

Apple

Modem 300/1200 User's Manual

Part I: Reference



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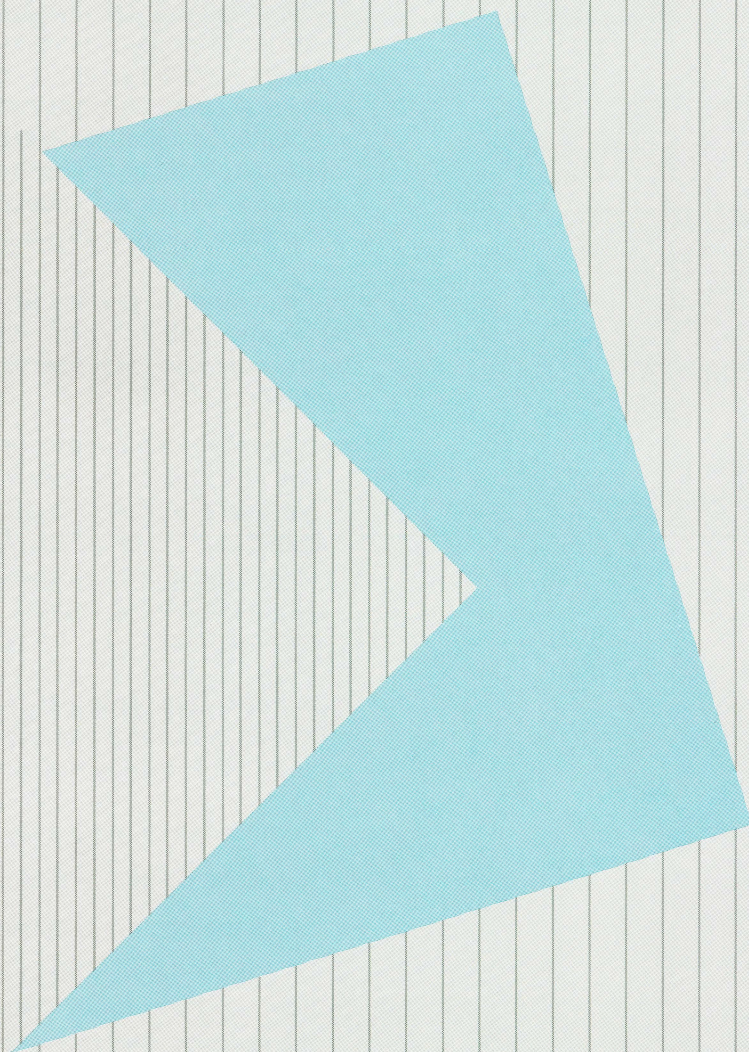
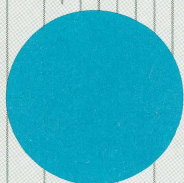
Warning

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/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception. The Apple 300/1200 Modems are FCC certified with shielded interface cable to prevent radio & television interference.

Apple

Modem 300/1200 User's Manual

Part I: Reference



If necessary, you should consult your dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet, prepared by the Federal Communications Commission:

“How to Identify and Resolve Radio-TV Interference Problems”
This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, stock number 004-000-00345-4.

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About This Manual

This manual is the first book you should read when you open your Apple Modem package. Depending on which type of Apple computer you have, you'll get another volume of this manual, the *Apple Modem 300/1200 User's Manual, Part II*, containing information specific to the use of the Apple Modem with that computer.

What This Manual Contains

This manual is arranged so you can find the information you need, quickly and easily. Here is a summary of what this manual contains.

- Chapter 1, "Getting to Know Your Modem," tells you what the modem is and what it can do. This chapter contains pictures that will help you identify the modem's parts and controls.
- Chapter 2, "Installation and Testing," leads you through the process of preparing your modem to communicate with your Apple computer. Details on connecting your modem to your particular type of Apple computer are given in Part II of this manual.
- Chapter 3, "Care and Handling," tells you how to take care of your modem so that you will always get the results that it was designed to produce.
- Chapter 4, "Controlling Your Modem," describes all the controls and program commands you can use to make your modem perform.
- Appendixes A through D contain useful technical information referred to throughout the rest of this manual.
- A glossary provides you with a concise explanation of technical information contained within the manual.
- An index helps you quickly locate information.
- A Reference Card provides you with a quick reference for all modem commands.

Who Should Read What

The following chart shows which chapters are recommended for various kinds of readers. You may fall into more than one of the categories (for example, you may be a first-time user setting up your own system).

Reader	Chapters				Appendixes			
	1	2	3	4	A	B	C	D
Person setting up the system	•	•	•	•				
First-time user	•	•	•					•
Experienced Apple computer user		•		•	•		•	
Programmer				•	•	•	•	•
Business person				•			•	

Aids to Understanding

Look for these visual aids throughout the manual:

- Gray boxes contain incidental information you may find useful.
- Warning boxes indicate potential problems or disasters.
- Notes in the margins point to useful information contained elsewhere in the manual.



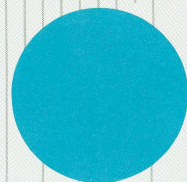
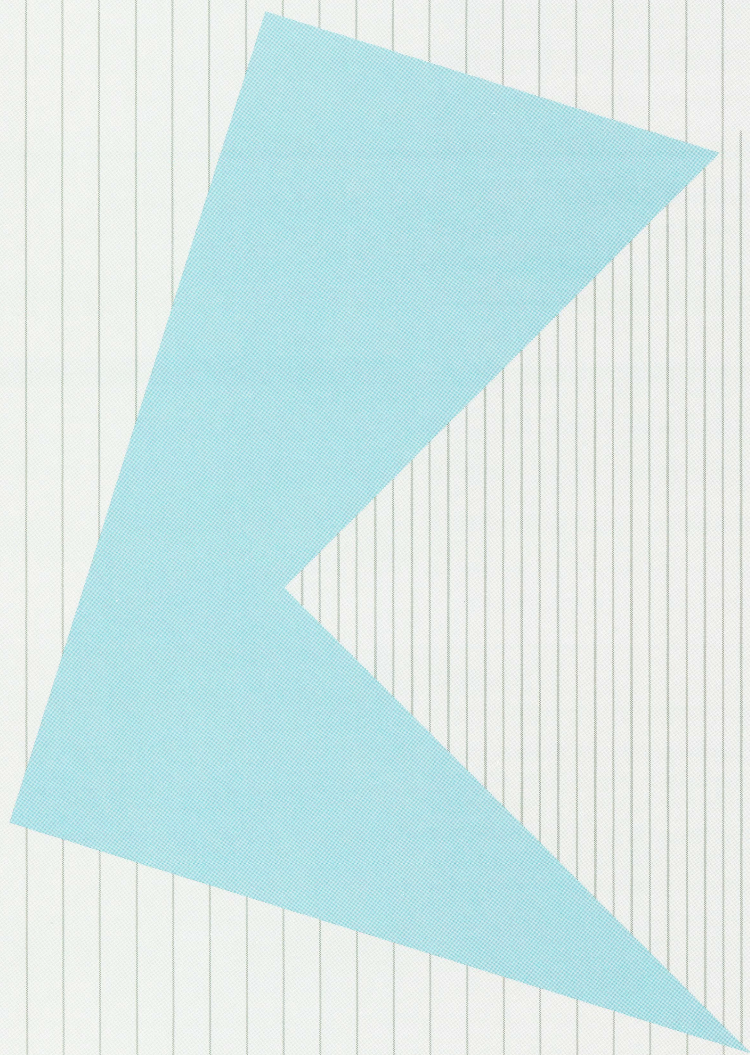
Warning

This equipment is intended to be electrically grounded.

This product is equipped with a three-prong power module. As a safety feature, the plug is designed to fit only into a polarized, grounded three-hole outlet. If you don't have such an outlet, have a licensed electrician install one (and a grounding conductor, if necessary) where you will use the computer. Do not defeat the purpose of the grounded plug.

Getting to Know Your Modem

-
- 4** Names of Parts
 - 5** Controls
 - 6** What Your Modem Can Do



Getting to Know Your Modem

This chapter introduces you to the Apple Modem and tells you about some of the things it can do.

The Apple Modem is a compact device that allows you to communicate with other computers by simply using your telephone. It is designed to be as “friendly” as possible with few controls to concern you, and it can be positioned under your telephone to take up a minimum of desk space.

Your Apple Modem is an *intelligent* modem, which means that, along with handling itself automatically, it can both answer and dial your telephone. What makes your modem *intelligent* is its built-in microprocessor that allows it to handle all of the communications between your computer and the computer that you are calling, with a minimum amount of effort from you. Using your modem to dial telephone numbers becomes a simple task—just type the telephone number on your Apple computer keyboard and the modem does the rest. Your modem can automatically answer the telephone and receive messages if you have the appropriate communications software.

By the Way: Make sure that the person you are dialing also has a modem hooked up to a computer—otherwise, your modem will end up talking to itself.

Your modem’s microprocessor takes information from your Apple computer and sends it across the telephone lines to the computer on the other end of the line. With appropriate communications software, you can tell your computer system whatever message, file, or program you wish to send, and your modem will faithfully transmit the information to the other computer. The person at the other end of the line can send you a reply and your modem will transmit this information to your computer in the same manner.

In short, your Apple Modem opens up a whole world of new communication possibilities for you and your Apple computer, allowing you to expand beyond the physical limitations of your own computer system.

Names of Parts

If your Apple Modem is still in the box, unpack it now. Save all packing materials; they will come in handy when you want to store or transport your modem. After you have unpacked the modem, place it, the power module, and the telephone cable on a table in front of you so that you can easily find the parts.

Make sure that you have the correct Apple Modem Accessory Kit for your specific Apple computer system. The model type of your computer should be marked on the Accessory Kit box. In addition to Parts I and II of this manual, the Accessory Kit contains the modem data cable. Check the packing list for any software associated with your computer.

You need the correct Accessory Kit to match your computer.

Now look at Figures 1-1 and 1-2. Figure 1-1 shows a front view of your modem with a telephone on top of it—notice the single indicator light on the front of your modem.

Before you try to hook up your modem or turn it on, take a minute to look over your modem and become familiar with it.

Figure 1-1. Front View of Modem



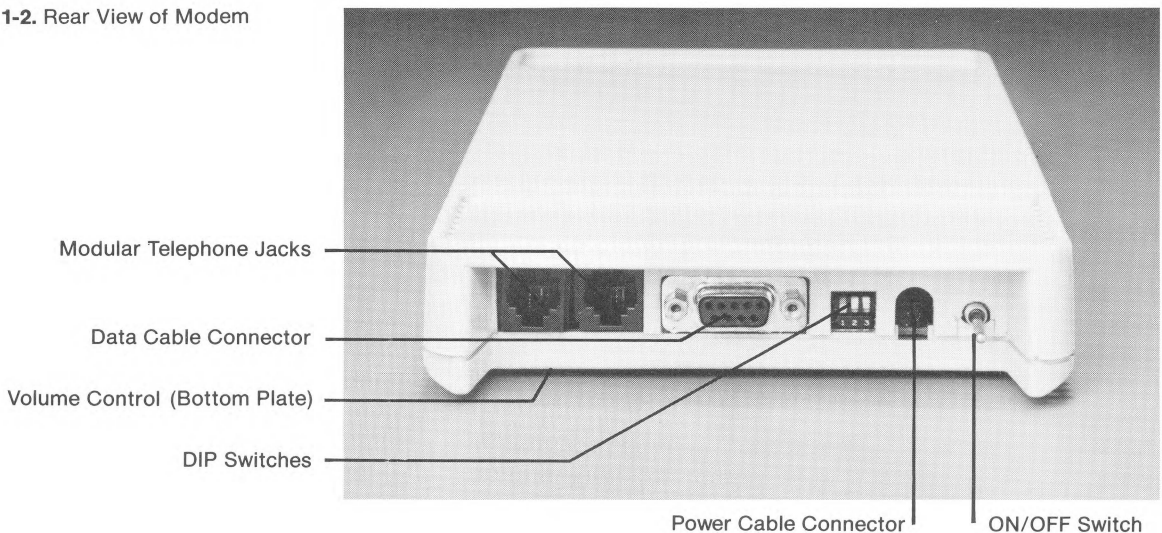
There is only one part that concerns you in Figure 1-1, and that is the indicator.

Now turn your modem around and look at the back. Compare what you see with Figure 1-2—this is where the action is:

- Two modular telephone jacks
- Data Cable Connector
- Three DIP Switches
- Power Cable Connector
- ON/OFF Switch
- Volume Control (Bottom Plate)

Note: The volume control for your modem is located on the bottom plate of the modem. It is preset to the mid-range at the factory, but you can change the volume by inserting a small, flat-bladed screwdriver into the hole in the bottom plate and turning clockwise or counterclockwise, respectively, to increase or decrease the volume.

Figure 1-2. Rear View of Modem



Controls

While your modem is on the table in front of you, notice that there are only the ON/OFF switch, DIP Switches, and one indicator that you need be concerned with—all the rest of the controls are taken care of by the modem's microprocessor.

What Your Modem Can Do

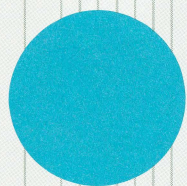
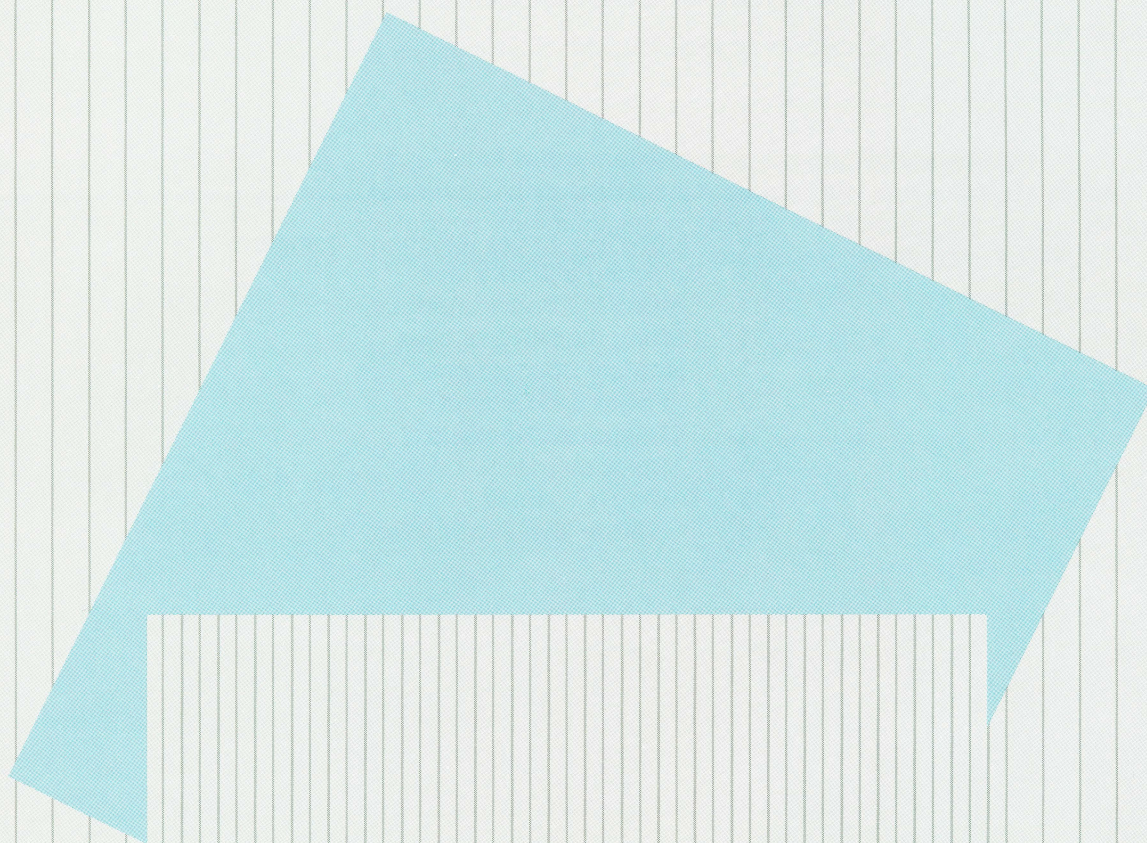
Your Apple Modem allows you to communicate with other computers by simply using your telephone. It has the following built-in functions:

- Automatic or Manual Telephone Answering
- Automatic or Manual Telephone Dialing
- Self Test

After initial setup, your modem, in conjunction with the communications software, automatically looks after all of the computer communication aspects — all that's left for you to do is to type in your messages and sit back to read the replies.

Installation and Testing

-
- 10** Notify Your Local Telephone Company
 - 10** Selecting a Workspace
 - 11** Setting the Serial Interface
 - 11** Setting the DIP Switches
 - 13** Electrical Connections
 - 13** Power and Ground
 - 14** Telephone Hook-Up
 - 14** Computer Hook-Up
 - 15** Testing it Yourself
 - 15** Built-in Test Procedures



Installation and Testing

Setting up your Apple Modem and connecting it to your Apple computer is not difficult. Everything you need is contained in the Accessory Kit that came with the modem.

Look for hook-up instructions in Part II of this manual.

This chapter deals with the modem's end of its connection to your computer. The modem-to-computer and modem-to-telephone setup is covered in Part II of this two-volume manual.

Find Part II of this manual and turn to the section dealing with connecting the modem to your computer. When you have both parts of this manual in hand, you are ready to begin installing your modem—the following list is an overview of the procedures we will be going through:

1. Notify your local telephone company that you are hooking up a modem to their lines, and provide them with registration numbers, as directed in this chapter.
2. Set up a workspace for the modem as described in the next section of this chapter, "Selecting a Workspace".
3. Adjust the DIP switches on the modem according to the instructions given in the section "Setting the DIP Switches" later in this chapter.
4. Connect the modem to your computer, following the instructions in Part II of this manual.
5. Run the built-in test to see that the modem is working properly. Part II of this manual tells you how to do this.
6. Do any performance tests that are described in Part II of this manual to check your completed installation.

Notify Your Local Telephone Company

Before hooking up your modem to the telephone line, notify your local telephone company business office to tell them that you are connecting a modem to their lines. Supply them with the following information:

If you have an Apple Modem 300:

- FCC Registration Number: BCG794-12381-DM-E
- Ringer Equivalence Number: 0.4B
- Manufacturer and Model Number: Apple Computer, Model 300

If you have an Apple Modem 1200:

- FCC Registration Number: BCG794-12381-DM-E
- Ringer Equivalence Number: 0.4B
- Manufacturer and Model Number: Apple Computer, Model 1200

Selecting a Workspace

You should install your Apple Modem in the same kind of workspace as your Apple computer—clean, indoors and adequately lighted, and within reach of a telephone jack. The six-foot connecting cable normally limits the distance between your computer and your modem.

For Detailed Environmental Specifications see Chapter 3 “The Working Environment,” and Appendix A “Hardware Specification Summary.”

Your Apple Modem is designed to be placed under a telephone, so it needs no extra desk space. However, you do need both a power outlet and a modular telephone jack nearby (within six feet) in order to plug in the modem.

Note: If your telephone has the old style four-prong jack, obtain a modular-to-four-prong adapter and a four-prong-to-modular adapter from your local hardware dealer before continuing—otherwise you will not be able to connect your modem to your telephone.

Setting the Serial Interface

Your modem has an RS-232-C input/output.

Your Apple Modem can be connected to virtually any computer. This is because its electrical input/output conforms to a standard called the **RS-232-C Interface**. RS-232-C is the identification number of a computer industry standard; most computers have inputs/outputs that conform to it. Thus the code number RS-232-C defines the kinds of electrical signals the computer is supposed to receive and send. In effect, any device with an RS-232-C input/output (such as your modem) can be successfully plugged into any other device with an RS-232-C input/output (such as your computer).

However, within the RS-232-C standard there can be variations of signal format and transmission speed to suit different machine-to-machine communication requirements. A terminal communications program determines how the RS-232 Interface will behave; see Part II of this manual for the terminal communications program tailored to your computer system.

Note: The RS-232-C standard cable configuration provides for two 25-pin (DB-25) connectors. Due to space considerations on the back of your modem, we use a 9-pin (DB-9) connector at the modem end. This cable is electrically compatible with the RS-232-C standard—see Appendix D for DB-25 to DB-9 pin-to-pin connection data.

Serial Interface settings for other computers.

If you are connecting your Apple Modem to a computer made by a company other than Apple, consult Appendix D, “Serial Interface Definitions.” Appendix D contains a description of the serial interface, which will help you set the interface for connecting the modem to other computers.

Setting the DIP Switches

Your modem was shipped from the factory with its DIP Switches correctly set for normal operation with your Apple computer. This setting is shown in Figure 2-1.

By The Way: DIP Switches take their name from the manner in which they are manufactured. DIP Switch stands for *Dual In-line Package* Switch—meaning that the switch has two lines of pins that fit into a circuit board or socket. These switches are normally too small to be set using your fingers. As a result the switches must be set with a small pointed tool, such as a toothpick, to flip the switch to the desired position.

Look at the back of your modem now and verify that the switches look like Figure 2-1. If they do not, move them up or down with a pointed tool (such as a toothpick) until they do.

For experts only: The DIP Switches, shown in Figure 2-1 do the following:

Apple Modem 1200

- Switch 1—Carrier Detect

- | | | |
|------|---|---|
| up | — | Your computer will supply Carrier Detect signals which will go from high to low when it detects carrier from the other modem. See Appendix D for pin configuration. |
| DOWN | — | Your modem will supply Carrier Detect signals which are set high. See Appendix D for pin configuration. |

- Switch 2—Balanced Capacitor

- | | | |
|------|---|--|
| UP | — | Your modem will not try to compensate for non-standard phone lines caused by some PBX or CBX systems that do not meet Bell specifications. |
| down | — | Your modem <i>will</i> compensate for such non-standard PBX or CBX characteristics. You would use this setting only in an office environment served by PBX or CBX phone lines which do not meet Bell specifications. |

- Switch 3—Data Terminal Override

- | | | |
|------|---|---|
| UP | — | Your computer supplies the Data Terminal Ready signal to the modem. |
| down | — | Your modem supplies the Data Terminal Ready signal. |

Apple Modem 300

- Switch 1—Carrier Detect

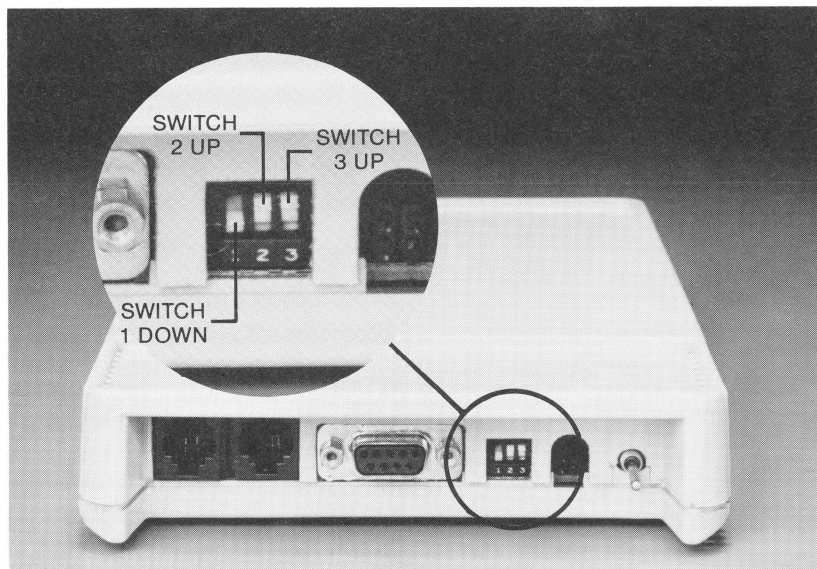
- | | | |
|------|---|---|
| up | — | Your computer will supply Carrier Detect signals which will go from high to low when it detects carrier from the other modem. See Appendix D for pin configuration. |
| DOWN | — | Your modem will supply Carrier Detect signals which are set high. See Appendix D for pin configuration. |

- Switch 2—Not Connected

- Switch 3—Data Terminal Override

- | | | |
|------|---|---|
| UP | — | Your computer supplies the Data Terminal Ready signal to the modem. |
| down | — | Your modem supplies the Data Terminal Ready signal. |

Figure 2-1. DIP Switch Settings



Electrical Connections

You need to make three electrical connections to finish installing your modem:

- Power and ground connections
- Telephone connection to your modem
- Interface connection to your computer

Power and Ground

The Apple Modem operates from most AC power sources. Your particular unit is adjusted for 115/120 volts 60 Hz. The name plate on the power module indicates the maximum voltage, wattage, and amperage ratings for your modem.



Warning

This equipment is intended to be electrically grounded.

This product is equipped with a three-prong power module. As a safety feature, the plug is designed to fit only into a polarized, grounded three-hole outlet. If you don't have such an outlet, have a licensed electrician install one (and a grounding conductor, if necessary) where you will use the computer. Do not defeat the purpose of the grounding plug.

If your power source has the correct voltage and there is a proper ground circuit:

Electrical Connections

Figure 2-2. Modem Hook-Up



1. Find the power module, with power cable attached, that was packed with your modem.
2. Turn the modem switch off (down).
3. Plug the connector end into your modem; see Figure 1-2 for location. This connector is manufactured so that you can only connect it the correct way.
4. Plug the power module into your power source.

Telephone Hook-Up

In order for your modem to communicate across the telephone lines, your telephone must be included in the modem/computer system circuit. To make this happen, you must remove the modular jack from the back of your telephone and plug it into either of the two telephone jacks at the back of your modem. See Figure 1-2 for telephone jack locations. Find the telephone cable that was packed with your Apple Modem Accessory Kit and plug one end into the remaining telephone jack on your modem, and the other end into your telephone.

Your telephone will still work as it did before you attached your modem to it—what's different is that you are now able to attach your modem to the telephone line as well as carry on normal telephone conversations. Leave the modem switch in the off (down) position to receive normal telephone calls. That's all there is to modifying your telephone circuit to accept your modem—easy, wasn't it?

Computer Hook-Up

Find the modem data cable that came packed in your Modem Accessory Kit and plug the 9-pin connector into the connector at the back of your modem; see Figure 1-2 for location. Tighten the two small screws on each side so that the connector can't work loose. Then follow the instructions in Part II of this manual to connect the other end to your computer, and complete the installation procedure.

Warning

You can damage your modem or your computer, or both, by connecting them together incorrectly. Use the Apple data cable that came in the Apple Modem Accessory Kit. It is shielded to meet FCC standards. If you need a special data cable, consult your Apple dealer. Appendix D provides technical details about your modem's interface.

Testing it Yourself

You can test your Apple Modem only after you hook it up to your computer, using the modem self-test routine. Part II of this manual tells you how.

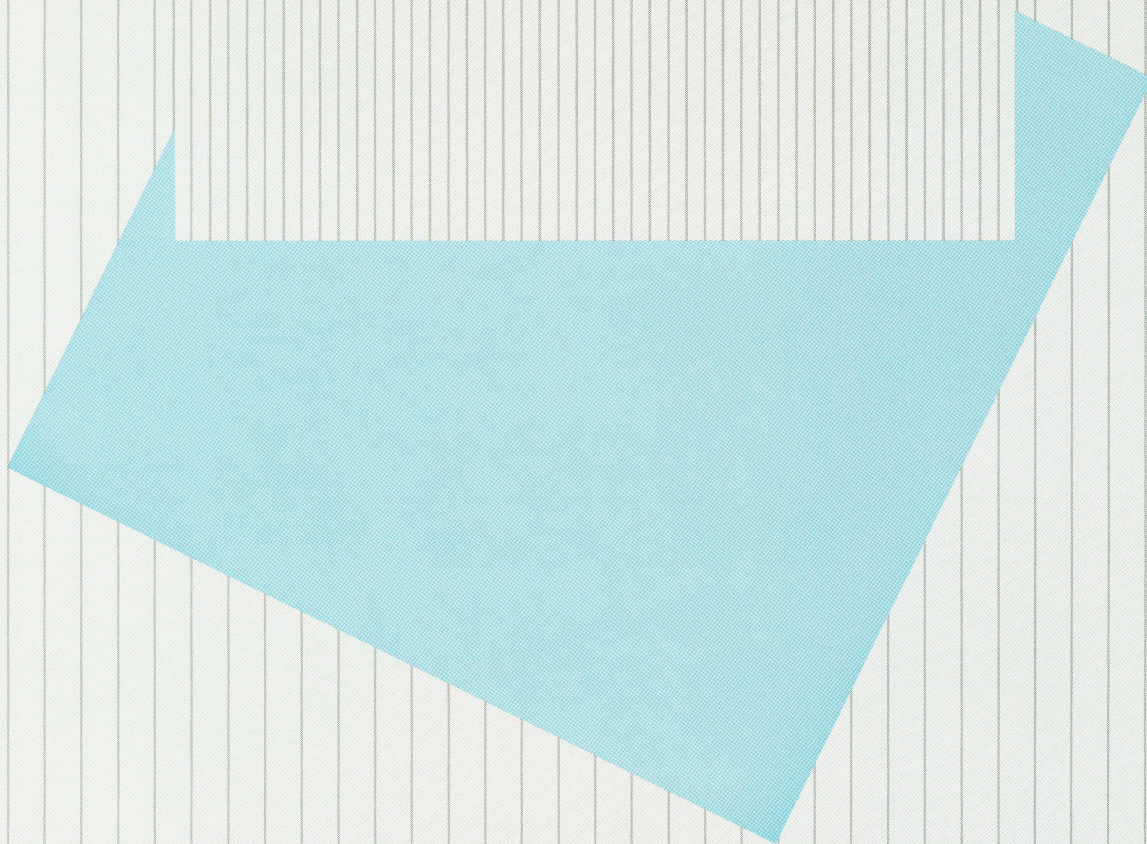
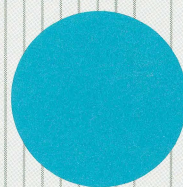
Built-in Test Procedures.

Built-in test procedures for your modem can only be run after you have hooked up your modem to your computer, see Part II of this manual.

Built-in test system

Care and Handling

-
- 19** The Working Environment
 - 20** Cleaning
 - 20** Transportation and Storage



Care and Handling

No regular maintenance is required.

The Apple Modem requires no regular care; it is designed to operate without maintenance. But this does not mean that you can misuse or neglect it without paying a penalty. Like any precision instrument, your modem will perform better if you treat it with kindness. This chapter contains suggestions for keeping your modem in tip-top shape.

Temperature and Humidity range.

The Working Environment

You can set up and operate your Apple Modem in any reasonably clean, indoor location. It will work reliably over a temperature range of 50 to 104 degrees Fahrenheit (10 to 40 degrees Celsius), while the relative humidity varies from 5 to 95 percent. You should not try to operate your modem in an environment that is outside of these ranges.

Your modem is sensitive to Electro Magnetic Radiation (EMR) and Radio Frequency Interference (RFI)—which is just another way of saying “keep your modem out of the way of equipment that generates magnetic fields or radio signals.”



Warning

Equipment such as televisions, radios, motors, etc., generate magnetic fields and as such, should be kept at a distance from your modem. Stray magnetic fields (EMR) and radio signals can cause your modem to lose, or scramble data. Your computer, and computer peripheral equipment, are shielded to minimize EMR and RFI, and can be positioned close to your modem without adversely affecting it.

Keep your modem away from steam and chemical fumes.

Your modem's plastic cover protects the modem adequately from dust and foreign objects, but it has little effect against liquids and vapors. Spilling any liquid inside your modem, or exposing it to chemical or solvent fumes, including steam from a coffee maker, can quickly ruin your modem beyond repair.

Cleaning

To clean the outside of your Apple Modem, just wipe it with a damp cloth. For fingerprints, add a drop of liquid soap to the cloth.



Warning

Never use household cleansers, ammonia, or solvents such as cleaning fluid on your Apple Modem—they may eat the plastic cover.

Do not try to get inside your modem.

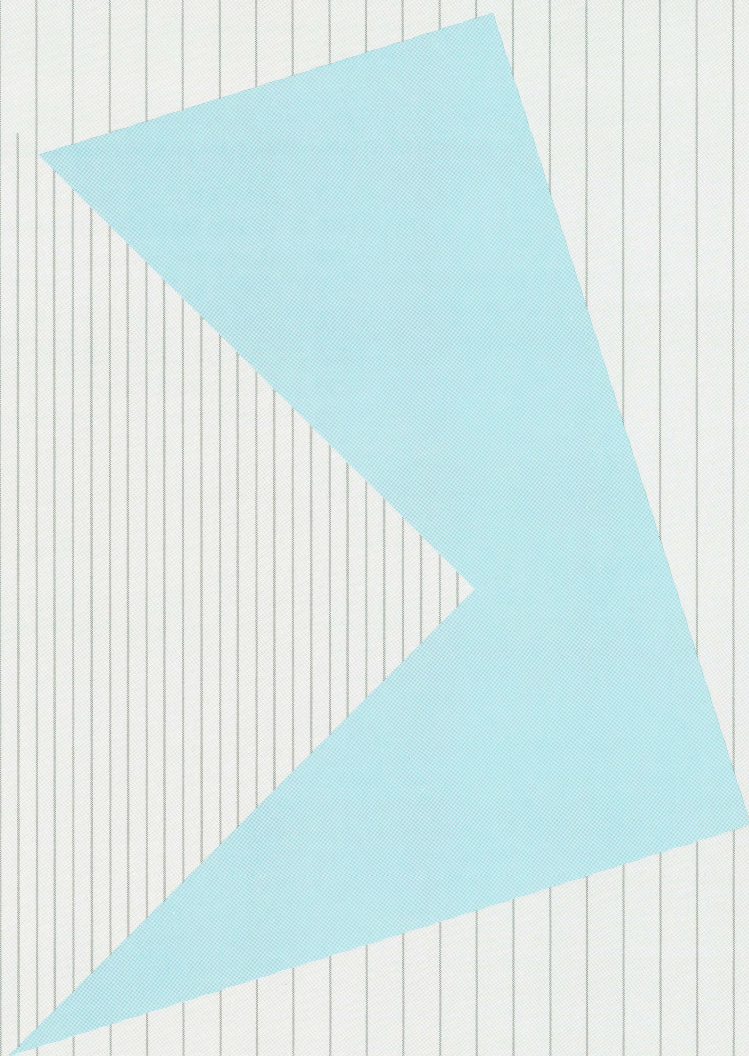
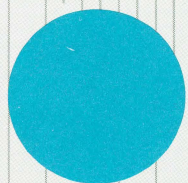
There are no parts inside your Apple Modem that require any upkeep. Do not try to remove the plastic cover.

Transportation and Storage

You would be wise to save the original shipping carton and packing materials. Then whenever you want to move your Apple Modem or put it in storage, you can repack it so it will be completely safe.

Controlling Your Modem

23	Modem Commands
24	Typing Modem Commands
25	Modem Command Default Values
29	General Commands
29	Dial Commands
30	Special Commands
31	Respond Codes
32	Command String Examples



Controlling Your Modem

This chapter gives you all of the commands for controlling your modem. They seem like a lot to learn, but don't let them cause you concern. If you use the terminal communications program prepared for your computer, or any other prepackaged modem program designed for your computer, you don't need to read this chapter through-and-through—simply skim over it to become acquainted with the commands and what they do.

For Experts Only: These command codes are for you to use when you create your own modem programs, or modify packaged modem programs—you will need to read through this chapter and understand it.

Commands: Special sequences of letters and numbers that tell your modem what to do.

Your Apple Modem does only what it is told to do. When you are running a terminal communications program, all of the instructions are sent to your modem through your Apple computer keyboard. These instructions are known as computer **commands** and they consist of short sequences of ordinary letters and numbers made up specifically for communication with your modem. This chapter explains all about them.

Every time you switch on its power, your modem automatically gets itself ready to receive instructions. At this point, if you have loaded a terminal communications program your modem sees everything you type on the keyboard as a command it must execute. This allows you to tell your modem what you want it to do, using **Modem Commands**. Modem Commands recognized by your modem are explained in the following sections.

Modem Commands.

A modem command consists of a set of characters that control your modem in one way or another. The modem commands used to control your Apple Modem come in three different flavors:

- General Commands—connect your modem to your computer and allow you to communicate with the modem through your keyboard.
- Dial Commands—control the modem when it is sending messages.
- Special Commands—allow you to escape, test your modem, or repeat the last command.

Note: To disconnect from Dial Mode type the escape sequence `+++.`

Modem commands are organized into a line of letters and numbers called a command string. The order in which the command string is written determines the order in which the modem obeys the command. The modem won't execute a command string until you press `(RETURN)`. You may type general commands in any order, but the letters `AT` must appear at the start of a command string.

Note: Modem commands are normally used only to switch between Data Modes, and to set control values that cannot be set in the communications program. See Part II of this manual for a discussion of the communications program for your computer. Always use your terminal communications program to set as many control values as you can.

Typing Modem Commands.

As we mentioned earlier, the modem enters Command Mode automatically when it is first turned on and a communications program is loaded. It will obey all letters typed at this time as modem commands—you can tell when your modem is in the Command Mode when you see the respond message `OK` or `NO CARRIER` displayed on your monitor screen.

The letters `AT` are used to start a new command string. Command letters and numbers should be typed together as if they were part of the same word. Command characters may be mixed in any order, provided the Answer, Dial and Reset commands are last in the command string.

The `(←)` key is used to move the cursor back and retype over an error. `(CONTROL)-(H)` is also used to space back over an incorrect character. `(RETURN)` is used to execute the command.



Warning

The `RT` command must be typed correctly—do not use backspace, or the command will be ignored.

Modem Command Default Values.

When you turn your modem on, it assumes certain command values, known as default values, so you don't have to type them. The modem always sets these values until you tell it to set something else. Modem commands allow you to reset these values to fit other conditions. See Table 4-1 for a listing of these values.

Note: The first character of each command in Table 4-1 is a letter, which may be entered either upper or lower case. The second character is a numeral. Do not mistake the numbers 1 and 0 for a lower case “L” or a capital “O”.

Table 4-1. Modem Default Commands

Command	Definition
Initial Start (Default Modem)	The modem is in the Command/Answer mode when it turns on. This means that it will respond to your commands from the keyboard; will answer a telephone call on the first ring; and will receive and display any message it receives from a remote system on your monitor screen.
E1	The modem will display command characters on the monitor screen.
F1	The modem is in full-duplex mode when it turns on. This means that it can send and receive messages at the same time.
M1	The modem speaker is turned on while a telephone call is being dialed and before the call is answered, but turns off when the call is answered.
P	The modem uses the pulse dialing method to dial a telephone number.
Q0	Respond strings are sent from the modem.

S0=1	The modem will answer a telephone call on the first ring.
S2=43	The modem will respond to ASCII character 43 (the plus sign) as the escape character.
S7=30	The modem will wait 30 seconds for a carrier when it tries to place a telephone call.
V1	The modem displays a respond string, such as OK, on the monitor.
X0	The modem sets a standard respond code.

General Commands

General commands are used to determine how the modem and computer communicate.

Table 4-2. General Commands

Command	Definition
E	<p>Monitor Echo Command. When the modem is in Command Mode and not connected to a telephone line, this command can display the characters you type on the keyboard, on your monitor screen.</p> <p>E0 turns off the command echo. E1 turns on the command echo.</p>
F	<p>Transmission Mode Command. This command selects between full-duplex and half-duplex transmission modes. It operates only in a <i>data mode</i>. In half-duplex, it automatically echoes characters you type on your keyboard onto your monitor screen, so you can see them. In full-duplex, it does not echo characters to your monitor screen—the remote computer echoes those characters, so you can see whether it has received characters correctly.</p> <p>F0 sets the transmission mode to half-duplex. F1 sets the transmission mode to full-duplex.</p>



Warning

If your monitor screen displays two identical characters for every character you type, then your computer may be in half-duplex mode and your modem may be in full-duplex mode. The characters you type are being transferred once to your monitor screen by your terminal communications program, and a second time by the modem. You should change the modem to half-duplex, or change the terminal program to full-duplex.

M

Monitor Speaker Command. This command controls the monitor speaker.

M0 turns the monitor speaker off.

M1 turns the monitor speaker on in Command Mode, and turns the speaker off when the modem switches to a Data Mode. The speaker turns off when the modem recognizes a return carrier tone from another modem. This is the default command.

M2 turns the monitor speaker on and leaves it on in both Command and Data Modes.

P

Pulse Dial Command. This command instructs the modem to use pulse dialing method to dial the numbers that follow.

Q

Quiet Command. This command either displays modem respond messages on your monitor screen, or suppresses them.

Q0 sends modem respond messages to your monitor screen.

Q1 stops modem respond messages from appearing on your monitor screen.

S0=n

Answer Register. This register sets the number of times a telephone must ring before your modem will answer a call. This register recognizes a number between 0 and 255. Setting this register equal to 0 tells the modem not to answer any telephone calls.

S0=1 Tells the modem to place the value 1 in the register S0. This register determines how many times a telephone can ring

before the modem will answer the call. The value 1 commands the modem to answer any calls it receives on the first ring. The command string looks like this:

```
ATS0=1 (RETURN)
```

S2=n

Escape Character Register. This register lets you choose any ASCII character to represent the escape sequence character.

When the modem detects a one-second data silence, followed by a string of three escape sequence characters, followed by another one-second data silence, it disconnects from the telephone line and changes mode to local Command Mode.

To send a new escape code character to the modem: select the new character, type the register number, type an equals = sign, and then type the hexadecimal ASCII equivalent to the character you selected. See Appendix B for the ASCII character set. The default character is a plus sign +. The register recognizes any ASCII number between 0 and 255.

Example: A plus + character equals ASCII 43. If you want to change the character to an asterisk *; then look up the ASCII-equivalent number for the asterisk * in Appendix B—the asterisk * equals ASCII 42. Then type S2=42, which will then allow you to use three asterisks *** to escape from a Data Mode.

S7=n

Telephone Carrier Register. This register controls the length of time (in seconds) that the modem will wait for a carrier (telephone connection) before hanging up. The modem will wait for the number of seconds equated to the value S7=. The default value for this register is 30. This register recognizes any value from 0 to 255.

T	Touch-ToneSM Dial Command. This command instructs the modem to use the Touch-ToneSM dialing method to dial the numbers that follow.
V	Respond Code Command. A Respond Code is the message your modem displays on your monitor screen, to prompt you to type commands or data, report whether the telephone line is connected or disconnected, or report an error. Each respond has a number, and a string attached to the code. V0 displays the respond number. V1 displays the respond string.

Dial Commands

All Dial Commands are preceded by `AT`, which causes the modem to interpret all characters appearing after the `AT` as a telephone number that it must dial.

Remember: If you use the Dial Command by itself you must precede it with `AT`.

Table 4-3. Dial Commands

Command	Definition
D	The Dial Command. This command signals the modem that the numbers, letters and commas following it are all part of a telephone number that it will dial. The modem dials a telephone number and enters the Originate Data Mode.
,	The Pause Command. Entering a comma in a Dial Command causes the modem to pause for two seconds before continuing to process the command characters that come after it. This command is useful whenever you need to dial 9 to get an outside phone number.

Note: Other non-numeric characters (parentheses, hyphens or letters other than those reserved as command characters) may be imbedded in the Dial Command, but will have no effect.
Example:
MCI: 555-0029,83741/INFO#(408)555-1212.

Special Commands

Table 4-4 lists Special Commands.

Table 4-4. Special Commands

Command	Definition
A	Answer Mode Command. The modem enters the Answer Mode without receiving a telephone call (a ringing signal) first. This is similar to picking up the telephone and listening to the dial tone. This command forces the modem to answer the telephone without waiting for any rings.
L	Self-test Command. This command tests the modem to determine if all connections and modem functions are operating properly. The modem receives text from the keyboard and sends it back to the monitor screen. Use the special escape code sequence +++ to exit the test.

Note: The following commands stand alone and do not use RT in front of them.

A/	Repeat Last Command. This command instructs the modem to repeat the last command line. Pressing (RETURN) is not required. The command can redial the last number dialed.
+++	The Escape Character Sequence. This sequence changes the modem from any Data Mode: Dial, Answer, or Self-test, and returns it to the Command Mode—this will hang up the telephone and disconnect the modem from the telephone line. Follow this brief sequence to escape from a Data Mode, and return to the Command Mode: Your modem should be in one of three Data Modes: Dial, Answer, or Self-test. <ol style="list-style-type: none">1. Pause one second.2. Type the escape character sequence +++.

3. Allow one more second to pass without sending or receiving data through the modem.
4. The modem will respond with a NO CARRIER message. Your modem is now in the Command Mode and can process a new command.
5. To change the escape sequence character from a plus + sign, select a new character and place its corresponding ASCII number equal to register S2 (Refer to Appendix B for ASCII values).

Respond Codes

The modem Respond Codes are listed in Table 4-5. You can select these codes to display six screen messages (numbered 0 through 5).

Numbers Display	String Display
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5	CONNECT 1200

Table 4-5. Respond Codes

Command	Definition
X	<p>Regular or Extended Result Code List.</p> <p>This command selects to display, on your monitor screen, either Respond Code messages 0 through 4, or messages 0 through 5.</p>

Note: The X command does not operate on the Apple 300 Modem.

- X0 The modem displays only Respond Codes 0 through 4. This is the default setting.
- X1 The modem displays all Respond Codes. At present, programs will only recognize CONNECT.

Z

Reset. This command causes the system to reset. The modem immediately goes to default values. The modem remains in Command Mode. Refer to the default values listed in Table 4-1 for specific default conditions. Do not place any modem command characters after the letter Z in a command line.

Command String Examples

Examine the following command string examples to assist you in creating your own command strings.

Table 4-6. String Examples

Command	Definition
ATL (RETURN)	Self-Test Command. This is the command that starts the modem self-test procedure, which checks that the modem is properly connected, turned on, and functional.
ATS0=2 (RETURN)	This command string sets the S0 register to answer a telephone call on the second ring.
ATD408-555-1212 (RETURN)	This command string issues the dial command, and dials a telephone number. The modem ignores the two hyphens typed in the telephone number. (This example would dial Directory Assistance for the 408 area code.)
ATQ1E1D408-555-1212 (RETURN)	This command string tells the modem to display all modem Respond Codes and display all modem command characters on your monitor screen (Default settings—refer to Table 4-1 in this Chapter), and then dials a telephone number.
ATS7=30S0=1V1M2D9,,T408-555-1212 (RETURN)	This command tells the carrier register S7 to wait 30 seconds for a carrier before hanging up. Then it tells the modem to answer the telephone on the first ring, display Respond Code messages on your monitor screen, and leave the monitor

speaker turned on during data transmission.

Note that Register Commands and General Commands may be mixed in any order between the AT characters and the D character that follows.

The command dials a telephone number as follows:

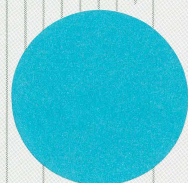
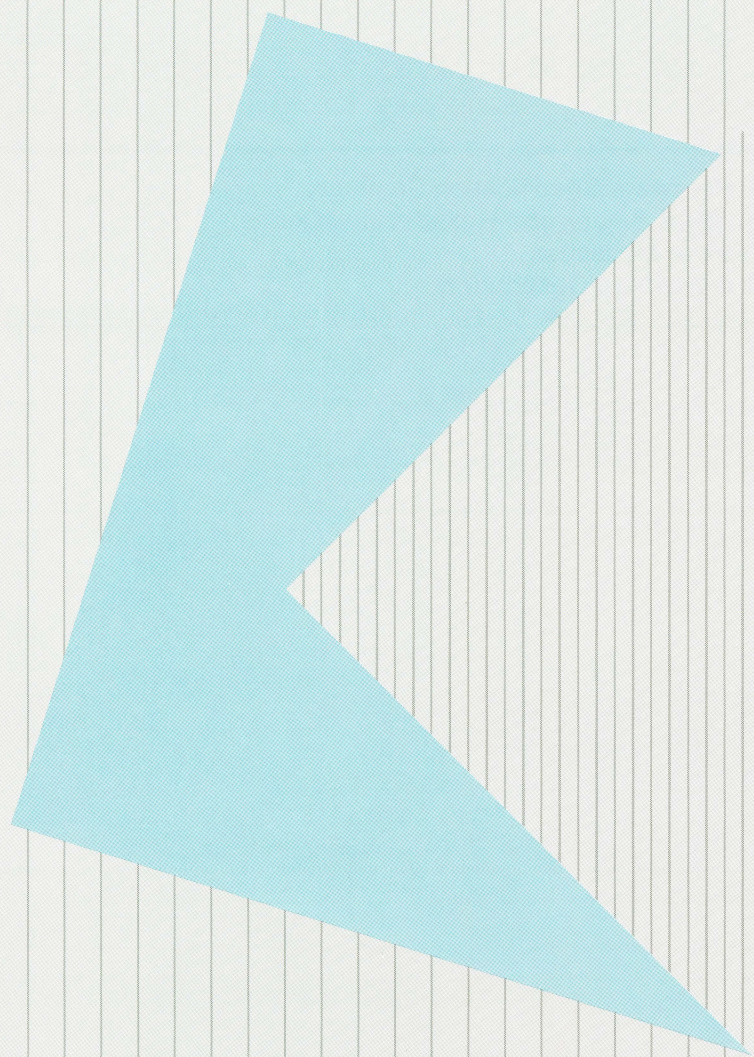
The letter D always marks the start of a telephone number. The modem uses pulse dialing to dial 9—the number often used by private telephone exchange systems like PBX or PCX to access the public telephone system (get the outside dial tone).

The modem switches to **Touch-ToneSM** dialing for the next ten digits.

Note: Two consecutive commas in a command string cause the modem to wait four seconds for an outside carrier.

Appendixes

-
- 37** A Hardware Specification Summary
 - 41** B ASCII, Binary, and Hexadecimal Codes
 - 45** C Error Messages
 - 47** D Serial Port Description



Hardware Specification Summary

Unless otherwise indicated, specifications apply to both the Apple Modem 300 and the Apple Modem 1200.

Table A-1. Hardware Specifications

Characteristic	Description
Data Format	<p>Serial, binary, asynchronous; odd, even or no parity.</p> <p>One start bit, 7 data bits, one parity bit, one or two stop bits.</p> <p>One start bit, 8 data bits, no parity bit, one or two stop bits.</p> <p>Custom Data Formats, up to 8 bits in length.</p>
Data Speed	<p>Apple Modem 300: 0 to 300 bits per second.</p> <p>Apple Modem 1200: 0 to 300 bits per second in low-speed mode; 1200 (+1.0%, -2.5%) bits per second in high-speed mode.</p>
Operating Modes	<p>The operating modes are as follows:</p> <p>Manual originate and answer.</p> <p>Automatic originate and answer.</p> <p>Automatic dial.</p>
Communication Mode	<p>Full-duplex or half-duplex on two-wire switched telephone channels.</p>

Modulation and Compatibility	<p>Apple Modem 300: Bell 103-series per Bell System Technical References 41104 and 41106.</p> <p>Apple Modem 1200: Bell 212A per Bell System Technical Reference 41214—less synchronous mode.</p>										
Receiver Dynamic Range	0 to -45 dB full-duplex.										
Bit Error Rate	Less than 1 in 1,000,000 bits on all lines meeting Bell tariff 3002 (standard voice grade) channel specifications, with no impulse noise or line interruptions.										
Transmitter Level	Fixed at -10 dB per FCC Part 68 permissive interconnect specifications.										
Self-Test and Loopbacks	Modem performs local analog loopback test on command.										
Telephone Line Interface	<p>Two-wire 750-ohm, balanced, telephone interface meeting FCC Part 68 rules. Two parallel RJ11C-type modular jacks on modem rear panel wired as follows:</p> <table> <tr> <th>Jack 1</th><th>Jack 2</th></tr> <tr> <td>2</td><td>5</td></tr> <tr> <td>3</td><td>4</td></tr> <tr> <td>4</td><td>3</td></tr> <tr> <td>5</td><td>2</td></tr> </table> <p>Pins 1 and 6 are open circuits.</p>	Jack 1	Jack 2	2	5	3	4	4	3	5	2
Jack 1	Jack 2										
2	5										
3	4										
4	3										
5	2										
Power Supply and Indicator	<p>Power is supplied to the modem from a 3-prong outlet-mounted transformer (power module) capable of 8 VAC rms and 500 mA maximum current. The power module is supplied with an integral 2-meter (6 feet) long cable terminated in a miniature three-pin phone jack, which is connected to the power connector on the modem's rear panel.</p>										

A green light-emitting diode, visible through the modem's front panel, indicates power-on when lighted continuously, and self-test mode when lighted intermittently.

Serial Data Interface Seven-conductor interface with DB-9 connector on modem rear panel. The connector is wired as follows:

Pin	Function	Abbrev.
1	Not connected	
2	Data set ready	DSR
3	Signal ground	SGND
4	Not Connected	
5	Receive data	RXD
6	Data Terminal Ready	DTR
7	Data Carrier Detect	DCD
8	Chassis ground	GND
9	Transmit Data	TXD

Physical Dimensions 13.65 x 23.18 x 3.18 centimeters
(5 3⁄8 x 9 1⁄8 x 1 1⁄4 inches).

Environmental Both modems meet specification requirements, when operated under the following conditions:

Operating:

Ambient temperature:10 to + 40 degrees Celsius (+ 50 to + 104 degrees Fahrenheit)

Relative humidity: 95% maximum with no condensation

Storage:

Ambient temperature: − 20 to +65 degrees Celsius (− 4 to + 149 degrees Fahrenheit)

Relative humidity: 95% maximum with no condensation

FCC Certification and Compliance Meets applicable portions of FCC Part 15 rules for class B for electromagnetic radiation. The modem is certified for use under FCC part 68 rules, on single-line telephone lines.

ASCII, Binary, and Hexadecimal Codes

There are 256 possible eight-bit binary numbers, from 00000000 to 11111111. Of these, the first 128 (from 00000000 to 01111111) have been assigned to characters and commands used in data processing and communication. Their standard assignment forms the ASCII character set. (ASCII stands for the American Standard Code for Information Interchange.)

The remaining 128, which differ from the first 128 only because their most significant binary digit (first digit) is 1 instead of 0, are not officially assigned. Nevertheless, they are often called high ASCII characters.

The following chart lists the 128 standard ASCII character assignments. For each character it gives the binary, decimal, and hexadecimal equivalents for both standard and high versions. Note that the first 27 codes are control characters set by pressing the CONTROL key simultaneously with the desired character key.

Control	Low ASCII				High ASCII			
	ASCII	Dec	Hex	76543210	Dec	Hex	76543210	
CONTROL-@	NUL	0	00	00000000	128	80	10000000	
CONTROL-A	SOH	1	01	00000001	129	81	10000001	
CONTROL-B	STX	2	02	00000010	130	82	10000010	
CONTROL-C	ETX	3	03	00000011	131	83	10000011	
CONTROL-D	EOT	4	04	00000100	132	84	10000100	
CONTROL-E	ENQ	5	05	00000101	133	85	10000101	
CONTROL-F	ACK	6	06	00000110	134	86	10000110	
CONTROL-G	BEL	7	07	00000111	135	87	10000111	
CONTROL-H	BS	8	08	00001000	136	88	10001000	
CONTROL-I	HT	9	09	00001001	137	89	10001001	
CONTROL-J	LF	10	0A	00001010	138	8A	10001010	
CONTROL-K	VT	11	0B	00001011	139	8B	10001011	
CONTROL-L	FF	12	0C	00001100	140	8C	10001100	
CONTROL-M	CR	13	0D	00001101	141	8D	10001101	
CONTROL-N	SO	14	0E	00001110	142	8E	10001110	
CONTROL-O	SI	15	0F	00001111	143	8F	10001111	
CONTROL-P	DLE	16	10	00010000	144	90	10010000	
CONTROL-Q	DC1	17	11	00010001	145	91	10010001	

Control	Low ASCII			High ASCII			
	ASCII	Dec	Hex	76543210	Dec	Hex	76543210
CONTROL-R	DC2	18	12	00010010	146	92	10010010
CONTROL-S	DC3	19	13	00010011	147	93	10010011
CONTROL-T	DC4	20	14	00010100	148	94	10010100
CONTROL-U	NAK	21	15	00010101	149	95	10010101
CONTROL-V	SYN	22	16	00010110	150	96	10010110
CONTROL-W	ETB	23	17	00010111	151	97	10010111
CONTROL-X	CAN	24	18	00011000	152	98	10011000
CONTROL-Y	EM	25	19	00011001	153	99	10011001
CONTROL-Z	SUB	26	1A	00011010	154	9A	10011010
	ESC	27	1B	00011011	155	9B	10011011
	FS	28	1C	00011100	156	9C	10011100
	GS	29	1D	00011101	157	9D	10011101
	RS	30	1E	00011110	158	9E	10011110
	US	31	1F	00011111	159	9F	10011111
	SP	32	20	00100000	160	A0	10100000
	!	33	21	00100001	161	A1	10100001
	"	34	22	00100010	162	A2	10100010
	#	35	23	00100011	163	A3	10100011
	\$	36	24	00100100	164	A4	10100100
	%	37	25	00100101	165	A5	10100101
	&	38	26	00100110	166	A6	10100110
	'	39	27	00100111	167	A7	10100111
	(	40	28	00101000	168	A8	10101000
	)	41	29	00101001	169	A9	10101001
	*	42	2A	00101010	170	AA	10101010
	+	43	2B	00101011	171	AB	10101011
	,	44	2C	00101100	172	AC	10101100
	-	45	2D	00101101	173	AD	10101101
	.	46	2E	00101110	174	AE	10101110
	/	47	2F	00101111	175	AF	10101111
	0	48	30	00110000	176	B0	10110000
	1	49	31	00110001	177	B1	10110001
	2	50	32	00110010	178	B2	10110010
	3	51	33	00110011	179	B3	10110011
	4	52	34	00110100	180	B4	10110100
	5	53	35	00110101	181	B5	10110101
	6	54	36	00110110	182	B6	10110110
	7	55	37	00110111	183	B7	10110111
	8	56	38	00111000	184	B8	10111000
	9	57	39	00111001	185	B9	10111001
	:	58	3A	00111010	186	BA	10111010
	;	59	3B	00111011	187	BB	10111011
	<	60	3C	00111100	188	BC	10111100
	=	61	3D	00111101	189	BD	10111101
	>	62	3E	00111110	190	BE	10111110
	?	63	3F	00111111	191	BF	10111111
	@	64	40	01000000	192	C0	11000000
	A	65	41	01000001	193	C1	11000001
	B	66	42	01000010	194	C2	11000010
	C	67	43	01000011	195	C3	11000011
	D	68	44	01000100	196	C4	11000100
	E	69	45	01000101	197	C5	11000101
	F	70	46	01000110	198	C6	11000110
	G	71	47	01000111	199	C7	11000111
	H	72	48	01001000	200	C8	11001000
	I	73	49	01001001	201	C9	11001001

Control	Low ASCII				High ASCII		
	ASCII	Dec	Hex	76543210	Dec	Hex	76543210
	J	74	4A	01001010	202	CA	11001010
	K	75	4B	01001011	203	CB	11001011
	L	76	4C	01001100	204	CC	11001100
	M	77	4D	01001101	205	CD	11001101
	N	78	4E	01001110	206	CE	11001110
	O	79	4F	01001111	207	CF	11001111
	P	80	50	01010000	208	D0	11010000
	Q	81	51	01010001	209	D1	11010001
	R	82	52	01010010	210	D2	11010010
	S	83	53	01010011	211	D3	11010011
	T	84	54	01010100	212	D4	11010100
	U	85	55	01010101	213	D5	11010101
	V	86	56	01010110	214	D6	11010110
	W	87	57	01010111	215	D7	11010111
	X	88	58	01011000	216	D8	11011000
	Y	89	59	01011001	217	D9	11011001
	Z	90	5A	01011010	218	DA	11011010
	[	91	5B	01011011	219	DB	11011011
	\	92	5C	01011100	220	DC	11011100
	]	93	5D	01011101	221	DD	11011101
	^	94	5E	01011110	222	DE	11011110
	_	95	5F	01011111	223	DF	11011111
		96	60	01100000	224	E0	11100000
	a	97	61	01100001	225	E1	11100001
	b	98	62	01100010	226	E2	11100010
	c	99	63	01100011	227	E3	11100011
	d	100	64	01100100	228	E4	11100100
	e	101	65	01100101	229	E5	11100101
	f	102	66	01100110	230	E6	11100110
	g	103	67	01100111	231	E7	11100111
	h	104	68	01101000	232	E8	11101000
	i	105	69	01101001	233	E9	11101001
	j	106	6A	01101010	234	EA	11101010
	k	107	6B	01101011	235	EB	11101011
	l	108	6C	01101100	236	EC	11101100
	m	109	6D	01101101	237	ED	11101101
	n	110	6E	01101110	238	EE	11101110
	o	111	6F	01101111	239	EF	11101111
	p	112	70	01110000	240	F0	11110000
	q	113	71	01110001	241	F1	11110001
	r	114	72	01110010	242	F2	11110010
	s	115	73	01110011	243	F3	11110011
	t	116	74	01110100	244	F4	11110100
	u	117	75	01110101	245	F5	11110101
	v	118	76	01110110	246	F6	11110110
	w	119	77	01110111	247	F7	11110111
	x	120	78	01111000	248	F8	11111000
	y	121	79	01111001	249	F9	11111001
	z	122	7A	01111010	250	FA	11111010
	{	123	7B	01111011	251	FB	11111011
	|	124	7C	01111100	252	FC	11111100
	~	125	7D	01111101	253	FD	11111101
		126	7E	01111110	254	FE	11111110
	DEL	127	7F	01111111	255	FF	11111111

Error Messages

Your monitor screen displays a single error message, `ERROR`, when any of the following conditions exist:

- The modem is unable to interpret a modem command.
- The modem receives a command string longer than sixty characters.
- The modem has received a valid command, but it contains commands that conflict with parameters already set by whatever terminal communications program you are using.

Note: The message `NO CARRIER` is not an error message. There is nothing wrong with your modem, it still works fine. It either couldn't detect a dial tone, or a remote system has hung up the telephone. The modem enters Command Mode after the `NO CARRIER` message is displayed on your monitor screen.

Serial Port Description

Your modem uses the RS-232-C Serial port protocol specification, to match input and output signals between it and the RS-232 port on your computer.

The RS-232-C specification defines the way that computers and modems send signals between them. By setting this standard, many different kinds of computers, modems and peripherals can send the same kinds of signals back and forth.

Note: The RS-232-C Specification specifies a 25-pin connector. Your modem uses a 9-pin connector. However, all of the electrical signals are the same as specified in the RS-232-C Standard.

Pin assignments and definitions for the RS-232-C Interface are given in Table D-1.

Figure D-1. Modem Data Cable

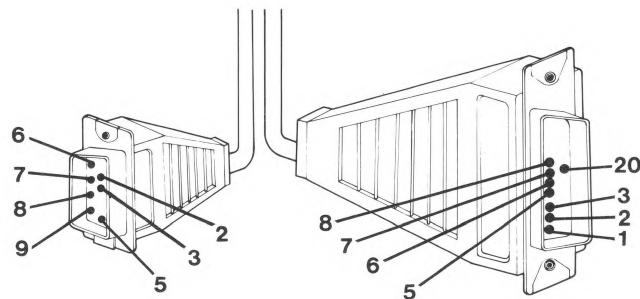


Table D-1. DB-9 to DB-25 Connector Pin Number Assignments.

Computer Pin Assignment (DB-25)	Modem Pin Assignment (DB-9)	Abbreviation	Definition	
-	1	Not Connected		
6	2	DSR	Data Set Ready. The modem generates this signal to indicate that it is turned on and can operate.	
7	3	SGND	Signal Ground	
3	5	RCD	Receive Data. Data is received from a remote computer through your modem over this connection.	
20	6	DTR	Data Terminal Ready. The computer sends this signal to the modem to indicate that it is ready. The computer turns off this signal to hang up the phone.	
8	7	DCD	Data Carrier Detect. The modem sends this signal to your computer when it detects a carrier on the telephone line. It turns off this signal when the carrier is no longer present.	
Pins jumpered				
5				CTS	Clear To Send This pin is jumpered to pin 8 on the DB-25 connector to provide a CTS signal whenever a DCD signal is present.
1	8	GND	Chassis Ground	
2	9	TXD	Transmit Data Data is transmitted to your modem from your computer over this connection.	

Glossary

address A location within a computer defined by a number to which a program can attach an item of data. An address can be part of computer RAM, ROM, or a peripheral.

amplitude modulation Impressing information on a carrier signal by changing its amplitude or strength.

answer/originate A method of assigning transmit and receive signals between two computers so that the transmit signals from one system will be received by the other and vice-versa.

argument Additional information following a command that is necessary to complete its function.

ASCII The American National Standard Code for Information Interchange character code. This standard 7-bit character code represents information in machine-readable form. It provides representations for 128 characters (See Appendix B).

asynchronous Having a variable time interval between characters. A mode of data transmission which provides framing information on a character-by-character basis.

baud The number of times per second that a signal carrier changes states.

binary A number system with two digits, 0 and 1, with each digit position moving from right to left representing a successive power of two. For example, 1 represents decimal 1, 10 represents decimal 2, 100 represents decimal 4, 1000 represents decimal 8, etc.

bit A Binary digit, either a 0 or a 1.

bits per second A measure of data transfer rate; the number of binary digits transferred per second.

BREAK A continuous spacing (ZERO) signal sent over a communication line to interrupt the sender.

buffer An area of the computer's memory reserved for a specific purpose, such as to hold text characters being read from some peripheral device. Often used as an intermediary "holding area" for transferring information between devices operating at different speeds, such as the computer's processor and a printer or disk drive. Information can be stored into the buffer by one device and then read out by the other at a different speed.

byte A sequenced order of eight bits that decodes to a non-binary number.

carriage return The ASCII character (decimal 13; Appendix B) that causes a printer or display screen to place the next character on the left margin of a character display field.

carrier signal An analog signal used to carry information through a transmission system.

code A method for representing information in one form using symbols of a different form. Data communication codes represent character information as sequences of binary digits or bits.

command data Data that causes a device to execute a controlled behavior.

command character The ASCII character reserved for use as a command rather than an information carrier.

data Datum: a fact or a piece of information which has been obtained by analysis or computation. Data: more than one datum. Note: analysis or computation does not mean that a computer must be involved.

default value A processing value that is assumed or set by a computer system, peripheral or program, in the absence of explicit instructions otherwise.

dial A device for signaling telephone numbers by producing pulses of current in the subscriber loop; to enter a telephone number with such a device.

dial tone A call progress signal returned by a telephone switching machine to indicate that it is ready to accept a telephone number.

dial pulses Current pulses produced in a telephone subscriber loop for the signalling of telephone numbers.

digital signal A signal that has two states: high or low.

DCE Data Communication Equipment; as defined by the RS-232-C standard, equipment which produces or uses information.

DTE Data Terminal Equipment. See DCE definition.

duplex A data transmission mode that allows data to transfer between both computer systems in a telecommunications system. Full-duplex echoes characters from the remote system. Half-duplex does not echo characters from the remote system.

echo To send an input character back to the originating device for display or verification.

escape character An ASCII character that allows you to perform special functions with the Apple Modem.

even parity Use of an extra bit set to 0 or 1 as necessary to make the total number of 1 bits in a character an even number. For example, the 7-bit ASCII code for the letter A (1000001) has two 1 bits; for even parity, the transmitting device appends an eighth bit equal to 0 so that the total number of 1 bits remains even (01000001). The receiving device can count the *one* bits as a way of checking for transmission errors.

FCC Federal Communications Commission; the federal agency responsible for administering telecommunications regulations in the United States.

FCC Registration A number indicating certification of a device Number for direct connection to the telephone network.

file A named collection of information stored on a disk. Each file has a unique file name by which the information may be retrieved.

format The form in which data is stored, manipulated, or transferred. Serial data transferred by the Apple Modem has a data format of one start bit, seven or eight data bits, a parity bit, and one or two stop bits.

full-duplex A setting causing characters which you enter on your computer to be echoed from a remote system.

half-duplex A setting causing characters which you enter on your computer not to be echoed from a remote system, but echoed on your screen.

Hertz The unit of frequency measurement. One Hertz equals one cycle per second.

hexadecimal The representation of numbers in terms of powers of sixteen, using the sixteen digits 0 to 9 and A to F. Hexadecimal numbers are easier for humans to read and understand than binary numbers and can be converted easily and directly to binary form. Each hexadecimal digit corresponds to a sequence of four binary digits, or bits.

jack A socket used for telephone line or other electrical connections.

linefeed An ASCII character (decimal 10; Appendix B) that causes a printer or monitor screen display to advance to the same column in the next line.

modem A device (MODulator-DEModulator) used to transform digital data signals into a form suitable for sending over a telephone line or other transmission facility.

modulator That portion of a modem which impresses information on a carrier signal by changing its amplitude, frequency, and/or phase.

odd parity Use of an extra bit set to 0 or 1 as necessary to make the total number of 1 bits in a character an odd number. For example, the 7-bit ASCII code for the letter A (1000001) has two 1 bits; for odd parity, the transmitting device appends an eighth bit equal to 1 so that the total number of 1 bits remains odd. The receiving device can count 1 bits as a way of checking for transmission errors.

originate/answer See answer/originate.

parity Maintenance of a sameness of level or count, usually the number of 1 bits in a character, for error checking.

parity bit A bit appended to the high-order end of a character code used for error checking.

parity error Absence of the correct parity bit in a received character.

peripheral Located at or outside the physical boundaries of the computer.

port A place of entry to or exit from a central processor, dedicated to a single data channel.

prompt A message provided by an operating system calling for an operator action.

protocol A set of conventions governing the format of messages to be exchanged between one computer and another communicating with it. For example, central processors which need to communicate may operate at different speeds, on different word lengths, with different access controls, etc. Protocols have been established so that each can recognize and act on signals being transmitted between them.

pulse An abrupt and relatively short change in voltage, either positive or negative, resulting in the conveyance of data in a circuit.

register A memory device capable of containing one or more bits which is used to facilitate data transfer between peripherals.

return The ASCII carriage return character. This character returns the cursor to the first column in row of characters.

ring To signal a telephone subscriber of an incoming call by placing a 20-Hertz alternating current on the line to energize a telephone ringer.

RS232C An interface standard issued by the Electronic Industries Association (EIA) for connections between Data Terminal Equipment and Data Communications Equipment.

self-test procedure A self-contained Apple Modem feature that executes by keyboard command, tests the modem, and displays the message `CONNECT`.

serial communications Communication along a single line with bits of information that follow one after another. Serial communications provides a means to convert parallel computer or terminal data to a serial bit stream at one end of the communications channel and then assemble the received serial bit stream into parallel data characters at the other end.

string A sequence of characters treated as a single item of information.

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