TANDY®

Intelligent Modem
DC-2212

OPERATION MANUAL
CAT. NO. 26-1176

IMPORTANT NOTE!

Your DC-2212 Intelligent Modem is factory preset with the AUTO ANSWER switch in the OUT position. At power-up, this switch position provides the ''Auto-Dial Mode'' which is the proper setting for most software applications.

Under XENIX, however, this switch must be set to the IN position for proper operation. (The IN position provides ''true carrier detect.'')

Also note that on Xenix versions prior to 3.0, the unattended auto-dial feature is not supported.

LIMITED WARRANTY

The FCC Wants You to Know . . .

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

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

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, you should consult the dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems.*

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

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.

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Getting to Know Your Modem

Tandy's DC-2212 high speed, intelligent modem has all the features needed to enhance your data-communications applications — including a data output rate four times faster than that of the standard "dumb" modem.

This direct-connect, 212-A type modem is not only designed with standard automatic dial, answer, and disconnect features, but a wide range of system configuration enhancements as well. After dialing is completed, the DC-2212 modem monitors the call and reports its progress to your computer over the serial RS-232-C link. These functions, which are roughly equivalent to the functions of an operator making a call, include:

- Waiting while the phone rings until the dialed number answers

- Hanging up and redialing later if the number is busy, or if the call has not been answered after a specified length of time

- Hanging up the handset at the end of a completed call

Each call-progress signal — *ring-back, no tone, busy tone,* or *dial tone* — that the modem detects is printed out as a serial status message on your display. An auto-disconnect feature permits the modem to disconnect if a carrier signal is not maintained after a data call has been set up or upon command. This feature is useful in preventing the tie-up of expensive computer facilities due to wrong-number calls, failure of the distant party to disconnect from a time-sharing system, or line failures.

All functions of the DC-2212 modem are controlled by ASCII *(American National Standard Code for Information Interchange)* encoded commands that you program from your computer keyboard over the serial RS-232-C interface. For example, you can control the selection of pulse- or tone-dialing through the dialer programming mode command, or the number of times the phone is to ring before being answered by using the advanced programming enable command.

One of its advanced features is the ability to determine your computer's communications parameters — *baud rate, data bits per word, parity,* and *stop bits per word* — and adjust its own operation to meet system requirements, using a simple command code sequence.

Designed with a high degree of intelligence, the DC-2212 allows you to operate your computer virtually unattended when linked to a telephone — making possible a wide range of telecommunications applications. Used with the proper applications software package, the modem is capable of performing operations such as electronic mail and shopping, central-data-base access, home banking and remote-peripheral sharing.

This manual, in the sections following, will describe how you can use the DC-2212 modem to call (originate) a host computer or information service, or receive (answer) a call from another computer, either manually or automatically. Additionally, you will learn how using the modem's advanced features can actually enhance your communications applications.

Setting Up the DC-2212 Modem

When you have made the peripheral connections as outlined on page 35, **Connecting the Modem**, you are ready to power-up and load your communications software.

When the power is freshly applied, several of the LED indicators on the modem's front panel will illuminate — and remain lit, depending on the status of the computer's protocol. These six indicators show the modem's internal and external operation status.

POWER SWITCH
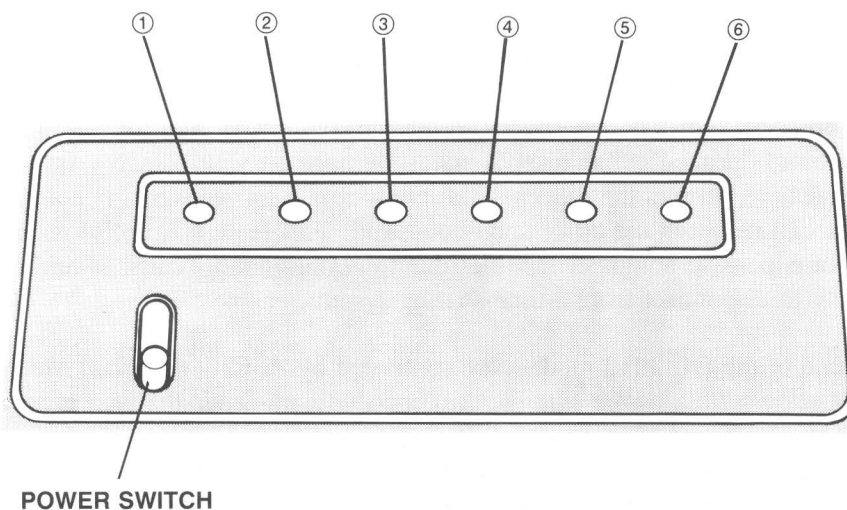
Figure 1. Front Control Panel

① **High Speed.**   Lights when the modem is in high speed (1200 baud) communications.

② **Off-Hook.**   Lights when your modem is on-line (connected to the phone lines).

③ **Terminal Ready.**   Lights when the terminal is supplying DTR.

④ **Carrier Detect.**   Lights when the modem receives a carrier tone or generates a false carrier.

⑤ **Transmit Data.**   Lights when the modem is transmitting data.

⑥ **Receive Data.**   Lights when the modem is receiving data.

Your DC-2212 modem permits a computer or terminal to communicate with a remote computer by converting that computer's electrical signals into audio tones that can be efficiently handled by the telephone system.

Likewise, the audio tones that the modem receives are converted back to electrical signals that are understood by the computer.

Setting Communications Parameters

The DC-2212 modem provides data communications in full- or half-duplex mode at either 0-300 bits-per-second (asynchronous) or 1200 bps (synchronous or asynchronous). Transmission speed is always selected by the originating modem.

Automatic originate mode operation is a default (preset) condition upon first power-up. When opened for programming with the auto-baud-rate-detect code (**Wake Up, DC-2212!**), the modem automatically synchronizes the baud rate, word length, parity, and stop-bit numbers of your computer system.

When programmed for **automatic answer mode** operation, the modem adapts the communications protocol of the remote computer system upon receipt of a telephone-line-ringing signal. This auto-answer feature makes it possible for data transmission to occur between a remote terminal interfaced to a modem and your computer — without intervention from the operator.

Refer to your computer owner's manual or applications software user's guide if you require instructions on setting communications parameters.

Sample Programming Applications

A Videotex Plus communications package for TRS-80 Model II, 12, and 16 microcomputers is used in the sample programming sessions following. With this package, you are able to communicate with a variety of information services and host computer systems. The examples are designed to familiarize you with some of the operations the modem is capable of performing.

A log-on session gets you started by showing how the modem is used to log on an information service. The remaining sessions demonstrate how you can program the modem to perform operations, such as dialing your calls and answering the phone automatically. Additionally, you will learn how the advanced programming options are used to enhance automatic operations.

Programming the modem . . .

All modem functions are controlled by ASCII encoded commands that you send from your computer keyboard. A two-key code sequence called the *wake-up* command is used to open the modem for programming. (See **Wake Up, DC-2212!** for an explanation of the importance of this command's function, page 13.)

When this two-key code sequence is issued, the DC-2212 automatically adapts the speed, word length, number bits, and parity of your computer. When answering calls, the modem adapts to the speed, word length, number bits, and parity of the calling modem.

1. Check again that all peripherals are correctly connected (**Connecting the Modem** page 35) and receiving power.

2. Flip the power switch on the modem's front panel to the ON position. *Carrier Detect (CD) indicator lights.*

3. Load and run the Videotex Plus communications program as described in your user's guide.

4. At TRSDOS Ready, type VIDTEX (ENTER). *Terminal Ready (TR) indicator lights.* The screen shows:

> VIDTEX 01.00.00
> Copyright 1983 Tandy Corp.
> All Rights Reserved

5. Set the baud rate, word size, parity, and stop bits that you want to use.

6. Open the DC-2212 modem for programming by typing the wake-up command sequence. Press ⟨*⟩⟨.⟩.

7. When the * echoes on your computer screen, enter the command that tells the modem to display or *list* its current parameters. Press ⟨L⟩ to send the **List Command**. These parameters appear on the screen as:

```
        PHONE NO:
  10 BITS/CHAR:Y
     ABORT CHAR:14H
  LOSS OF CARR:Y
     SEND SPACE:N
 RECEIVE SPACE:Y
  ABORT ENABLE:Y
    HIGH SPEED:Y
   ANALOG LOOP:N
      ORIG MODE:Y
   MANUAL MODE:N
  FORCE CARDET:Y
    PULSE DIAL:Y
     SLOW DIAL:Y
```

Since the modem is defaulted for automatic originate mode operation when cold-started, the list should show:

```
      ORIG:Y
    MANUAL:N
```

where Y and N indicates a *yes* or *no* response to the prompt.

If you are set up for 1200 baud communications, the list will show HIGH SPEED:Y. You can also see that the modem is currently programmed to dial any phone number entered using pulse signaling (PULSE DIAL:Y) at a slow dialing rate (SLOW DIAL:Y). (See page 23 for the List Command, under **Programming Commands**, for a complete discussion of the modem's parameters menu.

After the parameters are listed, the modem returns to the **command receptive state** (off-line status) where it waits for further instructions.

. . . log on CompuServe Information Service

CompuServe Information Service is widely known for its numerous on-line services for both business- and home-computer owners. Dedicated telephone numbers in major cities provide you access to CompuServe. Use your information service user's guide to find out how to contact and use the service.

Since the modem is already in the command receptive state — waiting for your command — all you have to do to begin the log-on is prepare it to dial the information service access number. For dialing instructions, refer to the **D Command** under **Programming Commands** for the valid dialing codes, page 27.

1. Press **D** to place the modem in the dialer programming mode.

    Example:

    If you enter 1(111)555-1234 as your local 1200 baud access number, the sequence appears as:

        D1(111)555-1234

2. When the phone number is properly formatted, press **X** to force the modem to seize the telephone lines and to begin dialing the number. *Off-Hook (OH) indicator lights.*

    The screen shows DIALING ، ، ،, then the number string that was dialed.

3. When the ringing stops, the modem sends the message:

        ON LINE ORIGINATE

    Other line conditions (BUSY, DEAD LINE, NO TONE) that can be detected by the modem are discussed in **Automatic Mode Operations**, page 17.

4. Press **CTRL C** (break character C˄ appears) and type the User ID number that you received with the software package when the screen prompts:

        User ID:

5. Next, type the password that you received with the software package when the prompt appears:

        Password:

    Your password is not printed on the screen to retain its secrecy.

At this point, your log on to CompuServe is complete and you may begin using the service. To use other information services and host systems, simply substitute the appropriate dialog as provided in the information service user's guide.

. . . answer or originate a call automatically

When communications is completed with the information service, the modem reverts into the disconnect mode. To program the modem to resume monitoring the telephone lines for incoming calls, enter:

⟨*⟩⟨.⟩	**Wake up.**
⟨A⟩	**Select answer mode.**
⟨X⟩	**Do it!!!**

TR indicator lights. The modem prompts the screen by sending the message AUTO ANSWER, and waits for the telephone to ring.

Later that day, you may decide to use the service again. Assuming that no other call has been made and the modem is still waiting for the phone to ring, you would program the modem to dial (originate) the number by entering:

⟨*⟩⟨.⟩	**Wake up.**
⟨0⟩	**Select originate mode.**
⟨X⟩	**Do it!!!**

OH Indicator lights. The modem seizes the phone lines and begins dialing the access number that you used earlier. Remember, any number entered in dialer memory will remain intact until a new number is entered or the modem is turned off. When the call is completed, the modem goes back off-line and communications ends with the DISCONNECT prompt.

Answering and originating calls automatically is discussed in more detail under **Automatic Mode Operations**, page 15.

. . . change advanced programming options

The DC-2212 modem is equipped to perform many operations that are equivalent to the functions of an operator making a call.

When the modem detects a busy signal after dialing a number, the message BUSY is printed on the screen. (DC-2212 enters the disconnect mode.) In a similar situation, a telephone operator might say: *"I'm sorry, that number is busy. Would you like to place the call again later?"* You would hang up the receiver, wait about 30 minutes, and try to make the call again.

With the modem programmed to redial a number found busy, the second attempt is made after a 60-second delay. When a busy signal is received, the cycle — disconnect, wait, redial, disconnect, wait, . . . — continues until the number of programmed attempts is completed, or you abort the process with the * command.

To change the defaulted dial attempts setting or any of the advanced parameter settings, follow these steps:

    (*)(.)   **Wake up.**

    (I)   **Bring the advanced programming options to the screen.**

1.   Press **(ENTER)**. The DIAL ATTEMPTS prompt appears on the screen.

        DIAL ATTEMPTS:1?

2.   Change the defaulted number to a value other than 1 by typing in that new number. Press **(ENTER)** (five times) until you have exited the menu.

3.   Press **(D)**, enter the phone number to be dialed, and press **(X)**.

Other automatic operations that you can control through the advanced programming command (**I** Command) are explained in **Programming Commands**, page 31.

Manual Mode Operation

When operating in manual mode, you control the system by manually dialing and answering the telephone. Manual mode (answer or originate) is useful when you want to talk by telephone to a friend on the other side of town, and later, exchange computer data without redialing.

Example:

The phone rings and you answer by picking up the receiver. After talking awhile to a friend, you decide to exchange information by computer (telecommunications) — without breaking voice call.

1.   Your friend selects to be the originate station, while you are the answer station. Set up your modem by entering:

    (*)(.)   **Wake up.**
    (M)   **Select manual mode.**
    (A)   **Select answer mode.**

2. Give your friend time to set up the originate modem by entering ⊙⊙Ⓜ. You may recall that automatic originate mode is a preset condition at initial power-up.

3. When you hear the originate modem's carrier tone (a high-pitched sound), press Ⓧ. Your modem seizes the line and lets you know that communications can take place by sending the message ON LINE ANSWER.

4. The answer station **always** issues the **X** command first. After hearing the answer modem's carrier tone, the originate station sends the **X** command to make the connection and the screen prompts ON LINE ORIGINATE.

Be sure to keep quiet when the handset is off-hook — noise picked up could cause errors in the data being passed by the modems.

After the data has been successfully transmitted, the modem sends the message DISCONNECT. Be careful when you hang up the telephone since slamming or dropping the phone back on the hook while the modems are controlling the lines could disrupt carrier long enough to start a loss-of-carrier disconnect sequence.

To return to voice communications after transmitting data:

1. Carefully pick up the receiver (both modems).

2. Type at the keyboard that you will be aborting carrier. For example, you might signal your friend by entering:

        THAT'S ALL THERE IS FOR NOW,I AM ABORTING CARRIER,

3. After making sure your handset is off-hook, enter the abort character sequence (see page 21, "Transmission of the Abort Character") to force the modem off line. For Model II, 12, and 16 users, this sequence is **CONTROL T**. Press ⒸⓄⓃⓉⓇⓄⓁ Ⓣ.

After 3 seconds of inactivity, your modem logs out with the disconnect prompt and your friend's modem (if automatic) shuts down, too.

TRS-XENIX Operation

Your DC-2212 modem is configured to operate with a TRS-XENIX Operating System (*Version 1.3.2.* or *later*). This section will be helpful in explaining how using the DC-2212 with TRS-XENIX differs from operations in other modes.

When you are ready to use the modem with TRS-XENIX, you should be familiar with the following functions: *enable logins*, *disable logins*, and *dial out*.

To access TRS-XENIX, you *must* log in as the super-user — or "root" — and tell the system which serial channel (A or B) you plan to use. For example, enable a channel by typing:

```
enable tty01 (ENTER)                Enable Channel A
                        or
enable tty02 (ENTER)                Enable Channel B
```

The serial channel that is used must be disabled before using the **cu** command for making a call (originate mode) or "dial out." To disable a channel (A or B), type:

```
disable tty01 (ENTER)      or      disable tty02 (ENTER)
```

To operate in automatic answer mode:

Set the AUTO-ANSWER switch, located on the modem's rear panel, to the position nearest the DB-25 jack and power up the DC-2212. From a power-on condition, the DC-2212 will power up into the call-waiting state and monitor the telephone line for an incoming call. When DTR is asserted *(this happens when logins are allowed using the enable command)*, the modem will pick up the call and assume auto-answer, 10-bit word, 1200 baud operation.

Note: This switch is only read (active) when power is freshly applied to a DC-2212 operating TRS-XENIX. Be sure you turn the modem's power OFF, then ON again, whenever you change the position of the switch.

Dial Out

Set the AUTO-ANSWER switch on the modem's rear panel to the position nearest the DB-25 jack, and power up the DC-2212. Program the modem to automatically dial a call by entering the **cu** command:

cu *phone number* -s 1200 (ENTER)

where ***phone number*** is the number you want dialed and the **-s** value is the baud rate selected. To dial the call out on Channel B, type:

cu *phone number* -s 1200 -a /dev/cua1 -l /dev/cul1 (ENTER)

When the prompt connected appears, you can begin communications. See your TRS-XENIX system's documentation for more information on using a modem with TRS-XENIX.

Note: cu will assume tone dialing. If your phone system requires pulse (rotary) dialing, insert "r" before entering the phone number.

Wake Up, DC-2212!

At the initial power-up — after breaking connection with the telephone lines — the modem enters an **off-line (or waiting) mode** and remains in this mode until you tell (command) it what to do next.

The **wake-up** command is the only command the DC-2212 modem responds to while in the off-line mode (from power-up). It is the **auto-baud-rate-detect code sequence** which forces the modem from the off-line status into the command receptive state. To send this command from your computer or terminal keyboard, press ⟨*⟩⟨.⟩. The screen echoes *.

You may have noticed that the * was not echoed until you pressed ⟨.⟩, the second key in the auto-baud-rate-detect code sequence. That's because both keys are needed to determine the baud rate, bit count, and parity (if any) you are using at your computer or terminal. When the correct baud rate is detected, this character * (2A, in hex code) is output.

Switching From High to Low Baud Operation

The DC-2212 modem automatically synchronizes with the standard 75, 110, 150, 300, 600, and 1200 baud rates.

Switching from a high speed (1200 baud) to a low speed (300 baud) operation occurs when you wake up the modem. If the wake-up code sequence detects a 1200 baud rate, the modem communicates in high speed. If it is awakened at 300 baud, low speed operation is used.

What happens if you wake up the modem in low speed mode, but want to call a high speed modem? If that modem has low-speed detection circuitry, it selects 300 baud operation. If it cannot shift baud rates, the originating modem must change its

operation. The *originating* station always **determines** the speed of operation when one DC-2212 modem calls another DC-2212 modem.

Entering Command Receptive State (CRS)

The modem is now in the command receptive state and is waiting for you to begin programming or setting the *internal* switches that tell it what operations are to be performed.

The wake-up command opens the DC-2212 for programming and precedes any command issued while the modem is in the command receptive state. The list of commands that the modem expects to receive are briefly described in Table 1. A detailed description of each command's function is provided later in this manual in the section **Programming Commands**.

DC-2212 Programming Commands

Command	Function
L, l	*List user options/switches*
A, a	*Answer mode operation*
O, o	*Originate mode operation (default)*
T, t	*Tone dialing global command*
R, r	*Rotary (pulse) dialing command (default)*
S, s	*Slow dialing speed (default)*
F, f	*Fast dialing speed*
Q, q	*Flag for selt-test*
D, d	*Dialer programming mode enable*
@	*Refresh abort character*
M, m	*Manual/automatic toggle command (automatic default)*
G, g	*Forced carrier detect toggle (default)*
E, e	*Echo disable/enable command*
I, i	*Advanced programming feature enable*
C, c	*Clear out all user options*
X, x	*Exit command receptive state and execute current switches*

Table 1. DC-2212 Programming Commands

These commands can be entered in upper- or lowercase characters. Seven-bit words and even or odd parity are possible. If parity is set up on your computer terminal before you send the wake-up command, the modem automatically corrects its parity parameters. Seven-bit words with two-stop bits are also operable.

Automatic Mode Operations

The DC-2212 modem can be programmed to make a call or answer your telephone automatically. In the automatic mode operation, you can call an information service without picking up the phone — just type in the phone number on your computer keyboard. You can also tell the modem to answer your telephone. When the answer command is received, an auto-answer feature enables the modem to enter the answer mode automatically when the phone-line-ringing is detected.

Automatic Answer Mode

To program your DC-2212 modem to automatically answer incoming calls:

1. Press ⦿⦿ to wake up the modem, then press Ⓐ to send the answer command. Remember, if this is a cold start-up, the modem will be defaulted to the automatic originate mode and you will need to press Ⓐ to select the answer mode. (To check that all the parameters are set correctly, press Ⓛ for the list command and look for the ORIG MODE and MANUAL MODE parameters.) The display shows:

    *A

    Then, press Ⓧ to force the modem to seize the phone lines.

2. The modem prompts AUTO ANSWER and waits for the telephone to ring.

3. When the phone rings, the modem begins counting the rings as you have programmed (**I** command, page 31). When the modem answers the line, the computer displays the message:

    ON LINE ANSWER

When carrier is asserted by your modem, the calling modem replies with its carrier. The modems are now in an on-line status and telecommunications can begin.

If the modem does not receive a valid tone from the other modem within 13 seconds, it aborts the call with the statement NO TONE (no carrier tone). The DC-2212 modem then reverts back into the auto-answer mode and outputs AUTO ANSWER to your computer.

When either modem breaks connection after a successful data exchange, the DC-2212 alerts you by sending the message DISCONNECT and returns to the auto-answer mode and monitors the lines. As long as the modem is in the auto-answer mode, it will continue to monitor the telephone lines for an incoming call.

Regardless of the number of calls received and the number of calls that transferred computer data to your system, the DC-2212 modem always returns to the call-waiting state. You can turn off this call-waiting mode by pressing (*) ((.) is not needed). When the modem sees the * (* will not be echoed), it will return to the command receptive state.

Note: The parameters are still not changed! If you want to return to the auto-answer mode, send the **X** command. If you want to make an outside call, press (**0**) (originate mode) to take the modem out of the answer mode.

Automatic Originate Mode

When you want to call another modem, but do not want to dial it yourself, you can program the modem to dial it in the auto-originate mode.

1. Press (*)(.) to wake up the modem. When cold-started, the modem defaults to automatic originate mode. Press (L) to check the modem's current parameters. These commands echo as:

    *L

    If your listing does not show MANUAL MODE:N and ORIG MODE:Y, press (**M**) (**0**).

2. Use the **D** command to program the dialer memory, — that is, tell the modem what number you want dialed. After typing in the phone number, press (**X**) to force the modem out of the command receptive state and to begin dialing the number. (See dialing instructions and codes under **Programming Commands**, page 27.)

3. When the **X** command is received, the DC-2212 outputs a carriage return and line feed. Then, it seizes the telephone line and outputs to the computer:

    DIALING . . .

    Each number dialed is flashed on your screen in the sequence and speed specified. The modem **must** detect a dial tone before it begins signaling the telephone line. See signaling rates, under **Programming Commands**, pages 25-26.

4. When the carrier tone is heard, the modem sends the message:

    ON LINE ORIGINATE

When the DC-2212 modem reaches the end of its programmed dialer memory, another carriage return/line feed is issued and the modem's line status circuitry checks the progress of the call made. Actually, the modem has used part of its line status capability when it first made sure there was a valid dial tone on the line before it started dialing.

See **Line Status Conditions** to find out the line conditions that can be detected by the modem.

Line Status Conditions

After a number has been successfully dialed, one of four status conditions results:

1. **Modem hears ring-back — ringing of phone called.** *Sweet success!*
2. **Modem hears nothing!** *Ooops!*
3. **Modem hears a busy signal.** *Darnit!*
4. **Modem hears a re-order signal.** *Oh, oh!*

Line Condition 1 — *Ring-Back*

When the modem hears the phone ring, the message RINGING . . . is displayed. Each ring cycle detected by the modem is counted until the ringing stops. The count stops when the telephone receiver is picked up or if the modem is programmed (**I** command, advanced programming feature) to abort a call that is not answered on a designated number of rings.

When the ringing stops, the modem assumes the call is complete and outputs the message ON LINE ORIGINATE (if you did not use the **A** command in the dialer program). As soon as the carrier tone is received from the called modem, you can begin communications. You are now in the on-line mode.

Line Condition 2 — *No Sound*

When nothing happens after a number is dialed, check the number that you stored in the dialer memory. Or, maybe the problem is within the telephone company. The modem will wait for about 50 seconds before aborting a call. Then the message DEAD LINE is displayed. The modem returns to an off-line status and enters the waiting state. Send the wake-up command to enter the command receptive state.

Line Condition 3 — *Busy Signal*

The message BUSY appears on your display when a busy signal is detected. The modem disconnects itself from the telephone lines and returns to the off-line waiting state until it receives the wake-up command.

If the **DIAL ATTEMPTS** parameter of the modem is programmed for a number other than 1 (the defaulted number), the busy redial sequence is activated. Therefore, after the first attempt, the modem will automatically wait for about 60 seconds, then it will seize the line, look for a dial tone, dial the number, and monitor the progress of the call.

What happens if the line is still busy on the second attempt? Well, DC-2212 hangs up and starts the process again. If the modem is programmed for two dial attempts and has tried twice, but failed to complete the call, everything stops here and the modem enters the off-line state. If programmed for more than two dial attempts, the modem waits for 60 seconds and tries again. The modem will keep trying until the attempts count is completed, or until the call is completed. When completed, the message ON LINE ORIGINATE is printed to the display.

Line Condition 4 — *Re-order Tone*

The re-order tone is a beeping tone the telephone company uses to tell you that something is wrong. Either your modem's numeric data was not valid, you dialed too fast, or, for some reason, the company can't process your call.

Since the DC-2212 cannot distinguish a re-order tone from a dial tone, it will wait the full time-out time before it stops looking for a carrier condition.

Dial Sequence Emergency Shutdown Command

When you discover that the modem is dialing an incorrect telephone number, or you don't want to wait for the time out to expire, you can turn off the dial sequence. Press

any key **after** the **X** command is issued and **before** ON LINE ORIGINATE is displayed on the screen. This will shut down the dialer and return the message DISCONNECT.

Busy Number Redial Interruption

While the modem is in the 60-second timer delay (before making another attempt to redial a number found busy), you can interrupt the process by using the (*)(.) wake-up sequence. The wake-up command forces the modem into the command receptive state and aborts the busy redial mode.

Aborting On-Line Modes

There are four conditions which will abort an on-line status while you are in communications over the telephone lines.

1. **Loss of carrier**
2. **Loss of Data Terminal Ready (DTR)**
3. **Reception of a Long Space**
4. **Transmission of the Abort Character**

Condition 1 — *Loss of Carrier*

The carrier is the sound you hear if you pick up the receiver while the DC-2212 is in communications with another modem. If you are operating at low speed (less than 1200 baud), the carrier sounds like a steady, pure tone. You will be able to hear a change in the pitch of the tone if you type on the keyboard. During high speed operations (1200 baud), the carrier sounds like running water, or static.

Regardless of the speed of operation, the tone (or noise) is the carrier signal. When the carrier signal is detected, the CD indicator lights on the front panel. If the carrier is interrupted longer than 300 milliseconds, the modem will begin the disconnect sequence. The message DISCONNECT is displayed on your screen and the modem goes into the off-line state.

A "loss of carrier" disconnect can result other than from being turned off by one of the modems. If you drop the receiver back onto the telephone cradle, or shout into the handset, the noise generated may be strong enough to MASK the carrier so that the DC-2212 thinks carrier is turned off. Although the low speed carrier is less susceptible to noise than the high speed carrier, there is always the possibility of data errors.

Condition 2 — *Loss of Data Terminal Ready (DTR)*

Data Terminal Ready is a protocol signal that the DC-2212 receives from your computer or terminal. It must be true (asserted) before any modem operation is allowed. If you get to this point (on-line mode), carrier has been asserted.

DTR is defaulted ON in the DC-2212. Therefore, if your computer does not have a DTR control wire, the modem will make sure this signal is set up. Of course, if your cable connection is incorrect and the DTR pin at the modem is shorted out, you will not be able to get the modem to *talk*.

On computers with DTR control, you can stop any function by forcing the signal to disassert.

Beware of the accidental DTR switch off! For example, if you decide to change a terminal feature (i.e., turn on a printer port) while you are communicating with a time sharing service, you could switch your terminal software around to its utilities menu and, suddenly, the DC-2212 could drop its telephone connection! Some terminal (and software) systems turn off DTR when the system is doing utilities work.

Condition 3 — *Reception of a Long Space*

The serial data going to the DC-2212 over the RS-232-C cable is normally in a marking state. When you press a key, a start bit is transmitted (the serial line goes spacing) for a time depending on the baud rate you are using. The bits which make up the word are then serially shipped to the modem, one-by-one. These bits are marking or spacing levels, depending on the type of bit (1 or 0). The last bit to be transmitted is the stop bit and it is always a marking level.

A long space is a start bit that takes anywhere from a half to one full second to end. It is not a character, although some systems consider it to be the null (0) word with a framing error (it lasted too long before the stop bit happened along.)

The long space is an old method that teletype machines used to say: *"Hey, you! Pay attention to me!!!"* Several long spaces can be strung together by multiple closures of a key (usually (BREAK)). This string of spaces can tell a modern day modem: *"I'm all done. Go ahead and turn off."* The long space method of disconnecting a modem from the lines is known as a long space disconnect sequence.

If DC-2212 receives a long space from the host computer which lasts 1.5 seconds or longer, it will go into the off-line mode and disconnect from the telephone lines.

Remember, you can turn this feature off with the **I** command parameters.

Condition 4 — *Transmission of the Abort Character*

The abort character disconnect feature enables you to disconnect an on-line DC-2212 without having to remember about long spaces or shouting into the telephone. The abort character can be used in the following manner:

> **If you transmit (*and type*) the abort character and do not transmit any other character for three seconds, the modem will disconnect from the telephone lines.**

The abort character can be turned off by typing any key within that three-second period. The **I** command parameters are set up to allow you to disable the abort character disconnect feature.

The abort character (when sent) uses long space disconnect signaling to tell the other end of the line that your modem is about to shut down. This long space signaling is only true if you have not disabled transmission of long space with the **I** command parameters.

Analog Self-Test Mode

If you exit the command receptive state and the DC-2212 goes into the self-test mode (the **Q** command is active) you are considered to be in an on-line mode. Of course, you are not connected to the telephone lines, but you can exit the mode using the abort character disconnect sequence or by dropping (disasserting) DTR.

Programming Commands

The operating parameters are controlled from your computer or terminal keyboard. You can program the modem for manual or automatic dial, or pulse or Touch-Tone dial signaling. Select the number of times you want the phone to ring before the modem answers the line, or change any of its parameters — just by entering a command from your keyboard. These commands can be entered using upper- or lowercase characters.

L,l   *List of user options/switches*

The **list** command gives the current status of the modem's *internal* switches. When this command is entered from your computer or data terminal, the screen displays a list of the modem's current parameters. Press ⒧ to send the list command. The screen echoes your command and displays:

PHONE NO:	**Dialable telephone number**
10 BITS/CHAR:Y	**(See *note below*)**
ABORT CHAR:14H	**HEX for Control T**
LOSS OF CARR:Y	**Abort on carrier loss?**
SEND SPACE:N	**Send space disconnect?**
RECEIVE SPACE:Y	**Abort on long space?**
ABORT ENABLE:Y	**Abort on abort char?**
HIGH SPEED:Y	**1200 baud mode?**
ANALOG LOOP:N	**Analog self-test?**
ORIG MODE:Y	**Originate mode?**
MANUAL MODE:Y	**Manual mode?**
FORCE CARDET:Y	**Force carrier to terminal?**
PULSE DIAL:Y	**Default to pulse dialing?**
SLOW DIAL:Y	**Default to slow dialing?**

Note: At 600 (and lower) baud rates, the list command displays the same parameters shown above, with the exception of 10 BITS/CHAR. The DC-2212 pays little attention to bit count during low speed operation. However, the bit count is important

during 1200 baud mode operation since the modem must process incoming and outgoing data.

The value of each parameter is indicated with a *yes* or *no response*, except for the abort character setting which is a hex value.

On initial power-up, the list will not show an entry for PHONE NO:. The 10 bits-per-word prompt is answered by the modem after receiving the wake-up command code sequence. If you are using 7-bit words with parity enabled, the 10 bits parameter responds with Y, or yes. If you use 7-bit words with no parity, the response is N, or no.

Of course, an 8-bit word with no parity is a 10-bit word (if you count the stop and start bits). If you have a computer (or terminal) which transmits 8-bit words and a parity bit (11 total bits) you will receive parity errors from the DC-2212 — that is, if it locks onto your wake-up sequence.

Each line of the parameter listing is terminated with a carriage return **and** a line feed. If your serial communications software automatically assumes another carriage return upon reception of a line feed code, the list will appear double-spaced.

O, o   *Originate mode operation*   *(default)*

The modem will always operate in originate mode when cold-started (initial power-up). Use originate mode when *you* want to call a time sharing network, like CompuServe. You can also use this mode to force the modem to automatically dial a telephone number for you (while in the automatic mode).

To check that the DC-2212 is in originate mode, enter the list command. The list shows ORIG MODE:Y : *"Yes, you are in the originate mode."*

A, a   *Answer mode operation*

The **A** command places the DC-2212 modem in the answer mode of operation. Unless you indicate otherwise with this command, the modem is defaulted to operate in originate mode.

Use the answer mode when you want to **receive** a call from a modem which is operating in the originate mode. The status of the manual/automatic switch determines whether the DC-2212 will wait for the telephone to ring (auto-answer mode) or seize the telephone line as soon as you exit the command receptive state with the **X (exit)** command.

To see how this command works, press (A) for the answer command, then press (L) to bring the parameters list to the screen. The reply line shows:

```
ORIG MODE:N
```

where N indicates that the answer mode has been selected and the modem is no longer in originate mode.

T, t   Tone dialing (global)

The **tone** command is only used when you have programmed the DC-2212 to automatically originate a call. When used here and not in the telephone number to be dialed, this command is a global instruction. If you program the modem to dial a telephone number, but do not specify the method for dialing, the modem examines this global area to determine what signaling type it should use.

You can examine the global signaling type by looking in the parameter listing at the reply line PULSE DIAL:N: *"No, do not pulse dial. Tone dial."*

R, r   Rotary (pulse) dialing   (default)

At initial power-up, the **rotary, or pulse,** signaling global command is automatically in effect, or defaulted. This means the modem will auto-originate a call for you using pulse signaling, unless you have specified otherwise while programming the dialer memory.

You can examine the global signaling type by looking at the listing line PULSE DIAL:Y: *"Yes, pulse dial."*

S, s   Slow dialing speed   (default)

When operating in automatic originate mode, you not only have the option to select the signaling type, but also the signaling speed.

Slow signaling speed is defaulted on a freshly powered-on modem. While in the slow speed mode, the modem pulse dials at 10 pulses per second and tone dials at 5 digits per second. Table 2 on page 26 gives the rates for slow speed dialing:

You can tell what speed rate the modem will dial by examining reply line SLOW DIAL:Y: *"Yes, slow dial."*

F, f   *Fast dialing speed*

If you want to tone or pulse dial using faster signaling rates, you can use the **fast** command. This command forces the modem to dial while in the automatic originate mode at 20 pulses per second for pulse-dialing or 10 characters per second for tone-signaling. Table 3 gives the rates for fast speed dialing:

Slow Speed Dialing Rates

PULSE SIGNALING		
Make Time	:	37 milliseconds
Break Time	:	63 milliseconds
Interdigital Time	:	853 milliseconds

TONE SIGNALING		
Tone on Time	:	100 milliseconds
Tone off Time	:	100 milliseconds

Table 2. Slow Speed Dialing Rates

Fast Speed Dialing Rates

PULSE SIGNALING		
Make Time	:	31.5 milliseconds
Break Time	:	18.5 milliseconds
Interdigital Time	:	427 milliseconds

TONE SIGNALING		
Tone on Time	:	50 milliseconds
Tone off Time	:	50 milliseconds

Table 3. Fast Speed Dialing Rates

Q, q   Flag for Self-Test

The **Q** command is one of several toggling commands that the DC-2212 modem uses. When power is first applied to the modem, the listing line ANALOG LOOP:N tells you that the modem is **not** selected to go into an analog self-test mode when it exits the command receptive state. When the line reads ANALOG LOOP:Y, then the modem is ready to enter the self-test mode upon exiting the command receptive state.

You can press ⓠ as many times as you like. Each time the key is pressed (toggled), the state of the modem's internal switch is changed from *no* to *yes* and *back again*. The self-test mode does not start until the command receptive state is exited.

The analog loop self-test mode forces the modem to *talk to itself*. 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.

Using this feature, you will be able to tell if the modem is functioning correctly. The analog loop self-test **does not** test, nor analyze, the condition of your telephone circuits, since this mode does not communicate over the lines.

D, d   Dialer programming mode enable

The **D** command tells the DC-2212 that you are about to send a string of characters which are to be stored in its dialer memory. To enter the dialer programming area, press ⓓ and use the format:

DnumberX

> where **number** is the telephone number you want to dial and **X** is the command that forces the modem out of command receptive state and to seize the phone lines and begin dialing the number.

Up to 40 characters can be entered in this dialer memory. These characters can be reviewed (use the **L** command) by looking at the first line of the modem's parameters list after PHONE NO:. Of course, this space will be blank if the modem was freshly powered on.

If you enter more than 40 characters in this memory or use an invalid character, the dialer programming mode is aborted and the modem returns to the command receptive state. Table 4 provides a list of the codes that are valid to the modem.

Valid Dialer Digits and Codes		
Character Code	**Description**	**Function**
0 - 9	Digits	Dialable digit
*, #	Digits	Dialable codes
(	Left paren	Space waster
)	Right paren	Space waster
-	Dash or Neg	Space waster
(SPACE)	Space bar	Space waster
T, t	Tone flag	Dial rest using tone
R, r	Pulse flag	Dial rest using pulse
P, p	Pause flag	Delay for 3.0 seconds
W, w	Wait delay	Wait here for dial tone
A, a	Answer wait	Wait here until answered
(BK SPC)	Back Space	Erase last key entered

Table 4. Valid Dialer Digits and Codes

1. To auto-dial the telephone number 123-0009 (Area Code 111), press ⊛ ⊙ to wake up the modem, press Ⓓ to place the modem in the dialer programming mode, then type the number:

   ```
   1(111)123-0009X
   ```

   Digits 1, 1, 1, 1, 1, 2, 3, 0, 0, 0, 9 are all valid dialing codes. X forces the modem to seize the telephone lines and begin dialing the phone number.

2. To auto-dial a number using Touch-Tone dialing at a fast speed, type:

   ```
   FDT1 2 3 0 0 0 9 X
   ```

   F selects the fast speed mode. T tells the modem that you will be using Touch-Tone dialing.

3. To auto-dial the same number on a dial 9 circuit, type:

   ```
   D9P123-0009X
   ```

   P tells the modem to wait three seconds after dialing 9 before dialing the remaining digits. Depending on your phone system, P can be replaced with W (see Table 4 above).

Valid Dialer Digits and Codes

0 - 9, *, #   *Dialable digits and symbols*

Special function symbols, # and *, are not defined in pulse signaling. If the modem comes across a special symbol during pulse signaling, the call is aborted and the modem returns to the command receptive state.

(,), -, (SPACE)   *Space wasters*

Used to format the phone number into a more readable sequence. Otherwise, they have no function in the dialer and are ignored by the modem.

T, R, P, W and A   *Non-dialable digits*

T (tone flag) or R (pulse flag) are used to override the global tone or pulse signaling commands. When one of these characters is in the number string, that type of signaling is used. Switching signaling types is useful when you are not using long distance services from your local phone company.

Using P (*dumb pause* flag) in the dialing string delays signaling for 3.0 seconds. Use P as many times as needed for longer delays.

W, in a dial string, tells the modem to "wait here until a dial tone is heard." Use W to dial an "outside line" code in a local exchange. Most local exchanges need time to get that outside line. W forces the modem to wait for a valid dial tone (from the outside line) before dialing the rest of the digits.

When A (answer wait flag) is in the dialer memory, the modem knows to "wait here until the telephone you have dialed stops ringing." A is most often used with long distance services where you have to dial a local number to get to the service, your ID number to tell the service who you are, and the long distance number you want to call.

(BK SPC)   *Non-dialable digit*

Erases the last key stroke entered in the dialer memory. If you press (BK SPC) and hold the key down (back spaces are auto-repeated), every digit that you entered while programming the dialer memory will be erased.

@   Refresh Abort Character

The @ command switches the modem into the abort character receive routine. With this command, you can change the **Control T** default abort character into any ASCII character you like.

The abort character is a software means by which the modem may be disconnected from the telephones. To program this symbol, press ⓐ. The next key the modem receives will be stored as the abort character. The type of abort character sent determines whether it is a displayable code. Therefore, the modem may or may not echo the selected abort character.

The abort character is shown in the listing in hex code since non-displayable codes are usually used. The **Control T** character is shown as ABORT CHAR:14H in the listing.

M, m   Manual/automatic toggle

The DC-2212 modem, when freshly powered on, defaults to automatic mode operation. To change to manual mode, toggle the manual/automatic flag by pressing Ⓜ for the **M** command. Then press Ⓛ to see the status of this flag. The list shows MANUAL MODE:Y: *"Yes, I'm in the Manual mode."* Press Ⓜ again and the list changes to MANUAL MODE:N: *"I'm in the automatic mode."* Pressing the key again changes the parameter setting to manual mode again.

G, g   Forced carrier detect toggle

This toggling command controls the carrier detect signal applied to the computer or the terminal. When freshly powered on, DC-2212 is commanded to force a carrier signal to your computer. If your computer does not need an asserted carrier to output RS-232 data (some do), you can turn the carrier off by toggling the carrier default.

You can see the action of the **G** command in two ways. First, watch the modem's front panel CD indicator go off and on each time you press Ⓖ. Next, check the parameter listing for reply line FORCE CARDET by using the **L** command to bring the list to the screen.

E, e   Echo disable/enable command

The **E** command toggle allows you to defeat or disable the modem's echo and list ability. Normally defaulted on, DC-2212 echoes displayable characters and generates a listing when the **L** command is received. After receiving the **E** command, the modem will not echo nor print out its status in response to the **L** command.

The **E** command is included to allow for systems that will display serial data as soon as it is transmitted (somewhat of a half duplex mode). Of course, since the **E** command is a toggling command, it can be used as many times as needed. Beware that the modem becomes *very* unfriendly when you send the **E** command.

I, i   *Advanced programming feature enable*

The **I** command takes you into a self-prompting menu where the modem's advanced options are programmed. To move through this menu, press (ENTER). If you want to change the defaulted value of a parameter, type in the new value. If not, press (ENTER) and the next option appears on the screen. The list of options you will find in this menu are:

```
AUTOANS RINGS:2?
DIAL ATTEMPTS:1?
    ABORT RING:8?
  LOSS OF CARR:Y?
    SEND SPACE:N?
RECEIVE SPACE:Y?
  ABORT ENABLE:Y?
```

Press (I) to bring the first prompt of this menu to the screen.

When power is initially applied to the modem, the values shown in this sub-menu are defaulted. The first prompt RETURN=NO CHG: tells you to press (ENTER) if you do not wish to change the defaulted value of a prompt and move to the next prompt. If you want to change the value, enter the new parameter value.

AUTOANS RINGS:2?

You have the option of changing the number of rings that the DC-2212 should count before answering a ringing telephone line. This parameter is only used while the modem is in the automatic answer mode and is monitoring the telephone line.

Any number from 1 to 9 (including 9) is a valid parameter for this prompt. If you enter a character out of this range, the modem questions it by printing ? and gives you a chance to re-enter your parameter.

DIAL ATTEMPTS:1?

The modem uses this prompt to find out: *"How many times do you want me to re-dial a telephone number if I get a busy signal?"* This parameter is only scanned if the

DC-2212 is operating in the automatic originate mode. You can use any number from 1 to 9 to respond.

ABORT RING:8?

Here you have the option to program how long the modem should wait for a phone to be answered that you dialed in automatic originate mode. DC-2212 monitors the number of times the dialed phone rings and after the defaulted 8 rings, it aborts the call. You can change this parameter to any number between 4 and 9 (any number less than 4 is defaulted to 4).

LOSS OF CARRIER:Y?

Once the modem is on-line with another computer, there are several conditions that cause the system to disconnect from the telephone line and go into the waiting mode. One of these conditions is the loss of carrier disconnect sequence. This parameter prompt gives you a chance to stay on the telephone line if carrier is disrupted.

If you do not press (ENTER) (leave alone), the prompt waits for a yes or no response. If the response is no, the modem remains connected to the telephone line even though carrier is lost.

SEND SPACE:N?

When you use the abort character to start an abort character disconnect sequence, your modem informs the other modem that you are about to exit. This is done with the use of a long space. If you answer this prompt by typing Y, the modem will allow a long space to be sent over the telephone lines after an abort character disconnect sequence was activated. Y, N, and (ENTER) are the only valid characters for this prompt.

RECEIVE SPACE:Y?

This is your end of the long space disconnect sequence prompt. By entering N, you are commanding the modem not to disconnect if it receives a long space from the *host* computer (the one you are talking to over the telephone lines).

ABORT ENABLE:Y?

This parameter allows you to turn off the DC-2212's ability to disconnect upon an abort character sequence. There may be times when there are no unused characters in a file that you can use as a software abort commands. So, instead of trying to invent some method of avoiding accidental disconnect, you can use this menu prompt to completely disable the function.

Note: As you can see, there are switches in the **I** command sub-menu which will completely disable your modem's ability to start a disconnect sequence. If for some reason you decide to turn off these disconnect options, there are only two ways you can force the DC-2212 to go back off-line. Turn off DTR or turn off the power switch.

C, c   *Clear out all user options*

The **C** command is the only command in the command receptive state which can bump you back to the waiting state, without first passing through an on-line condition.

This command clears all user options back to the modem's power-on defaults. It also clears out any telephone number you might have stored in dialer memory. You can use this command when you have changed several parameters and you don't want to go back and change them again, one-by-one. It also saves you from having to cycle the power switch off and on.

X, x   *Exit Command Receptive State. Execute current switches.*

The **X** command tells the modem that you have set up the DC-2212 the way you want it and now is the time to execute your instructions. The modem will do one of three things:

1. Enter a waiting state and monitor the telephone lines for an incoming call (auto-answer mode).

2. Seize the telephone lines and monitor for carrier (if in manual originate or manual answer mode) or the modem will start its signaling sequences (if in auto-originate).

3. Enter the analog loop (self-test) mode.

Connecting the Modem

Tandy's DC-2212 intelligent modem is Bell System 103/113- and 212A- compatible, connecting to the telephone lines via modular connector. The RS-232 input/output of the modem interfaces directly with the RS-232C-equipped TRS-80 computers.
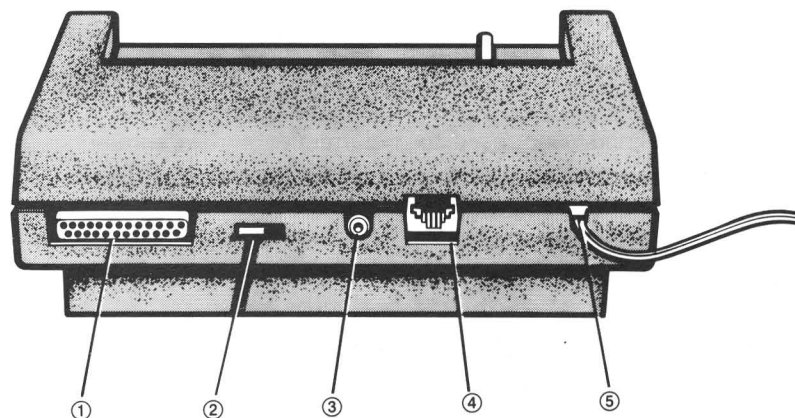

Figure 2. Rear Panel Connections

① **RS-232C Standard DB-25 Jack.** Connects the modem to the RS-232C interface of Radio Shack TRS-80 and Tandy computers.

② **AUTO-ANSWER Switch.** Allows the modem to power up in auto-answer mode when the switch is in the position nearest the DB-25 jack.

③ **POWER Jack.** Connects the modem to the AC power adapter.

④ **PHONE Jack.** Connects the modem to the telephone.

⑤ **Phone Line Cord.** Connects the modem to the telephone circuit.
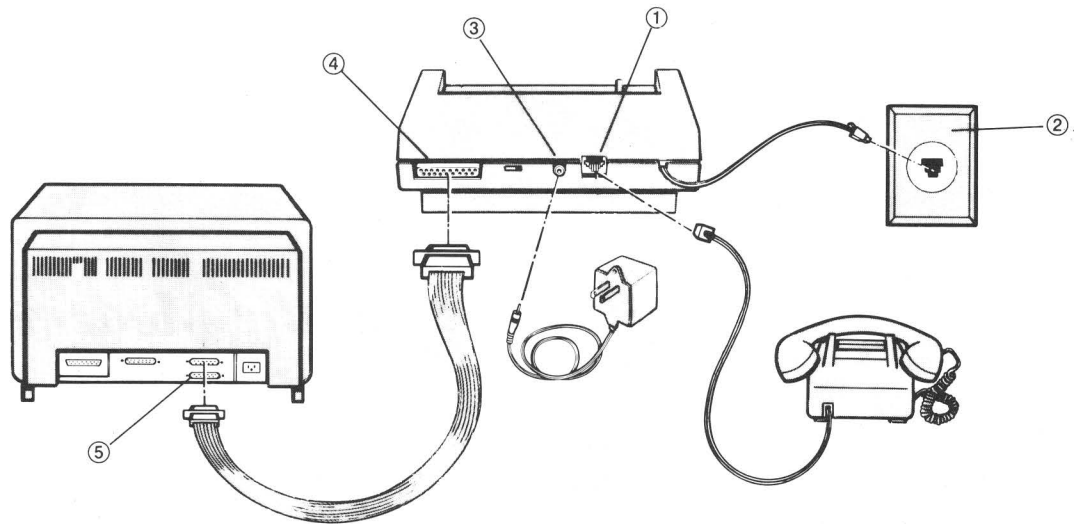
Figure 3. Connecting the Modem

Connecting to the Telephone

Although your telephone is not used for communicating (in automatic mode) when using the modem, the type of wall connection is important in determining how the DC-2212 modem is to be connected.

For a single-line connection:

1. Remove your telephone's plug from the modular wall jack and insert it in the PHONE jack ① on the rear of the modem.

2. Plug the modem's line cord ② into the modular wall jack.

   Note: For a four-prong wall connection, you will need an adapter (*Radio Shack Catalog Number 279-360*) suitable for the older style wall connector.

If your telephone is wired directly to the wall, contact the telephone company to have modular connections installed.

For a multi-line connection:

The DC-2212 modem can be used with a multi-line telephone, but you may need a multi-line adapter (*Catalog Number 43-270/271*), a hardware modification to the modem, or both.

Connecting to a Power Source

Insert the AC adapter's plug into the AC POWER jack ③ on the rear panel of the modem. Plug the adapter into an electrical wall outlet or an approved power strip.

Be sure to connect the adapter to the modem before you plug the adapter into the wall outlet. Otherwise, damage to the adapter could result.

Important Note: Use the supplied UL-listed adapter only. Another type of adapter could damage the modem.

Connecting to the Computer

The DC-2212 modem uses the RS-232-C standard serial interface cable to connect to your computer. Table 5 provides the cable and connection requirements for RS-232-C equipped TRS-80 computers. If you need more detailed information, refer to your computer's owner's manual.

Modem-to-Computer Cables and Connection Points

Computer	Cable Cat. No.	Location
Model I	26-1408	Leftside, Exp. Interface
Model II/16	26-4403	Rear panel
Model III/4	26-1408	Bottom panel
Model 4P	26-1408	Rear panel
Model 12/16B/16B HD	26-4403	Rear panel
Model 2000	26-1408	Rear panel
DT-1	26-1408	Bottom panel

Table 5. Modem-to-Computer Cables and Connection Points

Before connecting the DC-2212 modem to your computer, be sure to turn off power to the modem and to the computer.

1. Plug the appropriate end of the RS-232-C standard DB-25 interface cable into the RS-232-C jack ④ on the rear of the modem.

2. Plug the other end of the cable into the computer's RS-232-C jack ⑤.

Optional Modem Configurations

The DC-2212 modem has four internal configuration options. These options must be performed by a qualified Radio Shack service technician.

- **Multi-line phone operation**
- **RS-232 protocol extension**
- **Synchronous mode operation**

Option 1. Multi-line Phone Operation

This option allows the DC-2212 modem to be used with multi-line telephones. Internal circuitry can be configured to signal a local network that there is a MODEM on the line instead of a telephone. Unless the modem is modified internally, the local network will start flashing the BUSY indicator on the multi-line telephone when the modem seizes the line!

Option 2. RS-232 Protocol Extension

There are two RS-232-C lines that may be enabled to supply your computer with further information. These are RI and HS lines.

The DC-2212 has the option of signaling the RS-232 cable that the telephone is ringing. The RI pin on the RS-232 cable will toggle at the ringing rate anytime the modem is connected to a ringing line. The HS pin on the RS-232 may be enabled to supply the terminal (computer) with high speed indication if the modem switches to 1200 baud mode upon on-line condition.

Option 3. Synchronous Mode Operation

This option allows you to communicate in synchronous mode. In this mode, all automatic features are disabled and only manual operation is allowed. A jumper is used to determine if you will be required to use INT CLOCKing.

Troubleshooting

If 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 center.

- Phone connection is clean and noise-free.

- No one is talking on the telephone line.

- Phone and all extensions are on the hook.

- Baud rate, parity, and stop bits are correct for the modem you are using and the modem with which you are communicating.

Maintenance

The only maintenance your DC-2212 requires is a periodic checking of cables and connections. If you are experiencing data transfer problems, check the cable connections first. Then, run the analog loop self-test. If you still experience problems, check with your Radio Shack Computer Center.

Analog Loop Self-Test

The analog loop self-test does not test nor analyze the condition of your telephone circuits. Any keys that you enter from your keyboard after sending the **Q** command are echoed to your display. 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.

Specifications

Data Rate

    Low Speed Mode

0 to 300 bps
Asynchronous format

    High Speed Mode

1200 bps ($+1\%$, -2.5%)
Character-asynchronous or
bit-synchronous formats

Operation Mode

    Low Speed

Binary, serial, asynchronous

    High Speed

Character-asynchronous or bit-synchronous
format

Operating Modes

Full- or half-duplex, all speeds
Automatic originate or answer, manual
originate or answer

Character Length

Nine or 10 bits, including start/stop bits

Line Requirements

Two-wire dial-line

Line Signal

    Low Speed

Frequency shift-keying

    High Speed

Differential phase-shift-keying

Specifications Cont'd

Line Impedance	600 ohms-balanced
Modem Compatibility	
Low Speed	Bell System 103/113, 300 baud, FSK switched-network modems
High Speed	Bell System 212A
Data Interface	RS-232-C

RS-232C Interface
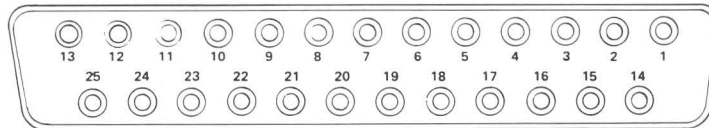
Pin No.	Signal	Input/Output
2	Transmit Data	Input
3	Receive Data	Output
5	Clear To Send	Output
6	Data Set Ready	Output
7	Ground	—
8	Carrier Detect	Output
12	High Speed/Low Speed	Output Option
15	Transmit Timing	Output
17	Receiver Timing	Output
20	DTR	Input
22	Ring Detect	Output Option
24	External Transmitter Timing	Input

Receiver Sensitivity	0 to −45dBm
Transmitter Timing	Internal or external

Specifications Cont'd

AC Power   120 volts, 10-volt Amps
                                          60 Hz, adapter supplied.

Environmental Requirements
    Ambient Temp. Range   0° - 55° Centigrade
                                          32° - 131° Fahrenheit

    Relative Humidity   Maximum 95% at 35° C.
                                          95% at 95° F.

Dimensions   6.5" x 7.5" x 2"
                                          (16.5 x 19.1 x 5.1 cm)

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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.

Because of the sensitivity of computer equipment, and the problems which can result from improper servicing, the following limitations also apply to the services offered by Radio Shack:

1. If any of the warranty seals on any Radio Shack computer products are broken, Radio Shack reserves the right to refuse to service the equipment or to void any remaining warranty on the equipment.

2. If any Radio Shack computer equipment has been modified so that it is not within manufacturer's specifications, including, but not limited to, the installation of any non-Radio Shack parts, components, or replacement boards, then Radio Shack reserves the right to refuse to service the equipment, void any remaining warranty, remove and replace any non-Radio Shack part found in the equipment, and perform whatever modifications are necessary to return the equipment to original factory manufacturer's specifications.

3. The cost for the labor and parts required to return the Radio Shack computer equipment to original manufacturer's specifications will be charged to the customer in addition to the normal repair charge.