Radio Shack

MODEM 4P
OPERATION
MANUAL

CAT. NO. 26-1084

Modem 4P
Operation Manual

Important Note

Before connecting your Modem 4P to the phone lines, notify your local telephone company of the:

Manufacturer: Radio Shack
Model: Modem 4P
USOC Number: RJ11C
FCC Registration Number: AAO 88U-68616-DM-E
Ringer Equivalence Number (REN): 0.7B

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Contents

Introduction

Congratulations on your purchase of the Modem 4P. This modem has no switches or lights and is entirely controlled by Model 4P Computer keyboard entries. A card edge connector at one end of the card connects the modem to the computer's power circuitry. The other end of the card has two telephone connectors which let you attach a telephone in parallel with existing telephone circuitry. Also, at the back of the card is an RS-232C cable, which connects to the RS-232C output of your computer. The Modem 4P is fully controlled by the RS-232C port and serial data is passed from the computer to the modem.

Commands are used to program the Modem 4P via the keyboard. You can program the Modem for Manual/Originate or Manual/Answer modes which means that if you are contacting a remote computer in Manual/Originate mode, you will manually dial the telephone number, and when you are in Manual/Answer mode, you will manually answer an incoming call. Or, you can program the Modem for Auto/Originate or Auto/Answer which means that when in Auto/Originate mode, the Modem will automatically dial the telephone number of a remote computer, and when in Auto/Answer mode, the Modem will automatically answer an incoming call.

In addition, the Modem 4P has these features:

- Easy installation
- Fully programmable from the keyboard
- Auto Dial and Auto Answer capability

This manual will:

- Give a description of the Modem 4P
- Show you how to program the Modem 4P

1/Description of the Modem 4P

① **Power Supply Connector.** Connects with the Power Supply channel located inside of the Model 4P.

② **RS-232C Cable.** Connect this cable to the Model 4P's adjacent RS-232C Output Channel.

③ **Modular-to-Telephone Outlet Jack.** Connect one end of a modular-type cable to this Jack. Connect the other end of the modular-type cable to the connector labeled, TO WALL. Connect the other end to a modular telephone outlet.

④ **Modem-to-Telephone Jack.** Connect the modular cable from the telephone to the Jack labeled, TO PHONE.

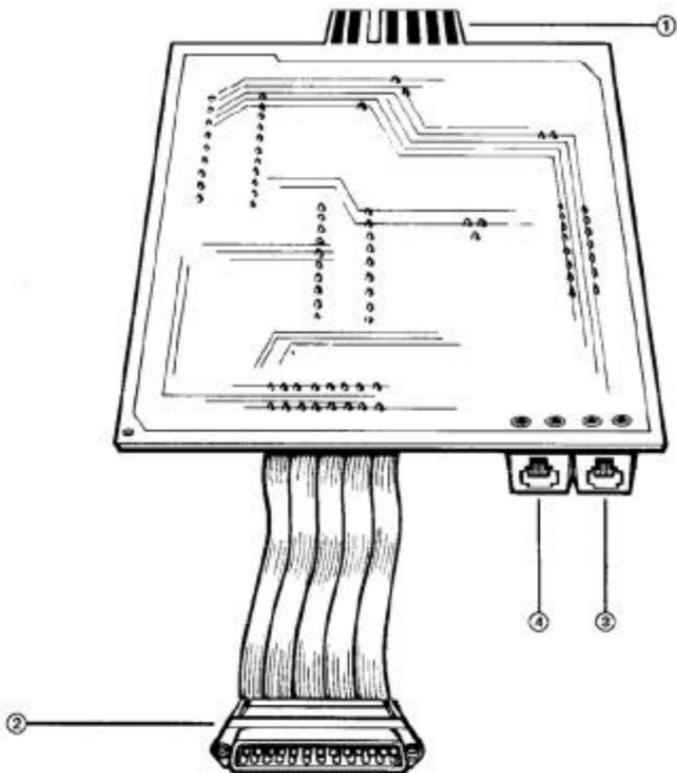**Note:** The TO WALL and TO PHONE Jacks are interchangeable.

Figure 1. Modem 4P

2/Setting Up the Modem 4P
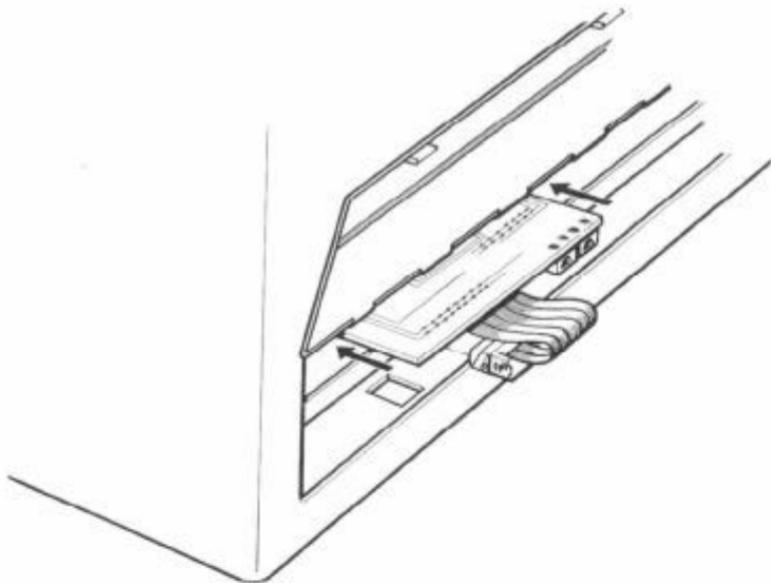
Figure 2. Installing the Modem 4P

1. Turn off all power to your Model 4P.

2. Open the panel on the back of the computer. Remove the metal plaque over the RS-232C connector using a ¼-inch socket nut driver.

3. Insert the Modem 4P (components side down) into the card slot.

4. Connect the RS-232C cable to the Model 4P's RS-232 output channel.

Connecting the Telephone to the Modem 4P

The way you connect your Modem 4P depends on how your telephone is connected to the wall. The following figures illustrate these connections.

If your telephone has the older style, four-prong connection, use an adapter (279-360) to connect it to your modem.

If your telephone is wired directly to the wall, contact your telephone company.
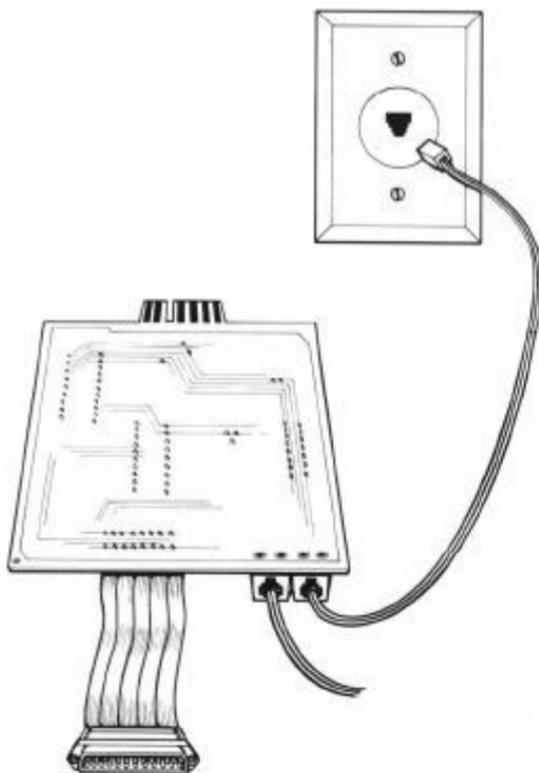
Figure 3. Modular Connector
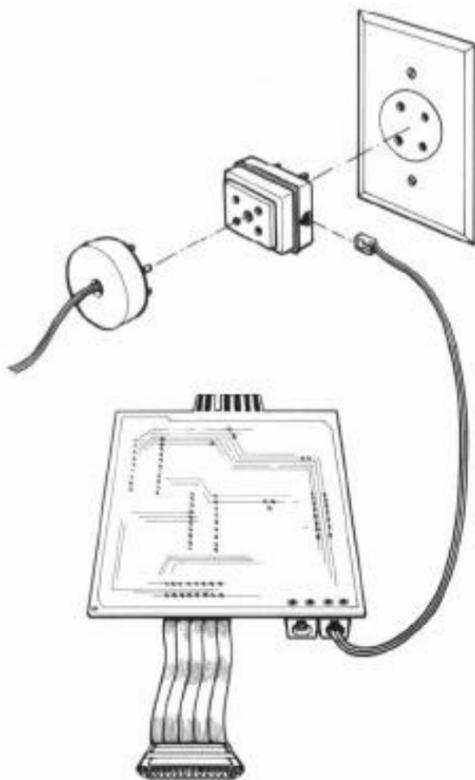
Figure 4. Wall Connector

Connecting the Modem 4P to Multi-Line Telephones

You can use your Modem 4P with a multi-line telephone. However, you may need a Multi-Line Adapter (such as Radio Shack Catalog Number 43-270/271), a hardware modification to the Modem 4P, or both.

If you use a Multi-Line Adapter only, the HOLD Button on an extension phone can interfere with communication. To avoid this problem, have a qualified Radio Shack Service Technician modify the Modem 4P.

For information about other Adapters which may be used, contact your Radio Shack store.

Notes:

3/Programming the Modem 4P

The Modem 4P accepts data from the Model 4P Computer, converts that data into tones and then sends the tones over telephone lines to another modem. It also accepts tones from telephone lines and changes those tones into data that your computer understands. You can program the Modem 4P to Auto Dial or Auto Answer and change other parameters simply by using the Programming Commands that let you communicate with the Modem.

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

- Both computers must have the same communications protocol:
  - x Baud Rate (0-300)
  - x Word Length
  - x Parity
  - x Number of Stop Bits

See your Computer owner's manual to find out how to set communication protocol.

- One Modem must be in the ORIGinate Mode and the other must be in the ANSwer Mode. Usually, if you call another computer, you should be in the ORIGinate Mode. If you receive a call, you should be in the ANSwer Mode.

When you use your Modem 4P in Automatic Mode, you don't have to dial any numbers or pick up your telephone receiver to answer a call—your Modem does all that for you. As long as you're going to be at your Computer throughout communications, you can control the Modem—and your telephone—through your Computer keyboard. This is another easy way to run certain communications programs such as Videotex.

You can also send or receive data from another computer while you're not at your Computer keyboard. Just write a BASIC or machine-language program and use the commands described in this manual (See Appendix B) to program your Modem to dial a number or answer the phone unattended. By programming your Modem to download daily receipts to another computer at 12:00 midnight, for example, you'll save time and be able to take advantage of lower telephone rates.

A Brief Overview of Modem 4P Commands

The Modem 4P is completely programmable using the following commands:

Modem 4P Programming Commands	
Command	**Function**
A	Switches modem to the Answer mode.
*	Opens modem for programming.
@	Stand by to receive a new Abort code.
C	Clears (resets) modem memory.
D	Clears current telephone number from memory. Must precede any new telephone number.
E	Toggle the Echo enable switch.
F	Fast Rotary or Tone dialing (20 pps.)
G	Toggle forced carrier detect switch.
L	Transmits (displays) current contents of modem memory to the computer (terminal).
M	Toggles the Manual/Automatic switch.
O	Switches the modem to the Originate mode.
P	Inserts a three-second pause in dialing sequence.
Q	Puts modem into LOCal Test Mode.
R	Rotary dialing (default value).
S	Slow Rotary or Tone dialing (10 pps.) (default value).
T	Tone dialing (10 digits per second).
X	Executes current program (dials phone number in memory, goes into Self-Test mode, waits for telephone to ring while in Answer mode).
(BKSP)	Erase the last code entered when programming dialing information.
(,), or -	Insert a user space when programming dialing information.

Table 1

Changing Communications Parameters

After you power-up the Model 4P with the Modem 4P installed
and load the communications software, you can change the
default communications settings. You will be using some of the
commands listed in Table 1. For a more thorough explanation of
these commands, refer to Appendix B.

To see the current modem setting, use the List Command by
typing ⊛Ⓛ.

The screen shows:

```
MODE=M
TYPE=O
F CD=Y
TEST=N
NUMB=
RATE=S
EXIT=14
```

Upon power-up, the modem will be set in the Manual/Originate
mode, Forced Carrier Detect ON, no specified telephone number,
slow dialing speed, and communications exit ⒸⓉⓇⓁⓉ. Each
setting can be changed individually or by typing the settings in
one line.

The following illustrates the possible settings:

MODE = M

The MODE setting can be either Manual or Automatic. If you select the Manual setting, the modem will not Auto Dial or Auto Answer. To change from Manual to Automatic type ⓂⓁ. To toggle back to Manual mode, type ⓂⓁ. When you press Ⓛ, the current parameter settings are displayed.

TYPE = O

Using the TYPE setting, you can place the Modem in either Originate or Answer Mode. When you are calling another computer, you will need to place the Modem in the Originate setting. If the MODE option is A and the TYPE option is O, the Modem 4P will Auto Dial the number you have saved in its memory (See NUMB =).

When you will be receiving a call, you use the Answer option (A). If the MODE option is A and the TYPE option is A, the Modem will wait for the telephone to ring, then answer the call. If the MODE option is M and the TYPE option is A, the Modem will answer the phone as soon as you type X.

To change the TYPE setting to Originate, type ⓄⓁ. To change the TYPE setting to Answer, type ⒶⓁ.

F CD = Y

The F CD line determines whether or not the modem will supply the computer with an asserted Carrier Detect. Upon system initialization, the F CD line will show Y, meaning yes. If you are running software that does not permit serial communications unless Carrier Detect is ON, be cautious when using this command. If you indicate that Carrier Detect is OFF, you will have no way to turn it back on without turning the Model 4P Off, then On again.

Type ⓒⓁ to tell the Modem to supply the computer with an asserted Carrier Detect ONLY when the Modem is in communications over the telephone lines. F CD = N will display when the List command is used.

Type ⓖ to tell the modem to supply the computer with an asserted Carrier Detect, even though you are NOT in communications over the telephone lines.

TEST = N

This lets you turn the Self Test Mode ON or OFF. When the Self Test Mode is ON (TEST = Y), the modem will NOT connect with telephone lines but will let you test to see if typed characters are displayed on the screen after the execute command (X) is used.

To change the Self Test Mode, type ⓠⓁ.

NUMB =

If you are in Automatic/Originate mode, you can program the modem to automatically dial the telephone number. At power-up, NUMB = has no predesignated telephone number.

To enter a telephone number, first press Ⓓ, type the telephone number, and then press Ⓛ. The telephone number will display with the other current parameter settings.

In addition to the telephone number, you can also specify whether you are using a Tone telephone (T) or a Rotary telephone (R), and any pauses during dialing (P).

For example, the sequence **DT9P1234567** tells the modem that you are using a Tone telephone, to dial 9, pause 2 seconds, and then dial the number 1234567.

RATE = S

You can select either Fast or Slow dialing. The modem will auto dial a telephone number (If previously entered for NUMB =) using slow or fast speed Pulse or Tone signaling.

To change the dialing speed to Slow, type Ⓢ.

To change the dialing speed to Fast, type Ⓕ.

You can set all parameters in a single line. Note the following example:

MOGFDT9P-1-(817)-555-1212

This example illustrates a program that would place the Modem in Auto/Originate mode. Also, Forced Carrier Detect is Off. The Modem is to Dial the following number using Tone at Fast Speed, then Dial 9, pause for three seconds, and then dial the rest of the number.

To reiterate, to execute the commands you programmed. press Ⓧ.

4/Troubleshooting and Maintenance

If you have trouble transmitting data (garbled data, intermittent errors, etc.) be sure that:

■ The phone connection is clean and noise-free.

■ No one is talking on the telephone line.

■ The phone and all extensions are on-the-hook.

■ The baud rate of the terminals is equal to 300.

If you still can't locate the source of your problem, run the LOCal test.

Error Messages

? Your Modem has received a character which isn't in proper order or which it doesn't understand.

Notes:

5/Specifications

Receive Frequencies

A. Answer
Mark 1270 Hz
Space 1070 Hz

B. Originate
Mark 2225 Hz
Space 2025 Hz

Transmit Frequencies

A. Answer
Mark 2225 Hz
Space 2025 Hz

B. Originate
Mark 1270 Hz
Space 1070 Hz

Transmit Level

-13 dBm $+/-1$ dB

Receive Sensitivity

-40 dBm

Baud Rate

0-300

Operating Temperature

55°F-85°F
(13°C-29°C)

Electrical Requirements

$+5$ VDC @ ma
-12 VDC @ ma
$+12$ VDC @ ma

Notes:

Appendix A/How Quickly Does Your Modem Dial?

You have the flexibility of controlling the dialing speed when using the Auto Dial feature of the Modem 4P. There are two types of dialing — Pulse (Rotary) and Tone. Each type can be specified as either Fast or Slow. The dialing speeds are applicable only when you are using the Modem 4P in the Automatic/Originate Mode. The information following shows the speeds at which you can control dialing:

S
Slow

In Slow speed, the Modem will Pulse dial at 10 pulses per second and will Tone dial at 5 characters per second. Either Pulse or Tone dial is significantly faster than you could dial a telephone manually. The Slow dialing speeds are shown in Table 2.

Dialing Using Slow Speed		
Pulse:	Break Time	63.0 mSEC
	Make Time	37.0 mSEC
	Intra Digit Time	700.0 mSEC
Tone:	Tone On Time	100.0 mSEC
	Tone Off Time	100.0 mSEC

Table 2

F
Fast

In Fast speed, the modem will Pulse dial at 20 pulses per second and will Tone dial at 10 characters per second. The following table illustrates the capacities of Fast dialing. The Fast dialing speeds are shown in Table 3.

Dialing Using Fast Speed		
Pulse:	Break Time Make Time Intra Digit Time	31.5 mSEC 18.5 mSEC 390.0 mSEC
Tone:	Tone On Time Tone Off Time	50.0 mSEC 50.9 mSEC

Table 3

Appendix B/Modem 4P Programming Commands

The following is a list of commands that you will be using to program or communicate with the Modem 4P via keyboard:

*

Opens the Modem 4P for Programming

This command forces the modem from an Off-Line status into the Command Receptive state which prepares the modem to accept commands from the computer. The * can be used in several places in the modem protocol. At initial power-up, you will need to precede any command with an *.

If used while the modem is waiting for a telephone call (waiting for the phone to ring), the * terminates the Answer mode and will not be echoed, but the TYPE option will be toggled to Manual. This ensures that the Modem is not accidentally told to go back to the WAIT FOR CALL mode.

If the * command is used while the Modem is dialing in Auto/Originate Mode, the * will not be echoed but the Modem will stop dialing and return to the Off-Line mode. To return the Modem to the command receptive state, you will need to type another * (which will be echoed).

The * command can be used at any time while in the command receptive state, it will be echoed to the computer, but no action will occur.

@
Abort On-Line Condition Character Programmer

This command lets you change the Abort On-Line code. Upon initialization, the EXIT code will be 14 HEX (CTRL T) You can change the code to any seven bit code. This command can be used to program the Modem to respond to an Abort command other than (CTRL)(T). Any ASCII character may be substituted following the @. For example, to change the Abort code from (CTRL)(T) to (CTRL)(R) after doing a List command, you would type:

@(CTRL)(R)

The Modem will watch for transmitter activity for two seconds after the Abort code is sent. If there is no activity during that two second period, the computer will abort any On-Line activity in progress. If there is keyboard activity within that two second period, the Modem will ignore the Abort command.

The (CTRL)(R) would be listed as EXIT = 12 (in HEX). (When you enter the ASCII character, it will not be echoed on the screen. Only the @ will be echoed, provided the Echo switch is not disabled.)

C
Clear (reset) memory

The C command clears the Modem's memory and resets the Modem to its default values. There is no need to follow the C command with an execute command (X) because the memory is cleared immediately when the C is pressed.

D
Program the Following Telephone Number

The D command tells the modem to store the telephone dialing instruction within memory. The modem's memory can handle up to 25 digits of data at one time. Only those codes listed will be saved or used. The following codes are valid Dialing instructions:

0-9   Telephone number.

P   P inserts a three second pause in the dialing sequence. This command is especially useful when you're dialing from a business system that requires an outside access code. For longer pauses, use more than one P. There is no limit as to the number of pauses that can be inserted.

R or **T** Used to indicate Rotary type dialing (pulse signalling) or Tone type dialing, respectively.

( )   Insert to separate portion of telephone number such as a prefix.

(BKSP) Delete last character entered.

-, (.) Insert to separate portion of telephone number.

The T, P, R and digits 9-0 can be in any position following the D command. Unless indicated, the Modem will dial using Pulse signalling. Thorofore, if you want to dial with Tone, you must precede the telephone number with the T command.

You can mix signalling types in a number. For example, the sequence D234333PPT1-(214)-988-1234 says to dial the number 234333 using Pulse signalling, pause for 6 seconds, and then dial the number 2149881234 using Tone signalling. The dashes and parentheses are ignored by the modem when dialing but are available for your use to make the sequence easier to read.

The (BKSP) code is simply an editing feature. If you are typing a number and make an error, press (BKSP) to delete the last character typed. If you press (BKSP) immediately after selecting the D command, a ? mark will appear, indicating an error condition.

E
Echo On or OFF

You can determine whether or not characters display on the screen using the Echo (E) command. The default parameter is an Echo enable. To toggle the Echo Enable/Disable, press (E). When echo is disabled, the Modem will still receive commands but nothing will be displayed on your screen.

F
Fast Rotary or Tone dialing

If you do not specify how you want your Modem to dial the number, it will dial rotary-style at 10 pulses per second. This command changes the dialing speed to 20 pulses per second. Before using this command, contact your local telephone business office to check whether your telephone exchange can use 20 pps dialing.

Use this command to change the Tone dialing speed to 10 characters per second.

G
Toggle Forced Carrier Detect

The G command turns the Forced Carrier Detect ON and OFF. It is defaulted to turn ON. When ON, the Modem will present a false carrier command to the computer. If the G command is issued from a power-on condition, Carrier Detect will turn OFF. It will stay off unless a true carrier is asserted to the modem, due to On-Line status. To check the Carrier status, use the List command.

L
List options

This frequently used command displays the Modem's current parameter settings of Manual or Automatic, Answer or Originate,

Forced Carrier Detect On or Off, Self-Test On or Off, Telephone
Number, Dialing Speed, and Abort On-Line code. The L
command may also follow the entry of new parameters.

Q
Toggle the Self-Test ON or OFF

The Self-Test mode is useful to determine if the Modem is
operating correctly. Upon initialization, the Self-Test mode is Off.
When the Self-Test mode is turned on using the Q command, the
Modem will not go On-Line if an X command is sent. Instead, the
internal circuits will be adjusted to allow the Modem to "talk to
itself." Always use the List command to check the status of the
Self-Test mode.

S
Slow Rotary or Tone Dialing

Use this command to program the Modem to Rotary or Tone dial
at 10 pulses per second.

X
Execute current program

Send an X to immediately execute the program currently in the
Modem's memory. At this point, the internal switches are read
and the modem's response depends on your parameter
designations.

Appendix C/Technical Information

Monitor Mode

After the Modem establishes communications with a remote modem, it is considered to be in the Monitor Mode. While in the Monitor Mode, parameters are constantly scanned. If any one of these parameters fail, the modem will break communications and will go Off-Line immediately. The following parameters are monitored:

- **Carrier Detect**

  The carrier monitored is that which is sent over the telephone line and not the false carrier that may be generated by the modem card. If this carrier is removed for longer than 300 mSeconds (.3 seconds), Monitor Mode is exited. If the carrier interruption is less than 300 mSeconds, the loss of carrier is ignored.

- **Manual Abort Entry**

  If you send a CTRL T (14 HEX), or another character that was programmed with the @ key, and do not send any other character for two seconds, the Modem card will exit the Monitor Mode. The DTR is also scanned in this mode. If the DTR is Off, the Modem will terminate communications, just as if the carrier had failed.

- **Modem Transmits a Space**

  If you transmit a long space (a space which is 1.5 seconds or longer), the Modem will abort communications.

- **Modem Receives a Space**

  If the Modem card receives a space from the remote modem that is longer than three seconds, communications will be aborted.

Modem Handshaking

End of Dial Code

In the Auto/Originate Mode, after the Modem has completed signalling the phone line, the Modem will issue a special code through the RS-232 connection. An ACK (06 HEX) is sent just after the modem has finished dialing the telephone number. In applications where the Modem is used as a directory dialer, not as a communications interface, this code can flag special software. The software can then take the Modem On-Hook, so that you may communicate with the dialed number using a telephone.

Communications Established Code

If the Modem receives a valid carrier detect from the telephone lines, it will issue a code string to the computer. When the

computer receives a line feed, line feed, carriage return (0A 0A 0D HEX), the communications channel is ready. The three byte code sequences will operate at any time (in all modes of operation) the modem receives true carrier over the telephone lines.

Communications Failed Code

A code sequence is sent when the Modem fails to establish communications, or when it escapes the Monitor Mode to the Off-Line Mode. This sequence is:

NAK, line feed, carriage return (15 0A 0D HEX).

This sequence is valid in all operating modes.

Auto Originate with "No Number To Dial" Detect

If you have failed to program at least one valid character into the Dialer memory, the Modem will abort the On-Line mode two seconds after the X command is issued. If there is a character or space programmed into the dialer memory by accident, the Modem will assume that that is the number and procede to dial (if the character can be dialed). The Modem will then wait for 25.6 seconds before aborting the unsuccessful dial attempt.

Communications Examples

The following illustrates some of the methods you can use while in either the Manual or Automatic and/or the Originate or Answer modes.

1. With the Model 4P and the communications software initialized, to use the default parameter settings, type: ***X**. When the ***X** command is used, the Modem will look for the carrier detect. If a number has not been dialed, the Modem will hang up after not locating a true carrier.

   The Manual/Originate mode is useful when receiving computer files (such as programs) from a remote computer using communications software.

2. At power-up, to change parameters to Auto Dial so that the telephone number 1234567 will automatically be dialed, press Ⓛ for the List command. Then type the following:

   *MD1234567X

3. With the system fully initialized, to indicate Fast Tone dialing of the above telephone number, you would type:

   *MFDT1234567X

4. To change the Modem setting to Answer, after disconnect type:

   *AX

5. To change to Originate Mode, and dial the telephone number as indicated in #4 above, type:

(to turn off WAITING FOR RING)
*OX

6. After disconnect from #5, go the Manual Answer by typing:

*MAX

7. After disconnect from #6, go to Manual Originate by typing:

^OX

8. After disconnect from #7, go to Auto Answer by typing:

*MAX