

**Racal-Vadic**

**9600VP** *Auto-dial Modem*

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**USER'S GUIDE**

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**RACAL**

*Please address comments about this manual to:*

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To set modem to Autoanswer

AT <return>

"OK"

ATS0=1 &W <return>

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Equipment returned to the factory should be accompanied by the following information: the reason for return, with a comprehensive description of the malfunction; shipping instructions; and the name and telephone number of a contact in the event of problems.

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## **FCC PART 68: REQUIREMENTS FOR END USERS**

### **Racal-Vadic 9600VP Modem**

#### **Type of Service**

Your 9600VP modem can be used on standard telephone lines. The 9600VP connects to the telephone line with a standard USOC RJ11C, RJ41S, or RJ45S jack. Connection to pay telephones is prohibited. Connection to party lines service is subject to state tariffs.

#### **Telephone Company Procedures**

The telephone company may occasionally make changes in their equipment, operations, or procedures. They will give you prior notice in writing, so you can make any necessary changes to maintain uninterrupted service. If you have any questions about your telephone line, call the telephone company.

In certain circumstances, the telephone company may request information concerning the equipment which you have connected to your telephone line. Upon their request, provide the FCC registration number and the ringer equivalence number (REN) of the modem. Both of these items are listed on the equipment label. The sum of all of the RENs on your telephone line should be less than five to assure proper service from the telephone company. In some cases, an REN sum of five may not be usable on a given line.

When the modem is enclosed in a cabinet, a label listing the unit's registration number and ringer equivalence number must be visible from the outside of the cabinet or other enclosure, in addition to the label required on the registered device itself. Additionally, OEMs must provide end users of their equipment with the attached warnings.

#### **If Problems Arise**

If your telephone equipment is not operating properly, immediately remove it from your telephone line, as it may cause harm to the telephone network. If the telephone company notes a problem, they may temporarily discontinue service. When you are notified, you will be given the opportunity to correct the problem and informed of your right to file a complaint with the FCC.

All repairs on your 9600VP modem should be performed by Racal-Vadic or an authorized representative of Racal-Vadic. For information contact:

**Racal-Vadic Customer Service**  
222 Caspian Drive  
Sunnyvale, CA 94089

## **FCC PART 15: RADIO/TV INTERFERENCE**

This equipment generates and uses radio frequency energy and, if not installed and used properly (in strict accordance with the manufacturer's instructions), 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 the FCC Rules, which are designed to provide reasonable protection against interference in a residential installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, try to correct the interference by one or more of the following measures:

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

If necessary, consult the dealer or an experienced radio/television technician for additional suggestions. You might 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 U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

**CANADIAN DEPARTMENT OF COMMUNICATIONS  
REQUIREMENTS FOR END USERS  
Racal-Vadic Model 9600VP**

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that connection to the line is allowed by the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a telephone extension cord. Compliance with the above conditions may not prevent degradation of service in certain situations.

Equipment repairs should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user, may cause the telecommunications company to request disconnection.

The electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, should be connected together. This precaution may be particularly important in rural areas.

The Load Number (LN) assigned to each terminal device indicates the total load percentage that can be connected to a telephone loop. The termination on a loop may consist of any combination of devices. However, the total LN of all the devices must not exceed 100.

The load number, Canadian certification number, and DOC connector codes are listed on the modem label. For internal modems where the agency information label cannot be seen when the modem is installed, a second agency label will be provided. The customer must attach the label to the exterior of the cabinet where the modem is installed.

**Repairs**

Inquiries regarding Canadian repair centers should be addressed to:

Racal-Vadic Customer Service  
222 Caspian Drive  
Sunnyvale, CA 94089 USA

or

Canadian General Electric  
396 Attwell Drive  
Rexdale  
Ontario M9 W5 C3  
Canada

## **Chapter 1 INTRODUCTION**

### **PRODUCT DESCRIPTION**

The 9600VP is a high-speed, dial-up modem for asynchronous and synchronous communications. It is compatible with Bell 212A, Bell 103, CCITT V.29, and Racal-Vadic Dynamic Duplex modems. The modem transmits data error-free with Superset Microcom Networking Protocol (MNP) error control. It is compatible with Hayes AT and Racal-Vadic auto-dialers.

In 9600 bps asynchronous operation, the modem operates asymmetrically to emulate 9600 bps full-duplex performance. Racal-Vadic's Dynamic Duplex protocol switches between a low-speed, full-duplex data channel for interactive communication (such as full-screen editing) and a 9600 bps half-duplex data channel during file transfers.

The 9600VP fits under a telephone or on a desk. It has front panel keys (membrane switches), an LED display, a telephone line jack, and a power cable jack. You can dial telephone numbers from the terminal keyboard, the modem's front panel, or from a telephone connected to the modem.

A lithium battery backs up the modem's memory of telephone numbers and options. It lasts for up to two years without power. As long as the modem is turned on, the battery does not discharge. It retains a safe charge level for up to ten years with the power on.

Racal-Vadic occasionally adds new features to the 9600VP modem. To add these new features, you can upgrade your EPROM. If you want Racal-Vadic to contact you when a new EPROM is available, send your name, address, and telephone number to:

9600VP EPROM  
Racal-Vadic  
1525 McCarthy Blvd.  
Milpitas, CA 95035

## FEATURES

- Compatible with a wide range of low-speed modems and communications software
- Compatible with the expanded AT command set (Racal-Vadic's ATPlus)
- Compatible with standard communications protocols for full-duplex 1200 and 300 bps operation (Bell 212A and Bell 103) and synchronous, half-duplex 9600, 7200, and 4800 operation (V.29 2-wire)
- Adjusts speed in response to line quality for maximum data throughput
- Asynchronous operation at 9600, 1200, and 300 bps
- Synchronous operation at 9600, 7200, 4800, and 1200 bps
- Superset MNP error control ensures error-free data
- Retransmits only bad data frames
- Built-in tests for rapid problem identification
- Automatic speed conversion
- Five types of flow control
- Auto-dial and auto-answer
- Front panel dialing
- Stores 15 numbers in memory for automatic dialing
- Dials an alternative number if the first number does not answer
- A battery sustains the modem's memory when the power is off
- Includes a cable for permissive connection to the telephone line
- Your telephone and modem can share one telephone line

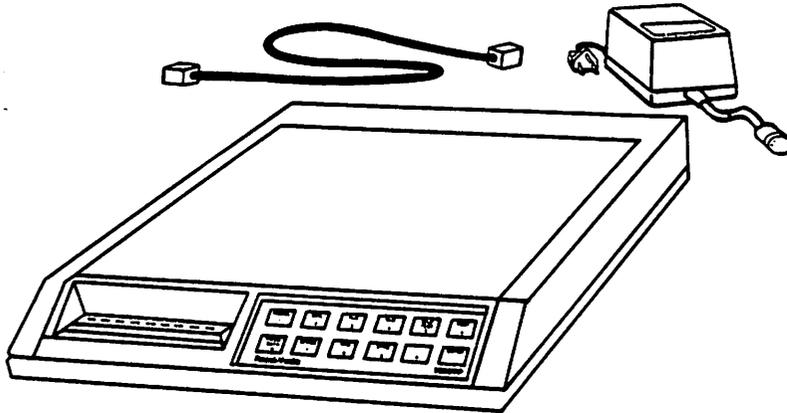
## CONVENTIONS

In this manual, the symbols < > mean to press the indicated key on your keyboard or modem. <RETURN> means to press the return key. <CTRL> means to press the control key. Hold down the control key while you press the keys following <CTRL>. For example, the command sequence <CTRL> C D means to hold down the control key while you press C, then D; then release both keys.

## Chapter 2 INSTALLATION

### UNPACK YOUR 9600VP

Remove the modem, power supply, and telephone cord from the carton and inspect them. If any item has been damaged, return it to your dealer.



9600VP-001A

**Figure 2-1: Contents of the Shipping Carton**

### MODEM CONNECTIONS

#### Connect the Modem to Your Computer or Terminal

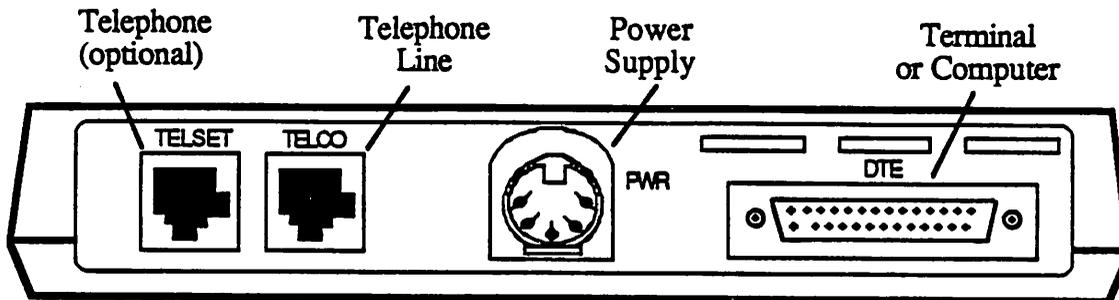
Connect your modem to your computer or terminal with an RS-232-C cable compatible with your equipment. Racal-Vadic does not provide an RS-232-C cable because different equipment requires different cables. Synchronous applications require pins 1 through 8, 15, 17, and 20. Asynchronous applications require pins 1 through 8 and 20. Appendix A gives RS-232-C information.

#### Connect the Modem to the Telephone Line

**Permissive connection**—Plug one end of the telephone cable into the telephone wall jack and the other end into the modem's TELCO jack. See Figure 2-2.

**NOTE:** Do not connect the telephone cable to the modem TELSET jack. Do not connect the modem to the telephone line through another piece of equipment, such as an answering machine.

**Programmable connection**—Have the telephone company install a data-quality telephone line and a programmable jack. Purchase a programmable telephone line cable (Racal-Vadic part number 15048-003). Plug one end of the telephone cable into the programmable line wall jack and the other end into the modem's TELCO jack.



9600VP-002A

**Figure 2-2. Modem Rear Panel**

### **Leased-Line Operation**

The 9600VP can operate synchronously or asynchronously on a 2-wire leased line or a 4-wire leased line with a 2-wire-to-4-wire converter. A leased line is a special, point-to-point connection for a specific purpose, such as connecting a remote terminal to its host computer. Leased-line modems are usually in constant operation and are rarely turned off. Most users install them in pairs, and set one to originate and one to answer. When powered up, the modems try to handshake according to their preset operating conditions (originate or answer; asynchronous or synchronous; 9600, 7200, 4800, or 1200 bps).

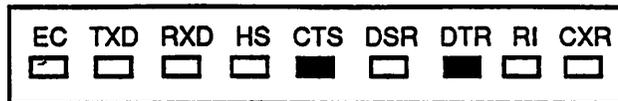
### **Connect the Modem to the Electrical Outlet**

Plug the power supply into the modem's PWR socket. (See Figure 2-2.)

### **CAUTION**

If you connect the modem to the ac power source with an extension cord, make sure the cord has a grounded plug.

Plug the power supply into a 110 V ac, 60 Hz receptacle. The front panel lights should look like Figure 2-3.



ON   
OFF

9600VP-003A

**Figure 2-3. The Front Panel Lights**

If the CTS and DTR lights do not come on, pins 4 and 20 are probably missing from the RS-232-C cable. Use a cable with pins 4 and 20.

#### **Connect an Optional Telephone to the Modem**

With an optional telephone connected to the modem, you can place voice calls, dial and answer manually, and switch between voice and data communications. Plug the telephone cord into the modem TELSET jack. (See Figure 2-2.)

## CONFIGURE THE MODEM

The 9600VP, the computer or terminal (also called Data Terminal Equipment, or DTE), and the communications software can only work together if they respond correctly to each other's signals. Modem options let you control how the modem responds to various signals. The modem's default settings are compatible with many common computers and terminals, but communications software options normally need some changes. Before operating the modem, check the following options and configure them to match your DTE's requirements. (Chapter 3 explains how to change options. Appendix A explains telecommunication equipment connections and signals. Appendix B explains basic telecommunications principles.)

### DSR and CXR Control

Some terminals can communicate with the modem only when the Carrier (CXR) and Data Set Ready (DSR) signals are ON at the RS-232-C interface. Most software packages requires CXR to be OFF. Some answering modems disconnect prematurely unless CXR is OFF. Racal-Vadic options 2 and 3 control the DSR and CXR signals. Configure these options to be compatible with your system requirements.

In the default setting, Computer Systems Interface (CSI), the modem forces DSR and CXR ON at the RS-232-C interface. Use this setting with terminals that require DSR and CXR to be ON. When the modem responds to an incoming call or an auto-dialing command, the CSI option turns CXR OFF until it detects true Carrier from the remote modem; then it turns CXR ON again. When CXR goes OFF, some minicomputers drop the Data Terminal Ready (DTR) signal, causing the modem to hang up. If this happens, change options 2 and 3 to settings 3 and 1, respectively.

If your communications software does not operate properly when CXR is HIGH, enter terminal emulation and reset option 3 to setting 1.

In AT operation, the default CXR and DSR signals are HIGH. The command AT&C changes the state of CXR, and the command AT\*D changes the state of DSR.

### Terminal Speed

Before you communicate at 9600 bps, set the terminal speed (the speed at which the terminal communicates with the modem) to 9600 bps.

### Line Feed After Carriage Return

The Racal-Vadic command set responds to a carriage return (CR) character, but not to a carriage return followed by a line feed (LF) character. Set your terminal or computer to issue only a carriage return when you press <RETURN>.

### Flow Control

Flow control protocols let the modem and DTE signal each other to stop and start sending data. Be sure to select a type of flow control compatible with your equipment, the remote equipment, and the data being sent. Option 17 controls flow control. Appendix B discusses types of flow control.

### **Speed Conversion**

Speed conversion lets your modem accept data from the DTE at 9600 bps, and communicate with a modem at a slower speed. Option 18 controls speed conversion. The default setting is disabled. Disable speed conversion for any communications program (such as GEORGE 2.2) that resets the Universal Asynchronous Receiver/Transmitter (UART) in response to on-line speed messages.

### **Speed and Parity**

Set your DTE, the remote DTE, and both modems to the same speed and parity. Set the modem flow control to be compatible with the DTE flow control. Speed can be 9600, 1200, or 300 bps. When you issue the commands <CTRL> E or AT, the modem automatically matches the speed and parity of the computer or terminal.

## **COMMUNICATIONS SOFTWARE**

The 9600VP operates with communications software designed for 9600 bps and the Racal-Vadic or Hayes AT command sets. You can control the modem with software commands from the latest versions of the following communications packages:

- Blast
- Carbon Copy
- Close-Up
- Crosstalk
- MEX-PC
- Professional-YAM
- Q-modem
- Relay Gold
- Respond

### **Error Control**

The 9600VP has error control, so you do not need error control software. Error control software slows throughput. If your communications package has error control, change the data packet size to at least 3.5 Kb—preferably 14 Kb. If you can use a larger data packet, use a multiple of 3.5 Kb.

Some error control protocols (such as XMODEM and Kermit) require an acknowledgment of each data packet. This type of protocol is inefficient. The modem works faster and more efficiently when it does not have to acknowledge each data packet, or when the data packet is 3.5 Kb or larger.

### **AT-Compatible Software**

Use this procedure for any communications software compatible with the AT command set. Refer to the software manual for specific instructions. When you transfer binary files, use a file-transfer protocol (such as Crosstalk's XMIT) that will transmit a large number of data packets without an acknowledgment from the receiver. Do not use a protocol such as XMODEM or KERMIT for transferring binary files, unless you can accept a low throughput.

1. From the software, set the terminal speed to 9600 bps.
2. Enter terminal emulation in your software program.
3. Type *AT&C1* <RETURN> to set CXR for normal operation in the modem.
4. Type *AT\*F2* <RETURN> to set RTS/CTS flow control in the modem. (Be sure that the software supports RTS/CTS flow control.)
5. Type *AT&W* to make these settings the default settings.
6. Set the software for RTS/CTS flow control.
7. Set the file transfer protocol to its largest block size.

### Software Packages

Racal-Vadic engineers have used several software packages, and offer the following set-up instructions to assist you.

### How To Set Up Crosstalk (Version 3.6 or Higher)

1. Change the speed and emulation settings:

Speed = 9600  
EMulate = VT100

2. Turn on hardware flow control. The screen displays:

HANDSHAKE = ON.

3. Change the BK setting to equal 255.

If the 255 setting causes consecutive errors (because of the data packet time out), change the BK setting to a value between 30 and 60.

4. Change dial and answer command strings so that the modem options are set properly. The dialing prefix is DP = *ATV0X1\*F2!ATDT*. The answer prefix is AP=*ATS0=1\*F2*.

5. Type *SAVE* <RETURN>.

6. To set modem CXR to normal in the modem, type *GO LOCAL* at the command prompt, then type *AT* <RETURN>. The screen displays:

OK

Type *AT&C1&W* <RETURN>. The screen displays:

OK

7. Press <ESC>.

8. Set the software on one side to answer (M<sub>O</sub>de=answer) and the software on the other side to call (M<sub>O</sub>de=call).
9. To send a file to the remote Crosstalk software, use the command XM. To request a file from the remote Crosstalk software, use the command RQ.

### **Carbon Copy**

Use the latest release of Carbon Copy's CCINSTALL.EXE and CCMODEM.EXE programs from Meridian Technology, Inc. CCMODEM.EXE lets you customize a definition of the 9600VP to the CCINSTALL.EXE program. The RESET string in CCMODEM.EXE should be:

```
(set 9600)(Delay 1 second)+++ (Delay 1 second)AT&C1&D2*F2E0QOV0X4S0=1*C1  
<RETURN> (Delay 1 second)
```

### **Close-Up**

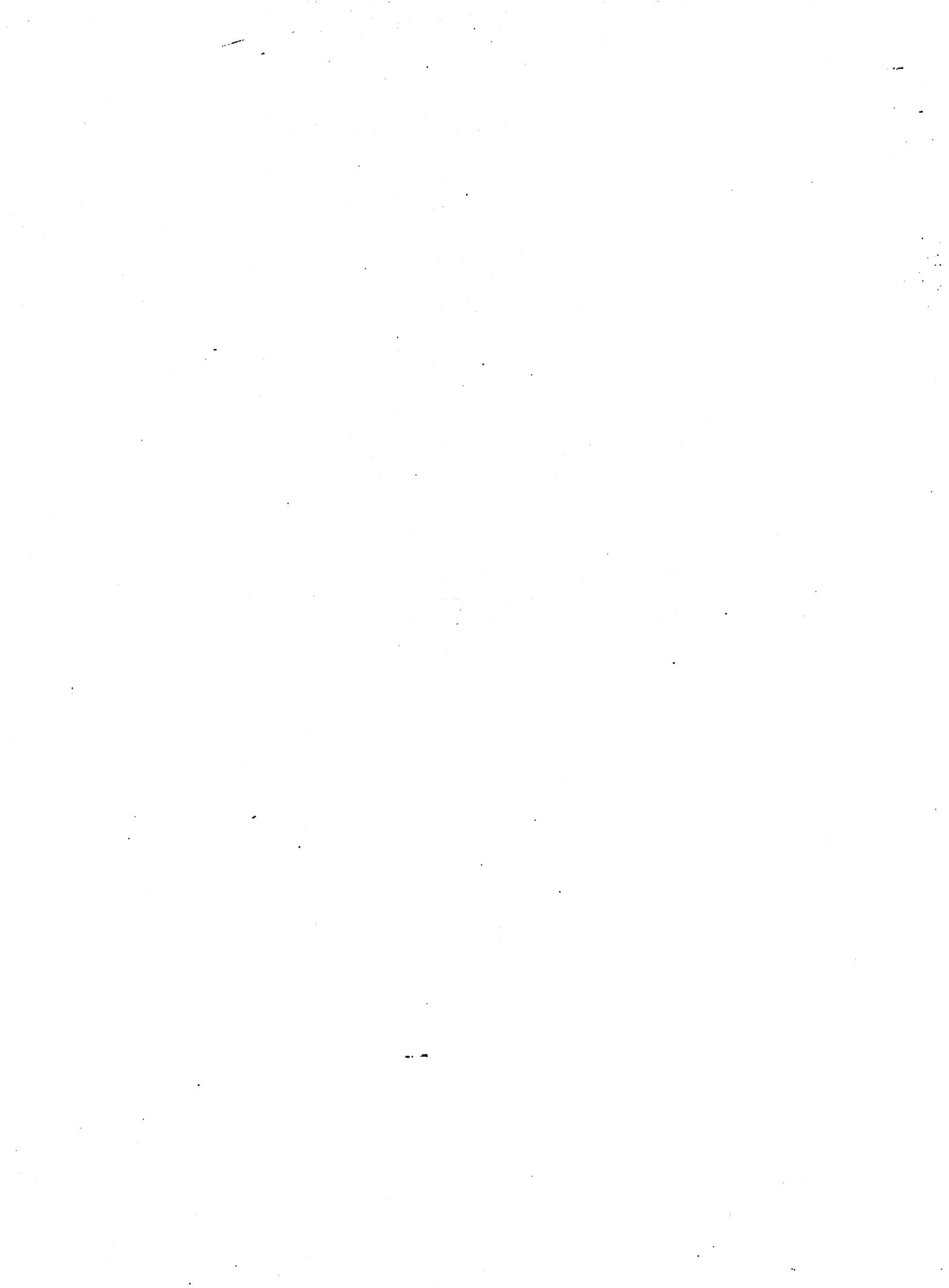
Use the most recent release of Close-Up from Norton-Lambert. Initialize both modems with the Close-Up command string for the 9600VP. The command string should include AT&C1&D2\*F2S0=1\*C1&W commands.

### **Co-Session**

The most recent version of Co-Session, Version 3.0, supports the 9600VP.

### **Reflection Series**

This package from Walker, Richer, and Quinn runs on DEC and H-P minicomputers as well as personal computers for PC-to-mini file transfers.



## Chapter 3 Racal-Vadic OPERATION

You can operate the 9600VP from a terminal or computer using Racal-Vadic commands. These procedures assume that you operate the modem from the keyboard of a 10-bit ASCII (asynchronous) terminal. To control the modem from the keyboard of a personal computer, use communications software to enter terminal emulation. You can type commands in either upper- or lower-case letters.

You cannot intermix AT and Racal-Vadic dialing commands and options. When you set Racal-Vadic options, the modem does not set the corresponding AT options to the same value. For example, if you set CXR to normal with Racal-Vadic option 3, CXR remains forced in AT operation.

### MAKING THE MODEM INTERACTIVE WITH THE TERMINAL

When you first plug in the modem, it is idle. It can answer a call (if configured to do so), but it cannot dial. Before the modem can respond to the Racal-Vadic command set, it must be interactive with the terminal. To make the modem interactive with the terminal, type <CTRL> E <RETURN>. The screen displays:

```
HELLO : I 'M READY
*
```

The asterisk prompt indicates that the modem is interactive with the DTE and ready to accept commands.

*NOTE: If you do not enter another command within two minutes, the modem returns to idle and the screen displays:*

```
*TIME OUT
```

### EDITING COMMANDS

When the modem is interactive, you can load telephone numbers into modem memory, view modem statistics, view and change modem options, and issue dialing commands from the keyboard. The terminal executes a command when you press <RETURN>. Before you press <RETURN>, you can use these keys to edit a command:

```
<CTRL> H  Moves the cursor to the left.
<CTRL> F  Moves the cursor to the right.
<CTRL> D  Deletes a single character marked by the cursor.
<CTRL> B  Blanks out an entire memory location.
```

## STORING NUMBERS IN MEMORY LOCATIONS

You can store telephone numbers and descriptions in the modem's 15 memory locations. Each memory location has an address. Each memory location can contain up to 60 characters.

### How To Store a Telephone Number in Memory

1. Type **C** <RETURN>. The screen displays:

```
*C  
ADDRESS?
```

2. Type the address of the desired memory location, then press <RETURN>. For example, if you choose memory location 1, the screen displays:

```
1  
01 :
```

The screen displays the contents of the memory location next to the address. If the location is empty, you can enter a telephone number.

3. Type the telephone number; for example, 4328008. The screen displays:

```
01 : 4328008
```

You may use spaces or dashes in the number to make it easier to read. For example, if you type 432-8008, the screen displays:

```
01 : 432-8008
```

The modem will not transmit spaces or dashes when it dials a number.

4. To store the number in memory, press <RETURN>. The screen displays:

```
ADDRESS?
```

prompting you to store additional numbers in memory. If you want to store another number, type another memory address and repeat steps 3 and 4.

5. When you finish entering numbers, press <RETURN> at the ADDRESS? prompt. The screen displays:

```
*
```

### How To Store a Telephone Number Description

You can store a description of each telephone number in memory. The description is for your convenience; the modem does not transmit it. To add a description when you store a telephone number in memory, type a semicolon and the description after the number. To add a description to an existing number:

1. Type <CTRL> C, then select a memory location; for example, 2. The screen displays:

```
02 : 2345678
```

2. Type <CTRL> F repeatedly until the cursor is at the right end of the line.

3. Type a semicolon (;).

4. Type the description. For example: SALES OFFICE.

### How To Display the Memory Locations

To display all the memory locations and their contents, type M <RETURN>. (See Figure 3-1 for a sample screen display.)

```
*M
01: 432-8008
02: 234-5678; SALES OFFICE
03:
04:
05:
06:
07:
08:
09:
10:
11:
12:
13:
14: 432-8008; MAIN OFFICE
15:
*
```

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**Figure 3-1. Sample Memory Location Display**

## ERASING MEMORY LOCATIONS

### How To Erase a Telephone Number from Memory

1. Type *C* <RETURN>. The screen displays:

```
*C  
ADDRESS?
```

2. Type *C* <RETURN>. (The *C* must be upper case.) The screen displays:

```
C  
CLEAR NUMBER?
```

3. Type the address of the memory location you want to clear. For example, type *1* <RETURN>. The screen displays:

```
1  
*
```

### How To Erase All Telephone Numbers Stored in the Modem's Memory

1. Type *C* <RETURN>. The screen displays:

```
*C  
ADDRESS?
```

2. Type *C* <RETURN>. (The *C* must be upper case.) The screen displays:

```
C  
CLEAR NUMBER?
```

3. Type *C* <RETURN>. (The *C* must be in upper case.). The screen displays:

```
C  
CLEAR ALL NUMBERS? (Y/N)
```

4. To erase the memory, press *Y*. The screen displays:

```
*
```

If you decide not to erase the memory, type *N* <RETURN>. The screen displays:

```
*
```

## LINKING MEMORY LOCATIONS

You can link two numbers together in memory. The modem automatically dials the second number when a call to the first number fails. This feature is useful for dialing numbers that are difficult to reach, but have alternative numbers. You can link as many telephone numbers as you want, but you must store all linked numbers in memory locations.

### How To Link Two Numbers

1. Type `L <RETURN>`. The screen displays:

```
*L
LINK NUMBER?
```

2. Type the address of the first number to dial, a slash (/), and the address of the alternative number. For example, to link the main office number (14) to the sales office number (2), type `14/2 <RETURN>`. The screen displays:

```
14/2
*
```

If the modem cannot connect with the main office number (address 14), it will dial the sales office number (address 2).

### How To Link Two Numbers to a Third Number

To link two linked numbers to another alternative number, type the address code of the first alternative number, a slash (/), and the address code of the second alternative number. For example, you can link the sales office number (2) to a local distributor number stored at memory location 3.

1. Type *L* <RETURN>. The screen displays:

```
*L  
LINK NUMBER?
```

2. Type *2/3* <RETURN>. The screen displays:

```
2/3  
*
```

If the modem auto-dials the main office number (location 14) and cannot connect, the modem automatically dials the sales office number (location 2). If that call also fails, the modem dials the local distributor (location 3). If you type *M* <RETURN> to display the contents of memory, you will see that the contents of addresses 2 and 14 look like this:

```
02 : 7654321 ;SALES OFFICE+03  
  
14 : 2345678 ;MAIN OFFICE+02
```

The three characters at the ends of the lines show that address 14 is linked to 2, and address 2 is linked to 3.

### How To Change a Link

1. Type *L* <RETURN>. The screen displays:

```
*L  
LINK NUMBER?
```

2. Type the address of the first number you want to dial, a slash (/), and the new alternative number, then press <RETURN>. The new alternative number overwrites the old alternative number. For example, to link the main office's number directly to the local distributor's number, type *14/3* <RETURN>. The screen displays:

```
14/3  
*
```

Racal-Vadic is now linked to the local distributor instead of to the sales office. However, the sales office (2) is still linked to the local distributor (3).

### How To Clear a Link from Memory

To clear a link from memory, clear the memory location. See How To Erase a Telephone Number From Memory above.

## DIALING

### How To Dial from the Keyboard

Type *D*, the number you want to dial, and <RETURN>. For example, type *D 8001234567* <RETURN>. The screen displays:

```
*D8001234567
DIALING . . .
RINGING . . .
ANSWER TONE
ON LINE 9600 (or 1200 or 300)
ERROR CONTROL
```

*NOTE: If you type D <RETURN> The screen displays:*

```
*D
NUMBER?
```

*To dial, type a telephone number and press <RETURN>.*

### How To Stop Dialing

To stop dialing while you are still typing the telephone number, press <RETURN>, then press any key. The screen displays (for example):

```
*D800123
*
```

To stop dialing after you have typed the number and pressed <RETURN>, press any key. The screen displays (for example):

```
*D8001234567
DIALING . . .
*
```

### How To Dial a Number Stored in Memory

Type the address of the number you want to dial, and <RETURN>. For example, type / <RETURN>. The screen displays:

```
* 1
1234567 ; RACAL-VADIC +03
DIALING . . .
RINGING . . .
ANSWER TONE
```

If there is no number at the selected address, the screen displays:

```
NOT FOUND
*
```

If the modem completes the call, the screen displays:

```
ONLINE 9600 (or 1200 or 300)
ERROR CONTROL
```

If the modem does not complete the call, it becomes interactive with the terminal again, and the screen displays an explanatory message. If the screen displays:

```
NO DIAL TONE
*
```

check whether the telephone cable is connected to the modem and wall jack. If the screen displays:

```
BUSY !
*
```

or

```
FAILED CALL
*
```

the other end was busy, it did not answer, or it was answered by a person and the modem could not complete the handshake.

## How To Redial from the Keyboard

You can redial the last auto-dialed telephone number (entered from the keyboard or dialed from memory). To redial a number from the keyboard:

1. Type *R* <RETURN>. The screen displays:

```
*R
NUMBER OF RETRIES?
```

2. Type the number of times you want the modem to redial the number, then press <RETURN>. To redial once, press <RETURN> twice. For example, to select five retries, type *5* <RETURN>. The screen displays:

```
*R
NUMBER OF RETRIES?
5
1234567 ;RACAL-VADIC
DIALING . . .
BUSY
1234567 ;RACAL-VADIC
DIALING . . .
RINGING . . .
ANSWER TONE
ONLINE 9600BPS
ERROR CONTROL
```

The modem continues to dial the number, and the screen continues to display messages, until the call goes through or until the modem has dialed the specified number of times.

*NOTE: The modem will not dial alternative (linked) numbers when you use the redial command.*

## MODEM STATISTICS

The modem collects statistics for each call and summary statistics for all modem use. Appendix B tells how to use the modem statistics.

## OPTIONS

Twenty-two programmable options stored in memory let you customize the 9600VP to suit your application. You can change option settings with commands from the keyboard.

### How To Display an Option Setting

1. Type *O* <RETURN>. The screen displays:

```
*0  
OPT ION NUMBER?
```

2. Enter the number of the option to be changed. For example, to check the setting of option 4, type *4* <RETURN>. The screen displays:

```
4* 1
```

Option 4 is at its default setting, 1.

3. To return to the asterisk prompt, press <RETURN>. The screen displays:

```
*
```

### How To Change an Option Setting

1. Type *O* <RETURN>. The screen displays:

```
*0  
OPT ION NUMBER?
```

2. Press the number of the option you want to change, then press <RETURN>. For example, to change option 4 (Auto-answer), type *4* <RETURN>. The screen displays:

```
4  
@4* 1
```

3. Enter the number of the new setting. For example, type *3* <RETURN> to answer after three rings. The screen displays:

```
3  
OPT ION NUMBER?
```

4. Option 4 is now set to setting 3. Repeat steps 2 and 3 to change another option setting. To return to the asterisk prompt, press <RETURN>.

## How To Change Several Option Settings at One Time

You can change the settings of several options at once. Enter the settings in numerical order. Set all options up to, and including, the ones you want to change. If you want an option setting to remain the same, enter an asterisk (\*) in its place. To change several options, type *O*, the new settings and <RETURN>. For example, to change options 1, 2, and 4, type *O23\*2* <RETURN>, where:

- O = Option command
- 2 = New setting for option 1
- 3 = New setting for option 2
- \* = Same setting for option 3
- 2 = New setting for option 4

The screen displays:

```
*023*2  
*
```

Table 3-1 lists the standard settings for the options.

**Table 3-1. Standard Option Settings**

<b>Option Number</b>	<b>Option Name</b>	<b>Standard Setting</b>
01	Standard option	1 - Enabled
02	DSR control	1 - Computer Systems Interface
03	CXR control	2 - Computer Systems Interface
04	Auto-answer	1 - Enabled
05	Local copy	1 - Enabled
06	Dial mode	1 - Auto Select
07	Blind dialing	1 - Disabled
08	Call progress detection	1 - Enabled
09	Response messages	1 - Long Messages
10	Data character length	1 - 10 Bits
11	Disconnect control	1 - Enabled
12	Not used	
13	Not used	
14	Async/sync	1 - Async
15	Automatic redial	1 - No Redial
16	Speed select	1 - Hunt
17	Flow control	6 - XON/XOFF Local Send/Receive
18	Speed conversion	1 - Enabled
19	Not used	
20	Not used	
21	CTS control	1 - Follow RTS
22	DTR control	1 - Normal
23	DTE protocol	1 - Transparent
24	Not used	
25	Sync fallback	1 - 4800 bps
26	Sync no activity control	1 - 30 seconds CXR Off/40 seconds CXR On
27	Not used	
28	Extended squelch	1 - Enabled (130 ms)

## How To Display the Option Settings Table

You can display a table of the options and their current settings on the screen. To display the options table:

1. Type **<CTRL> E <RETURN>**. The screen displays

```
HELLO : I 'M READY
*
```

2. Type **T <RETURN>**. The screen displays:

```
*T
01*1  STANDARD OPTION           02*1  DSR CONTROL
03*2  CXR CONTROL               04*1  AUTO ANSWER
05*1  LOCAL COPY                06*1  DIAL MODE
07*1  BLIND DIAL                08*1  CALL PROGRESS
09*1  RESPONSE MODE            10*1  CHARACTER LENGTH
11*1  DISCONNECT CTRL          12*1  **NOT USED**
13*1  **NOT USED**             14*1  ASYNC/SYNC
15*1  AUTO REDIAL              16*1  SPEED SELECT
17*6  FLOW CONTROL             18*1  SPEED CONVERSION
19*1  **NOT USED**            20*1  **NOT USED**
21*1  CTS CONTROL              22*1  DTR CONTROL
23*1  DTE PROTOCOL            24*1  **NOT USED**
25*1  SYNC FALL-BACK          26*1  SYNC NO ACTIVITY CTRL
27*1  **NOT USED**            28*1  SYNC EXTENDED SQUELCH
*
```

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**Figure 3-2. Option Setting Table Display**

## OPTION DESCRIPTIONS AND SETTINGS

An asterisk (\*) after a setting number indicates the default setting.

### Option 1 -- Standard Option

This option changes all other options to their default settings. When you change any option from its default setting, option 1 automatically changes to setting 2. To change all options to their default settings, set option 1 to setting 1.

Setting 1*	Enabled
Setting 2	Disabled

### Option 2 -- DSR Control

This option controls the Data Set Ready (DSR) signal to the RS-232-C interface. With setting 1, DSR goes OFF for four seconds after the modem goes off-line; then the modem forces DSR ON (the DSR and CXR indicator lights do not come on when the signals are forced internally by the modem). Setting 2 forces DSR to always be ON. With setting 3, DSR is ON when the modem is off hook or performing a test.

Setting 1*	Computer Systems Interface
Setting 2	DSR is always forced ON
Setting 3	DSR normal

### Option 3 -- CXR Control

This option controls the carrier (CXR) signal to the RS-232-C interface. With setting 1, CXR follows the true carrier signal from the remote modem. With setting 2, CXR comes ON until the modem detects answer tone; then it goes OFF until the modem detects true carrier. The modem then follows true carrier until it goes off-line. When the modem is off-line, CXR goes off for four seconds, then comes back on. Setting 3 forces CXR ON. With setting 4, the command <CTRL> E <RETURN> forces CXR ON. This option works only during asynchronous transmission.

Setting 1	CXR Normal
Setting 2*	Computer Systems Interface
Setting 3	CXR always ON
Setting 4	CXR ON after ENQ

### Option 4 -- Auto-answer

This option allows the modem to answer a call automatically after it receives a ring signal. With setting 1, it will answer after one ring. Setting 2 disables automatic answering. With setting 3, the modem will answer a call after three rings, giving the operator a chance to answer the telephone before the modem answers.

*NOTE: Even when you have selected settings 1 or 3, you must still toggle the ANS light ON with the <ANS> key before the modem will answer automatically.*

Setting 1*	N=1
Setting 2	Disabled
Setting 3	N=3

### **Option 5 -- Local Copy**

This option controls the screen display when the modem is interactive with the terminal or on-line. Setting 1 displays on the screen all data entered at the local keyboard. With setting 2, the screen does not display data from the local keyboard. With setting 3, the screen displays data received while on-line at 9600 bps in asynchronous format; it does not display data entered during interactive operation. Turn the host computer echo off when you use setting 3.

Setting 1*	Local copy
Setting 2	No local copy
Setting 3	Local copy 9600

### **Option 6 -- Dialing Mode**

With this option, you can select pulse dialing or tone dialing, or let the modem select pulse or tone dialing automatically. With setting 1, the modem tone dials the first digit, then waits five seconds for dial tone. If the modem does not detect dial tone, the modem tone dials the rest of the number. If dial tone is still on, the modem pulse dials the number from the first digit. When tone dialing on a tone line, use setting 2 so the modem will dial the number five seconds faster than with setting 1.

Setting 1*	Auto-select
Setting 2	Tone dialing
Setting 3	Pulse dialing

### **Option 7 -- Blind Dialing**

This option controls the function of the character K in a dialing command. In setting 1, a K forces the modem to wait for a dial tone. Setting 2 causes the modem to ignore dial tone and delay five seconds before dialing, and pause for five seconds for each K in the dialing string. This delay gives telephone equipment time to switch, and gives the modem access to telephone systems with nonstandard dial tones that cannot be detected by the modem.

Setting 1*	Disabled
Setting 2	Enabled

### **Option 8 -- Call Progress Detection**

Setting 2 disables the modem's busy tone and ring detection circuitry. This allows you to use the modem with nonstandard busy and ring signals, which otherwise would cause errors during auto-dialing. This option does not affect dial tone, answer tone, or carrier detection circuits.

Setting 1*	Enabled
Setting 2	Disabled

### Option 9 -- Response Messages

This option selects the form of the response messages displayed on the screen during interactive operation. (See Table 3-2 for the two kinds of response messages.)

Setting 1*	Word messages
Setting 2	Character messages
Setting 3	No response messages

All messages are preceded and followed by a line feed and a carriage return.

**Table 3-2. Response Messages**

Character Message	Word Message
A	ANSWER TONE
B	BUSY !
C	INVALID COMMAND
D	DIALING. . .
E	NO DIAL TONE !
F	FAILED CALL
G	LINKING. . .
H	HELLO : I 'M READY
I	IDLE
J	LINKING NUMBERS?
L	ON LINE (BELL)
N	NUMBER?
O	OPTION NUMBERS?
Q	NUMBER OF RETRIES?
R	RINGING. . .
S	ADDRESS?
T	TIME OUT
U	NOT FOUND
W	MEMORY CLEARED
Y	CLEAR NUMBER?
1	ON LINE 300
2	ON LINE 1200
5	ON LINE 9600
@	DISCONNECT
#	ENTER NUMBER
?	SELECTED SPEED UNAVAILABLE
+	ERROR CONTROL
&	REQUEST RDLB
(blank)	*
(blank)	1. LAST CALL
(blank)	2. SUMMARY
(blank)	3. RESET
(blank)	WHAT NUMBER?

### **Option 10 -- Data Character Length**

This option selects the character length of data being transmitted and received during asynchronous operation. It includes start and stop bits. This option has only one setting.

Setting 1\*      10 bits

### **Option 11 -- Disconnect Control**

This option controls the use of the disconnect command, <CTRL> C D, during 9600 bps asynchronous operation. When you enter this command from the keyboard, the modem disconnects from the telephone line. Do not send data for one second before and after you issue this command.

Setting 1\*      Enabled  
Setting 2      Disabled

### **Option 12 -- Not used**

### **Option 13 -- Not used**

### **Option 14 -- Async/Sync**

This option selects asynchronous or synchronous operation. You can also select asynchronous and synchronous operation from the front panel. When you select setting 2, the modem will operate synchronously after it returns to idle. To return to asynchronous operation from synchronous operation, press <SYNC>.

Setting 1\*      Asynchronous data format  
Setting 2      Synchronous data format

### **Option 15 -- Automatic Redial**

This option selects the number of times (N) the modem redials a telephone number when an auto-dialed call fails.

Setting 1\*      No redial  
Setting 2      Redial

### **Option 16 -- Speed Select**

With setting 1, the originate modem automatically hunts for the highest common speed with the remote modem (9600, 1200, or 300 bps asynchronous). Setting 2 forces the originate modem to connect only at the initialized speed of the terminal or computer.

Setting 1\*      Hunt  
Setting 2      Force

### Option 17 -- Flow Control

This option selects the flow control method during data communication. (See Appendix B for flow control methods.)

Setting 1	Disabled
Setting 2	XON/XOFF local send-only flow control (in-band)
Setting 3	CTS/RTS flow control (out-of-band)
Setting 4	CTS/DTR flow control (out-of-band)
Setting 5	XON/XOFF passthrough send/receive flow control (in-band)
Setting 6*	XON/XOFF local send/receive flow control (in-band)

### Option 18 -- Speed Conversion

Speed conversion lets the modem receive asynchronous data from a terminal or computer at a fixed speed (normally 9600 bps), and transmit to a remote modem at a lower speed (1200 bps or 300 bps). This lets the modem connect to a variety of remote modems all transmitting at different speeds, without changing your computer's or terminal's speed. For normal operation, disable speed conversion and set the terminal speed to 9600 bps. Disable speed conversion when you perform tests. For speed conversion to work correctly, you must use a flow control method (option 17) matched to your system. (See Appendix B for flow control methods.)

Setting 1*	Disabled
Setting 2	Enabled

### Option 19 -- Not used

### Option 20 -- Not used

### Option 21 -- CTS Control

This option determines the operation of the Clear To Send (CTS) signal (in asynchronous operation only) on the RS-232-C interface. With setting 1, CTS comes ON after RTS comes ON. With setting 2, CTS comes ON after true carrier comes ON.

*NOTE: When you select out-of-band (CTS/RTS or CTS/DTR) flow control (option 17), CTS goes OFF when the modem buffer fills, even if RTS or CXR are still ON.*

Setting 1*	CTS follows RTS
Setting 2	CTS follows CXR

### Option 22 -- DTR Control

This option controls the operation of the Data Terminal Ready (DTR) signal on the RS-232-C interface. With setting 1, DTR follows the signal from the terminal. Setting 2 forces DTR ON. To communicate with the modem, some computers or terminals require setting 2. If your system needs DTR forced ON, change the setting to 2, using a terminal that does not require DTR forced ON.

Setting 1*	Normal
Setting 2	Forced ON

### **Option 23 -- DTE Protocol**

This option enables or disables the Hewlett-Packard protocol. The transparent protocol disables H-P protocol. Setting 2 enables Hewlett-Packard's ENQ/ACK protocol. If you use this option, set both modems to setting 2; set option 17 to setting 2 on the minicomputer side; and set option 17 to setting 6 on the personal computer side.

Setting 1*	Transparent
Setting 2	H-P ENQ/ACK enabled

### **Option 24 -- Not used**

### **Option 25 -- Synchronous Fallback**

This option selects the manual fallback speed during 9600 bps synchronous operation. The setting determines the speed indicated by the red SPEED key light in synchronous operation (4800 bps with setting 1; 7200 bps with setting 2). Set this option only during asynchronous operation.

Setting 1*	9600/4800
Setting 2	9600/7200

### **Option 26 -- Sync No Activity Control**

This option selects when the modem will hang up (go on hook) in synchronous operation, in response to the prolonged loss of the carrier signal. The modem will hang up in the time selected by the setting. This option provides an automatic way to hang up a call on the answer side after a user has manually disconnected the originating modem.

Setting 1*	Disconnects automatically if CXR is OFF for 30 seconds, or if CXR is ON for 40 seconds
Setting 2	Disabled
Setting 3	Disconnects automatically if CXR is OFF for 10 seconds, or if CXR is ON for 40 seconds
Setting 4	Disconnects automatically if CXR is OFF for 20 seconds, or if CXR is ON for 40 seconds

### **Option 27 -- Not used**

### **Option 28 -- Extended Squelch**

In synchronous operation, this option selects the length of time needed from when a Request To Send (RTS) is issued until the modem signals Clear To Send (CTS). The default is 253 ms, plus an extended squelch of 130 ms. This additional delay ensures the remote modem receiver is ready to accept data. On a clear line, you can reduce the RTS/CTS delay by 130 ms when disabling the extended squelch.

Setting 1*	Enabled (130 ms)
Setting 2	Disabled (0 ms)

## OPTIONAL DIALING FUNCTIONS

### How To Dial a Tandem Number

A tandem telephone number has two or more sequences of numbers that must be dialed in succession. For example, PBX switchboards often require you to dial an access number (usually 9) to get an outside line. To make the modem wait for a second dial tone before it dials the rest of the telephone number, insert a K after the 9.

To type a tandem number sequence, insert a K between each telephone number in the sequence. For example, if you enter 9 K 222222 K 987654 1234567, the modem dials the code for an outside line; waits for the dial tone; dials the first number; waits for the dial tone; dials an identification code; and dials the third number. At any K in the telephone number sequence, if the modem does not detect a dial tone after 20 seconds, the screen displays:

FAILED CALL

### How To Blind Dial

Some telephone systems have nonstandard, inconsistent, or hard-to-identify dial tones. If the modem cannot detect one of these dial tones, you can force it to continue dialing automatically after a specified delay. A K makes the modem pause for five seconds before it continues dialing. Each K forces a five-second pause. You can insert more than one K for a longer pause. To enable blind dialing, set option 7 to setting 2.

For example, when calling through a PBX switchboard with the blind dialing option on, if you enter the sequence 9 K 222222 KK 987654 1234567, the modem dials the code for an outside line; waits for five seconds; dials the first number; waits for ten seconds; dials an identification code; and dials the third number. If the modem detects a dial tone before the five seconds for each K elapse, it will immediately continue dialing.

### Pulse Dialing and Tone Dialing

Option 6 controls the dialing method. The modem selects pulse or tone dialing automatically. You can force tone dialing with setting 2, and pulse dialing with setting 3.

## HOW TO DISCONNECT DURING Racal-Vadic OPERATION

To disconnect the modem from the telephone line when you are on-line with another modem, type <CTRL> C D. Do not press <RETURN>. The modem returns to idle. The screen displays:

DISCONNECT

*NOTE: When a log-off sequence causes DTR to go low and disconnect the answer modem, the originate modem will wait approximately 20 seconds before disconnecting.*

## AUTOMATIC ANSWERING

The 9600VP can automatically answer calls and send or receive data without the help of an operator. You can use this feature for remote data entry systems where a central computer calls at night when the telephone rates are low.

1. Set option 4 to automatic answer (setting 1 or 3).
2. Be sure the DTR light is on. If the DTR light is off, force DTR ON by setting option 22 to setting 2. The DTR light will remain off, but the modem can now answer.
3. Be sure the ANS light is on. If the ANS light is off, press the ANS key to turn it on.

The modem will now answer automatically. When it receives a ring signal, the modem will answer the call automatically and send an answer tone to the calling modem.

## LIST OF COMMANDS

To display the list of commands on your screen, type *P* <RETURN> or *?* <RETURN>. See Figure 3-3 for the command display.

```
*P
MODEM COMMANDS:
I          -IDLE MODE
CTL E     -INTERACTIVE MODE
CTL C,D   -DISCONNECT
P, ?     -DISPLAY COMMANDS
S         -STATISTICS

AUTO DIALING:
D         -DIAL
DXXX     -BATCH DIAL
1-15     -DIAL STORED NUMBER
R        -REDIAL
K        -PAUSE FOR DIAL TONE
CTL H    -BACKSPACE

OPTION CONTROL:
T        -LIST SETTINGS
O        -CHANGE OPTIONS
OXXX    -BATCH CHANGE OPTIONS
*

MEMORY CONTROL:
M        -DISPLAY MEMORY
C        -CHANGE/CLEAR MEMORY
CTL F    -CURSOR RIGHT
CTL H    -BACKSPACE
CTL D    -DELETE CHAR
CTL B    -BLANK LINE
L        -LINK NUMBERS
```

9600VP-006A

Figure 3-3. Commands Display



## Chapter 4 FRONT PANEL OPERATION

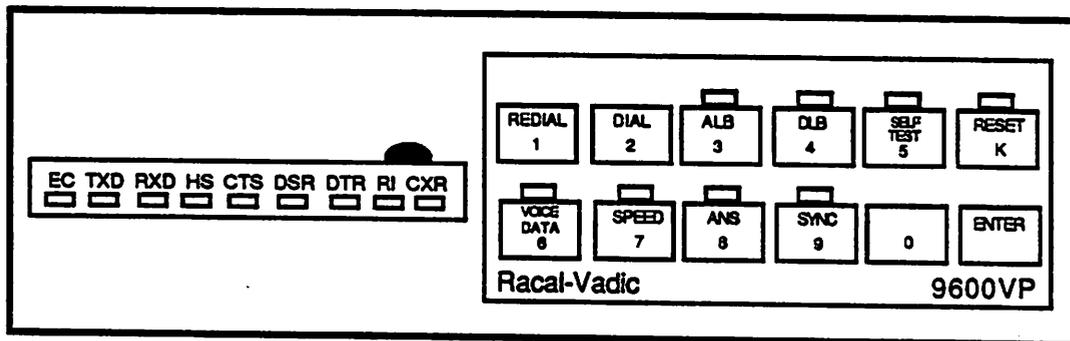
This chapter tells how to operate your modem's front panel controls, how to use the modem with a telephone to dial and answer calls, how to switch between voice and data communication, and how to set leased-line operation.

*NOTE: The front panel keys work only during Racal-Vadic operation and issue only Racal-Vadic commands, except for the <RESET> key, which also resets the modem (ATZ) during AT operation.*

### THE FRONT PANEL KEYPAD

The 9600VP front panel has a keypad with twelve keys. Each key has a name, a number, or both. Except when you press <DIAL>, each key performs the function indicated by its name. For example, <REDIAL> redials a number and <SPEED> changes the modem speed.

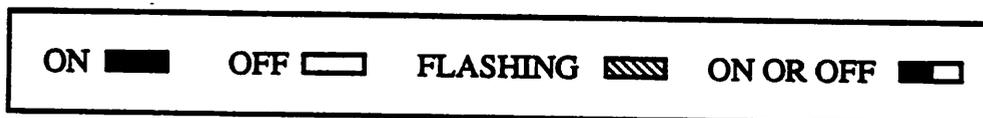
After you press <DIAL>, each key enters its number to address a memory location. For example, <REDIAL> enters the number 1 and <SPEED> enters the number 7. Use this feature to dial stored telephone numbers from the front panel. (See Figure 4-1 for the 9600VP front panel.)



9600VP-007A

Figure 4-1. Front Panel

Eight of the front panel keys have lights above them. In this manual, these symbols represent the states of the lights:



9600VP-003A

### **REDIAL/1 Key**

- To dial the last number that the modem auto-dialed, press <REDIAL> when the modem is idle.
- To enter the number 1, press this key when you dial from the front panel.

### **DIAL/2 Key**

- To dial a stored number, press <DIAL> when the modem is idle.
- To enter the number 2, press this key when you dial from the front panel.

*NOTE: Chapter 7, TESTING, explains the modem's built-in tests.*

### **ALB/3 Key and Light**

- To start an analog loopback (ALB) test, press <ALB> when the modem is idle. To start an analog loopback self-test when the ALB test is running, press <SELF TEST>. To end either test, press <RESET> or <ALB>.
- To enter the number 3, press this key when you dial from the front panel.
- The ALB light comes on when the modem is performing an analog loopback test or analog loopback self-test.

### **DLB/4 Key and Light**

- To start a remote digital loopback (DLB) test, press <DLB> when your modem is on-line with a remote modem, and running at 1200 bps (the SPEED light is red). To start a remote digital loopback test, press <SELF TEST> when the remote digital loopback test is running. To end either test, press <DLB>.
- To start a local digital loopback test, press this key when the modem is on-line with a remote modem, and running at 300 bps (the SPEED light is off). To end the local digital loopback test, press <DLB> again.
- To enter the number 4, press this key when you dial from the front panel.
- The DLB light comes on when the modem performs any of the digital loopback tests.

### **SELF TEST/5 Key and Light**

- To start an analog loopback self-test or a digital loopback self-test during an analog loopback or digital loopback test (the ALB or DLB light is on), press this key. (If the modem detects an error during a self-test, the EC light flashes.) To end the self-test, press <SELF TEST> again.
- To enter the number 5, press this key when you dial from the front panel.
- To start leased-line operation, press this key.
- The SELF TEST light comes on by itself when the modem is in leased-line operation. (The signal indicator lights may come on to indicate the modem's speed, whether it is set to answer or originate, and whether it is operating synchronously or asynchronously.)
- The SELF TEST light comes on when the modem performs an analog loopback self-test or a remote digital loopback self-test.

### **RESET Key and Light**

- To stop an operation and idle the modem, press <RESET>. (Pressing this key does not reset the options and numbers stored in nonvolatile memory.)
- To interrupt leased-line operation for ten seconds (to change operating conditions from the front panel), press <RESET>. After ten seconds, the modem automatically begins the handshake with the remote modem.
- The RESET light comes on while the modem resets.
- To stop leased-line operation, press this key, then press <SELF TEST> within five seconds. The SELF TEST light goes off.

### **VOICE DATA/6 Key and Light**

- To start data communication while you are talking on a telephone connected to the modem, press <VOICE DATA>. To originate, the ANS light must be off; to answer, the ANS light must be on. To communicate properly, one modem must be set to originate, and the other modem must be set to answer. Both modems must be set for the same speed.
- To stop data communication and begin talking on the telephone connected to the modem, lift the telephone handset and press <VOICE DATA>. The person at the remote modem should also lift the telephone handset and press <VOICE DATA> (or otherwise disconnect the modem from the telephone line) at approximately the same time.
- To enter the number 6, press this key when you dial from the front panel.
- The VOICE DATA light comes on when the modem detects a remote modem, and remains on during data communication.

### **SPEED/7 Key and Light**

- To select the modem speed when the modem is idle during manual operation, press <SPEED>.
- The SPEED light comes on in different colors, or goes off, to indicate the modem's speed.

#### **Asynchronous**

(SYNC light off)

Green = 9600 bps

Red = 1200 bps

OFF = 300 bps

#### **Synchronous**

(SYNC light on)

Green = 9600 bps

Red = 7200 or 4800 bps\*

OFF = 1200 bps

\* Depending on the setting of option 25

(Sync fallback)

- To enter the number 7, press this key when you dial from the front panel.

### **ANS/8 Key and Light**

- To switch automatic answer on or off, press <ANS>. (Both Racal-Vadic option 4 and AT register S0 follow this key automatically. Chapters 3 and 5 explain these options.)
- During a telephone conversation, you can switch to data communication. One operator presses <ANS> until the ANS light comes on. The ANS light on the other modem should be off. If both modems' speeds are set the same, they begin data communication when both operators press their <VOICE DATA> keys.
- To answer manually when the modem is idle, press <ANS> until the ANS light comes on, then press <VOICE DATA>. (This sends a high-pitched answer tone to the calling modem.)
- To enter the number 8, press this key when you dial from the front panel.
- The ANS light comes on when the modem is set to answer incoming calls automatically.

### **SYNC/9 Key and Light**

- To choose between asynchronous or synchronous data format, press <SYNC>.
- To enter the number 9, press this key when you dial from the front panel.
- The SYNC light comes on when the modem is configured for synchronous operation.

### **0 Key**

- To enter a 0, press <0> when you dial from the front panel.

### **ENTER Key**

- To dial a number from memory, press <ENTER> after pressing <DIAL> and the desired memory address number keys.

## SIGNAL INDICATOR LIGHTS

The signal indicator lights on the left side of the front panel display the status of true signals at the RS-232-C interface. (They do not display the status of signals forced on by modem options.) They also indicate when the modem is using error control, when it detects errors, and what type of dynamic duplexing the modem is performing.

### **EC Error Control Light**

- This light is normally on when the modem uses error control.
- The light goes off on the transmitting modem each time it retransmits data.
- During tests, the Error Control light is normally off, but flashes when an error occurs.

### **TXD Transmit Data Light**

- This light flashes when the modem accepts data from the DTE.

### **RXD Receive Data Light**

- This light flashes when the modem (interactive or on-line) sends data to the DTE.

### **HS High Speed Light**

- This light is used only during 9600 bps asynchronous operation. It indicates how the modem is using the telephone bandwidth. When the light comes on, most of the bandwidth has been allocated for the side with the most data. When the light goes off, the bandwidth has been split in half for transmission in both directions, as is necessary for sending small packets of data in a conversational application or error control acknowledgments.

ON = High speed half duplex  
OFF = Low speed full duplex

### **CTS Clear To Send Light**

- This light comes on when the modem is ready to transmit data.
- With RTS/CTS flow control, CTS can go off if the modem requires a pause in the data flow.

### **DSR Data Set Ready Light**

- This light comes on when the modem is on-line, or when it is performing a test.
- The light goes off when the modem is off-line and either idle or interactive.

### **DTR Data Terminal Ready Light**

- This light comes on when the modem has received DTR from the terminal.
- The light goes off when the modem has not received DTR from the terminal.

### **RI Ring Indicator Light**

- This light comes on when the modem is receiving a ring signal on an incoming call.

### **CXR Carrier Detect Light**

- This light comes on when the modem detects a valid carrier signal from the remote end or is running a test.

### **Power Light**

- This light is on when the modem has power.

## DIALING

You can dial a number with a telephone connected to the 9600VP, you can dial a number stored in memory from the front panel, and you can redial the last number dialed from memory or from the DTE.

### How To Dial with a Telephone

1. Set the required modem speed. Use the front panel <SPEED> key.
2. Lift the telephone receiver and dial the number manually.
3. **If a modem answers the call**—you will hear a high-pitched answer tone. When you hear an answer tone, press <ANS> until the ANS light goes OFF. Press <VOICE DATA>. The CXR light comes on when the two modems go on-line.

**If a person answers the call**—decide which modem will originate and which will answer. The person at the answering end presses <ANS> so the ANS light comes on, then presses <VOICE DATA>. The answering modem transmits a high-pitched answer tone. The person at the originate end presses <ANS> so that the ANS light goes off, then presses <VOICE DATA>. The CXR light comes on when the two modems go on line. In synchronous operation at 9600, 7200, or 4800 bps, or when receiving data from the remote modem, the CXR light will flash.

4. To stop transmitting data and go off line, press <VOICE DATA>.

### How To Dial a Stored Telephone Number

Chapter 3 tells how to store a telephone number at an address in memory. To dial a stored number asynchronously from the front panel keypad:

1. Make sure that the SYNC and ANS lights are off, and that you set your terminal and modem to the same speed.
2. The modem must be idle. Press <RESET> if necessary.
3. Press <DIAL>. The screen displays:

ADDRESS?  
\_ \_

*NOTE: For clarity, this manual assumes that the screen displays word response messages.*

4. Using the front panel keys, type the address of the number you want to dial, and press <ENTER>. For example, to dial the Racal-Vadic sales office number stored at memory location 2, type 2 <ENTER>. The screen displays the telephone number and the comments for that entry:

```
ADDRESS?  
02 :4328008 :RACAL-VADIC SALES OFFICE
```

5. The modem begins dialing. The screen displays:

```
DIALING. . .  
RINGING. . .  
ANSWER TONE  
ON LINE 9600  
ERROR CONTROL      (Occurs in 9600 bps operation only)
```

### How To Redial a Telephone Number

The modem can automatically redial the last number dialed from the terminal or from memory. It cannot redial a number dialed from a telephone. To redial the number, press <REDIAL>.

### How To Stop Dialing

To stop the modem from dialing and return it to idle, press <RESET>.

## SWITCHING BETWEEN VOICE AND DATA COMMUNICATION

### How To Switch from Voice to Data Communication

You can answer telephone calls manually, talk, then put the modem on-line to communicate.

1. When the telephone rings, pick up the receiver and answer.
2. While talking on the telephone, decide who will originate the call and who will answer the call.
3. The answer-side person presses <ANS>. The answer-side ANS light comes on. The originate-side ANS light must be off. If necessary, press <ANS>. Confirm that both SPEED lights are the same color.
4. Both persons press <VOICE DATA>. The DSR and VOICE DATA lights come on. The modems connect. When the CXR light comes on (or flashing in 9600, 7200, or 4800 bps synchronous operation), you can begin data communication.

## How To Switch from Data to Voice Communication

You can interrupt data communication and use the telephone to talk to the person at the remote station.

1. If you want to interrupt data communication and talk on the telephone, type a message at the keyboard telling the person at the other end to pick up the telephone receiver and press <VOICE DATA>.
2. Pick up the telephone receiver and then press <VOICE DATA>. The person at the other end should do the same at the same time.
4. You may hear modem noise briefly, and then you will be able to converse.

*NOTE: If the person at the other end doesn't pick up the telephone receiver when you press <VOICE DATA>, the modem will disconnect.*

## DISCONNECTING

If you dialed with a Racal-Vadic command, or with the front panel, press <VOICE DATA> or <RESET> to disconnect. If you dialed with an AT command press <RESET> to disconnect.

*NOTE: If you normally disconnect when logging off your computer system, the originating modem will automatically disconnect, but it will take approximately 20 seconds.*

## MODEM SPEED

Press <SPEED> to change the modem speed when you dial a call with a telephone, when you switch from voice to data communication, when you select synchronous operation, or when you conduct tests.

For example, suppose you are talking with someone on the telephone and decide to start communicating data. If the other person has a 1200 bps modem, press <SPEED> to set the speed of the 9600VP to 1200 bps. To change the speed:

1. The modem must be idle. Press <RESET> if necessary.
2. Press <SPEED>. The SPEED light will change color or go OFF, indicating a new speed. The speed changes each time you press <SPEED>, cycling through the three settings available. In asynchronous operation, it cycles through 9600, 1200, and 300 bps. In synchronous operation, it cycles through 9600, 7200 or 4800, and 1200 bps.

### Asynchronous

Green = 9600 bps  
Red = 1200 bps  
OFF = 300 bps

### Synchronous

Green = 9600 bps  
Red = 7200 or 4800 bps\*  
OFF = 1200 bps

\* Depending on setting of option 25 (sync fallback)

## SYNCHRONOUS OPERATION

The 9600VP operates synchronously, half duplex at 9600, 7200, and 4800 bps, and full duplex at 1200 bps. <SYNC> changes modem operation from asynchronous to synchronous. The modem resets to synchronous operation when it returns to idle. The SYNC light comes on when the modem is set to operate synchronously. In synchronous operation the modem will not accept asynchronous commands.

### How To Begin Synchronous Operation

*NOTE: You can only store telephone numbers in memory during asynchronous operation. Store numbers during asynchronous operation, and retrieve them from memory during synchronous operation.*

**Manual Dialing**—To originate a call manually, dial with a telephone. When you hear the answer tone, press <VOICE DATA>. Be sure that the ANS light is off.

**Front Panel Dialing**—To originate a call automatically, press either <DIAL> or <REDIAL> on the front panel.

To begin synchronous operation, be sure the SYNC light is on, and the ANS light is OFF.

1. Connect the modem to a synchronous terminal or to a personal computer with a synchronous adapter card.
2. Press <SYNC>. Option 2 (DSR) changes to setting 3, option 3 (CXR) changes to setting 1, and option 14 (Async/Sync) changes to setting 2. When the modem goes on-line, the DSR light goes on. (The RXD and CXR lights should begin to flash as the modem receives and transmits synchronous polls.)
3. To leave on-line synchronous operation, press <VOICE DATA>.

### How To Leave Synchronous Operation

Press <SYNC> to leave synchronous operation. The SYNC light goes OFF and options 2 and 3 return to their factory defaults.

### How To Improve Performance

If you communicate on short-distance lines (less than 1,000 miles), you can increase throughput by setting option 28 to 2 on both modems asynchronously. This shortens the RTS/CTS delay required for line turnaround.

## HOW TO RESET THE MODEM

<RESET> ends the current operation and returns the modem to idle, whether the modem is in Racal-Vadic or AT operation. In Racal-Vadic operation, all options and settings remain the same. In AT operation, the modem can lose some option settings unless you store option changes in nonvolatile memory with the command AT&W. Some AT options cannot be saved, and these return to their defaults then you press <RESET>. <RESET> also resets last call and summary statistics.

## LEASED-LINE OPERATION

The modem operates on a 2-wire leased line. You can use a 4-wire leased line with a 2-wire/4-wire hybrid converter from the leased-line provider.

### How To Switch between Synchronous and Asynchronous Operation

Press <RESET>, then <SYNC>. The SYNC light comes on during synchronous operation, and goes off during asynchronous operation.

### How To Select the Operating Speed

Press <RESET>, then <SPEED>. In asynchronous operation, the SPEED light is red during 1200 bps operation, off during 300 bps operation, and green during 9600 bps operation. In synchronous operation, the SPEED light is off during 1200 bps operation, red during 7200 and 4800 bps operation (select with option 25), and green during 9600 bps operation.

### How To Begin Leased-Line Operation

The modem will operate on a leased line asynchronously or synchronously at any of the front panel speeds. To set the modem for leased-line operation:

1. Select synchronous or asynchronous operation.
2. Select the modem speed. It must be the same at both modems.
3. Select one modem to be the answer modem. At the answer modem, press <ANS> until the ANS light comes on.
4. The other modem is the originate modem. At the originate modem, press <ANS> until the ANS light goes off.
5. To start leased-line operation, press <SELF TEST> so the SELF TEST light comes on at both modems. The modems are in leased-line operation, and will remain so until disabled.

### How To End Leased-Line Operation

Press <RESET>. Within 5 seconds, press <SELF TEST> until the SELF TEST light goes off. The modems return to switched network operation.



## Chapter 5

### AT OPERATION

The 9600VP is Hayes-compatible. You can operate it from a terminal or computer using the Hayes AT command set. You can use Hayes Smartcom 2.1 and compatible software. If you design software that sends AT commands to the modem, put 50 ms delays between succeeding command strings.

You cannot operate the modem with the Racal-Vadic and AT command sets at the same time. When you configure the modem with the AT command set, the modem does not set the corresponding Racal-Vadic options to the same values. For example, if you set CXR to normal in AT operation, CXR remains unchanged in Racal-Vadic operation. You can enter Racal-Vadic operation with the command <CTRL> E, but the modem resets some AT options to their default values.

You cannot issue AT commands from the modem's front panel. In AT operation, the modem responds to the <RESET> key only. <RESET> resets the modem's options to their last saved configurations.

Some AT commands, and memory locations called S registers, let you store optional settings so you can configure the modem to your application.

These procedures assume that you set the modem to display word messages on the screen.

### HOW TO BEGIN AT OPERATION

1. Set your terminal or computer to send 10-bit ASCII data at 9600 bps.
2. Type AT <RETURN>. The screen displays:

```
AT
OK
```

The OK prompt indicates that the modem is ready to receive AT commands.

### THE AT COMMANDS

The 9600VP supports most Hayes AT commands. If the modem does not support a command, it still responds with the OK prompt so your communication software does not lock up.

Some AT commands have the suffix *n*. These commands have optional settings, and you can configure them to your system's requirements. To change an option, type the command with a setting number in place of the suffix *n*. If you type a command without a setting number, the modem issues the command with setting 0. For example, if you type *ATE*, the modem issues the command *ATE0*. An asterisk (\*) identifies a command's default setting.

## **A Answer**

The command A selects manual answering, and switches the modem from voice to data communication. It forces the modem to go off hook (connect to the telephone line) and send an answer tone.

## **A/ Re-Execute Last Command**

The command A/ re-executes the last command entered. Do not use the AT prefix with this command.

## **AT Attention**

The command AT is the prefix to most other commands. To begin AT operation, type AT <RETURN>. The modem is ready to receive AT commands from your keyboard.

## **D Dial**

The command D dials the number that follows the D. The telephone number, including all dialing modifiers and punctuation, can be up to 40 characters long.

## **DS Dial Stored Number**

The command DS dials the telephone number that has been stored in the modem with the command AT&Z.

## **En Local Echo**

The command En controls local echo. At startup, local echo is on, and each command you type appears on your screen. If your computer or terminal also echoes characters, the screen displays double characters (AT looks like AATT) when you issue commands. Type ATE or ATE0 to turn off local echo. Local echo only affects the screen display when you issue commands; the modem does not transmit double characters. This command has two options:

- E0** Disables local echo
- E1\*** Displays command characters at the computer or terminal

## **Hn Hook**

The command Hn makes the modem go on hook or off hook. This command has two options:

- H0** Makes the modem go on hook
- H1** Makes the modem go off hook

## **I Product Code**

The command I requests the 3-digit product code stored in memory. Some communications programs read the product code to set the appropriate data speed.

## **O On-Line**

The command O causes the modem to go on-line. Use this command only after a semicolon to ready the modem to accept commands after it goes on-line.

## **P Pulse Dial**

The command **P** selects pulse dialing. Type *ATDP* to pulse dial a number. You may insert the dialing modifier **P** at any point in a telephone number to change the dialing method. Enter this dialing modifier after the dialing command **D**.

## **Qn Quiet**

During normal operation, the screen displays modem response messages. The command **Qn** enables or disables the response messages. If you use a communications program that sends other response messages, use the command *ATQ1* to turn the modem's messages off. This command has two options:

- Q0\*** Sends response messages to the screen
- Q1** Does not send response messages to the screen

## **Sn? Read S Register**

The command **Sn?** displays the contents of **S** register **n**.

## **Sn=x Write to S Register**

The command **Sn=x** changes the setting of **S** register **n** to the value **x**.

## **T Tone Dial**

The command **T** selects tone dialing. Type *ATDT* to tone dial a number. You may insert the dialing modifier **T** at any point in a telephone number to change the dialing method. Enter this dialing modifier after the dialing command **D**.

## **Vn Response Type**

The command **Vn** controls whether the screen displays response messages as words or as numbers. This command has two options:

- V0** Screen displays response messages as numbers followed by a carriage return. For example, 0 <RETURN>.
- V1\*** Screen displays response messages as words preceded and followed by a carriage return and line feed combination. For example:  
CR LF OK CR LF.

## **W Wait for Dial Tone**

Some telephone services, such as a PBX, answer a call with a dial tone. The command **W** causes the modem to wait for a dial tone before it continues dialing. Register **S7** determines the length of the wait.

### Xn Response Message Set

After the modem executes a command, it sends a message to the terminal. The command Xn controls the set of response messages to be sent. Use the command Vn to select number or word messages. This command lets you select from five sets of messages sent from both originating and answering modems (answering modems can send messages 1, 2, and 3). (See table 5-1 for AT response messages.)

- X 0 Enables messages 0-4
- X 1 Enables messages 0-5, 96
- X 2 Enables messages 0-6, 96
- X 3 Enables messages 0-5, 7, 96
- X 4\* Enables messages 0-7, 96
- X 9 Enables messages 0-99

**Table 5-1. AT Response Messages**

Response Message		Meaning
Character	Word	
0	OK	Command line executed as entered (with no errors) or command line was ignored
1	CONNECT	Carrier detected at 300 bps
2	RING	Ring signal detected from an incoming call
3	NO CARRIER	Carrier lost or never detected
4	ERROR	Error in command line; invalid command; command line exceeds 40-character maximum
5	CONNECT 1200	Carrier detected at 1200 bps
6	NO DIAL TONE	No dial tone detected during dialing (for a period exceeding value in S6 register; factory setting is 2 seconds)
7	BUSY	Busy tone detected during dialing
8	NO ANSWER	Used in conjunction with @ dial modifier
96	CONNECT 9600	Carrier detected at 9600 bps
97	SELECT SPEED UNAVAILABLE	Remote modem doesn't support the speed selected
99	ERROR CONTROL	Connection made with error control

## **Z Software Reset**

The command Z changes modem settings to the values stored in permanent memory. Some option settings and S register settings are not stored in permanent memory. This command resets these options and S registers to the default values in ROM.

## **, Pause**

The comma command causes the modem to pause during dialing. Use this dialing modifier to dial through an office telephone system when you have to wait for an outside line. The default pause is two seconds; register S8 controls the length of the pause.

## **; Force Command Readiness**

The semicolon command keeps the modem interactive with the terminal or computer after dialing, without disconnecting from the telephone line. Use this dialing modifier at the end of a command line. (You can send the command ATO after a semicolon to put the modem on-line for data communication.)

## **+++ Escape Code**

The command +++ forces the modem off-line when combined with ATH <RETURN>. To go on hook, follow the escape code with ATH or ATZ. Do not type AT before the escape code, or <RETURN> after the escape code. Do not send data for one second before and after issuing the escape code.

## **@ Wait for Quiet Answer**

Some telephone services answer a call without an answer tone. Use the dialing modifier @ to make the modem wait for five seconds of silence, then dial the rest of the number. If the modem does not detect a quiet answer, the screen displays:

```
NO ANSWER
```

## **! Hook Flash**

Hook flash means to press the switch hook briefly. Some office telephone systems use a hook flash to transfer calls. Use the dialing modifier ! in a dial command to make the modem hook flash for one-half second.

## **&Cn Carrier**

Some computers and most terminals need CXR ON to interact with the modem. In asynchronous operation, the command &Cn controls the CXR signal.

**&C0\*** Forces CXR ON

**&C1** CXR follows true carrier (necessary for most personal computer software packages)

### **&Dn Data Terminal Ready**

In asynchronous operation, the command &Dn determines the function of the DTR signal. The terminal sends DTR to the modem when it is connected and ready to operate. The modem can operate automatically only when DTR is ON. If a communications program uses DTR to control the modem, use this command to set DTR. The CXR pin follows Computer Systems Interface (CSI) rules. This command has four options:

- &D0\*** Forces DTR ON
- &D1, &D2, &D3** Modem goes on hook and disables auto-answer when DTR goes LOW. Raising DTR enables auto-answer. Use this setting to enable a DTR disconnect.

### **&F Fetch Factory Options**

The command &F loads the factory settings contained in ROM into RAM.

### **&W Write Active S Registers**

The command &W saves the current settings of registers S0, S14, S18, S21, S22, S23, S25, and S27 in permanent memory.

### **&Z Store Telephone Number**

The command &Z stores up to 40 characters in permanent memory.

### **\*Cn Speed Conversion**

The command \*Cn enables or disables speed conversion. With speed conversion enabled, the modem converts data coming from the remote modem to the speed of your computer or terminal. This command has two options:

- \*C0\*** Disables speed conversion
- \*C1** Enables speed conversion

### **\*Dn DSR Control**

The command \*Dn controls the state of the DSR signal. This command has two options:

- \*D0\*** DSR forced on
- \*D1** DSR normal

### **\*Fn Flow Control**

The command \*Fn establishes the flow control to be used between the modem and the computer or terminal. (See Appendix B for flow control methods.) This command has five options:

- \*F0** No flow control
- \*F1** XON/XOFF send only (local)
- \*F2** CTS/RTS
- \*F3** CTS/DTR
- \*F4** XON/XOFF (passthrough)
- \*F5\*** XON/XOFF send and receive (local)

### **\*Hn Flow Control Protocol**

The command **\*Hn** selects the flow control protocol. If you use this option, set both modems to **\*H1**. Set the command **\*F1** on the minicomputer side, and set the command **\*F5** on the personal computer side. This command has two options:

- \*H0\*** Transparent protocol
- \*H1** H-P ENQ/ACK protocol

### **\*Ln Force/Hunt**

The command **\*Ln** controls the modem's speed. **\*L0** instructs the modem to hunt for the highest obtainable speed, and **\*L1** forces the modem to connect only at the initialized speed. This command has two options:

- \*L0\*** Hunt
- \*L1** Force

### **\*Rn Redial Last Number**

The command **\*Rn** redials the last telephone number *n* times (from 1 to 9), or until the modem establishes a connection. The command **AT\*R** causes one redial. The last number dialed is not stored in permanent memory but is lost when power is off.

## THE COMMAND LINE

You can configure the modem's settings and dial a telephone number with a command line. A command line consists of the prefix AT, one or more AT commands, and a <RETURN>. The prefix and AT commands can be either all upper case or all lower case. For example, ATDT1234567 <RETURN> or atdt1234567 <RETURN>. A command line can contain any combination of up to 40 characters, including individual AT commands, the characters \* and #, and the digits 0 through 9. You may use spaces, parentheses, or hyphens to make a number easier to read—the dialer ignores them. (Parentheses and hyphens count as characters in the 40-character limit; spaces do not count.) For example, the following command line disables local echo, selects single-character response messages, and tone dials a telephone number: AT E0 V0 DT 123-4567 <RETURN>.

AT	=	The AT command prefix
E0	=	Disables local echo
V0	=	Selects single-character response messages
D	=	The command to dial a telephone number
T	=	A dial modifier that tells the modem to tone dial the number
123 4567	=	The telephone number

## STORING OPTION SETTINGS IN MEMORY

### How To Save a Setting in Permanent Memory

After you configure the modem's settings, you can save the new settings in permanent memory. To save the settings, type *AT&W*. The new settings remain in effect when you turn off the modem.

### How To Reset All Settings to the Settings in Permanent Memory

After you change the modem's settings, you can reset the modem to the settings previously saved in memory. To reset the modem, type *ATZ*.

### How To Reset All Settings to Their Default Values

To reset the modem's Random Access Memory (RAM) to the default option settings, type *AT&F*. The RAM loses its settings when you turn the power off.

### How To Save All Default Option Settings in Permanent Memory

To save the modem's default settings to memory, type *AT&F&W*. The default settings remain in effect when you turn off the modem, or when you enter the command *ATZ*.

## STORING TELEPHONE NUMBERS IN MEMORY

### How To Store a Telephone Number

You can store one telephone number (no longer than 40 digits) in nonvolatile memory. To store a number, type *AT&Z*, the telephone number (including dialing modifiers), and <RETURN>. For example: *AT&Z T 123-4567 <RETURN>*. A telephone number stored in memory remains there even if power is off.

## DIALING WITH AT COMMANDS

The 9600VP dials and redials automatically. When executing a dial command, the modem identifies the terminal's speed and parity, then automatically dials the telephone number.

### How To Dial a Telephone Number

Type *ATD*, the telephone number, and *<RETURN>*. For example, to dial 123-4567, type *ATD 123-4567 <RETURN>*.

*NOTE: If you press any key on your computer or terminal during dialing, or while waiting for the remote modem to answer, the modem stops dialing and goes on hook. The screen displays:*

NO CARRIER

If the modem detects CXR from the remote modem within 30 seconds, the screen displays:

CONNECT

and the speed transmission (except when set to response message code X0). For example:

CONNECT 9600

If there is no CXR from the remote modem within 30 seconds, the screen displays:

NO CARRIER

and the modem remains interactive with the terminal.

If you enter an incorrect command line, the modem resumes waiting for commands. For example, if you type *AT 123-4567 <RETURN>* the screen displays:

ERROR

In this example, an error occurs because no D command precedes the telephone number.

### How To Dial the Number Stored in Memory

Type *ATDS <RETURN>*. The modem dials the stored number. The screen displays the number:

T 123-4567

## OPTIONAL DIALING FUNCTIONS

### How To Dial Tandem Numbers

A tandem telephone number has two or more sequences of numbers that must be dialed in succession. For example, PBX switchboards often require you to dial an access number (usually 9) to get an outside line. To make the modem pause before dialing the next digit, insert a comma in the command line. For example, to get an outside line before dialing 123-4567, type `ATDT 9 , 123-4567 <RETURN>`. This command causes the modem to tone dial 9, pause two seconds, then tone dial 123-4567. You can insert more than one comma to increase the pause. For example, three commas cause a 6-second delay: `ATDT 9 ,, , 123-4567 <RETURN>`. Register S8 controls the length of the pause.

To make the modem wait for dial tone, insert `W` in the command line: `ATDT 9 W 123-4567 <RETURN>`.

To make the modem wait for five seconds of silence instead of a tone, insert `@` in the command line: `ATDT 9 @ 123-4567`.

### How To Blind Dial

Use blind dialing if your telephone system has a nonstandard dial tone. Some rural telephone systems and office PBXs have nonstandard dial tones, and require you to dial a digit (usually 9) to get an outside line. In blind dialing, the modem does not wait for the dial tone before dialing. Insert commas in the command line to cause a delay when the modem would normally pause for the dial tone. To prepare the modem for blind dialing:

1. Turn off the dial-tone detector and the corresponding response messages. Type `ATX0 <RETURN>`, `ATX1 <RETURN>`, or `ATX3 <RETURN>`.
2. Insert one or two commas in the telephone number to make the modem pause during the nonstandard dial tone. For example, `ATD 9 , 123-4567 <RETURN>`.
3. If the screen displays

`NO CARRIER`

insert another comma. Add commas until the modem can place the call.

### How To Tone Dial and Pulse Dial

To tone dial a telephone number, insert `T` before the number in a dialing command. For example, `ATDT 123-4567 <RETURN>`. To pulse dial a telephone number, insert `P` before the number in a dialing command. For example, `ATDP 123-4567 <RETURN>`. If you do not insert `P` or `T`, the modem dials with the method it used last.

You can dial some digits with pulse dialing and other digits with tone dialing. For example, in `ATDT 9 P 123-4567 <RETURN>`, the modem tone dials 9 and pulse dials the remaining numbers.

### How To Redial

To redial the last telephone number dialed, type `AT*R <RETURN>`. If you want the modem to redial the number several times, type `AT*Rn <RETURN>`, where *n* is the number of times (1 to 9) to redial the number.

### How To Repeat the Last Command Executed

The command `A/` re-executes the last command in the buffer. If your last command was to dial a telephone number, you can use `A/` to redial. For example, if you type `ATD 123-4567 <RETURN>` and receive a NO CARRIER message, type `A/` to redial the number. This command does not require the AT prefix or a `<RETURN>`.

### How To Dial Manually

Type `ATH1 ATO <RETURN>`, then dial the telephone number. The screen displays:

CONNECT

## AUTO-ANSWERING

The modem does not answer incoming calls until you enable auto-answer with the command `ATS0=n`. This command sets the modem to answer a call after *n* (1 to 255) rings. The modem answers an incoming call, determines the speed of the calling modem, and prepares to communicate data. For example, if you type `ATS0 = 1 <RETURN>`, the modem answers a call after one ring. The front panel `<ANS>` key does not need to be on during AT operation; only the `<RESET>` key operates during AT operation.

## DISCONNECT COMMANDS

### When the Modem Disconnects from the Telephone Line

The modem disconnects from the telephone line if:

- It fails to connect to the remote modem you call.
- It detects carrier from the remote modem (for example, when the remote modem hangs up).
- You enter the escape (+++) and the hook (ATH) commands.
- You turn off or unplug the modem.
- You turn off the computer or terminal when `AT&D2` is set. (This causes a loss of DTR signal.)
- You press the front panel `<RESET>` key.

### How To Stop Transmitting

To stop transmitting manually, type the escape character sequence `+++`. The modem remains ready to receive commands. The screen displays:

OK

### How To Disconnect from the Telephone Line

Wait until the screen displays `OK`, then type `ATH <RETURN>`, or `ATZ <RETURN>`. `ATZ` resets options to their last saved (`&W`) settings.

*NOTE: When a log-off sequence causes DTR to go low and disconnect the answer modem, the originate modem will wait approximately 20 seconds before disconnecting.*

## S REGISTERS

The S registers are memory locations that contain optional setting values for the AT command set. You can change most S register values with a command, and save some values in memory. When the power is off, the modem saves only S register values stored in memory.

### How To Display an S Register Value

To display the current value of an S register, type *ATSn?* <RETURN>, where *n* is the S register number. For example, to display the value of register S2 (Escape Character), type *ATS2?* <RETURN>. The screen displays:

```
043
OK
```

### How To Change an S Register Value

To change the value of S register, type *ATSn=x* <RETURN>, where *n* is the number of the S register and *x* is the setting value. For example, to set register S0 to prevent auto-answer, type *ATS0=0* <RETURN>. The screen displays:

```
OK
```

### How To Store an S Register Value in Memory

To store the values of an S register in memory, type *AT&W* <RETURN>. Only S registers S0, S1, S14, S18, S21, S22, S23, S25, and S27 can be stored in memory.

### How To Reset S Register Values

To reset the S register values to the values stored in memory—type *ATZ* <RETURN>. (Some S register values can be changed, but not stored in nonvolatile memory. The command ATZ returns these registers to their factory-set values.)

To return all S registers to their factory-set values—type *AT&F* <RETURN>.

To save the factory-set values in memory—type *AT&F&W* <RETURN>. The factory-set values will be in effect whenever the modem is turned on.

### Bit-Mapped S Registers

Bit-mapped S register values change automatically when you enter commands and when you use the front panel keys. If a user inadvertently resets a bit-mapped S register, the modem accepts the command, but does not change the value or send an ERROR message.

## S REGISTER DESCRIPTIONS

### S0 Auto-Answer

This register enables and disables auto-answer and determines the number of rings the modem must detect before answering. When set to zero, the modem does not answer the telephone. <ANS> switches S0 between 1 and 0.

Range: 0 to 255 rings

Factory setting: 0 rings (automatic answer off)

### S1 Ring Counter

This register counts the rings detected by the modem during an incoming call. It resets to zero if no ring occurs after eight seconds. When the number of rings in S1 matches the value in S0, the modem answers the call.

### S2 Escape Character

This is the escape feature setting. It is not programmable.

Factory setting: 043 (+) ASCII

### S3 Carriage Return

This is the character that the modem recognizes as a carriage return.

Factory setting: 13 (CR)

### S4 Line Feed

This is the character that the modem recognizes as a line feed.

Factory setting: 10 (LF)

### S5 Backspace

This is the character that the modem recognizes as a backspace.

Range: 0 to 32

Factory setting: 8 (BS)

### S6 Dial Tone Delay

This register determines how long the modem waits to blind dial after going off hook after the commands ATX0, ATX1, or ATX3. The default wait is two seconds. The commands ATX2 and ATX4 override S6 and cause the modem to wait for a dial tone.

Range: 1 to 255 seconds

Factory setting: 2 seconds

If the modem fails to detect dial tone in five seconds, the screen displays:

NO D IAL TONE

*NOTE: The dialing modifier W in the dial command overrides register S6. The failed-call timer (register S7) sets how long the modem waits for dial tone.*

### **S7 Carrier Wait Time (Failed Call Timer)**

After dialing or answering a call, the modem must receive the carrier (CXR) signal. This register sets the time (in seconds) that the modem will wait for CXR. If it does not receive a true carrier signal within the set time, the screen displays:

NO CARRIER

Range: 0 to 255 seconds

Factory setting: 30 seconds

This register also sets the duration of the W dial modifier.

### **S8 Comma Pause**

This register sets the length (in 1-second increments) of a pause caused by a comma in a dialing command.

Range: 0 to 255 seconds

Factory setting: 2 seconds

### **S9 Valid Carrier Signal (Carrier Timer)**

This register sets the time (in 1/10-second increments) that the modem receives a steady carrier signal before it recognizes the carrier as valid.

Range: 6 to 255 tenths of a second

Factory setting: 6 tenths of a second (600 milliseconds)

### **S10 Loss-of-Carrier Disconnect (Carrier Off Delay)**

The modem sends and receives data along the carrier signal. If the modem loses the carrier signal for a set time, the modem disconnects. This register sets the time (in 1/10-second increments) that carrier can be lost before the modem disconnects. This value must be greater than the value of S9, or any carrier loss will cause a disconnect.

Range: 2 to 255 tenths of a second

Factory setting: 14 tenths of a second (1.4 seconds)

### **S11 Not used**

### **S12 Escape Character Guard Timer**

This register sets the guard time before and after the escape character +++.

Range: 2 to 255 1/50 second

Factory setting: 50 1/50 second (1 second)

### **S13 Not used**

### **S14 Option Settings Register**

Bit mapped

### **S15 Flag Register**

Bit mapped

**S16 Not used**

**S17 Not used**

**S18 Not used**

**S19 Not used**

**S20 Not used**

**S21 Options Settings Register**  
Bit mapped

**S22 Option Settings Register**  
Bit mapped

**S23 Option Settings Register**  
Bit mapped

**S24 Not used**

**S25 Delay to DTR**  
This register controls the delay to DTR.  
Range: Fixed  
Factory setting: 0.05 seconds

**S26 Not used**

**S27 Option Settings Register**  
Bit mapped



## Chapter 6 TROUBLESHOOTING

Data communication involves software, hardware, and cable connections. If your modem does not work properly, the problem is probably an incorrect setting or interface. Although the default option settings are suitable for most terminals, an option setting will cause problems if it is incorrect for your application. You can resolve many problems by checking your system's communications settings. The following settings commonly cause problems:

- Parity
- Character length
- Terminal speed
- Synchronous or asynchronous transmission
- Terminal set to local copy (local echo)
- Flow control
- EIA settings (CXR, DSR, DTR, and CTS)

### POSSIBLE MODEM PROBLEMS AND SOLUTIONS

The following trouble-shooting procedures help you to isolate problems. You will check software and hardware settings and connections. If the modem still does not work properly, conduct the tests in Chapter 7.

#### The Modem Does Not Respond to Commands

- Make sure that your terminal or computer software is set to 9600 bps.
- Change the communications port setting in the communications software. If you are using an Apple® II+ or an Apple IIe, make sure that you have selected the right slot.
- Type on the keyboard and see whether the modem's TXD light comes on. If it does not come on, then your settings are incorrect, the terminal or RS-232-C cable doesn't provide RTS, option 21 is set to 2, or option 3 is set to 1.
- Open the RS-232-C connector at the modem end. If pin 4 has no wire, get an RS-232-C cable with a wire for RTS.
- If typing on the keyboard causes the TXD light to come on, type <CTRL> E <RETURN>, then type on the keyboard again and see whether the RXD light comes on. If the RXD light comes on, the modem responds to commands, but option 3 is set to setting 1, CXR normal. Press <RESET>. Press <SYNC> so the SYNC light comes on. Press <SYNC> again so the SYNC light goes off. Type <CTRL> E <RETURN>, or AT <RETURN> for AT operation. The screen should display HELLO: I'M READY or AT. (In AT operation, type AT&F&W to restore and save default option settings.)

#### The Screen Does Not Display What You Type

Enable Local Copy by changing option 5 to its default setting 1. (The equivalent AT command is ATE1.)

#### The Screen Displays Double Characters

Disable Local Copy by changing option 5 to setting 2. (The equivalent AT command is ATE0.)

### **Your Modem Is Off-Line, but Your Communications Program Functions As If the Modem Is On-Line**

Enter terminal emulation with your communications software. Change CXR to normal by setting option 3 to setting 1. In AT operation, type *AT&C1&W*.

### **The Screen Displays Unusual Characters or the Modem Locks Up**

- Check the communication settings of your communications software or terminal.
- Check that the modem front panel is set to the proper data format. For asynchronous operation, the SYNC light must be off.
- On the answering modem, set option 17 to setting 2 (or *AT\*F1&W*), and on the originating modem, set option 17 to setting 6 (or *AT\*F5&W*) if you use XON/XOFF flow control.

### **Character Echo Delay**

A small amount of character echo delay is normal for error-controlled modems. If you communicate over a noisy line with a system that supports 9600VP error control, you may notice delays while the modems retransmit data blocks. The EC light flashes off with error retransmission.

### **The Modem Does Not Answer Incoming Calls**

- Force DTR ON (if it is not supplied by the terminal or computer) by changing option 22 to setting 2 (or *AT&D0*).
- Set option 4 to setting 1 to enable auto-answer. The front panel ANS key light must be on.
- In AT operation, enable auto-answer with *ATSO=1*. Type *AT&W* to save this setting in nonvolatile memory.

### **The Modem Will Not Dial**

- Connect a telephone to the wall jack to verify a dial tone. If you hear a dial tone, ensure that the telephone cable supplied with the modem has been inserted into the TELCO jack in the modem.
- If you do not hear a dial tone, your telephone or telephone line is out of order. Try another telephone or telephone wall jack.
- Connect a telephone to the modem's TELSET jack and listen for dial tone.
- If dial tone is present, it is probably nonstandard. Change option 7 to setting 2. For AT operation, use the command *ATX0&W*.

### **You Can Dial a Number, but Cannot Communicate Properly**

- The other system may be faulty. Try calling a different system.
- The other system may not be able to accept 9600 bps. Try 1200 bps.
- Check that the modem and DTE flow control settings match.
- Dial the number with a telephone to be sure that a modem answers with a 10- to 15-second answer tone. If the answer tone is very short, change option 3 to setting 1 and option 2 to setting 3 (or *AT&C1\*D1&W*) on the answer modem.
- If you are dialing through a PBX system, be sure to use the number required (8 or 9) to get an outside line.

### **The Modem Answers Calls Intermittently in Asynchronous Operation**

A computer system can send data to the modem when it is idle. If the data contains the characters "AT" (as in the word "DATA"), the modem goes into AT operation causing the modem not to answer (the default is S0=0). To check whether this has happened, call into the modem with a telephone. Watch the ring indicator on the answering modem. If the RXD light goes on, off, on, the modem has gone into AT operation. If this happens, set the modem options to keep it in AT operation.

A suggested modem setup on the answer-side 9600VP is:

```
AT&C1&D2*F1*D1E0V0Q1S0=1&W<RETURN>
```

The screen will not display an OK message, because Q1 is set.



## Chapter 7 TESTING

If the modem does not operate correctly after trouble-shooting, use the built-in tests to isolate the problem. An occasional error, shown by an incorrect character on the screen, or a flash of the EC light, does not necessarily indicate a serious problem. If the modem is faulty, call Racal-Vadic for service.

### TEST PROCEDURES

The modem runs tests at 1200 bps and 300 bps asynchronously for better diagnostic information.

#### Before You Run a Test

1. Disable speed conversion at both modems. Change option 18 to setting 1, the default setting.
2. Be sure that the modem is idle. If necessary, press <RESET>, or type / <RETURN> at the asterisk prompt.
3. Set the speed of the terminal or computer to 1200 or 300 bps, depending on the speed at which the test is to be run.
4. Press <SPEED> until its red indicator goes on (for 1200 bps) or off (for 300 bps).
5. If the test requires you to connect with another modem, dial with the Racal-Vadic protocol <CTRL> E, or manually with a telephone.

These symbols represent the indicator lights:



9600VP-009A

If the remote site has an operator, use the tests shown in Figure 7-1. If the remote site does not have an operator, use the tests shown in Figure 7-2. Perform the tests in the order shown to isolate the problem. The solid lines show the area being tested. The broken lines show the area previously tested. When a test indicates errors, the problem probably lies in the area shown by the solid line.

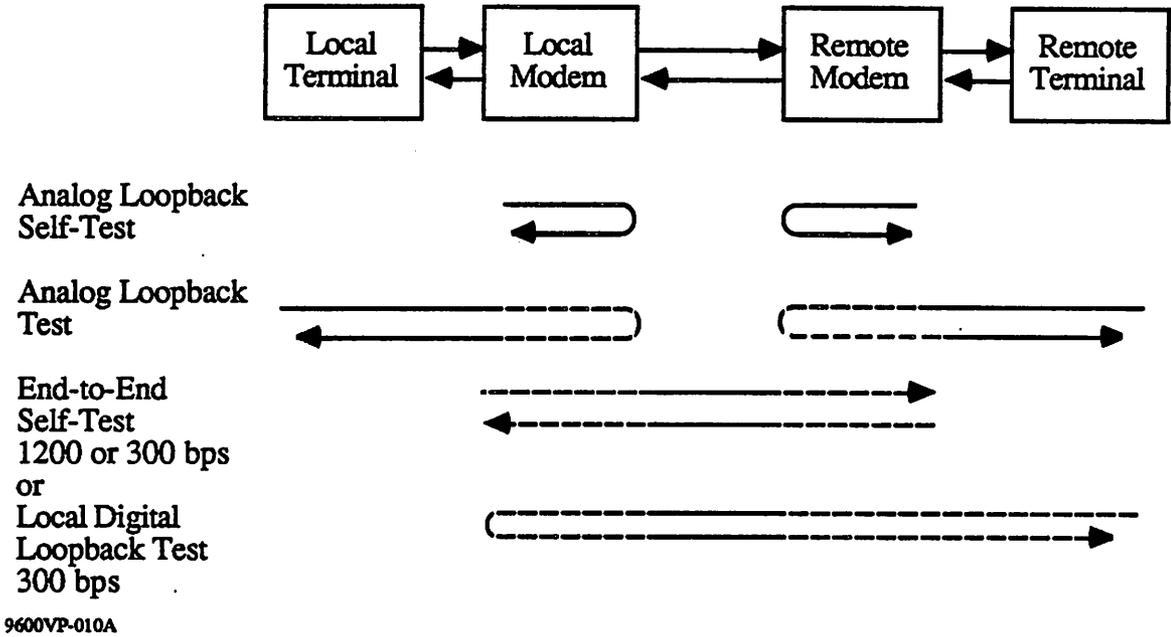


Figure 7-1. Test Sequence with a Remote Operator

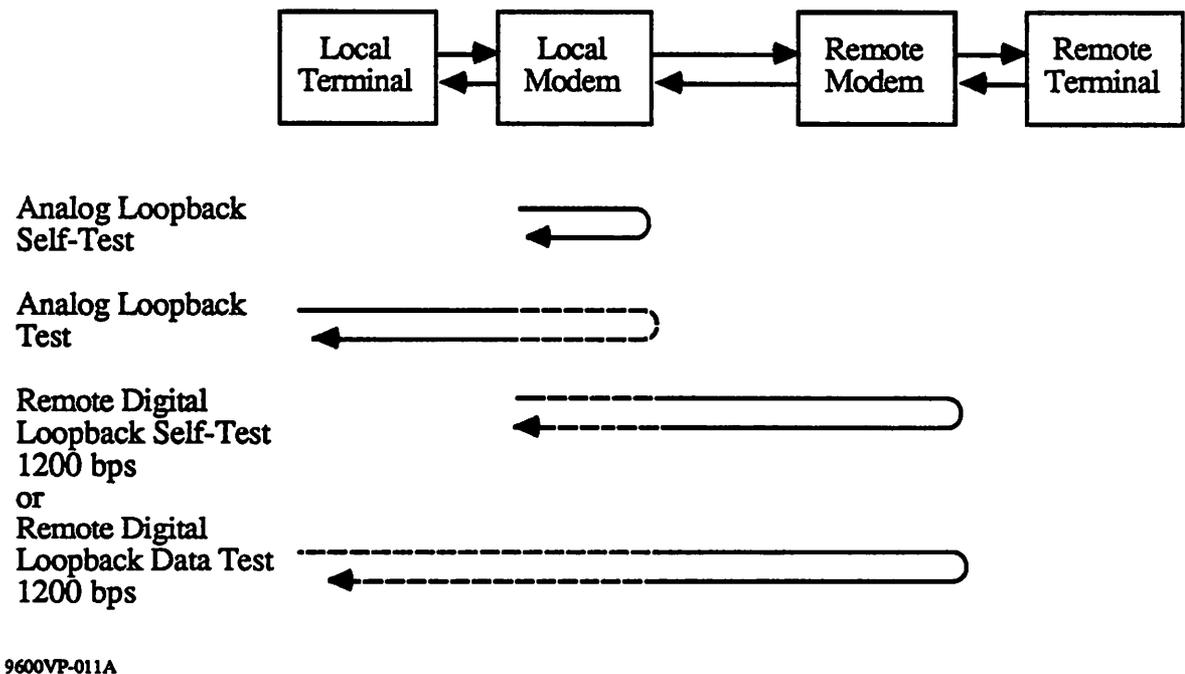
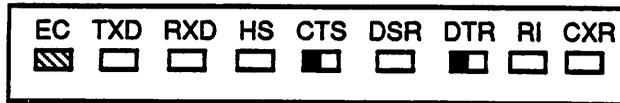


Figure 7-2. Test Sequence without a Remote Operator

## AUTOMATIC SELF-TEST

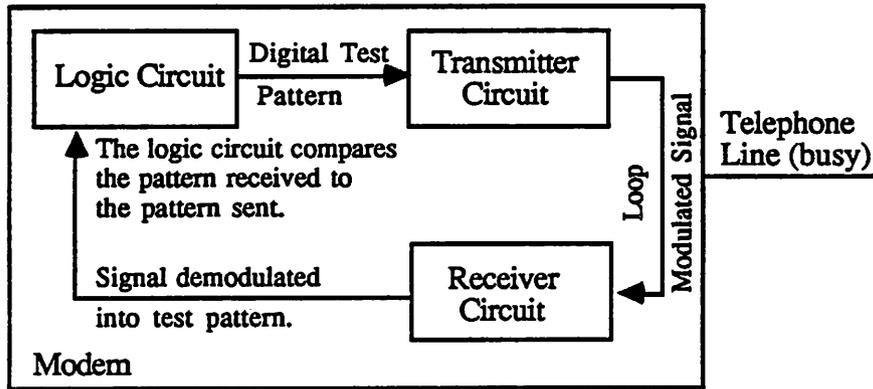
When the modem is idle, it tests itself automatically. The automatic self-test checks the transmitter, receiver, and microprocessor circuits. When the modem detects an error, the EC light flashes briefly:



9600VP-012A

## ANALOG LOOPBACK SELF-TEST

The analog loopback self-test (Figure 7-3) checks the modem's transmitter and receiver. The modem sends a test pattern through its transmitter and receiver, and compares the pattern received with the pattern transmitted. If there is an error, the EC light flashes on briefly. During this test, incoming callers receive a busy signal.



9600VP-013A

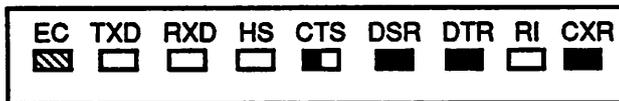
Figure 7-3. Analog Loopback Self-Test

### Procedure

1. For an asynchronous test, press <SPEED> until the SPEED light turns red (for 1200 bps) or goes off (for 300 bps).
2. Press <ALB>. The ALB light comes on.

*NOTE: The EC light flashes on briefly when the self-test turns on.*

3. Press <SELF TEST>. The SELF TEST light comes on. The indicator lights should look like this:

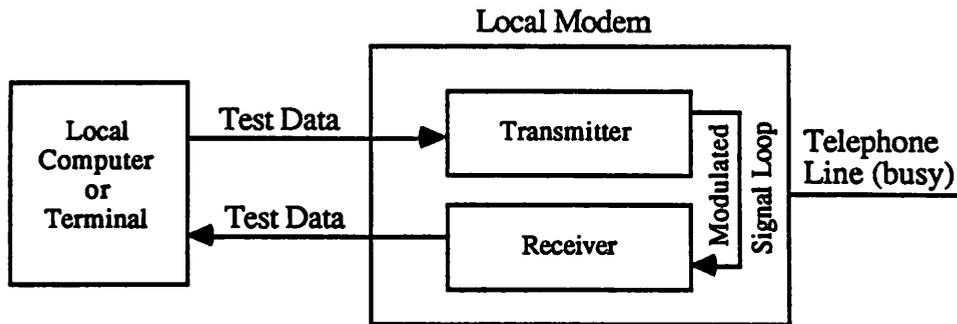


9600VP-014A

4. If the modem detects an error, the EC light will flash on briefly. An error indicates a faulty transmitter or receiver.
5. To end the test, press <RESET>, or <SELF TEST> and <ALB>.

## ANALOG LOOPBACK TEST

This test (Figure 7-4) checks the modem's transmitter, receiver, and terminal interface.

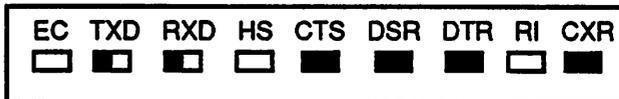


9600VP-015A

**Figure 7-4. Analog Loopback Test**

### Procedure

1. For an asynchronous test, press <SPEED> until the SPEED light turns red (for 1200 bps) or off (for 300 bps). Set your terminal to the modem speed (1200 or 300 bps).
2. Press <ALB>. The ALB light comes on. Incoming callers receive a busy signal. The indicator lights should look like this:

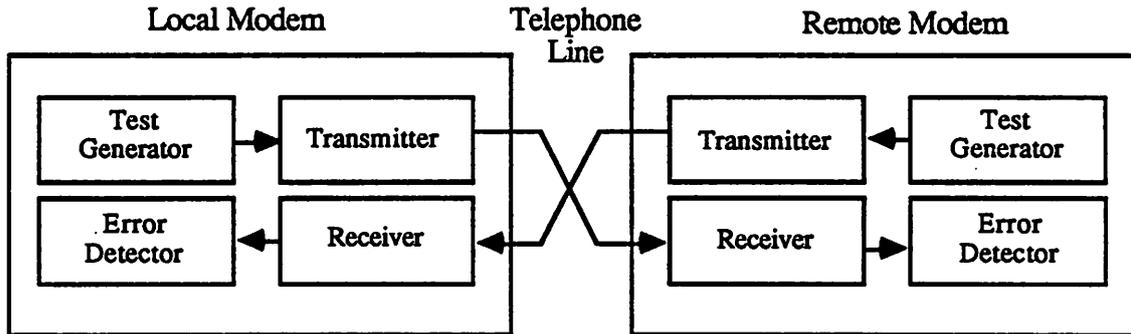


9600VP-016A

3. Type characters at the keyboard. The screen will display single or double characters, depending on whether or not your terminal echoes characters. Compare the characters on the screen to the characters you typed. For example, type *ABC*. If your screen normally displays characters, it should display:  
  
AABECC
4. If the data match, the terminal connection and modem are working properly. If the data do not match, check the RS-232-C cable. If it is connected properly, make sure that you have set the terminal to the proper settings.
5. To end the test, press <RESET> or <ALB>.

## END-TO-END SELF-TEST

This test (Figure 7-5) checks the local and remote transmitters and receivers, and the telephone line between them. Some Bell 103 modems cannot generate a test pattern. If you are communicating with such a modem, use the digital loopback data test instead of the end-to-end self-test.

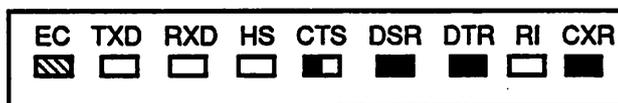


9600VP-017A

Figure 7-5. End-to-End Self-Test

### Procedure

1. Press <SPEED> until the SPEED light turns red (for 1200 bps) or off (for 300 bps).
2. Connect with the remote modem.
3. After connecting with the remote modem, press <SELF TEST> at the local modem. Have the remote operator press <SELF TEST> on the remote modem. The local modem indicator lights should look like this:



9600VP-018A

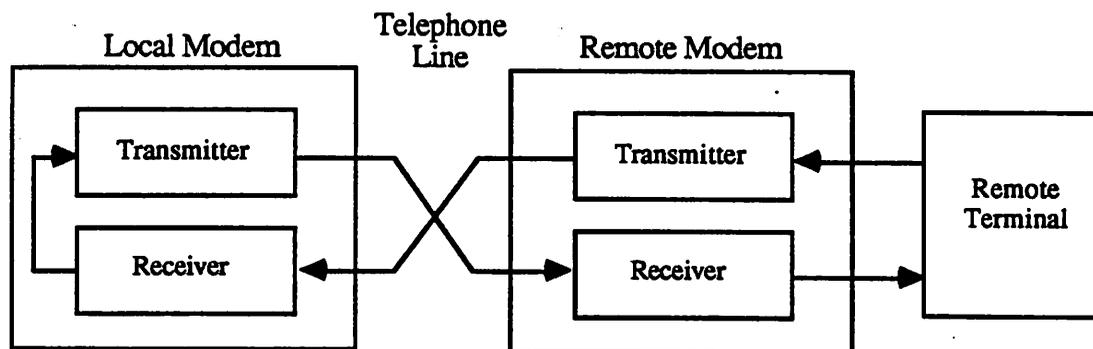
4. If the modem detects an error, the EC light will flash on briefly, then go off. An error indicates a faulty transmitter, receiver, or telephone line.

**NOTE:** The first modem to begin a self-test will display errors until the second modem begins a self-test.

5. To end the test, press <SELF TEST>, and have the remote operator press <SELF TEST> at the remote modem. The indicator lights should go off. The modems remain connected.
6. To return the modem to idle, press <RESET>.

## LOCAL DIGITAL LOOPBACK TEST (300 BPS)

This test (Figure 7-6) checks the transmitter and receiver of the local and remote modems, the telephone line, and the remote modem-to-terminal interface.

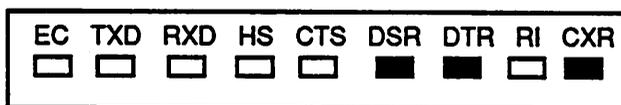


9600VP-019A

**Figure 7-6. Local Digital Loopback Test**

### Procedure

1. Set the speed of the terminal or computer to 300 bps.
2. Press <SPEED> until the SPEED indicator goes off.
3. Connect with the remote modem at 300 bps.
4. Press <DLB>. The indicator lights should look like this:

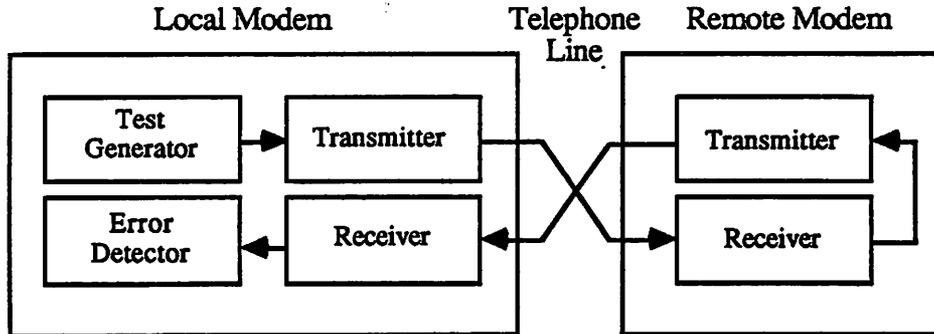


9600VP-020A

5. Have the remote operator type in characters at the remote terminal keyboard.
6. Have the remote operator compare the data received to the data typed in. Incorrect characters on the remote screen indicate errors. An error indicates a problem in either modem, in the telephone line, or in the remote modem-to-terminal interface.
7. To stop the test, press <DLB> until the DLB indicator goes off. The modems remain connected.
8. To return to idle, press <RESET>.

## REMOTE DIGITAL LOOPBACK SELF-TEST (1200 BPS)

This test (Figure 7-7) checks the transmitters and receivers of the local and remote modems and the telephone line in between.

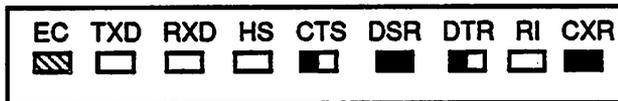


9600VP-021A

Figure 7-7. Remote Digital Loopback Self-Test

### Procedure

1. For asynchronous tests, press <SPEED> until the SPEED light turns red (for 1200 bps).
2. Connect with the remote modem at 1200 bps.
3. Press <DLB> so that the DLB light comes on. If the remote modem cannot respond to a DLB test, the DLB light will go off within a second.
4. Press <SELF TEST> so that the SELF TEST light comes on. The indicator lights should look like this:

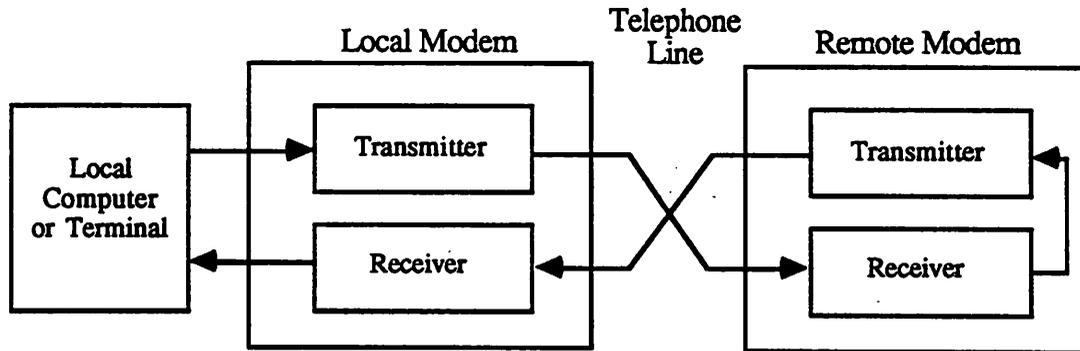


9600VP-022A

8. If the modem detects an error, the EC LED flashes on, then off. An error indicates a problem with either modem or the telephone line between them.
9. To end the test, press <SELF TEST> until the SELF TEST light goes off. Press <DLB> until the DLB light goes off. The modems remain on-line.
10. To return the modem to idle, press <RESET>.

## REMOTE DIGITAL LOOPBACK TEST (1200 BPS)

This test (Figure 7-8) checks the modem-to-terminal interface, the local modem, the telephone line, and the remote modem.

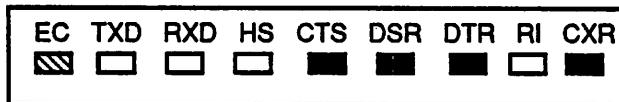


9600VP-023A

Figure 7-8. Remote Digital Loopback Test

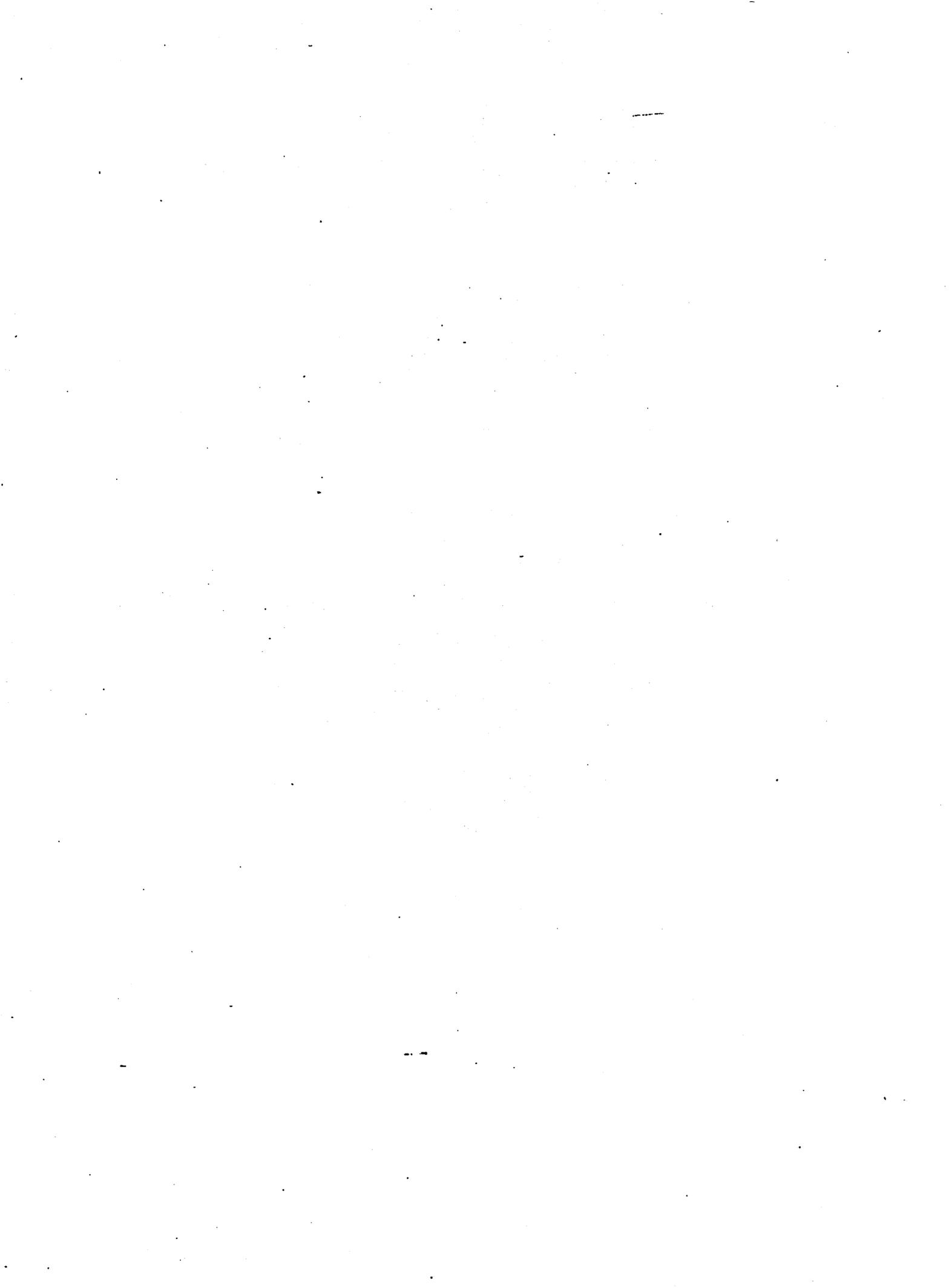
### Procedure

1. For an asynchronous test, press <SPEED> until the SPEED light turns red (for 1200 bps).
2. Connect with the remote modem at 1200 bps.
3. Press <DLB> until the DLB light comes on. If the remote modem cannot respond to a DLB test, the DLB light will go off within a second. The indicator lights should look like this:



9600VP-024A

4. Type characters at your terminal keyboard. Compare this data to the characters displayed on the screen. Errors appear as incorrect characters. An error indicates a problem with either modem, the telephone line, or the local modem-to-terminal interface.
5. To end the test, press <DLB> until the DLB light goes off. The modems remain on-line.
6. To return the modem to idle, press <RESET>.



**Appendix A**  
**EQUIPMENT CONNECTIONS**

**Table A-1. Terminal-to-Modem Interface (RS-232-C) Signals**

Pin No.	Racal-Vadic	EIA/Bell	Description
1	FG	AA	Protective Ground
2	TXD	BA	Transmit Data
3	RXD	BB	Receive Data
4	RTS	CA	Request To Send
5	CTS	CB	Clear To Send
6	DSR	CC	Data Set Ready
7	SG	AB	Signal Ground
8	CXR	CF	Carrier Detect
9	+V	+P	Testing Voltage
10	-V	-P	Testing Voltage
11	--	--	Not used
12	--	--	Not used
13	--	--	Not used
14	--	--	Not used
15	SCT	DB	Serial Transmit Clock
16	--	--	Not used
17	SCR	DD	Serial Receive Clock
18	--	--	Not used
19	--	--	Not used
20	DTR	CD	Data Terminal Ready
21	--	--	Not used
22	RI	CE	Ring Indicator
23	--	--	Not used
24	SCTE	DA	External Serial Transmit Clock
25	--	--	Not used

**Table A-2. Telephone Jack Pin Assignments**

<b>Modem Jack</b>	<b>TELCO Jack</b>	<b>Description</b>	<b>TELSET Jack</b>	<b>Description</b>
1	(nc)	No Connection	(nc)	No Connection
2	(nc)	No Connection	(nc)	No Connection
3	MI	Mode Indicator	MIC	Mode Indicator Common
4	Ring	Ring	Tip	Tip
5	Tip	Tip	Ring	Ring
6	MIC	Mode Indicator Common	MI	Mode Indicator
7	PR		(nc)	No Connection
8	PRC		(nc)	No Connection

## **Appendix B MODEM OPERATION**

### **9600 BPS OPERATION**

The 9600VP is an asymmetrical modem with a proprietary design that enables high-speed operation and fast keyboard response. The key features—Dynamic Duplex, Superset MNP error control, and dynamic fallback and fallforward—work together to reduce errors and provide optimum data throughput. At 9600 bps, these features give the modem a typical data throughput of approximately 8000 bps over normal telephone lines.

#### **Dynamic Duplex**

The Dynamic Duplex feature emulates full-duplex 9600 bps asynchronous transmission. It switches automatically between full-duplex, low-speed operation and half-duplex, high-speed operation to make optimum use of the bandwidth in the Public Telephone Switched Network (PTSN). In 9600 bps asynchronous operation, it begins transmitting at 1200 bps full duplex, and remains at that speed if its buffer does not fill. When its buffer fills (as it will during screen filling or large file transfers), the 9600VP switches to 9600 bps, allocating the entire bandwidth for efficient data transfer. After transmitting at high speed, the modems switch to full-duplex operation for the acknowledgment or retransmission messages.

The switching technique is transparent when one modem transmits a large amount of data and the other modem transmits only a small amount. This is typical of most data communication, except for switched network multiplexer applications, protocol file transfers (XMODEM, Kermit), and some mainframe-to-mainframe file transfers.

#### **Error Control**

Superset MNP (Microcom Networking Protocol) is an automatic and transparent error control protocol for asynchronous data communication. The modem transmits data in frames of 256 characters each. The modem sends a number of frames, then requests a signal from the remote modem acknowledging that it has correctly received the data. With selective retransmission, when an error occurs, the remote modem requests the 9600VP to retransmit only the frames in which errors occurred, then resumes transmitting where it left off.

#### **Dynamic Fallback/Fallforward**

The dynamic fallback/fallforward feature maintains the optimum data transmission rate. The 9600VP adjusts its transmission speed according to the number of errors detected. The number of errors typically decreases as line quality increases. A transmitting 9600VP in asynchronous 9600 bps operation automatically reduces its transmission speed to 7200, 4800, or 2400 bps in response to the number of errors detected.

A transmitting 9600VP counts the data frames that must be retransmitted. When this number exceeds a set limit, the transmitting modem signals the receiving modem to fall back (slow down) to 7200 bps. At the lower speed, the transmitting modem continues to monitor the number of retransmitted frames. If the error level still exceeds the limit, the modems fall back to 4800 bps and so on to 2400 bps. When the number of errors decreases, the transmitting modem signals the receiving modem to fall forward (speed up) to the next highest transmission speed. When the transmitting modem falls forward, it changes its equalization to compensate for the line noise that caused the fallback.

## FLOW CONTROL

During data communication with error control, data can overflow the modem's buffers and be lost unless the data flow stops. Flow control lets the modem and terminal signal each other to stop and start sending data. You can select out-of-band or in-band flow control methods. Determine which type of flow control your system supports, and which method will work best for your application. The wrong type of flow control will cause garbage characters, missing data, or a system lockup.

### Out-of-Band Flow Control

Out-of-band flow control methods use signals at the RS-232-C interface to start and stop the data flow. Use out-of-band flow control if your system supports it, because it eliminates problems encountered when transmitting binary files with in-band flow control. This modem supports RTS/CTS and DTR/CTS out-of-band flow control.

**RTS/CTS flow control**—uses signals on pins 4 (RTS) and 5 (CTS) of the RS-232-C interface. The modem lowers CTS to stop data flow from the terminal, and raises CTS to start the data flow. The terminal lowers and raises RTS to turn the data flow off and on at the modem.

**DTR/CTS flow control**—uses signals on pins 20 (DTR) and 5 (CTS) of the RS-232-C interface. The modem lowers CTS to stop data flow from the terminal, and raises CTS to start the data flow. The terminal lowers and raises DTR to turn the data flow off and on at the modem. Do not force DTR ON (option 22 setting 2) if you use DTR/CTS flow control.

### In-Band Flow Control

In-band flow control methods, also called XON/XOFF flow control, use ASCII control characters in the data stream to start and stop the data flow. The XON character DC1 (or <CTRL> Q) starts the data flow, and the XOFF character DC3 (or <CTRL> S) stops the data flow.

**XON/XOFF send-only local flow control**—is the most useful in-band flow control for a host computer. The modem sends flow control characters to its terminal, but does not respond to flow control characters received from the host computer. This prevents the modem from interrupting the data flow during binary file transfers if the data contains the ASCII characters DC1 and DC3.

Most personal computers cannot receive data constantly at 9600 bps. A personal computer receiving data at 9600 bps may have to stop the data flow. If the computer stops the flow at the remote terminal, but the modems continue to transmit the data in their buffers, the computer loses the data. Therefore, when you use a high-speed error-controlled modem, your computer must be able to control the flow of data from the modem, as well as from the remote terminal. Use one of the following:

**XON/XOFF send/receive local flow control**—is the most common in-band flow control method for remote personal computers or terminals. The computer sends XON/XOFF characters to the local modem. The modem responds to the XON/XOFF characters and controls the data flow, then it discards the flow control characters. This method is not suitable for transmitting binary files containing the XON and XOFF characters; the modem will respond to the characters and discard them, distorting the data.

**XON/XOFF send/receive passthrough flow control**—controls the data flow at both ends. The computer or terminal sends the flow control character to its modem. The modem stops the data flow to the computer and passes the XOFF flow control character through to the remote computer, which also stops transmitting data.

If your system or software requires in-band flow control, set the transmitting modem for XON/XOFF send-only local flow control (option 17 setting 2), and the receiving modem for XON/XOFF send/receive local flow control (option 17 setting 6).

## STATISTICS

Statistics allow you to monitor data traffic, system performance, modem performance, and line conditions. You can use statistics to determine the amount of data sent or received, and the number of times the modem or DTE has controlled the data flow. They let you calculate the average data frame size and the compression percentage, and analyze line conditions and the types of modem disconnections. The modem records statistics only when you originate or answer a call with another 9600VP in Racal-Vadic operation. The modem does not keep statistics on AT operation. The modem can display statistics for the last call or all statistics since its last reset. To display statistics, type *S* <RETURN>. The screen displays:

1. LAST CALL
  2. SUMMARY
  3. RESET
- WHAT NUMBER?

### Last Call Statistics

If you press 1 (Last Call), the screen displays the statistics of the last call. (See Figure B-1.)

K BYTES RCVD	0
K BYTES SENT	0
DCE FLOW CNTL	0
DTE FLOW CNTL	0
BYTE OVERFLOW	0
RETX FRAMES	0
RETX BYTES	0
COMPRESSION %	0
% OF BYTES AT 9600	0
% OF BYTES AT 7200	0
% OF BYTES AT 4800	0
% OF BYTES AT 2400	0
NORMAL DISCONNECT	0
RETX ON 1 FRAME	0
NO RESPONSE TIMER	0
OTHER	0

9600VP-025A

**Figure B-1. Last Call Statistics Display**

The K BYTES RCVD and K BYTES SENT counters keep track of K bytes (1024 characters per K) sent or received, up to 9 digits. When a question mark appears in the left-hand digit, the counter needs to be reset.

The DCE FLOW CNTL and DTE FLOW CNTL counters keep track of flow controls requested by the modem (DCE) and the terminal or computer (DTE). The counters count flow control requests in accordance with the setting of option 17. They count XON/XOFF characters for in-band flow control, and raised DTR and RTS/CTS signals for out-of-band flow control. Each counter has eight digits.

The BYTE OVERFLOW counter shows the amount of data lost by the transmitting modem. When the modem flow controls the terminal or computer, it can accept up to 80 bytes. If it receives more data, it throws away the 81st byte and records 1 on the counter. The byte thrown away never reaches the buffer; it is lost. This counter has eight digits and records only on the transmitting modem.

The RETX FRAMES and RETX BYTES counters record data sent, but not correctly received, and retransmitted. For a rough estimation of the average size of a data frame, divide the bytes retransmitted by the frames retransmitted. A larger data frame is more efficient. The maximum frame size is 256 bytes. Each counter has eight digits and works only on the transmitting modem.

The COMPRESSION % counter gives the ratio of data received (Data In or DI) to data sent by the modem (Data Out or DO) by the transmitting modem. The formula for the compression percentage is:

$$\text{COMPRESSION \%} = \frac{\text{DI} - \text{DO}}{\text{DI}} \times 100$$

For example, when the modem sends (DO) 8 bytes for every 10 that it receives (DI), it has a data compression percentage of 20%. When the modem sends 5 bytes for every 10 that it receives, it has a data compression percentage of 50%. When the modem sends 2.5 bytes for every 10 that it receives, it has a data compression percentage of 75%. This counter has two digits and records only on the transmitting modem.

The four % OF BYTES counters count the percentages of bytes at particular speeds, and represent all high speed data traffic. The four counters will add up to 99 or 100%. Each counter has two digits. These counters represent analog line conditions, and let you calculate the approximate throughput for a call or series of calls. (The counter does not consider flow control or the compression percentage.) 9600 bps represents a good line; 7200 bps represents a fair line with normal impairments; and 4800 or 2400 bps represents a very bad line with severe impairments and noise.

To calculate throughput, use this formula:

$$\frac{9600A + 7200B + 4800C + 2400D}{A + B + C + D} \times .85 = \text{Throughput}$$

Where A = % of traffic at 9600 bps, B = % of traffic at 7200 bps, C = % of traffic at 4800 bps, and D = % of traffic at 2400 bps.

For example, a modem that transmits 150,000 bytes—50% at 9600 bps and 50% at 7200 bps—has a throughput of  $(9600 \times .5 + 7200 \times .5) \times .85 = 7140$  bps.

The NORMAL DISCONNECT counter records disconnects from the receiving modem. Normal disconnects can be caused by

- <CTRL> C D
- Loss of DTR
- Loss of CXR
- <RESET>
- <VOICE DATA>

When the modem detects one of these conditions, it counts 1 normal disconnect. Often, the NO RESPONSE TIMER counter will count on the other modem. This counter has four digits.

The RETX ON 1 FRAME counter records how often the modem disconnects after eight retries transmitting one frame at 2400 bps. This counter has four digits.

The NO RESPONSE TIMER counter records how often the local modem gets no response from the other modem, then times out and disconnects. This counter has four digits.

The OTHER counter is reserved for future expansion. Any number on this counter is unimportant. This counter has four digits.

The modem resets the Last Call Statistics counters when reset, when it establishes a new call, or when you press the front panel <RESET>.

## Summary Statistics

The modem gathers summary statistics of all calls. Summary Statistics appear on the same counters as Last Call statistics, and also on counters for attempted calls and completed calls. If you press 2 (Summary), the screen displays the statistics of all calls since you last reset the statistics counters. (See Figure B-2.)

ATTEMPTED CALLS	0
COMPLETED CALLS	0
K BYTES RCVD	0
K BYTES SENT	0
DCE FLOW CNTL	0
DTE FLOW CNTL	0
BYTE OVERFLOW	0
RETX FRAMES	0
RETX BYTES	0
COMPRESSION %	0
% OF BYTES AT 9600	0
% OF BYTES AT 7200	0
% OF BYTES AT 4800	0
% OF BYTES AT 2400	0
NORMAL DISCONNECT	0
RETX ON 1 FRAME	0
NO RESPONSE TIMER	0
OTHER	0

9600VP-026A

### Figure B-2. Summary Statistics Display

The ATTEMPTED CALLS counter operates on the originating modem only. When the modem goes from on hook to off hook, the Attempted Calls counter increases by 1.

When the modem completes a modem handshake and can begin communicating data, the COMPLETED CALLS counter increases by 1.

If the modem attempts many more calls than it completes, you should investigate and determine the reason. For example, the central site may not have enough modems.

### Reset

If you press 3 (Reset), all the summary statistics counters reset to zero.



## **Appendix C SPECIFICATIONS**

### **MODEM**

#### **Speed**

##### **Asynchronous:**

9600, 1200, and 300 bps

##### **Synchronous:**

9600, 7200, 4800, and 1200 bps

#### **Fallback and Fallforward**

##### **Asynchronous:**

In 9600 bps operation, dynamic fallback and fallforward to 7200, 4800, and 2400 bps

##### **Synchronous:**

Manual fallback to 7200 and 4800 bps

#### **Compatibility**

Bell 212A, Bell 103, V.29 2-wire

#### **Modulation Technique**

##### **9600/7200/4800 bps:**

QAM (V.29)

##### **212 operation:**

DPSK

##### **103 operation:**

Binary phase coherent FSK

#### **Operation**

##### **High speeds:**

Asynchronous full-duplex terminal operation

Synchronous half-duplex operation

##### **Low speeds:**

Full duplex

#### **Equalization**

Automatic adaptive equalized receiver (9600 mode)

Fixed compromise equalization at 1200 and 300 bps

#### **Data Input Format**

Binary, serial, synchronous or asynchronous

#### **Character Length**

10-bit only

**Line Interface**

RJ11C 6-position or RJ41S/RJ45S 8-position plug  
Permissive and programmable connections available

**Transmitter Output Level**

Permissive: -10 dBm  
Programmable: 0 to -12 dBm

**Receiver Sensitivity**

ON: -43 dBm maximum  
OFF: -48 dBm maximum  
Hysteresis: 2 dBm minimum

**Terminal Interface**

Compatible with EIA RS-232-C

**Speed Conversion**

The 9600VP maintains a 9600 bps connection to the DTE, while accepting calls at 9600, 1200, or 300 bps.

**Flow Control**

XON/XOFF, CTS/RTS, or CTS/DTR

**Built-in Tests**

Automatic self-test  
Analog loopback self-test  
Analog loopback data test  
End-to-end self-test  
Local digital loopback  
Remote digital loopback self-test  
Remote digital loopback data test

**Dimensions**

Height: 1.5 in (3.81 cm)  
Width: 8.0 in (20.3 cm)  
Length: 13.3 in (33.8 cm)  
Weight: 5.6 lb (2.52 kg) including power supply

**Operating Temperature**

32° to 122° F (0° to 50° C)

**Power Requirements**

20 W maximum  
117 V ac  $\pm$  10%  
47 to 63 Hz

## **AUTO-DIALER**

### **Dialer Type**

Tone, pulse, or automatic selection.

### **Input Format (from terminal)**

Asynchronous, ASCII, 10-bit character length (includes start and stop bits); upper- or lower-case characters.

### **Dialing Protocols**

Racal-Vadic and the expanded Hayes AT command set.

### **Auto-baud and Parity**

Control E or the AT command causes the modem to detect the speed and parity of the DTE/DCE interface.

### **Call Progress Detection**

During an automatic call in Racal-Vadic operation, the modem reports the presence of dial tone, busy tone, ringback, answer tone, carrier, speed of modem called, and presence of error control.

### **Tandem Dialing**

A character embedded in a telephone number causes a pause for new dial tone, allowing dialing through Sprint, MCI, or PBX systems.

### **Telephone Directory**

Up to 15 telephone numbers and identification names up to 60 characters may be stored in permanent, nonvolatile memory and updated with the built-in memory editor.

### **Linking**

Numbers stored in the telephone directory may be programmed to link to an alternative number if the primary connection cannot be established.

## **ERROR CONTROL**

### **Protocol**

Superset MNP in 9600 bps mode allows selective retransmissions and data compression.

## **AGENCY REGISTRATION INFORMATION**

### **FCC Part 68**

Registration Number: AJ496M-15839-MD-E

Ringer Equivalence: 0.9B

### **FCC Part 15**

Class B: AJ496M9600VP

UL Listed

Call the number below for technical assistance or before shipping any equipment in for repair.

(408) 7477-4500

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MNP is a registered trademark of Microcom, Inc.

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