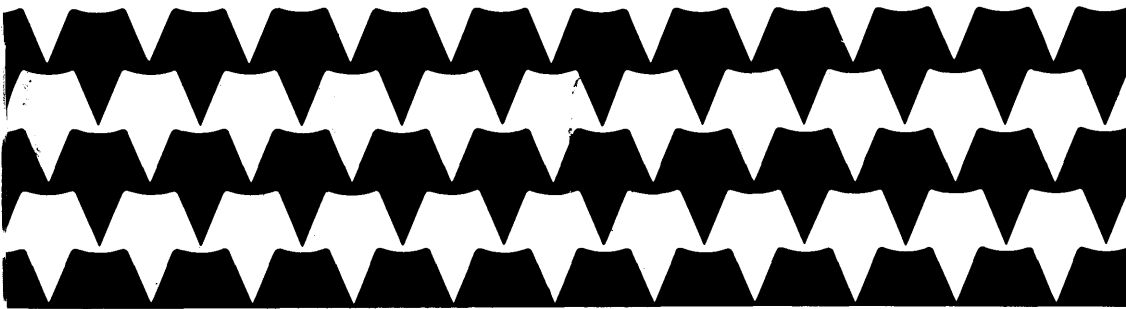Tandy 1000

PLUS 300-Baud PC Modem

Owner's Manual

TANDY®

For your own protection, we urge you to record the serial number of this unit in the space provided. The serial number is affixed on the board.

Serial Number _____

Contents

Tables

Introduction

Your new **PLUS 300 Baud PC Modem** lets you add a built-in 300 bits/second modem to your computer.

The Modem accepts data from a computer, converts the data into two-frequency tones and then sends the tones over telephone lines to another modem. Conversely, the Modem accepts tones from telephone lines and changes those tones into data that your computer understands.

This direct-connect, Bell 103-type modem is not only designed with standard automatic dial, answer and disconnect features, but also a wide range of system configuration enhancements as well.

Your Modem is AT-compatible and capable of running with Hayes software. Special command instructions and registers in Hayes protocol allow you to program the Modem from your computer keyboard.

For example, you can set the Modem for manual originate or manual answer mode, in which you manually dial the telephone number or answer an incoming call when you are contacting a remote computer. Or you can program the Modem for auto-originate or auto-answer mode and let the Modem dial the telephone number of a remote computer or answer an incoming call.

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

Sample programming sessions are provided in each section of 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 have become familiar with the manual and your Modem, the handy Quick Reference Card should keep you "up-and-running!"

Description of the PC Modem 1

The following is a brief description of the PC Modem.

① **DIP Switches** control the Modem's power-up condition. These switches must be set before you install the Board in your computer.

② **Phone Jacks** connect the Modem to a modular wall jack and a telephone. These jacks are interchangeable.

③ **Pin Socket** connects the Board to the row of pins on the Memory PLUS Expansion Board (Radio Shack Cat. No. 25-1011) or the PLUS Upgrade Adapter Board (25-1016), or the Memory PLUS Expansion Adapter (25-1062) for the Tandy 1000 EX Personal Computer.

④ **Stand-Offs** secure the Board to the expansion board. Snap these three stand-offs into the corresponding holes on the expansion board.

⑤ **Bracket (A)** replaces the current bracket of the expansion board.

⑥ **Holder** grounds the Board to Chassis. Used with Bracket (A).

⑦ **Bracket (B)** is used for installing the Modem Board in Tandy 1000 EX.

⑧ **Modular Cable** can be used for the phone jack-to-modular wall jack connection.

Modem Board ① DIP Switches

③ Pin Socket

④ Stand-Off ② Phone Jacks

⑤ Bracket (A)

⑥ Holder

⑧ Modular Cable ⑦ Bracket (B)
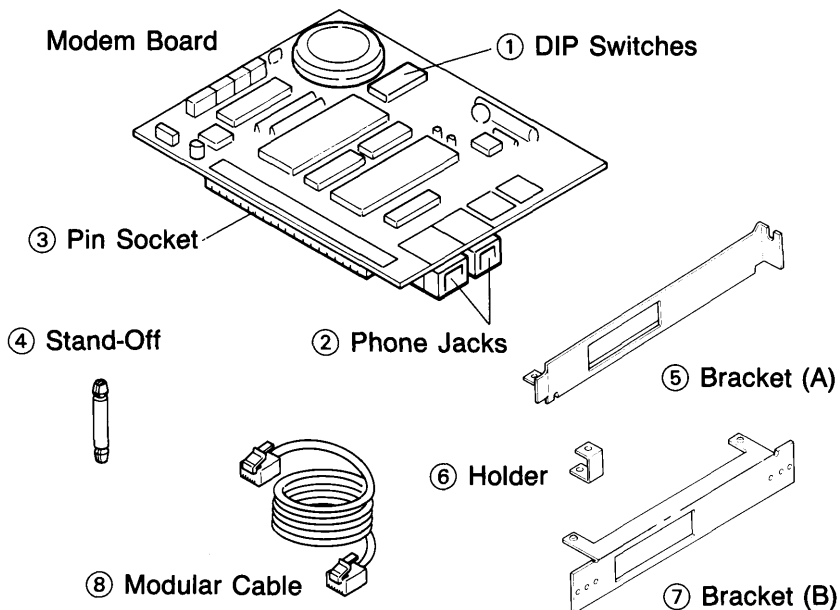
Warning: **Do not stand on a carpeted floor when you handle the Modem Board.** Walking on carpets promotes the build-up of static electricity, which if discharged while you are handling a circuit board, can destroy integrated circuits (IC's) on the board. Touch a grounded metal object **before** handling any circuit board to avoid static electricity build-up.

DIP switches

DIP switches control the Modem's power-up condition. These switches must be set before you install the Modem Board.

Refer to Figure 1 for the suggested switch settings.

NO RESULT CODES ─────────┐   ┌───────── COMMAND ECHO OFF
VERBAL RESULT CODES ───────┐│   │┌──────── AUTO ANSWER DISABLE
FORCED CARRIER ────────┐││   ││┌─────── NO FUNCTION*
FORCED DTR ┐│││   │││┌── COM 2

ON □
OFF □

1 2 3 4 5 6 7 8

TRUE DTR ─┘ ││   ││ └ COM 1
TRUE CARRIER ──┘│   ││ └── NO FUNCTION*
NUMERIC RESULT CODES ──────┘   │└───── AUTO ANSWER ENABLE
SEND RESULT CODES ─────────┘   └─────── COMMAND ECHO ON
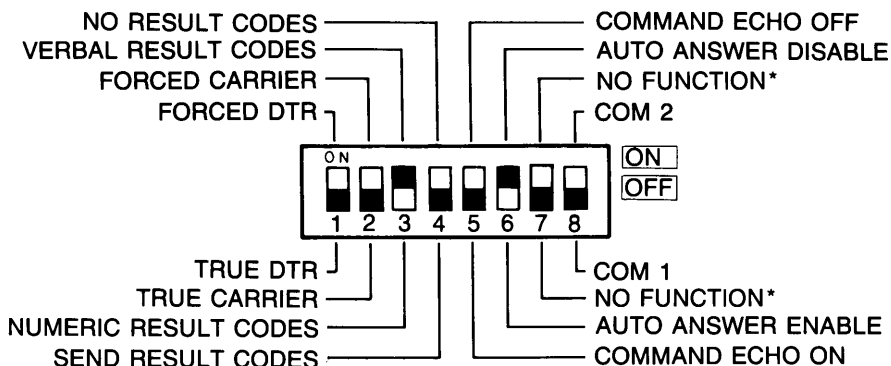
* DIP swich 7 must always be off.

Figure 1. DIP Switch Settings

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Table 1. DIP Switch Settings

SW	Position	Function
1	ON	**Forced DTR (Data Terminal Ready).** Modem accepts commands from the local computer without a DTR signal.
	OFF	**True DTR.** Modem is OFF until it receives a true DTR signal from the computer.
2	ON	**Forced carrier.** Modem issues a forced carrier signal to the local computer as soon as power is turned on.
	OFF	**True carrier.** Modem will be off until it receives true carrier from the remote computer.
3	ON	Displays verbal result codes.
	OFF	Displays numeric result codes.
4	ON	Result codes disabled. Disables Switch 3.
	OFF	Result codes enabled. Enables Switch 3.
5	ON	Command echo disable.
	OFF	Command echo enable.
6	ON	**Auto-answer disable.** Modem assumes auto-originate upon power-up.
	OFF	**Auto-answer enable.** Modem assumes always auto-answer upon power-up.
7	Should be OFF	No Function.
8	ON	**COM 2.** Occupies the I/O address space* of 2F8 — 2FF (hex.).
	OFF	**COM 1.** Occupies the I/O address space of 3F8 — 3FF (hex.).

* I/O address ... DIP SW 8 allows you to select either one of two I/O address spaces COM 1 and COM 2 reserved for serial asynchronous communication devices. If you have installed another serial device, such as a serial printer etc., set DIP SW 8 to ON (COM 2). Otherwise, keep it OFF (COM 1).

Installation

The Modem Board will occupy the width of two expansion slots in any system, with the exception of the Tandy 1000 EX computer.

Connecting the Modem Board to the expansion board

Your Modem Board plugs into the Memory PLUS Expansion Board (25-1011), and the expansion board plugs into one of the slots on the computer's main circuit board.

It is recommended that you have the Modem Board installed by the service technicians at your Radio Shack Service Center. Doing so not only ensures expert installation, but also enables the technicians to quickly check that all the equipment is functioning properly.

If, however, you **do** decide to install the boards yourself, follow the instructions in this manual exactly. The details on installation will vary from computer to computer. With the following description, please refer to your computer's installation manual as well.

The Modem Board can also be used with the PLUS Upgrade Adapter Board (Cat. No. 25-1016).

For instructions on installing the PC Modem in the Tandy 1000 EX, refer to **"Installing the Modem Board in the Tandy 1000 EX."**

1. If your Memory PLUS Expansion Board is already installed, turn off your computer and disconnect all the peripherals. Wait at least 10 seconds, then remove the screw that fastens the board to the computer. Remove the expansion board from the socket on the main board of the computer by grasping it by 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 IC's to the board. If so, perform these steps now so that you do not have to remove the Modem Board later. See your Memory PLUS Expansion Board Installation Guide for information on reconfiguring the jumper and installing the IC's.

3. The expansion board comes with a metal bracket. To install the Modem Board, you must replace this bracket with the one supplied with the Modem Board — Bracket (A).

    Remove the 2 screws that secure the bracket. Remove the bracket and save it with the screws for future use.

4. Attach the bracket (A) to the expansion board and secure its left edge with the screw supplied with the bracket. Mount the supplied holder on the expansion board with longer side down, and secure it to the expansion board and right edge of the bracket as shown in Figure 2. Do not overtighten the screws.
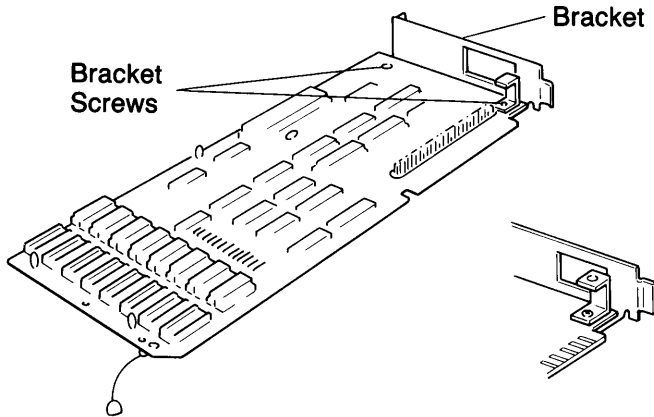
Figure 2. Memory PLUS Expansion Board

5. Packaged with the Modem Board are 3 nylon stand-offs used to help support the Modem Board. Insert the larger end of each stand-off into one of the holes on the Modem Board, as shown in Figure 3.
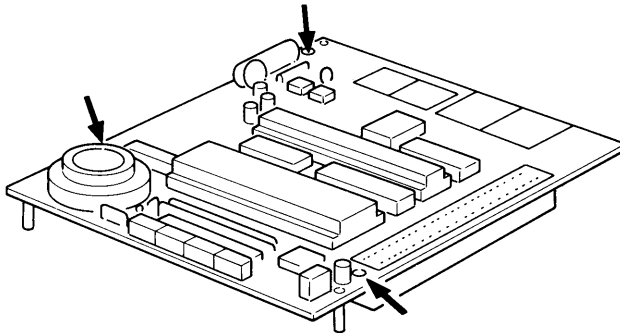
Figure 3. Modem Board and Stand-Offs

Note: If you are planning to use the Modem with a multi-line telephone, make the modification now. Refer to "Multi-line" in the section **Telephone Connections** later in this chapter.

6. Hold the Modem Board at a slight angle to the expansion board so that its phone jacks fit into the cutout as shown in Figure 4.

Carefully align the Modem Board's pin socket over the row of pins on the expansion 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 is parallel to the memory board, check to see that all pins are fully inserted into the socket. If you encounter any resistance, stop. Do not force the Board. You might have a bent pin that requires repair by a Radio Shack technician.
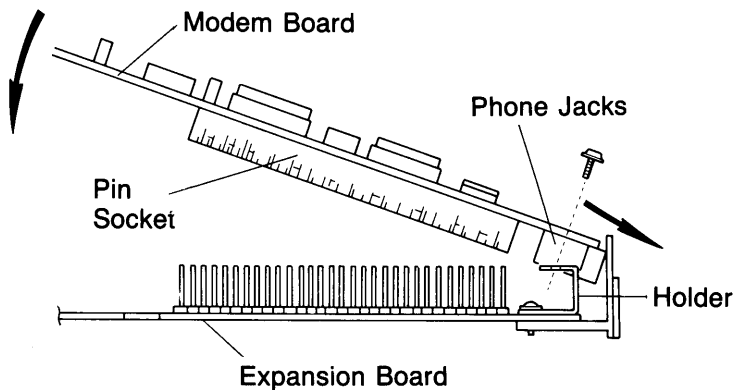
Figure 4. Modem Board Installation

7. Snap each stand-off into the corresponding hole on the expansion board by applying pressure to the Modem Board. Secure the holder to the Modem Board with the supplied screw.

You are now ready to install your Modem/expansion combination board onto the computer's main circuit board.

Installing the Combination Board in the computer

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

1. Be sure to touch a grounded metal object before beginning the installation, and do **not** stand on a carpeted floor.

2. Remove the computer cover by unfastening the screws and sliding it toward the front of the unit.

3. 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.
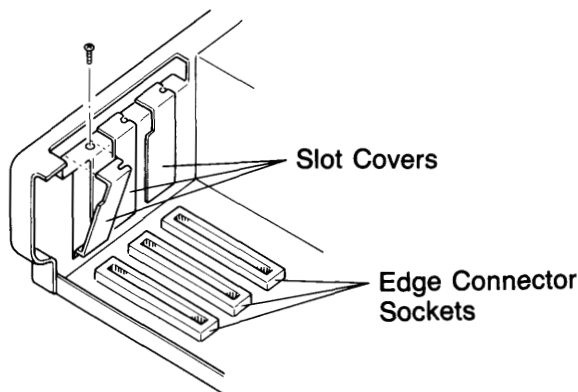
Figure 5. Removal of Option Slot Cover

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

5. As you look at the computer from the rear, check the upper right corner of the main circuit board for a small, multi-pronged metal connector (see Figure 6).

   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 in step 8.

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6. Touch a grounded metal object. 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 the slot covers are mounted. At the same time, apply downward pressure evenly, engaging the Edge Connector in the socket.
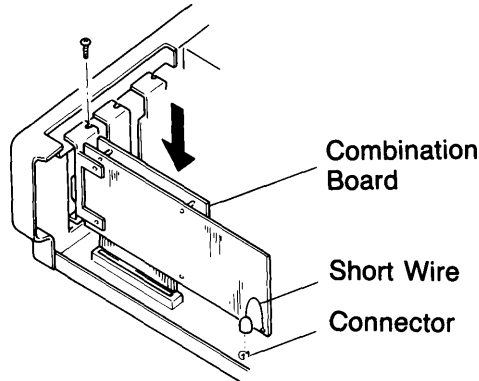
Figure 6. Installation of Combination Board

7. Align the board's bracket so the cutout is positioned over the screw hole. Replace the screw you removed earlier. Do not overtighten it.

8. If you did not remove the wire mentioned in Step 5, fasten the free end of it to one prong of the multi-pronged connector (see Figure 6).

9. Replace the computer's cover, securing it with the screw previously removed.

Installing the Modem Board in the Tandy 1000 EX

The second bracket (B) in your PC Modem Package is specially designed for use with the Tandy 1000 EX. If you plan to install the Memory PLUS Expansion Adapter (25-1062) when you install your PC Modem or if the Memory Board is already installed, the Modem Board must be mounted on that board. If, however, you will not be installing an additional board, the Modem Board can be mounted directly on the computer's main circuit board.

To install the Modem Board 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 and slide the cover toward you.

3. Remove the option slot cover on the rear panel by removing the 6 plastite screws.

4. Attach bracket B to the Modem Board with the phone jacks extending through the cutout. From the bottom of the board, insert and tighten the 2 bracket screws (shorter ones) provided with the Modem Board package. See Figure 7.
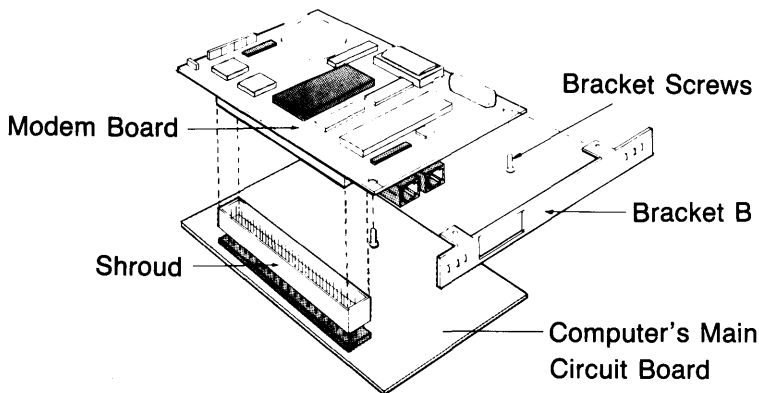
Figure 7. Modem Board (and Bracket B) Installation

5. Carefully align and lower the Modem Board's pin socket on the pin header on the computer's main circuit board as shown above. Ledges on the computer will help secure the board once installed.

6. Secure bracket B to the computer's rear panel. Align 1 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 Board package, then tighten.

7. Snap off 1 segment of the rear panel's break-a-way type slot cover and attach the remaining part of the cover to the rear panel. Align the cover holes with the 4 holes on the panel above the Modem Board bracket and insert the plastite screws that you removed earlier.
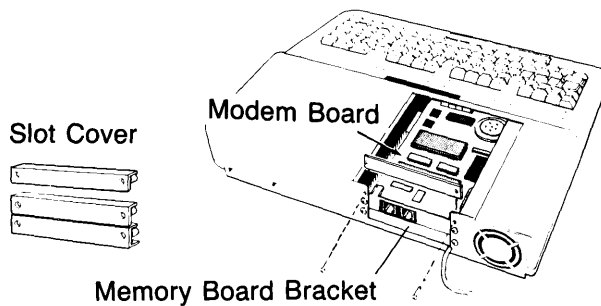
Figure 8. Memory Board and Slot Cover Installation

To connect the Modem Board to the 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 Board. Be sure to touch a grounded metal object to discharge any static electricity.

2. Remove the option slot cover as described in the previous section in steps 2 and 3.

3. First, attach the memory board's bracket as described in the board's installation guide. Carefully align and lower the board's pin socket on the pin header on the computer's main circuit board.

4. Secure the bracket to the computer's rear panel with the screws provided in the Memory Board package (Figure 8).

5. Attach bracket B to the Modem Board as shown in Figure 7 and carefully align and lower the Modem Board's pin socket onto the shorter of the 2 pin headers on the Memory Board.

6. Secure bracket B to the rear panel with the screws provided in the Modem Board package.

7. Snap off 1 segment of the rear panel's break-a-way type slot cover and attach it to the panel with the plastite screws that you removed earlier. Refer to Figure 8.

   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 aligning the pin connectors.

Telephone connections

Your Modem Board has been designed and constructed to conform to federal regulations and can be connected to the phone line as described in this manual.

Please note that each product connected to the telephone line places a certain load on the line. This is designated 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 5, your phone may not ring. In rural areas, a total of 3 may impair ringer operation. To be sure, check with your local telephone company.

The registration number as well as ringer equivalence number appears on the FCC label located on the Modem Board.

Warning: The Modem Board must not be connected to coin-operated phones and party-line phones.

Single-line

1. Remove your telephone's plug from the modular wall jack and insert it to one of the Phone Jacks. If you plan to use the Modem in automatic mode only, you do not need to use a telephone.

2. Connect the modular wall jack and the unused phone jack using the supplied modular cable.
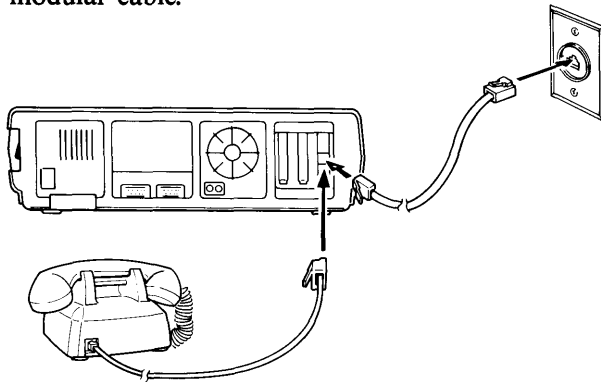
Figure 9. Modular Telephone connection

If your telephone has the older style, four-prong connection, use an adapter (279-360) as shown in Figure 10.

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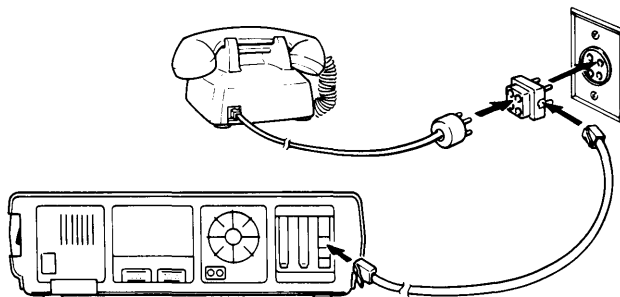
Figure 10. Connection to a Four-Prong Jack

If your telephone is wired directly to the wall, the jacks and adapters neces-sary for the conversion are available at your nearest Radio Shack store. Or, you may contact the telephone company to have modular connections installed. The telephone company is authorized to charge you for the instal-lation of such jacks. The U.S.O.C. number for the plug connection is RJ-11C.

Multi-line

The Modem Board can be used with a multi-line telephone, but you may need to use a multi-line adapter (43-271), change the jumper on the Modem Board, or both.

If you use a multi-line adapter only, the HOLD button on an extension phone can interfere with communication if someone presses it. To avoid this problem, modify the Modem Board by moving the short connector, CN2, to 2-3 position with a pair of long nose pliers. See Figure 11.

Radio Shack has several adapters that can be used for connecting the Mod-em Board to multi-line telephones. Contact your Radio Shack Computer Center or store for details.

Phone Jacks

CN2

original position (1-2)   3 o o o 1   3 o o o 1   multi-line use position (2-3)
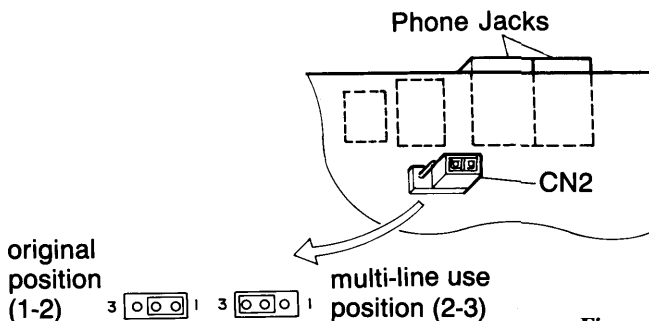
Figure 11

Communications protocol

The following criteria must be met before computer-to-computer communication can occur.

1. Both computers must have the same communications protocol:

    300 bits/second (bps)
    Word length (7 bits or 8 bits)
    Parity (even, odd or none)
    Number of stop bits (1 or 2 bits)

    See your computer owner's manual for instructions on setting the communications protocol.

2. One modem must be in originate mode and the other must be in answer mode. Usually, when you call another computer, you should be in originate mode. When you receive a call, you should be in answer mode.

The Modem provides automatic and manual operations in both originate and answer modes. When opened for programming by the attention code sequence, it will automatically synchronize the speed rate, word length, parity and stop-bit numbers (communications protocol) of your computer system.

Helpful Tip:

When you use your Modem for the first time or when you seem to be getting garbled data, use the self-test mode to help you find the cause of the problem. Refer to the section on **self-test** in Appendix A, **Command reference**.

Refer also to the operation manual which accompanies your communications software package.

The commands designate the Modem's operation and the register values determine how the commands will be executed. The command structure is patterned from the industry standard AT-string-interface command, which makes the Modem Hayes-software compatible.

Command codes

All command lines begin with the AT (attention code) string and end with a carriage return (ENTER) . AT must be entered in uppercase letters, but the commands following can be entered in either upper- or lowercase letters. When the AT command is received, the Modem will automatically set the baud rate 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. These commands, however, must be entered in logical order in order to be executed. If the command line exceeds the buffer-character limit, the Modem will not execute the commands and instead sends an error result code (Table 6).

Example 1. Sample command line

   AT V1 S6 = 3 DP9, T(111)123-4567R (ENTER)

Now, to review the commands, one by one:

AT	Beginning of command line. Place the Modem in command receptive mode.
V1	Display the verbal result code. (Refer to **Result codes** later in this chapter.)
S6 = 3	Wait 3 seconds for the dial tone.
DP9,	Dial 9 by pulse dialing, then pause 2 seconds (default value of register S8). (Refer to the section on **Registers**.)
T	Touch-tone dial the telephone number that follows.
R	Change to answer mode and wait for carrier.
(ENTER)	End of command line. Execute all commands.

The attention code AT, control characters and spaces do not take up space in the command buffer. The punctuation used in the telephone number to make it easier to read does take up space. Input the attention code AT, reset command Z, or turn OFF the power supply of the Modem to clear the command buffer.

The basic commands needed for programming the Modem are provided in Table 3. Table 4 lists the dialing and answering commands. For a detailed explanation of each command, refer to Appendix A, **Command reference.**

Commands with parameters

Some of the commands have parameters. The parameter value, usually 0, 1 or 2, follows the command. When the command parameter is not used, the Modem assumes a value of 0. For example, the echo command E does not echo when parameter 0 is assumed. It does echo when parameter 1 is issued. E used alone is the same as E0.

Table 2. Commands with Parameters

Code	Parameter	Function	Default
Q	0	Result codes ON.	Defined by DIP Switch 4.
	1	Result codes OFF.	
V	0	Numeric result codes.	Defined by DIP Switch 3.
	1	Verbal result codes.	
E	0	Commands are not echoed.	Defined by DIP Switch 5.
	1	Echo commands.	
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 disconnected when not in use).	H0
	1	OFF HOOK (phone line is connected regardless of its condition).	

Table 3. Basic Command Codes

Code	Description	Function
AT	Attention Code	Wakes up the Modem to command receptive state. Starts the command line.
CR	Carriage Return	Closes the command line and executes commands. Register S3 defines the carriage return character.
BS	Backspace	Edits the command line by deleting characters one by one. Register S5 defines the backspace character.
+ + +	Escape Code	Returns the Modem to command mode from on-line mode. Register 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.
Z	Reset	Resets the Modem to default condition.

Table 4. Dialing and Answering Command Codes

Code	Description	Function
D	Dial	Sets the Modem to originate a telephone call. D command parameters include: 0-9, ( ), space, *, and #.
P	Pulse Dial	Sets the Modem to pulse dialing mode.
T	Touch-tone Dial	Sets the Modem to touch-tone dialing mode.
R	Reverse Mode	Automatically changes the Modem to answer mode after a call is originated.
, (comma)	Pause	Causes the Modem to pause while dialing. Follows the access code. Length of pause is set by Register S8.
; (semicolon)		Returns the Modem to command mode after dialing.
A/	Repeat Command	Repeats the command line. AT and ENTER are unnecessary for this command.
A	Answer Mode	Immediately sets the Modem to answer mode without waiting for a ringing signal.

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Registers

Registers are used to store the parameters which control communications. Each register has variables that determine how the Modem operates or supplies information on the Modem's current condition. The Modem has 14 registers:

Table 5. Registers

Register	Range	Unit	Function	Default
S0	0-255	Ring	Defines the rings in answer mode.	0*
S1	0-255	Ring	Counts the rings.	0
S2	0-127	ASCII code	Defines the escape code character.	43
S3	0-127	ASCII code	Defines the CR code character.	13
S4	0-127	ASCII code	Defines the LF code character.	10
S5	0-32,127	ASCII code	Defines the BS code character.	8
S6	2-255	Seconds	Defines the dial tone wait time.	2
S7	1-255	Seconds	Defines the carrier wait time.	30
S8	0-255	Seconds	Defines pause duration for comma (actual maximum value is 54, but a value up to 225 can be input).	2
S9	1-255	1/10 sec.	Defines carrier detect response time.	6
S10	1-255	1/10 sec.	Defines carrier loss time to 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-S15			Not used.	
S16	0		Self-test mode OFF.	0
	1		Self-test mode ON.	

* When DIP SW 6 is OFF, the Modem will power-up in auto answer with S0 = 1.

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 S5-S12 control the function time and register S16 is for the self-test.

Note: The ASCII code value is expressed in decimal.

Command syntax

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 S*x*? or S*x* = *n* command syntax.

S*x*?   Check the register value

To check the value of a register, use the S*x*? syntax. The value of the registers are displayed on the screen in decimal numbers. For example, to check the value of register S2, type:

   AT S2? (ENTER)

On the screen, you will see —

   043
   OK

You can also check the values of plural registers in the same command line. To check the values of register S3 and register S4, type:

   AT S3? S4? (ENTER)

The screen might show:

   013
   010
   OK

S*x* = n   Change the register value

Use the S*x* = *n* syntax to assign or change the value of a register. 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 Appendix A, **Command reference**.

Result codes

Result codes are displayed in either numeric or verbal code after the command line is executed.

Command Q determines whether the result codes will be displayed. When Q1 is selected, the result codes will not be displayed. When Q0 is selected, you can see the codes on the screen. Command V selects either numeric (V0) or verbal (V1) codes.

The default values of these controls are fixed by DIP switches. For example, when DIP Switch 4 is set to ON, the result codes do not appear on the screen unless Q0 is entered from the keyboard. (Refer to Chapter 1, **DIP switches**).

Table 6. Result Codes

Numeric	Verbal	Meaning
0	OK	Executed the command line without errors.
1	CONNECT	Detected carrier.
2	RING	Detected an incoming phone line ring signal.
3	NO CARRIER	Carrier was lost or never heard.
4	ERROR	Error in the command line, command is invalid (not recognized by the Modem), or the command line exceeds command buffer size.

Logons in MS-DOS operating systems

With DeskMate's Telecom applications program and your Tandy Personal Computer, you can easily program your Modem to log on to a host computer, information service or another terminal either manually or automatically. Follow the instructions in your DeskMate Tutorial and Reference manual for setting the parameters and using the functions available. Depending on the computer you are using, the procedures may differ slightly from those shown. A Tandy 1000 DeskMate is used for the examples following.

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`	`300`
`Data Word Length`	`8 BITS`
`Parity`	`NONE`
`Number of Stop Bits`	`1 BIT`
`XON/XOFF Flow Control`	`ON`
`ASCII Character Filter`	`OFF`
`Line Feed Filter`	`OFF`
`Echo (Half Duplex)`	`OFF`
`Redial (# of Retries)`	`0`

3. Select **Yes** for the Autodial Modem status setting and press (F2) . When the `DEFINE MODEM FOR COMPUTER DIALING` screen appears, 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 number which will be input at terminal mode.
`SEND: ^M`	Send ^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 touch-tone dialing, change ATDT to ATDP in the first SEND line.

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

Manual logon

1. Enter terminal mode from the TELECOM-STATUS screen ((F5)).

2. At the TERMINAL MODE screen, press (F8) and type in the telephone number of the information service, then 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 autolog file and enter your log file name, 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 file. When completed, the screen for your autolog file might show:

   ```
   STATUS: Y, 30, 8, N, 1, ON, OFF, OFF, OFF, 0
   CALL: 123-4567 (Use your local TELENET number.)
   PAUSE: 5
   SEND: ^M^M
   RECV: TERMINAL =
   SEND: D1^M
   RECV: @
   SEND: C 60942^M
   RECV: ????
   SEND: DJNS^M
   ```

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 will dial your local access number, connect to the service, then automatically execute the rest of the autolog file.

Appendices

Command reference A

Programming commands

AT   **Attention code**

Every command line starts with the attention code. Always enter this code in uppercase letters. Other commands may be typed in lower- or uppercase letters.

CR   **Carriage return**

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

BS   **Backspace**

You can edit a command line with the (BS) key, but the attention code at the beginning of a command line cannot be deleted. The (BS) key is defined as 08 in ASCII value. To redefine it, change the value of register S5.

+ + +   **Escape code**

Use the escape code to return to command mode from ON LINE. When you input escape code + + +, the Modem returns to command mode and displays the result code OK. The telephone line will remain connected until you input H0 (ON HOOK command) or Z (Reset command).

The escape character can be redefined with register S2. When you redefine the escape character, do not select characters which 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.

The escape guard time can be redefined with register S12. Its default value is 50 (1 second). When entering the escape code with default values, wait at least 1 second, input + + +, 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 the A command is entered, the Modem goes OFF HOOK and waits for the carrier signal. Use this command to begin computer communication immediately after talking with a friend by phone. In this case, one user should input A while the other uses the dial command D. Any command placed after A will not be executed. If you want to execute other commands, insert the commands before the manual answer command.

Example:

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

D, d   **Autodial 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 7. When used alone, D sets the Modem to auto-originate mode.

Table 7. Dialer Codes

Codes	Function
0-9	Used for the telephone number.
(,), -, space	Used to make the telephone number readable.
*, #	Used only in touch-tone dialing mode.
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.
, (comma)	Sets the Modem to pause while dialing (can be used after the access code).
; (semicolon)	Returns the Modem to command mode after dialing.

Example:

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

After dialing the number, the Modem waits for a carrier signal. When a carrier is not detected within a time set by register S7, the Modem automatically releases the line and sends the result code:

    NO CARRIER (or 3)

When a carrier signal is detected, the Modem goes ON LINE and sends the result code:

CONNECT (or 1)

The result code ON/OFF condition is determined by the Q command (DIP Switch 4). The type of the code is determined by the V command (DIP Switch 3).

R, r   Reverse mode command

Use this command to call and establish communication with an originate-only modem. When R is entered, the Modem enters answer mode automatically after it dials the telephone number.

Example:

AT D(111)123-0009R ⎛ENTER⎞   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 rotary type, input P at any point in the telephone number sequence. You can change to pulse dialing mode from touch-tone dialing 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 T is added 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 will need to add a pause before dialing the number that follows. Insert the , command between the access code and the telephone number.

The pause duration is determined by register S8. The default pause duration of 1 comma is 2 seconds. You can accumulate the duration by using multiple commas.

;   **Return the Modem to command mode**

Place this command code at the end of the dial 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:

The screen shows:	Command line	Function
	AT D T(111)123-4567; (ENTER)	Wake up! Originate the call by touch-tone dialing. Return to command mode.
OK		
	AT D 43278#; (ENTER)	Transmit the ID number. Return to command mode.
OK		
	AT D8881#; (ENTER)	Transmit the password. Return to command mode.
OK		
	AT D 273*65#; (ENTER)	Enter the transaction. Return to command mode.
OK		
	AT H0 (ENTER)	Terminate the call.

A/   **Repeat the command line (Redial command)**

The Modem repeats the command line stored in the command buffer when repeat command A/ is entered. Use this command to dial again 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 command buffer is cleared under the following conditions:
- New command line beginning with AT is entered
- Reset command Z is entered
- Modem is switched OFF

O, o   **On-line command**

The on-line command returns the Modem to on-line mode from 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**

This command clears the Modem command buffer and resets all commands and registers to the default values. When you have changed the commands and registers from default condition, use this command to return to the default settings. It will save you from cycling the power switch OFF and ON.

E, e   **Echo command**

This command is used to disable or enable the command echo function. Enter E1 to echo the command line to 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 the echo feature is disabled (E0), the Modem will appear dead, but actually it is working normally. The default setting of this command is set by DIP switch. For example, if DIP switch 5 is OFF, the default is E1. If the switch is ON, the default is E0.

F, f   **Full/half duplex**

Selects full- or half-duplex communications mode. F1 sets the Modem to communicate in full-duplex mode which only echoes received data when ON LINE (default). F0 sets the Modem to communicate in half duplex. In this mode, the Modem echoes both received and transmitted data to the display when ON LINE.

Q, q   **Result codes ON/OFF command**

Determines whether the result codes will be sent to the screen. Enter Q0 to display result codes and Q1 if the codes are not to be sent.

V, v   **Result codes mode selector**

Selects the type of result codes displayed. V0 is used for numeric codes and V1 is for verbal codes.

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

C, c   **Transmitter ON/OFF command**

The C command sets the Modem's transmitter carrier signal ON or OFF. When C1 is entered, the transmitter is switched ON. The carrier signal is ON when the Modem originates or answers a call or connects to the remote modem. Otherwise, it is OFF.

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When C0 is entered, the transmitter is switched OFF and remains OFF until C1 or reset command Z is entered. As long as the transmitter is OFF, the Modem will not issue carrier even when it detects the answer modem's carrier tone during originate mode operation. For further information, refer to **Data line monitoring** in later in this chapter.

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. In the H1 setting, the handset is off the hook and the telephone line is in use.

Use the H0 setting for normal operation. When originating or answering calls, the Modem controls the off hook condition automatically.

M, m   Speaker control

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   Defines the rings for answering a call

The value of register S0 determines the number of times the phone will ring before the Modem answers a call. Input any decimal number greater than 0 to set the Modem to auto-answer mode. If the value is set to 0, the Modem will not answer a call. Since the default value of S0 is preset at 0, use the prescribed syntax (refer to **Command syntax** in Chapter 2) to change the value when you use the Modem in auto-answer mode.

When DIP Switch 6 is OFF, the Modem will power-up in always auto-answer mode 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. This will operate only if the value of S0 is greater than 0.

S2   Escape code definition

S2 stores the ASCII value of the escape code character. The default value is set to 43 (+). To change the escape function key, change the code using the S$x = n$ 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 be disabled.

S3   Carriage return code definition

S3 stores the ASCII value of the carriage return character. Enter a decimal number in the range 0 to127 when you want to change the carriage return function key. The default value is 13.

S4   Line feed code definition

S4 stores the ASCII value of the line feed character. The value is predefined as 10 (default). You can redefine the value by inputting 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 is supported (V1). 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 between 0 and 32 or 127. These numbers do not include printable ASCII characters 33-126.

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 it takes to input the first digit of the phone number after you pick up the telephone receiver. The default value is set at the minimum wait time of 2 seconds, To change the wait time, input the number of seconds you want. If a value less than 2 is programmed into S6, it will still wait for 2 seconds.

S7   Carrier tone wait time definition

The carrier tone wait time is defined as the length of time the Modem can wait for a carrier tone transmitted from the remote modem. The value of S7 determines this wait time. If the Modem cannot receive a carrier tone within the restricted time, it hangs up and displays result code NO CARRIER or 3 when Q0 is supported, then returns to command mode. It is defaulted to 30 seconds. To change, input the number of seconds you wish.

Once the carrier tone is detected, the Modem displays CONNECT or 1 and it goes ON LINE.

S8   Pause (,) duration definition

To access an outside line through a PBX or when using a special telephone service, the comma (,) is used to pause after dialing an access code. The value of register S8 determines pause duration for this comma. Defaulted to 2 seconds, it can be changed by inputting the desired number of seconds.

S9   Carrier detect response time definition

The value of register S9 determines the length of time (carrier duration) which the Modem takes to recognize the carrier tone and go ON LINE. As the value increases, the possibility of detecting a false carrier from noise decreases. The default value of S9 is set at 6 with the unit of 1/10 second (0.6 seconds). To change it, input the desired duration times 10.

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 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.

When you set the value to 255, the Modem assumes the carrier is always present and ignores carrier detect. It is defaulted to 7 (0.7 seconds). To change, input the desired number of seconds times 10.

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 in units of milliseconds. This sets the dialing rate to 7.14 digits per second. The dialing rate of 5 (10) digits per second can be obtained by applying the value 100 (50) to S11. 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. This escape guard time is specified to 20 minimum and 255 maximum in units of 1/50 second. The default value is 50, that is, 1 second.

Beware that the small guard time you assign should be greater than the time required to transmit one of the 3 escape characters.

S16   Self-test toggle

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

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

Since the Modem goes off-hook during the test, **be sure to disconnect the wall jack phone line cord from the wall jack before executing a self-test.**

To set the Modem for self-test mode, type:

   AT S16 = 1 D (ENTER)   Self-test mode ON.
                               Originate mode.

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

   AT S16 = 1 A (ENTER)   Self-test mode ON.
                               Answer mode.
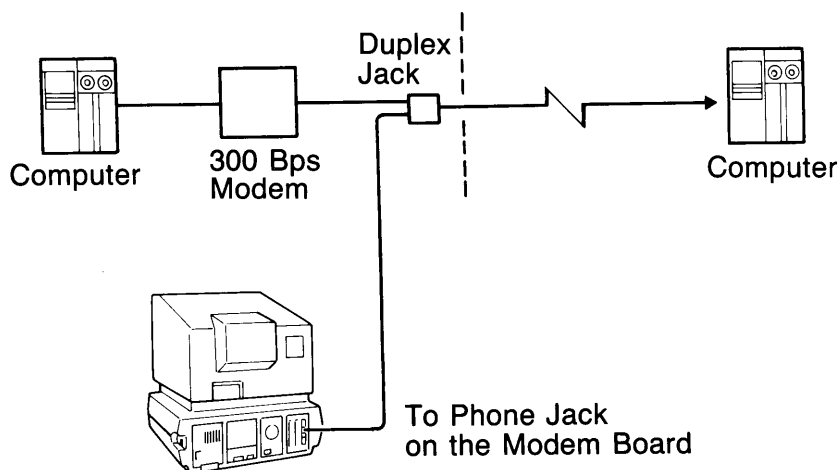
Data line monitoring

The Modem can be used to monitor a data line up to 300 bps as shown in the figure below. To accomplish this monitoring mode, the Modem's carrier transmitter should be turned off and loss of carrier condition should be ignored.

For originate mode, input:

AT C0 S10 = 255 D (ENTER)

For answer mode, input:

AT C0 S10 = 255 A (ENTER)

When you have problems transmitting data (garbled data, intermittent errors, etc.), there are a few checks you can make before taking the unit to a Radio Shack service technician:

- Phone connection is clean and noise-free.
- No one is talking on the telephone line.
- Phone and all extensions are on hook.
- Baud rate is 300.

The only maintenance your Modem requires is a periodic checking of cables and connections. When you experience data transfer problems, first check the cable connections. Then run the self-test. If you still experience problems, check with your Radio Shack Computer Center or store.

Precautions

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.

Lightning. Your Radio Shack phone product has built-in protection circuits that meet or exceed FCC requirements to reduce risk or damage from surges in telephone line current. However, an incident such as a lightning strike near, or directly to, the telephone line may cause an excessive surge of voltage that can damage the phone device. Lightning damage is uncommon, but can occur to the phone and other electronic devices. If you are concerned about it or live in an area with frequent and/or severe electrical storms, it is suggested that you unplug the electronic products during storms.

Analog loop self-test

When you cannot locate the source of your problem, test the Modem with $S16 = 1$. This test causes the data sent from your computer to be looped back to the receiver, thus letting you know whether the Modem is functioning properly. The analog loop self-test does not test nor analyze the condition of your telephone circuits.
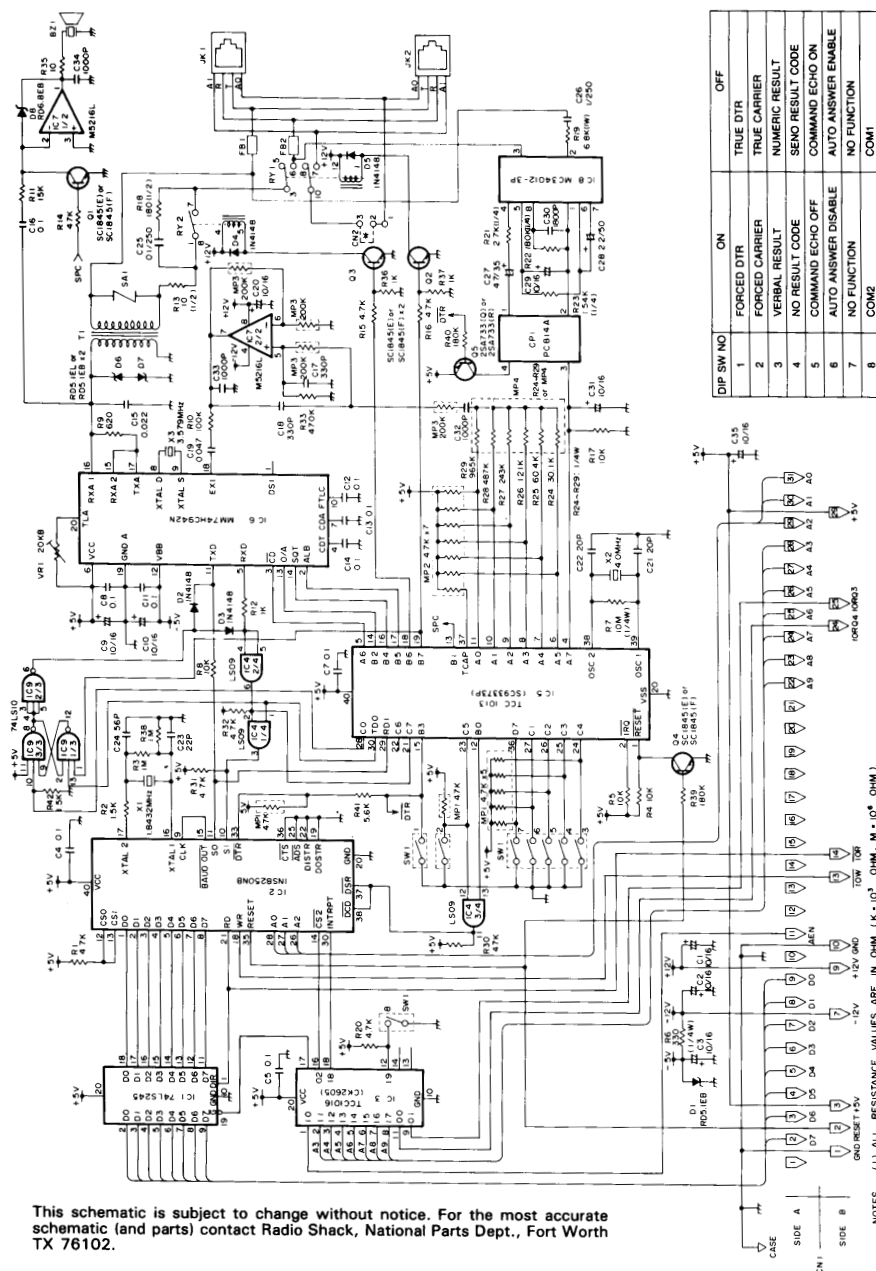
Specifications C

Performance

Operation mode

Hayes protocol
Full or half duplex
Automatic answer/originate
Manual answer/originate

Receive frequencies

  Answer

Mark 1270 Hz
Space 1070 Hz

  Originate

Mark 2225 Hz
Space 2025 Hz

Transmit frequencies

  Answer

Mark 2225 Hz
Space 2025 Hz

  Originate

Mark 1270 Hz
Space 1070 Hz

Transmit level

-13 dBm

Receive sensitivity (NO ERROR)

-35 dBm

Carrier detect sensitivity

-40 dBm

Baud rate

300 bps

Output impedance

600 ohms

Telephone dialer (auto-originate mode)

  Pulse dialing

Dialing rate (slow), 10 pps
Breaking ratio (slow), 60%
Interdigital pause (slow),
820 mS

  Touch-tone dialing

Duration of signals (slow),
100 mS
Interdigital time (slow),
100 mS

Physical/environmental

Operating temperature

55°F-85°F (12.8°C-29.4°C)

Humidity

  Operating environment

90% relative humidity (non-condensing)

  Storage

90% (non-condensing)

Dimensions (PC Board size)

5-1/2″ × 3-15/16″
(140 × 100mm)

Weight

4.6oz (130g)

DIP SW NO	ON	OFF
1	FORCED DTR	TRUE DTR
2	FORCED CARRIER	TRUE CARRIER
3	VERBAL RESULT	NUMERIC RESULT
4	NO RESULT CODE	SEND RESULT CODE
5	COMMAND ECHO OFF	COMMAND ECHO ON
6	AUTO ANSWER DISABLE	AUTO ANSWER ENABLE
7	NO FUNCTION	NO FUNCTION
8	COM2	COM1

NOTES
(1) ALL RESISTANCE VALUES ARE IN OHM (K = 10³ OHM, M* = 10⁶ OHM)
(2) ALL CAPACITANCE VALUES ARE IN µF (P = 10⁶ µF)
* THE SHORT CONNECTOR IS USED FOR MULTI-LINE PHONES AND OTHERWISE SHOULD BE OPENED

This schematic is subject to change without notice. For the most accurate schematic (and parts) contact Radio Shack, National Parts Dept., Fort Worth TX 76102.

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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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