&Q0+MS=***

Note: Add **V0\V0** to the end of the initialization string if numeric response is required. Usually, you will need to tell the modem to start its negotiation at a particular speed. Please go back to the section in chapter 5 that tells you about your +MS command and set the value accordingly.

Recommended initialization string for some modem-to-modem games:

5634RCS **AT&F&C1&D2&K3\N3%C3**

C Pin assignments

Appendix C provides RS-232C technical information for the modem.

C.1 RS-232C Connector

The modem provides a DTE interface via a 25-pin female (DB-25s) connector that conforms to the EIA RS-232C standard. The connector is labeled RS-232 and located on the back of the modem (see Figure B-1).

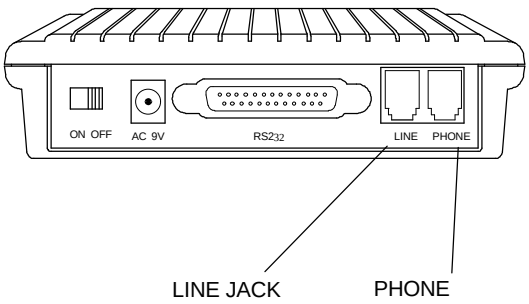


Figure B-1 DB25 connector on the modem back panel

C.2 RS-232C Pin Assignments

Table B-1 summarizes the RS-232C pin assignments that pertain to the modem. Your cable must provide these signals for your computer to communicate with your modem.

Table C-1. RS-232C pin assignments

Pin	Abbreviation	V.24 Designation	Function	Signal Direction
2	TXD	103	Transmit Data	To modem
3	RXD	104	Receive Data	From modem
4	RTS	105	Request to Send	To modem
5	CTS	106	Clear to Send	From modem
6	DSR	107	Data Set Ready	From modem
7		102	Signal Ground	Common
8	DCD	109	Received Line Signal Detector	From modem
15*	TXCLK	114	Transmit Clock	From modem
17*	RXCLK	115	Receive Clock	From modem
20	DTR	108	Data Terminal Ready	To modem
22	RI	125	Ring Indicator	From modem
24*	XTCLK	113	External Serial Clock Transmit	To modem
* These signals are used during synchronous operation only.				

Troubleshooting

The following diagnostic diagram will illustrate some simple methods to isolate your modem problem. Refer to the flowchart in figure C-1 step by step to isolate your hardware problem.

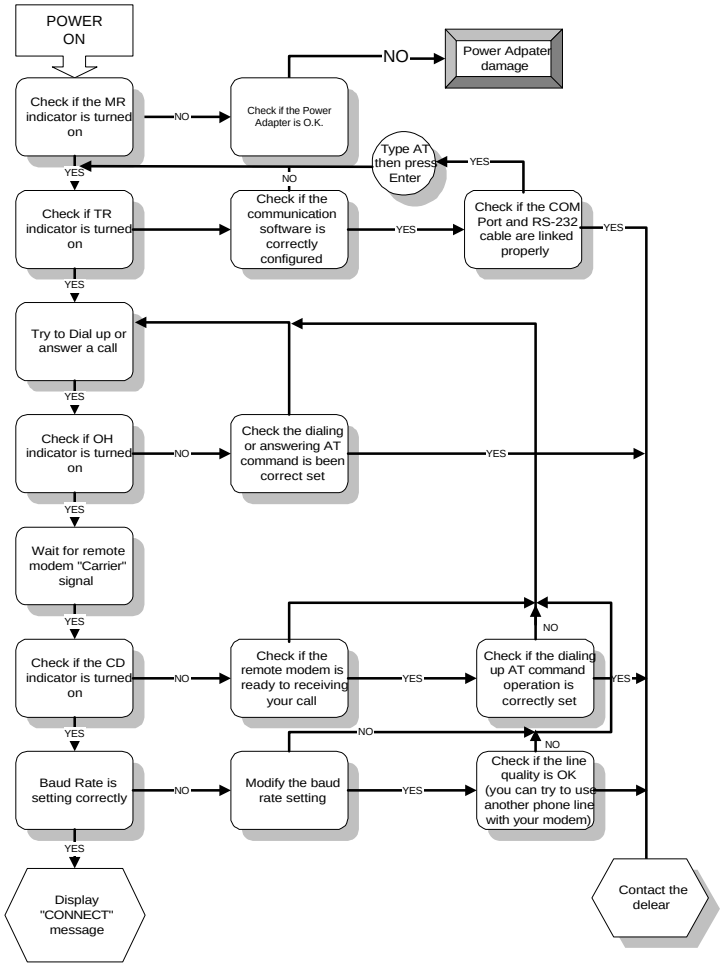


Figure C-1 Hardware Troubleshooting Diagnosis