1200-BPS PLUS Card Modem Operation Manual

TANDY

The FCC Wants You to Know

This equipment generates and uses radio frequency energy. If not installed and used properly, that is in strict accordance with the manufacturer's instructions, it may cause interference to radio and television reception.

It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause 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 the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
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Warning

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/ouput devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to a Class B certified computer. Operation of non-certified peripherals with a Class B certified computer is likely to result in interference to radio and TV reception.

For your own protection, we urge you to record the serial number of this unit in the space provided. You will find the serial number on the label packaged with the unit.

Serial Number _____

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Introduction

The Tandy® 1200-bps PLUS Card Modem has all the features needed to enhance your data communications applications — including a data output rate four times faster than that of a 300 BPS modem.

This direct-connect, Bell 103/212A-type modem is designed with standard automatic dial, answer, and disconnect features, and also has a wide range of system configuration enhancements. Its central processing unit (CPU) provides operation in Hayes® protocol mode. Your modem is AT-compatible and capable of running with Hayes software.

After dialing a phone number, the modem monitors the call and reports its progress to your computer. You can even control the dialing method — pulse or touch-tone — and the number of times the phone rings before the modem answers.

These functions and others are controlled by ASCII (American Standard Code for Information Interchange) encoded commands that you program from your computer keyboard.

The basic operation of your modem is, in some ways, like that of a telephone operator making a call. Your modem:

- Waits as the phone rings until the dialed number is answered
- Hangs up if the number is busy or if the call is not answered after a specified period of time
- Disconnects the line at the end of a completed call

Incorporating a high degree of intelligence, the modem allows your computer to function virtually unattended when linked to a telephone, making possible a wide range of telecommunications applications. Used with the proper applications software package, the modem is capable of performing operations such as electronic mail and shopping, central database access, home banking, and remote-peripheral sharing.

Another feature of the modem is a built-in monitor speaker that enables you to audibly monitor the dialing and data communication progress. The situation is reported visually on your computer display with messages called result codes.

Sample programming sessions are provided in this manual to help familiarize you with the various functions of the modem and to get you started using your modem as quickly as possible. After you are familiar with the manual and your modem, the handy Quick Reference Card should keep you "up-and-running."

Description of the Modem 1

Before you connect the 1200-bps PLUS Card Modem, read the instructions in Appendix A, "Setting Up." Be sure to turn off the power to your computer before connecting the modem.

Communications Protocol

Certain criteria must be met before computer-to-computer communication can occur. The modem operates on 10 or 11-bit data words. The following combinations are allowed:

START BIT COUNT	DATA BIT COUNT	PARITY BIT	STOP BIT COUNT
1	8	NO	1
1	8	NO	2
1	7	YES	1
1	7	YES	2
1	7	NO	2

The condition of 1 start bit, 7 data bits, no parity bit, and only 1 stop bit will be auto recognized as having a marking or spacing 8th data bit. A communication error could result if you do not use at least 10 bits as shown above. If you must operate with fewer than 10 bits, remember that abort sequences, where character recognition is needed, might not operate. Long space disconnects and carrier drops will, however, still operate.

When opened for programming by the attention code sequence, the modem automatically synchronizes the baud rate, word length, parity, and stop-bit numbers (communications protocol) of your computer system.

High and Low Speed Operations

The 1200-bps PLUS Card Modem automatically synchronizes with standard speed rates of 300 and 1200 bits per second (bps).

Switching from high-speed (1200 bps) to low-speed (300 bps) operation occurs when the modem receives the attention code in Hayes protocol mode. When the modem detects 1200 bps after receiving the code sequence, it communicates in high speed. If the modem is awakened at 300 bps, it uses low-speed operation.

The originating station always determines the speed of operation. If you wake up the modem in low-speed mode, the modem will select the low-speed 300-bps operation. If you intend to call a high-speed modem, you must set your modem to high speed before calling a remote modem unless the remote modem has low-speed detection circuitry.

Automatic Operation

When you want the modem to dial a phone number or answer the phone for you, set it to automatic operation mode. In this mode, the modem dials the phone number you store in its memory or answers the phone when someone calls you. Automatic mode, for instance, lets you dial the information service number without picking up the phone. Simply type the number, along with the proper modem programming commands, on the computer keyboard.

Originate vs. Answer Mode

To place a call to an information service or another person using communications software set the modem to originate mode. In this mode, the call originates from your computer. When you want to receive a call (answer the phone), set the modem to answer mode.

For further operation information, refer to the operation manual that accompanies your communications software package.

In Hayes protocol mode, commands control the modem's operation, and register values determine how the commands are executed. The command structure is patterned from the industry standard AT-string command interface, thus making the modem Hayes-software compatible.

Command Codes

All command lines begin with the AT (attention code) string and end with a carriage return ((ENTER)). You must enter *AT* in upper case letters, but the commands following can be in either upper or lower case. When the modem receives the *AT* command, it automatically sets the operation speed and parity.

You can store a sequence of commands in the command buffer memory, provided the command line does not exceed the 40-character buffer capacity. To execute these commands, however, you must enter them in a "logical" order. If the command line exceeds the buffer-character limit, the modem does not execute the commands; instead, it sends the ERROR result code (Table 9).

Example:

    AT V1 S6=3 DP9, T(111) 555-1234; (ENTER)

Now, to review the commands, one by one:

    AT   Beginning of command line. Places the modem in command receptive mode.

    V1   Displays the verbal result code. (Refer to "Commands with Parameters" later in this section.)

    S6=3   Waits 3 seconds for the dial tone (see Table 4, "Registers".)

    D   Dial command.

    P9,   Dials 9 with pulse dialing, then pauses for 2 seconds (default value of register S8 which determines the pause value of the comma character).

T   Touch-tone dials the telephone number that follows.

;   Returns to command mode and waits for the next command.

(**ENTER**) End of the command line. Executes all commands.

The attention code (*AT*), control characters, and spaces do not take up space in the command buffer. But, the punctuation used in the telephone number to make it easier to read does take up space.

The command buffer is cleared when you input the attention code *AT*, input the reset command *Z*, or turn off the computer.

The basic commands needed for programming the modem in Hayes protocol mode are provided in Table 1. Table 2 lists the dialing and answering commands. For a detailed explanation of each command, refer to Chapter 3, "Reference."

Table 1. Basic Command Codes

Code	Description	Function
AT	Attention Code	Wakes up the modem to command receptive state. Starts the command line.
(ENTER)	Carriage Return	Closes the command line and executes command. S3 defines the carriage return character.
(BACKSPACE)	Backspace	Edits the command line by deleting characters one by one. S5 defines the backspace character.
+++	Escape Code	Returns the modem to command mode from on-line mode. S2 defines the escape code character. S12 defines the escape code guard time.
O	On-Line	Returns the modem to on-line mode from command mode.
A/	Repeat Command	Repeats the command line. Neither AT nor (ENTER) is necessary for this command.

Table 2. Dialing and Answering Commands

Command	Description	Function
D	Dialing	Sets the modem to originate a telephone call. D command parameters include: 0-9, ( ), -, space, *, =, A, B, C, and D.
P	Pulse Dialing	Sets the modem to pulse dialing mode.
T	Touch-Tone Dialing	Sets the modem to touch-tone dialing mode.
R	Reverse Mode	Changes the modem to answer mode automatically after a call is originated.
,	Pause	Causes the modem to pause when dialing. Place it after the access code. Length of pause time is set by S8.
/		Delay for 0.125 seconds (a short pause).
@		Delay until no sound is heard.
!		Flash the switchhook for 0.7 seconds.
;		Returns the modem to command mode after dialing.
A	Answer Mode	Sets the modem to answer mode immediately without waiting for a ringing signal.
W		Waits for a dial tone before touch-tone dialing. It must be preceded by the D command.

Commands with Parameters

Some of the commands have parameters (Table 3). The parameter value, usually 0, 1, or 2, follows the command. When you do not select a command parameter, the modem assumes a value of 0. For example, command echo is disabled when you use command *E* to select a parameter value of 0. Command echo is enabled when you designate a parameter value of 1. *E* used alone is the same as E0.

Table 3. Commands with Parameters

Command	Parameters	Function	Default
Q	0	Result codes on	Defined by DIP
	1	Result codes off	Switch 7
V	0	Numeric result codes	Defined by DIP
	1	Verbal result codes	Switch 5
X	0	Result code set 0	X0
	1	Result code set 1	
	2	Result code set 2	
	3	Result code set 3	
	4	Result code set 4	
E	0	Commands are not echoed	Defined by DIP
	1	Echo commands	Switch 4
F	0	Half duplex	F1
	1	Full duplex	
M	0	Monitor speaker always off	M1
	1	Monitor speaker on until carrier-detect	
	2	Monitor speaker always on	
C	0	Transmitter off	C1
	1	Transmitter on	
H	0	On hook (phone line is discon-nected when not in use)	H0
	1	Off hook (phone line is con-nected regardless of its con-dition)	

Command	Parameters	Function	Default
I	0	Product code	None
	1	ROM checksum	
	2	Internal memory test	
Z	0	Resets the modem to default condition	Z0
	1	Goes back to the command mode with user settings intact	

Registers

Registers are used to store the parameters that control communications. Each register has variables that determine how the modem operates or supplies information on the modem's current condition. The modem's 15 registers and the default values are shown in Table 4.

Register S0 defines the number of ringing signals before a call is answered, register S1 counts the rings, registers S2-S5 define the function key characters, registers S6-S12 are used to control function time, and register S16 is for the self test. S13 is the bit-mapped register. With the exception of the last bit-mapped register, S13, you can read the current value of a register or assign a new value to match the registers to your particular environment by using the command syntax.

Command Syntax

Sx?   Check the register value

Use this syntax to check register values. The value of each register is displayed on the screen in decimal numbers in the range 0 to 255. For example, to check the value of register S0, turn off the auto-answer function and type:

AT S0? (ENTER)

On the screen, you will see —

        000
         OK

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You can also check the values of more than one register in the same command line. To check the values of register S0 and register S7, type:

   AT S0? S7? (**ENTER**)

The screen might show:

     000
     030
     OK

Sx=*n*   Change the register value

Use this syntax to assign or change register values. To assign the value 3 to register S0, type:

   AT S0=3 (**ENTER**)

After changing the value, the modem signals OK. Another syntax for changing a register value is:

AT S0 (**ENTER**)	Set the pointer to register S0.
AT ? (**ENTER**)	Read the value of S0.
AT=3 (**ENTER**)	Assign the new value 3 to S0.

For more information on the registers, refer to Chapter 3, "Reference."

Table 4. Registers

Register	Range	Unit	Function	Default
S0	0-255	Ring	Defines the rings in answer mode	0*
S1	0-255	Ring	Ring counter	0
S2	0-127	ASCII code	Defines escape code character	43
S3	0-127	ASCII code	Defines CR code character	13
S4	0-127	ASCII code	Defines LF code character	10
S5	0-32, 127	ASCII code	Defines BS code character	8
S6	2-255	Seconds	Defines dial tone wait time	2
S7	1-255	Seconds	Defines carrier wait time	30
S8	0-54	Seconds	Defines pause duration for comma	2
S9	1-255	1/10 sec.	Defines carrier detect response time	6
S10	1-255	1/10 sec.	Defines carrier loss time for hang up	7
S11	50-255	Millisec.	Defines touch-tone dialing speed	70
S12	20-255	1/50 sec.	Defines escape code guard time	50
S13			Bit-mapped register	
S14-S15			Not used	
S16	0 1	. .	Self test mode off Self test mode on	0

* When DIP SW3 is on, the modem powers up in auto-answer mode with S0=1.
Note: The ASCII code values are expressed in decimal.

Logons in MS-DOS Operating Systems

With DeskMate's Telecom application program and your Tandy personal computer, you can easily program your modem to log onto a host computer, an information service, or another terminal, either manually or automatically. Follow the instructions in your DeskMate tutorial and reference manual for setting parameters and using the functions available. **Depending on the computer you are using, the procedures might differ slightly from those shown.** A Tandy 1000 EX personal computer is used for the following examples.

1. Power up the computer, and load your communications software.

2. At the main menu, select Telecom and change the TELECOM-STATUS screen to show:

Autodial Modem	Yes
BAUD Rate	1200
Data Word Length	8 BITS
Parity	NONE
Number of Stop Bits	1 BIT
XON/XOFF Flow Control	OFF
ASCII Character Filter	OFF
Line Feed Filter	OFF
Echo (Half Duplex)	OFF
Redial (# of Retries)	3

3. When the DEFINE MODEM FOR COMPUTER DIALING screen appears (after you select Yes for the Autodial Modem status setting) and you press (F2), change the dialing sequence to show:

PAUSE: 2	Pause for 2 seconds.
SEND: ATDT	Wake up and originate a call using touch-tone dialing

NUMBER	Send the number which will be input at terminal mode
SEND: ˆ M	Send ˆ M to force the modem to execute the commands
WAITC	Wait for carrier detect before continuing

Note: If your telephone system requires pulse rather than tone dialing, substitute "ATDP" for the "ATDT" in the SEND line above.

4. Press (F12) twice to save the dialing sequence and return to the TELECOM-STATUS screen.

Manual Logon

1. Enter terminal mode from the TELECOM-STATUS screen ((F5)).
2. Press (F8) (CALL). Type the telephone number of the information service, and press (ENTER).
3. After the connection has been made successfully, proceed with the logon procedures, step by step.

Automatic Logon

1. At the TELECOM-STATUS screen, press (F4) to create an auto-log file and enter your log filename. Then press (ENTER). Press (F1) to create the STATUS line. After selecting the parameters, press (F12) to return to the original screen and complete the rest of the file. When completed, the screen for your autolog file might show:

```
STATUS: Y, 12, 8, N, 1, OFF, OFF, OFF, OFF, 3
CALL: 555-1212            (Use your local information access number)
PAUSE: 5
SEND: ˆM ˆM
RECV: TERMINAL=
SEND: DIˆM
RECV: @
SEND: C 60942ˆM
RECV: ????
SEND: DJNSˆM
```

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2. Press (F12) (ENTER) to save this autolog file and return to the TELECOM-STATUS screen.

3. Input (F3) *filename* (ENTER) to execute your autolog file. When the logon sequence is entered correctly, the modem dials your local access number, connects to the service, and then automatically executes the rest of the autolog file.

Reference 3

Programming Commands

AT   **Attention Code**

Every command line starts with the attention code. Always enter this code in upper case letters. You can type other commands in lower or upper case letters.

(**ENTER**)   **Carriage Return**

This key ends the command line. The modem does not execute a command until you press (**ENTER**). The carriage return key is defined as decimal 13 in ASCII value. To redefine it, change the value of register S3.

(**BACKSPACE**)   **Backspace**

You can edit a command line with the (**BACKSPACE**) key. The (**BACKSPACE**) key is defined as decimal 8 in ASCII value. To redefine it, change the value of register S5.

+ + +   **Escape Code**

Use the escape code to return to command mode from communications mode. When you input the escape code + + +, the modem returns to command mode and displays the result code OK. The telephone line remains connected until you input H0 (On hook command) or *Z* (Reset command).

You can redefine the escape code character with register S2. When you redefine the escape character, do not select characters that are frequently used in the data line.

The escape code is marked off from data by the escape guard time. This guard time is inserted between the last character transmitted and the first character of the escape code. It is also inserted after the third character of the escape code. As a result, the escape code is sandwiched by the escape guard time.

You can redefine the escape guard time with register S12. Its default value is 50 (1 second). When entering the escape code with default values, wait at least 1 second, input + + +, and then wait 1 second more before entering the command line. Without the guard time, the modem cannot recognize the escape code.

To return on-line, enter ATO (ENTER) .

A, a   Manual Answer Command

When you enter the *A* command, the modem goes off-hook and waits for the carrier signal. Use this command to begin computer communication immediately after talking with someone by phone. One user should input *A* while the other person uses the dial command *D*. Any command placed after *A* is not executed. If you want to execute other commands, insert the commands before the manual answer command.

For example:

    AT F1 A (ENTER)   Wake up!
                            Select full duplex.
                            Wait for a carrier tone.

D, d   Auto-dial Command

The *D* command sets the modem to originate a call without using a telephone. *D* can be followed by the dialer codes shown in Table 5. When used alone, *D* sets the modem to originate mode.

@   Wait Until There is No Sound

When you enter @ command in a dial string, the phone lines are monitored for dial tones, clicks, pops, etc., until there is at least 5 seconds of quiet or until the line is monitored for 30 seconds — whichever comes first.

W   Wait for Dial Tone

When you use the *W* command in a dial string, it tells the modem to wait until you hear a dial tone. This character is useful when you have to dial an outside line code in a local exchange. Most local exchanges need a little time to get that outside line. Using *W* forces the modem to wait until it has a valid dial tone (from the outside line) before dialing the rest of the programmed digits.

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Table 5. Dialer Codes

Code	Function
0-9	Used for the telephone number
( ), -, space	Used to make the telephone number readable
*, #, A, B, C, D	Used only in touch-tone dialing
P	Sets the modem to pulse-dialing mode
T	Sets the modem to touch-tone dialing mode
R	Changes the modem from originate mode to answer mode once communication is established
,	Sets the modem to pause while dialing (can be used after the access code)
;	Returns the modem to command mode after dialing
/	Delay for 0.125 seconds (a short pause)
@	Delay until no sound is heard
!	Flash the switchhook for 0.7 seconds
W	Wait for a dial tone, then dial the number

Example:

    AT DT1(111)123-0009   Wake up!
                                 Originate a call by touch-tone dialing.

The result codes set selector, X command, is related to the dialing condition. In the default condition (X0), the modem only monitors whether a carrier signal is present after dialing the number. When you send X1 before the number, the modem monitors the speed of the carrier signal and sends one of two connect messages, depending on the speed.

The result code on/off condition is determined by the Q command (or DIP Switch 7), and the type of the code is determined by the V command (or DIP Switch 5).

Q, q   **Result Codes On/Off Command**

This command determines whether the result codes are sent to the screen. Enter Q0 to display result codes and Q1 if the codes are not to be displayed.

V, v   **Result Codes Mode Selector**

This command selects the type of result codes displayed. V0 displays numeric codes, and V1 displays verbal codes.

> **Note:** The default values of commands *Q* and *V* are set using DIP switches.

X, x   **Result Codes Set Selector**

The default is X0 for the *X* command. With this set enabled, only result codes 0 through 4 are enabled (OK, CONNECT, RING, NO CARRIER, and ERROR). Refer to "Command Results" in Appendix B. The modem acts somewhat like a 300-bps modem. But the modem still performs 1200-bps communications, even though CONNECT is always used (instead of CONNECT 1200).

If X1 is activated, result code 5 is added (CONNECT 1200 when 1200-bps communications are enabled and CONNECT if 300-bps timing is enabled).

If X2 is activated, the result code range extends from 0 through 6. The NO DIAL TONE result code is added. This is the first time any form of call progression is enabled. Instead of doing a blind dial (the modem goes off-hook and dials the telephone number 2 seconds after connection), the line is monitored for a dial tone. The dial tone must be present for at least 2 seconds. The line is monitored for a total of 5 seconds. If there is not a dial tone (or not enough dial tone time) within the 5 seconds, the call is cancelled, and the result code NO DIAL TONE is issued.

When X3 is activated, the dial tone detect option is removed from the result code table, and the BUSY result code is added. This gives a range from 0 to 5 and 7 as valid. Code 6 is not enabled. The modem blind dials the number and then monitors the line for a carrier or busy tone. If a busy tone is detected, the result code BUSY is issued, and the telephone call is terminated.

X command X4 activates all result codes, 0 through 7. Dial tone detect and busy sense are enabled.

Table 6. Summary of the X Command Conditions

Function	X0	X1	X2	X3	X4
Result codes enabled	0-4	0-5	0-6	0-5, 7	0-7
Blind dial number	yes	yes	no	yes	no
CONNECT only	yes	no	no	no	no
Dial tone detect	no	no	yes	no	yes
Busy detect	no	no	no	yes	yes

R, r   **Reverse Mode Command**

Use this command to call and establish communication with an originate-only modem. When you enter *R*, the modem dials the telephone number (originate mode) and then activates the answer mode automatically.

Example:

    AT D1(111)123-0009R   Wake up!
                                   Originate a call.
                                   Change to answer mode and wait for
                                   carrier.

P, p   **Pulse-Dialing (default)**

The *P* command sets the modem to pulse-dialing mode. If your phone line is a rotary-type, you can input P at any point in the telephone number sequence. You can change to pulse-dialing mode from touch-tone mode by entering ATP any time you want.

When the type of dialing (pulse or touch-tone) is not specified in the command line, the modem defaults to the type used in the last command. Pulse dialing is fixed at 10 pps (pulses per second).

T, t   **Touch-Tone Dialing**

When you add *T* to the dial command, the modem is set to touch-tone dialing mode. Use register S11 to change the speed of touch-tone dialing.

,   **Pause**

When you use the modem in an office or anywhere that requires an access code to get an outside telephone line, you need to add a pause before dialing the number that follows. Insert a comma between the access code and the telephone number.

The pause duration is determined by register S8. The default pause duration for one comma is 2 seconds. You can lengthen the pause duration by using multiple commas.

;   **Return the Modem to Command Mode**

Add the semicolon at the end of the command line when transmitting information to a telephone order service or bank service that recognizes touch-tones. By inserting the semicolon, you can enter a long command line before establishing communication with another modem.

Example:

Response	Command	Function
	AT D T1(111)123-4567;	Wake Up!
		Originate the call by touch-tone dialing.
		Return to command mode.
OK		
	AT D 43278#;	Transmit the ID number.
		Return to command mode.
OK		
	AT D 8881#;	Transmit the password.
		Return to command mode.
OK		
	AT D 273*65#;	Enter the transaction.
		Return to command mode.
OK		
	AT H	Terminate the call.

A/   **Repeat Command Line**

The modem repeats the command line stored in the command buffer when you enter the repeat command *A/.* Use this command to repeat dialing when you get a busy signal or if a carrier signal is not detected.

There is no need to input the attention code *AT* or carriage return before or after the repeat command. Just enter *A/.* The repeat command is cancelled under the following conditions:

- You enter a new command line beginning with *AT*.
- You enter the reset command *Z*.
- You turn off the computer.

O, o   **On-line Command**

The on-line command returns the modem to the on-line mode from the command mode (reverse of the escape command). Use this command to return to the on-line state after executing the local command.

Z, z   **Reset Command**

Use this command to reset the modem's controller, without having to turn the computer off and on. The Z0 command resets all user-changed parameters back to the original default settings. The Z1 command keeps all user settings intact but goes back to the AT waiting area.

E, e   **Echo Command**

This command disables or enables the command echo function. Enter El to echo the command line so that you can verify that the modem is accurately receiving the commands sent to it. Enter E0 when you do not want to echo the command line.

When you disable the echo feature (E0), the modem only returns the result codes. The default setting for this command is set by DIP Switch 4.

F, f   Full/Half Duplex

This command selects full- or half-duplex communications mode. F1 sets the modem to communicate in full-duplex mode. Use this mode to communicate with a remote system that echoes characters. F0 sets the modem to communicate in half duplex and is used to communicate with a remote system that does not echo characters.

C, c   Transmitter On/Off Command

The *C* command sets the modem's transmitter carrier signal on or off. When you enter C1, the transmitter is switched on. The carrier signal is on when the modem calls, answers, or connects to the remote modem; otherwise, it is off.

When you enter C0, the transmitter is switched off. Once C0 is entered, the transmitter stays off until you enter C1 or the reset command *Z*.

H, h   Hook Switch Control

Controls the hook switch of a telephone. The H0 setting is comparable to the condition of the handset resting on the hook while the telephone line is not in use. The H1 setting is comparable to the handset being off the hook and the telephone line being used.

Use the H0 setting for normal operation. With this setting, the modem is connected to the telephone line automatically when the modem originates or answers a call.

M, m   Speaker Control

This command controls the built-in speaker. Use M1 (default) to monitor a call in progress. You can monitor signals on the telephone line such as a dial tone, ring-back tone, busy signal, and carrier tone. The speaker turns off when the modem recognizes a carrier signal and sends a CONNECT result code.

When you want to continue monitoring the data communication, use M2 instead of M1. Or, input M0 if you do not want to use the speaker function at all.

Registers

S0   Wait for a Ring Before Answering a Call

The value of register S0 determines the number of times the phone should ring before the modem answers a call. Input any decimal number in the range 0 to 255. If the value is set to 0, the modem does not answer a call. Since the default value of S0 is preset at 0, use the prescribed syntax to change the value when you use the modem in auto-answer mode. When DIP Switch 3 is on, the modem powers-up in auto answer with S0=1. Answer command *A* disregards the S0 value since it enters answer mode immediately.

S1   Counts the Rings

The value of S1 increases each time the phone rings and clears if no rings occur within about 8 seconds of the last ring.

S2   Escape Code Definition

S2 stores the ASCII value of the escape code character. The default value is set to decimal 43 (+). To change the escape function key, change the value using the Sx = *n* syntax. The value must be a decimal number in the range 0 to 127. If you enter a value out of this range, the escape will not work, thereby disabling the escape code sequence.

S3   Carriage Return Code Definition

S3 stores the ASCII value of the carriage return character. Enter a decimal number in the range 0 to 127 when you want to change the carriage return function key. The default value is decimal 13.

S4   Line Feed Code Definition

S4 stores the ASCII value of the line feed character. The value is predefined as decimal 10 (default). You can redefine the value by entering the new ASCII character code as a line feed function key. The character is output after the carriage return only when the verbal result code (V1) is supported. The value must be a decimal number in the range 0 to 127.

S5   Backspace Code Definition

S5 stores the ASCII value of the backspace character code. The default value (decimal) is set to 8. To change the backspace function key, select a value from 0-32 or 127. Although you can input a value from 33 to 126, these numbers are printable ASCII characters. You should exclude them.

S6   Dial Tone Wait Time Definition

Register S6 determines the wait time for receiving a dial tone. This wait time is defined as the length of time between first picking up the telephone receiver and dialing the first digit of the phone number. The default value is set at the minimum wait time of 2 seconds, which is regulated by the FCC. To change the wait time, input the number of seconds in the range 2 to 255.

S7   Carrier Tone Wait Time Definition

The carrier tone wait time is defined as how long the modem waits for a carrier tone transmitted from the remote modem. The value of S7 determines this wait time. The default is 30 seconds. If the modem does not receive a carrier tone within the specified time, it hangs up and displays the result code NO CARRIER (or 3) when Q0 is supported. The modem then returns to the command mode. To change the wait time, input the number of seconds in the range 1 to 255.

Once the carrier tone is detected, the modem displays CONNECT (or 1), and it goes on-line.

S8   Pause Duration Definition (for comma)

When you want to access an outside line through a PBX or use a special telephone service, use the comma (,) to pause after dialing an access code. The value of register S8 determines pause duration for this comma. The default is 2 seconds, but you can change the value by entering the desired number of seconds in the range 0 to 54. Although you can input a value up to 255, the actual maximum value is 54.

S9   Carrier Detect Response Time Definition

The value of register S9 determines the length of time (carrier duration) that the modem takes to recognize the carrier tone and send the CONNECT result code. As the value increases, the possibility of detecting a false carrier from noise decreases. The default value of S9 is fixed at 6 with the unit of 1/10 second (0.6 seconds). To change this value, input the desired duration in the range 1 to 255.

> **Note:** Do NOT confuse S9 with the carrier tone wait time definition, S7.

S10   Carrier Loss Time Definition

Register S10 decides how long the modem waits for a carrier before disconnecting the line. When the modem does not receive a carrier tone within the time fixed by the S10 value, it disconnects the telephone line.

The default is 7 (0.7 seconds). To change the value, input the desired number in the range 1 to 255. If you set the value to 255, the modem assumes the carrier is always present and ignores carrier detect.

S11   Touch-Tone Dialing Speed Definition

The value of S11 defines the duration and spacing of the tones during touch-tone dialing. The default value of S11 is 70 milliseconds. The minimum value for reliable dialing is 50 and the maximum value is 255.

Register S11 does not affect the pulse dialing speed; it is fixed at 10 pps.

S12   Escape Code Guard Time Definition

The value of S12 determines the escape code guard time. You can specify an escape guard time in the range 20 to 255 (in units of 1/50 second). The default value is 50 (1 second).

> **Note:** Be careful when you assign a small guard time. The guard time should be greater than the time required to transmit one of the three escape characters.

S16   Self Test Toggle

Apply value 1 to S16 when you want to set the modem to self test mode. The self test mode forces the modem to "talk to itself." Using this feature, you can tell if the modem is functioning correctly.

When the modem is in self test mode, the internal switches are selected so that data transmitted from the computer is looped back to the receiver and processed as if it were in communication over the telephone lines. Keys entered from the computer are echoed to the screen.

To set the modem for self test in originate mode, type:

AT S16=1 D (**ENTER**)   Self test mode on.
Originate mode.

To set the modem for self test in answer mode, type:

AT S16=1 A (**ENTER**)   Self test mode on.
Answer mode.

Bit-Mapped Register

S13 is a bit-mapped register. The supported register bits are defined in Table 7.

A bit-mapped register provides some useful information and may be accessed through your own program. However, do not use this register to control the modem. **Writing to a bit-mapped register may produce unpredictable results.**

S13

Table 7. Bit-Mapped Register S13

Bit	Condition	Function
0		Undefined
1		Undefined
2	0	Parity disabled
	1	Parity enabled
3	0	Odd parity
	1	Even parity
4	0	7 data bits
	1	8 data bits
5		Undefined
6		Undefined
7		Undefined

Data Line Monitoring

You can use the modem to monitor a data line up to 1200 bps. To accomplish this monitoring mode, turn off the modem's carrier transmitter. Ignore the loss of a carrier condition.

For originate mode, input:

AT C0 S10= 255 D (ENTER)

For answer mode, input:

AT C0 S10= 255 A (ENTER)

Appendices

Information About the Telephone Line

To operate, your modem must be connected to a telephone line. Your modem is FCC registered for direct connection to the telephone line. Give your local telephone company the following information if they request it:

Registration: AA09YN-10052-MD-E
Ringer Equivalence: 0.4B

Please note that each product connected to the telephone line places a certain load on the line. We designate this as the unit's "Ringer Equivalence Number."

When using more than one product on the line, total all the ringer equivalence numbers. If they total more than five, your phone might not ring. In rural areas, a total of three might impair ringer operation. To be sure, check with your local telephone company.

> **Warning:** This modem board must not be connected to coin-operated or party-line phones. Also, do not connect your modem to multiple-line telephones without an optional multiple-line controller.

Before Installing Your Modem

DIP switches control the modem's power-up condition. You must set these switches before you install the modem.

> **Note:** Whenever you are installing or removing circuit boards in your computer, make sure that the power is switched off. Never insert or remove the modem when the power is on.

DIP Switch Settings

The following illustration shows the default settings of the DIP switches and their functions:
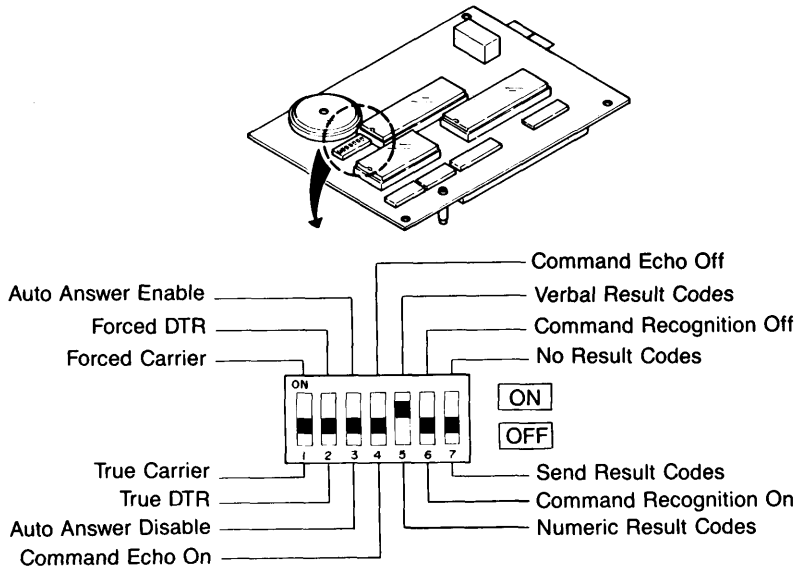
Figure 1. DIP Switch Settings

In Table 8, the factory default settings are in bold.

Table 8. DIP Switch Default Settings

Switch	Position	Function
1		**Forced Carrier-Detect Switch**
	ON	Forces carrier detect.
	OFF	Allows true carrier detect.
2		**Forced DTR Switch**
	ON	Forces DTR asserted.
	OFF	Allows true DTR.
3		**Auto-Answer Control Switch**
	ON	Modem will auto answer.
	OFF	Modem will not auto answer.

Switch	Position	Function
4		**Echo Control Switch**
	ON	Only result codes are sent.
	OFF	Commands are echoed.
5		**Verbal Result Codes Select Switch**
	ON	Verbal codes are sent.
	OFF	Numeric codes are sent.
6		**Command Recognition Control Switch**
	ON	Does not respond to commands.
	OFF	Responds to commands.
7		**Send Result Codes Control Switch**
	ON	Does not send result codes.
	OFF	Sends result codes.

When you power up the computer, the values set by the switches on the modem board become operative. You can override switches 3, 4, 5 and 7 using commands.

Switch 3		This switch setting determines whether the modem will answer incoming calls.
ON	(S0 = 1)	Sets the modem to answer a call within one ring.
OFF	(S0 = 0)	Sets the modem so that it will not answer calls.

Note: The n parameter can be set to any value from 0 to 255 by the S0 = n command. However, setting Switch 3 to the ON position always sets the modem to answer the phone after one ring, unless overridden by a software command.

Switch 4		This switch setting determines whether keystrokes are echoed back to the screen when the modem is in the command state.
ON	(E0)	Only result codes are sent. Commands are not echoed.
OFF	(E1)	Commands are echoed.

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Switch 5		This switch selects the type of result codes displayed.
ON	(V1)	Displays verbal codes.
OFF	(V0)	Displays numeric codes.

Switch 7		This switch determines whether the result codes are sent to the screen.
ON	(Q1)	The codes are not displayed.
OFF	(Q0)	Displays result codes.

Switches 1, 2, and 6 cannot be overridden by direct commands to the modem.

You should use the default settings with communications software in most cases. Please note the following exceptions and change the switch settings if required before you install the modem inot your computer.

• **AUTO-ANSWER**

Switch 3 controls the auto-answer operation. In the ON position, the modem is set to answer the phone automatically. When the modem needs to share the phone line with people, it is probably better to turn auto-answer off by setting Switch 3 to OFF. The modem can then be set to auto-answer via software. If the line is used only for data, the auto-answer should be left on.

Use of Phone Line	Position of Switch 3	Result
Data only	ON	Modem will automatically answer all incoming calls.
Data and voice	OFF	Modem will not answer incoming calls unless commanded.

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Selecting a Com Port

Most computers allow two Com ports, Com 1 and 2, to identify the I/O address map for each serial device. The shorting connector CN4 is factory set to select Com 1. If you want to select Com 2, change the connector position so that it covers both pins. See Figure 2.

If your communications software allows you to select a com port, be sure to select the same port you set with CN4.
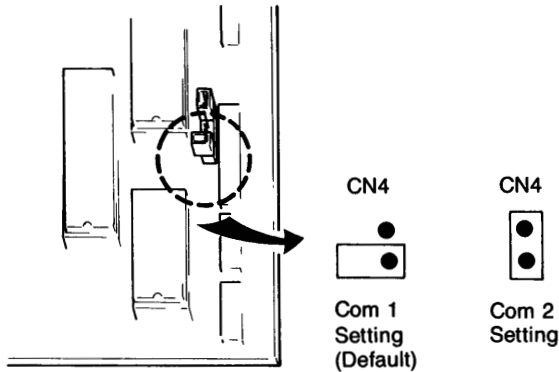
Figure 2. Com Port Setting

Selecting the Interrupt Signal

The interrupt signals IRQ3 and IRQ4 are used to inform the I/O condition of the modem to your computer. The modem is set to output IRQ4 through shorting connector CN6. If you already used the IRQ4 interrupt for another device, select IRQ3 by changing the socket position.

> **Note:** The interrupt signal should match with the I/O port you have assigned for the modem. If you assigned Com 1, you must select IRQ4. If you assigned Com 2, select IRQ3.

Selected Interrupt Signal	IRQ4 (Com1)	IRQ3 (Com2)
Shorting Connector Position	CN6 ⊡ CN5 ⋮	CN6 ⋮ CN5 ⊡
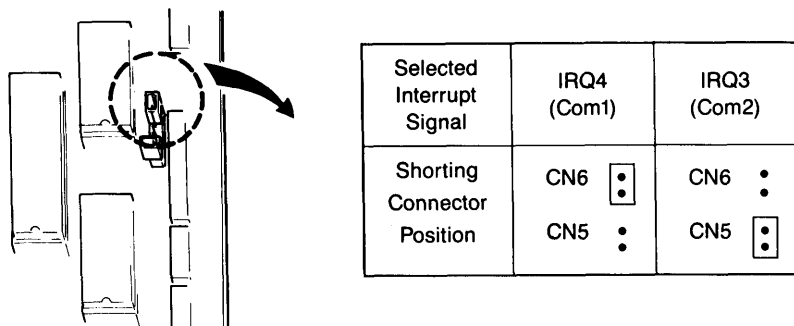
Figure 3. Interrupt Signal Setting

Multi-line Business Phone Connection

If you are planning to connect the modem to a multi-line business phone, you have to change the position of shorting connector CN3. Remove the connector and reinsert it so that it covers both pins as shown in Figure 4. This is necessary on some key systems to signal the local network that the line is in use (A-A1 signaling).

CN3   CN3

Default Position   Multi-line Use Position
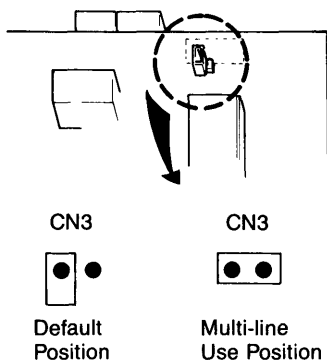
Figure 4. Multi-line Setting

Installation in Your Computer

Do not stand on a carpeted floor when you handle the modem. Walking on carpets promotes the build up of static electricity, which, if discharged while you are handling a circuit board, can destroy integrated circuits (ICs) on the board. Touch a grounded metal object before handling any circuit board to avoid static electricity buildup.

This chapter will show you how to install your modem in your computer when you want to:

Connect the Modem to a Memory Board	**Example 1**
Install a Modem/Memory Combination Board	**Example 2**
Install the Modem in the Tandy 1000 EX/HX	**Example 3**
Install the Modem and a Memory Board in the Tandy 1000 EX/HX	**Example 4**

To install the boards, follow the instructions in this manual exactly. Details on installation will vary from computer to computer. Within the following description, please refer to your computer's installation manual as well.

Example 1. Connecting the Modem to a Memory Board

Your modem plugs into the Memory PLUS Expansion Board (Cat. No. 25-1011), and the memory board plugs into one of the slots on the computer's main logic board. (The modem can also be used with the PLUS Upgrade Adapter Board, Cat. No. 25-1016).
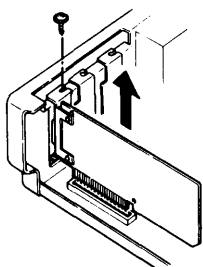
1. If your Memory PLUS Expansion Board is already installed, turn off your computer, and disconnect all the peripherals. Wait at least 10 seconds before handling the board.

   Remove the computer cover by unfastening the screws. Remove the screw that fastens the board to the computer. Remove the memory board from the socket on the main logic board of the computer by grasping it on the upper edge.
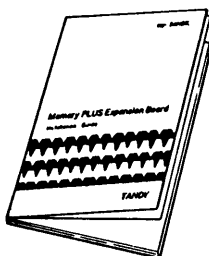
2. If you plan to install additional memory, you might need to remove the jumper on your memory board and add memory ICs to the board.

If so, perform these steps now so that you do not have to remove the modem later. See your Memory PLUS Expansion Board Installation Guide for information on reconfiguring the jumper and installing the ICs.

Memory
Board
Bracket
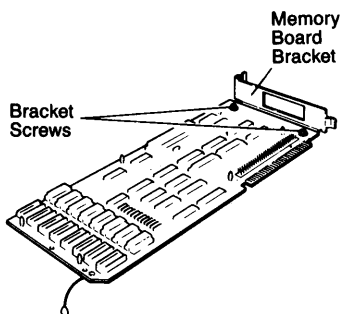
Bracket
Screws

3. The memory board comes with a metal bracket. To install the modem, you must remove this bracket.

Remove the two screws that secure the bracket. Remove the bracket, and save it with the screws for future use.
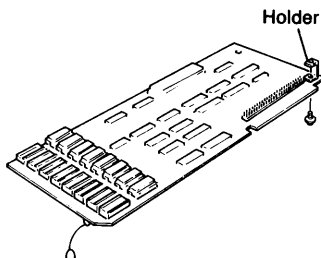
Holder

4. Mount the supplied holder on the expansion board with the longer side down, and secure it with one of the three shorter screws (supplied) as shown. Do not overtighten the screw.
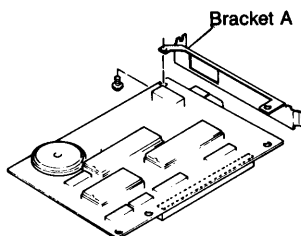
Bracket A

5. Attach Bracket A to the modem and secure its right edge with the shorter screw (supplied).
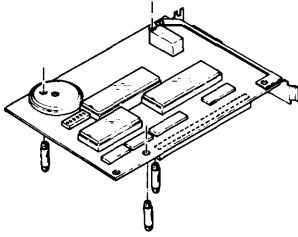
6. Packaged with the modem are three nylon stand-offs used to help support the modem. Insert the larger end of each stand-off into one of the holes on the modem.

7. Carefully align the modem's pin socket over the row of pins on the memory board. Then slowly lower the board onto the pins, maintaining the alignment so that the pins go into the corresponding holes on the socket.

When the board is completely seated and parallel to the memory board, check that all pins are fully inserted into the socket. Stop if you encounter any resistance. Do not force the board. It might have a bent pin that requires repair by a Radio Shack technician.
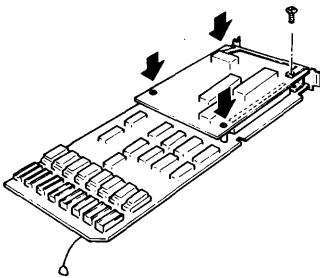
8. Snap each stand-off into the corresponding hole on the memory board by applying pressure to the modem. Secure the holder to the modem's bracket left edge with the shorter screw (supplied).

You are now ready to install your modem/memory combination board onto the computer's main logic board.

Example 2. Installing the Modem/Memory Combination Board in the Computer

Turn off your computer and disconnect all the equipment. If any unit is on, you might damage the central processing unit or the board. Wait at least 10 seconds before removing or inserting any board into the computer.

Be sure to touch a grounded metal object before beginning the installation, and do not stand on a carpeted floor.
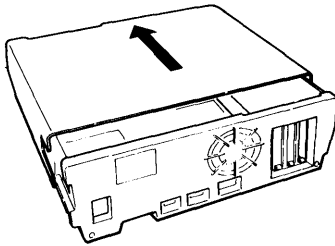
1. Remove the computer cover by unfastening the screws and sliding the cover toward the front of the unit (or toward the back, depending on your computer).
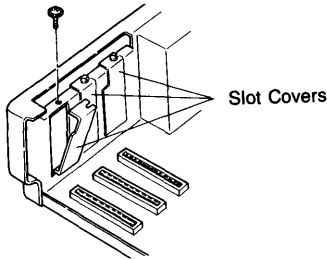
2. Rotate the main unit so that the rear panel faces you. Select one of the unused slots, and remove its slot cover by unfastening the screw. Store the removed slot cover for future replacement.
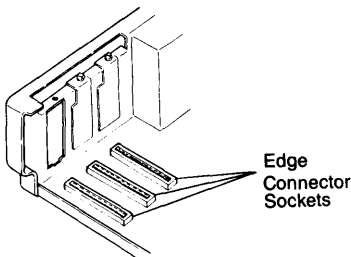
Slot Covers

On the main logic board, directly behind the slot cover, is a thin edge connector socket.

Edge Connector Sockets
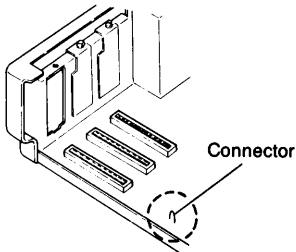
Connector

3. As you look at the computer from the rear, check the upper right corner of the main logic board for a small, multi-pronged metal connector.
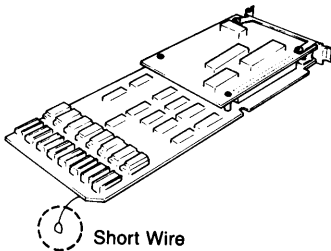
Short Wire

If your board does not have the connector, remove the short wire attached to one corner of your memory board. You do not need it.

If your board has the connector, do not remove the wire. You will connect this wire in Step 6.
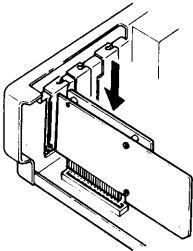
4. Touch a grounded metal object. Then, grasp the combination board by its upper edges, and position it above the socket. Insert the combination board's bracket into the slot in the same way as the slot covers are mounted. At the same time, apply downward pressure evenly, engaging the edge connector in the socket.
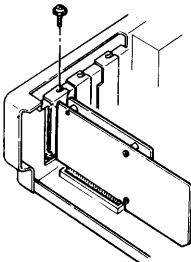
5. Align the board's bracket so the cutout is positioned over the screw hole. Replace the screw you removed earlier. Do not overtighten it.

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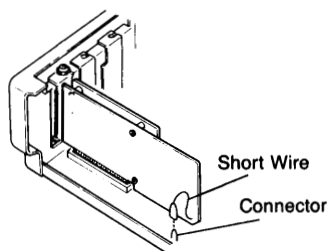
6. If you did not remove the wire mentioned in Step 3, fasten the free end of it to one prong of the multi-pronged connector.

Short Wire

Connector
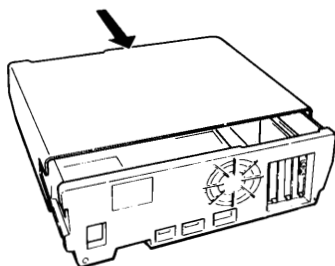
7. Replace the computer's cover, securing it with the screws previously removed.

Example 3. Installing the Modem in the Tandy 1000 EX/HX

You can also install the modem into the Tandy 1000 EX/HX. If you do not plan to install a memory board when you install the modem, you can mount the modem directly on the computer's main logic board. If you plan to install the Memory PLUS Expansion Adapter (Cat. No. 25-1062) in addition to the modem, or if the memory board is already installed, you must mount the modem on that board. (Refer to Example 4.)

To install the modem only:
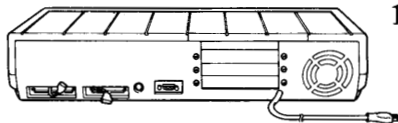
1. Turn off all equipment and disconnect any peripherals.
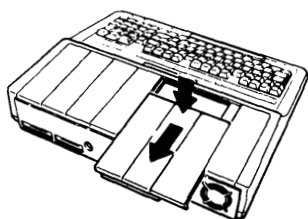
2. With the rear panel of the computer facing you, remove the option slot cover located on the top panel. Place your thumb on the edge nearest the front of the computer, and press down to disengage the hook-latch. Then, slide the cover toward you.

3. Remove the option slot cover on the rear panel by removing the six screws.
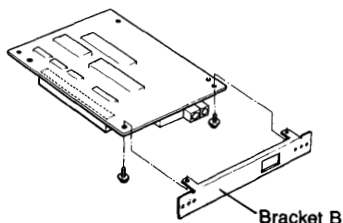
4. Attach Bracket B to the modem. From the bottom of the board, insert and tighten the two bracket screws (supplied).
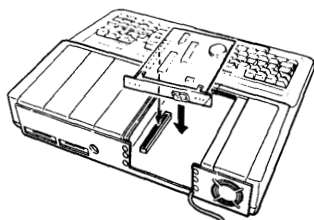
Bracket B

5. Carefully align and lower the modem pin socket on the pin header onto the computer's main logic board. Ledges on the computer will help secure the board once installed.
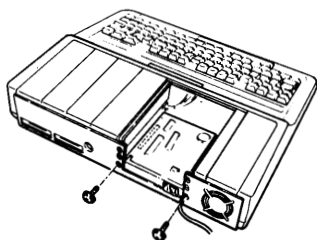
6. Secure Bracket B to the computer's rear panel. Align the hole on each end of the bracket with the hole on each side of the slot opening. Insert the longer screws supplied in the modem package, and tighten them.
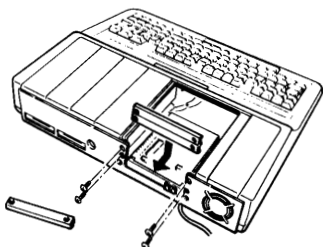
7. Snap off one segment of the rear panel's breakaway-type slot cover, and attach the remaining part of the cover to the rear panel. Align the cover holes with the four holes on the panel above the modem bracket, and insert the screws that you removed earlier.

Example 4. Connecting the Modem to a Memory Board in the Tandy 1000 EX/HX

If you plan to install the Memory PLUS Expansion Adapter (Cat. No. 25-1062) when you install your modem in the Tandy 1000 EX/HX, you must mount the modem on that board.
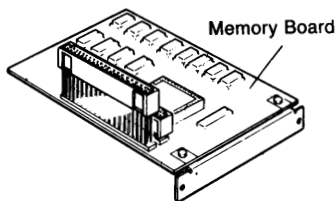
Memory Board

1. Turn off all equipment and disconnect any peripherals. If the memory board is already installed, wait at least 10 seconds before installing the modem. Be sure to touch a grounded metal object to discharge any static electricity.
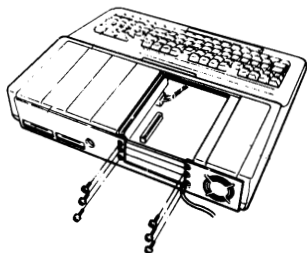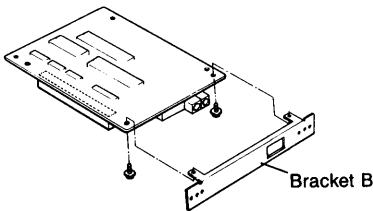
2. Remove the option slot cover as described in Steps 2 and 3 in the previous section.
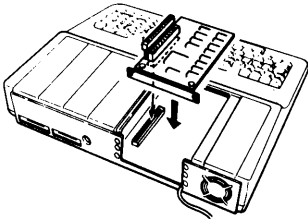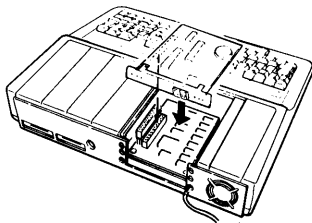
3. Carefully align and lower the memory board's pin socket onto the pin header on the computer's main logic board.
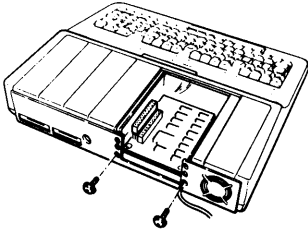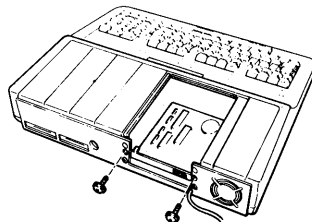
4. Secure the memory board's bracket to the computer's rear panel with the screws provided in the memory board's package.
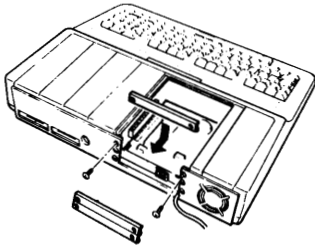
5. Attach Bracket B to the modem as shown.

Bracket B

6. Carefully align and lower the modem pin socket onto the shorter of the two pin headers on the memory board.

7. Secure Bracket B to the rear panel with the screws provided in the modem package.

8. Snap off one segment of the rear panel's breakaway-type slot cover, and attach it to the panel with the screws that you removed earlier.

Note: When the board(s) are completely seated and parallel, check that all pins are fully inserted in the socket. Do not force the board. The shroud on the pin header is useful when you are aligning the pin connectors.

Telephone Connection

There are two modular phone connectors on the modem. Connect one end of the modular phone cable supplied with the modem to either of these two jacks. These jacks are identical; it does not matter which one you use.

Connect the other end of this modular cable to the phone jack on your wall.

Note: You can connect your standard telephone to the second jack on the back of the modem. This jack is provided for your convenience so that you can continue to use your telephone normally. As long as you leave your modem and phone connected, you can continue to use your telephone even when your computer is turned off.

To be sure your modem is operating correctly, run the self test as described in Chapter 3, "Reference."

You are now ready to make a call.

Commands and Settings **B**

Functional States

Your modem will always be in one of two states: local command state or on-line state. In the local command state, you make commands to the modem under keyboard or program control. No data is being sent or received. The local command state is provided so that you can command the modem to perform various functions, such as changing configurations and dialing. In the on-line state, the data is sent and received over the phone lines.

When on-line, the modem is in the originate mode (when the modem is making a call) or answer mode (when accepting an incoming call). Occasionally, you might make use of a special form of answer mode, called reverse mode, which is used to initiate a call to an originate-only modem.

In normal operation, the change from the local command state to the on-line state is automatic. For instance, once you give the command to dial, the transition to the on-line state is performed automatically once the connection to another modem is made. The modem also automatically switches to the on-line state when it answers a call. When the carrier is lost, for whatever reason, the modem automatically returns to the local command state.

The Changing of States

The modem will not respond to local commands when on-line. If you wish to enter a command, you must first return the modem to the local state. To return the modem to the local state, enter the escape code.

Escape Code

The escape code is a message to your modem which tells it to return to the local state, allowing you to enter commands. The format consists of an escape guard time and an escape character. The escape code does not drop the connection with the other modem; it merely suspends the transmission and reception of data over the line temporarily. You must enter the command to hang up, ATH, to drop the phone line.

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Command Syntax

Attention

All commands must begin with the letters *AT. AT* is short for "attention" and is used by the modem to automatically set the baud rate and parity. You must enter *AT* in upper case; all other commands may be in either upper or lower case. This prefix is the signal to the modem that what follows is a command.

Line Length Limits

You may follow *AT* with one or more commands. The commands will be performed in the order entered. The number of commands you can enter at once is limited by the line length, which cannot exceed 40 characters following *AT.* Control characters and spaces are not counted, but punctuation marks such as dashes or commas are. For example, the syntax of a command to the modem is as follows:

<div align="center">AT <command> <u>ENTER</u></div>

Carriage Return

This is the command terminator; the command is not processed until you press <u>ENTER</u> .

Example:

<div align="center">AT M2 DT (408) 767-8900 <u>ENTER</u></div>

Line Editing

When entering commands to the modem, you can correct typing mistakes by using the <u>BACKSPACE</u> key, which moves the cursor backward, erasing typed characters.

Null Parameters

Commands to the modem consist of a letter, such as *D* for DIAL, followed by a number, or parameter, generally 0, 1 or 2. If you inadvertently or intentionally leave out a command parameter, the modem assumes a value of 0. For instance, if you enter

AT M DT (408) 767-8900 (**ENTER**)

it would be equivalent to

AT M0 DT (408) 767-8900 (**ENTER**)

The parameter associated with the M command would be 0 instead of 2 as in the previous example. The result of this change would be to turn the speaker off.

Command Results

After you press (ENTER), your modem returns a result code. This code may be expressed as a number or an English word. The following table lists the eight possible results and their meanings.

Table 9. Command Results

Number (V0)	Word (V1)	Description
0	OK	The command line was successfully processed.
1	CONNECT	The carrier signal has been detected.
2	RING	The phone is ringing.
3	NO CARRIER	Carrier was not detected or was lost.
4	ERROR	There was an error in the command line.
5	CONNECT 1200	Carrier has been detected at 1200 bps.
6	NO DIAL TONE	No dial tone has been detected by the modem.
7	BUSY	The modem has detected a busy signal.

Result Codes Notes

— V0 and V1 are the modem commands that determine whether the modem is to render numeric (V0) or verbal (V1) result codes.

— The Q command determines whether results are sent. Q0 turns on result codes and Q1 turns off result codes.

— The default value of V and Q commands is fixed by DIP switches. For example, when DIP Switch 7 is set to ON, these result codes do not appear on the screen unless you enter Q0 from the keyboard. (Refer to "DIP Switch Settings" in Appendix A.)

— Another command related to the result code is the X command. Depending on the selected value of this command, the result code that appears will vary. Refer to Chapter 3, regarding the X Command.

— RING only indicates that the phone is ringing. The modem does not answer it unless commanded to or unless auto-answer is enabled.

— NO CARRIER is displayed if the carrier signal from the other modem is not detected for a sufficient length of time. NO CARRIER means that a data call was not successfully completed, or that the carrier was lost during a connection.

Speed of Transmission

When your modem calls another system, it automatically detects and adjusts to the transmission speed (bits per second) at which your terminal or computer is operating. The transmission speed is thus governed by the device you have connected to the modem. You must set the speed of your computer or terminal either by setting a switch in the hardware or by entering a software command. A command to the modem will not change the speed of the equipment.

If the modem is answering a call, it adjusts to the speed of the calling modem. You can use the X command to determine the speed of the call the modem is answering. For example, after connection, the result codes would read:

CONNECT	(for a 300-bps connection)
or	
CONNECT 1200	(for a 1200-bps connection)

For further information, refer to the *X* command in Chapther 3.

Note that the modem will accept a call from either a 1200-bps modem or a 300-bps modem. Your computer must be set to the correct baud rate (1200, 300) for the call.

Dialing Basics with Examples

Since dialing and answering are the main functions of the modem, the following is a summary of the instructions for these operations with examples. For detailed explanation of the various codes, refer to Chapter 3, "Reference."

Dialing

When you enter a dial command, the modem is immediately put into originate mode. You are then able to call any distant computer connected to a modem or timesharing system.

The dial command is *D*. You may follow this command with a number of commands associated with the dial command. Or, you may follow *D* with only the number to be dialed.

Example:

ATD7678900   ⟮**ENTER**⟯

After you enter this command, the modem will dial the number. You will hear the phone dialing. The modem will then wait 30 seconds (default time) for a response from the distant modem. If another modem answers, the modem sends the code CONNECT, CONNECT 1200, 1, or 5, depending on what parameters have been set. The modem then goes on-line, permitting you to communicate. If no carrier is detected, the modem will hang up and send a NO CARRIER or 3 result code.

Note that the modem will ignore the spaces and the dash in the above example. You could also enter:

ATD7678900   ⟮**ENTER**⟯

Auto-Dialing for Voice Calls

The modem may be used to automatically dial a number for you. You would enter the command, listen for the ring, pick up the phone, and when someone answers, press any key (which tells the modem to hang up). You can then talk to the person on the other end.

If the phone line is busy, you would then only have to enter A/ to redial.

Timing Parameters

The time assigned to the dialing sequences, such as the 30 second time the modem will wait for an answer, is controlled by registers S6 through S11. For more information on these registers, see the "Registers" section in Chapter 3.

Auto-Answer Mode

The modem can be set to automatically answer calls. This is a useful feature when you wish to access your computer from a distant location, for example.

Factory settings

The modem is set in the factory to disable auto answer.

On the modem, the auto-answer function is controlled by DIP Switch 3. The factory setting is OFF, which means that the modem will not answer an incoming call without a command.

To put the modem into auto answer, you can set Switch 3 to ON or override the switch by entering the direct command AT S0 = 1.

The S0 register can be used to control the auto-answer feature also. This register determines the number of rings the modem will wait before answering a call. The register may have values from 0-255. Setting the register at 0 tells the modem not to answer the call at all.

Examples:

S0=0   Modem does not answer.
S0=1   Modem answers after one ring.
S0=5   Modem answers after five rings.

The default value of this register is 0 when DIP Switch 3 is off, 1 when the switch is on. So, if you enter S0 = 1 after the modem is turned on, the modem will pick up the phone after one ring regardless of whether DIP Switch 3 is off or on. This new value will be in effect until you enter a Z (reset) command or until you turn off the computer. At that time, the S0 register will default to the value determined by the position of DIP Switch 3.

When the phone rings and the modem is in auto-answer mode, your modem will wait until the ring number in register S0 is reached and then answer the phone by sending a signal to the other modem. Your modem then waits until a carrier signal is received. If it is, you will see a CONNECT result code on your screen. If no carrier is detected within 30 seconds (default time), the modem will return a NO CARRIER result code, hang up, and return to the command state.

If the auto answer is off by setting S0 = 0 or by setting the auto-answer switch to OFF, you will receive a RING result code on your screen if another modem calls your system. If you are not set up to auto answer, and the phone is ringing, you can type AT A (**ENTER**), and the modem will answer.

The A Command

This command, which means Answer Immediately, tells the modem to pick up the phone, regardless of whether or not there is a ring. You can use this command to answer an incoming phone call when the modem is not set for auto answer.

You can also use it to transfer a call in progress between two people from voice communication to modem communication. No other command may precede it, and the other modem must enter a D command.

Example: AT A (**ENTER**)
Meaning: Answer the telephone immediately.

Timing Parameters

As with the dialing commands, the timing parameters associated with answering are controlled in the S registers. Registers S0, S7, S9, and S10 control the functions.

Escape Code Precaution

In some contexts, you might want to disable the escape code. For example, if the modem is in answer mode while attached to a computer operating in full duplex, the distant computer could inadvertently send the escape code as part of its message. This would make the modem revert to the command state when the string is echoed by the computer, causing all subsequent data to be construed as commands with unpredictable results.

> **Note:** To disable the escape code, define the escape character in register S2 as a non-ASCII (i.e., greater than 127) value.

Carrier Sensitivity

The modem does not sense the presence or absence of a carrier when it is in the command state. Consequently, the other end could drop the connection without any response by the modem. To avoid this situation, have the program respond to the loss of carrier by sending the AT H0 command so that the modem will hang up.

Troubleshooting   C

When you have problems transmitting data (garbled data, intermittent errors, etc.), there are a few checks you can make.

- Phone connection is clean and noise-free.
- No one is talking on the telephone line.
- Phone and all extensions are on the hook.
- Operation speed is correct for the modem you are using and the modem with which you are communicating.
- Run the self test as described in Chapter 3, "Reference".

If you still cannot transmit data, disconnect your modem to see if the phone line is operating correctly. If it is, the trouble is probably in your modem. Take it to a Radio Shack serviced technician for further testing and/or repair.

> **Note:** It is very unlikely . . . but if your modem causes problems on the phone line, the telephone company has the right to temporarily discontinue your service. If this happens, the telephone company will notify you and give you a chance to have the problem corrected. Also, the telephone company has the right to make changes in their lines and/or equipment. If these changes affect your modem or require changes in its connection, the phone company will notify you in writing so that you can take the necessary steps to ensure uninterrupted service.

Maintenance

The only maintenance your modem requires is a periodic checking of telephone line connections. When you experience data transfer problems, first check the cable connections. Then, run the analog loop self test described in Chapter 3, "Reference." If you still experience problems, check with your Radio Shack Computer Center or store.

Precaution

Lightning. Your modem has built-in protection circuits that meet or exceed FCC requirements to reduce risk of damage from surges in telephone line current. However, an incident such as a lightning strike near, or directly to, the telephone line might cause an excessive surge of voltage that can damage the phone device.

Lightning damage is uncommon, but it can occur to phones and other electronic devices. If you are concerned about it or live in an area with frequent and/or severe electrical storms, we suggest that you unplug electronic products during storms.

Specifications D

Modem Compatibility:	Bell 212-A at 1200, 300 bps. Bell 103, 113 at 300 bps.
Dialer Compatibility:	Industry standard "AT" command set.
Modem Data Rates:	1200 and 300 bps.
Speed Selection: Originate Mode:	 Automatic on attention character.
Answer Mode:	Automatically set to speed of incoming call.
Operating Modes:	Automatic operation.
Test Modes:	Analog (local) loopback (initiate and respond). Software command controlled.
Receiver Sensitivity:	−41 dBm.
Transmit Level:	−10.5 dBm.
Tone Dial Level:	0 dBm.
Line Impedance:	600 ohms.
Ringer Equivalence:	0.4 B.
Modulation: 300 bps:	 Frequency shift keyed (FSK).
1200 bps:	Differential phase shift keyed (DPSK).
Data Formats:	8 bit, no parity; 7 bit even, odd, mark or space parity.

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Dialing:
   Pulse: Rotary (10 pps).
   Tone: Including * and #,
duration 70 ms (adjustable).

Command Buffer: 40 characters.

Speaker: Normally on during dialing; can be turned off by command.

Technology: Low power CMOS circuitry utilizes proprietary LSI modem circuits, 68HC05 microprocessor. Control program: 4K bytes.

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Notes

SERVICE POLICY

Radio Shack's nationwide network of service facilities provides quick, convenient, and reliable repair services for all of its computer products, in most instances. Warranty service will be performed in accordance with Radio Shack's Limited Warranty. Non-warranty service will be provided at reasonable parts and labor costs.

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