

Zypcom

Network Managed Rackmount **Modems**

User's Guide

Z34-RX
Z32t-RX
Z32b-RX

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About This Manual

Shown below is a chronological listing of revisions to this manual. The revision sequence, date, and synopsis of revised materials are included to provide the reader with a comprehensive manual history.

REVISION NUMBER	DATE	DESCRIPTION
18008-506A	04/94	1st Edition (preliminary)
18008-506B	08/95	2nd Edition (preliminary)
18008-506C	06/97	3rd Edition

Zypcom welcomes your comments concerning this manual. Although every effort has been made to keep it free of errors, some do occasionally occur. When reporting a specific problem or error, please describe it briefly and include the manual name, the document number, the paragraph or figure number, and the page number.

Mail, phone in, or fax your comments to:

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Warranty and Limitation of Liability

During this warranty period, Zypcom will, at no cost, promptly ship a replacement RX-Series modem within 24 hours on normal business days for any equipment determined by Zypcom to be defective (transportation charges prepaid by Zypcom) for destinations within the continental United States. The buyer will return defective equipment, prepaying transportation charges via United Parcel Service. Warranty repair for locations outside the continental United States, the buyer will return defective equipment, prepaying transportation charges and Zypcom will return such equipment, transportation charges prepaid via the same or like method as received. A repair number must accompany all returned equipment (see “Service Information” later in this section).

This warranty shall not apply to damage resulting from abuse, negligence, accident, natural disaster, loss, or damage in transit. The warranty shall be voided should the Buyer attempt any repairs or alterations without prior written permission of Zypcom, Inc.

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Any action by the Buyer for any alleged breach of the warranty set forth herein shall be brought to the attention of Zypcom, Inc. by the Buyer within the warranty period, but not later than thirty (30) days after the alleged breach.

THIS STATEMENT OF WARRANTY AND LIMITATION OF LIABILITY IS A COMPLETE AND EXCLUSIVE STATEMENT OF ALL WARRANTY AND LIABILITY REPRESENTATIONS OF ZYPCOM, INC. It may not be varied, supplemented, qualified or interpreted by any prior dealings between the parties, or by any usage of the trade, or upon the face or reverse of any form to which this is attached or is a part of, nor may it be modified by any agent, employee or representative of Zypcom unless such modification or representation is made in writing and signed by an officer of Zypcom, Inc.

Repairs and/or replacements under the terms of this warranty *SHALL NOT EXTEND THE WARRANTY LIFE OF THE ORIGINAL EQUIPMENT SUPPLIED.* After this warranty has expired, service can be purchased directly from Zypcom, Inc.

Service Information

In the event of malfunction or other indication of product failure, please follow this procedure:

1. Call Zypcom Technical Support at (510) 783-2501, Monday through Friday from 8:00 A.M. to 5:00 P.M. Pacific time (excluding holidays).
2. Your support representative will ask you to perform a few easy tests. If the tests and other remedies do not solve the problem, you will be issued a Repair Order (RO) number.



3. Return the unit in the original box or similar protective shipping container and send it prepaid to:

Repair Department
Reference: RO Number _____
Zypcom, Inc.
2301 Industrial Parkway West, Bldg. 7
Hayward, CA 94545

Please mark the shipping container on the outside with the RO number and enclose a written description of the problem with the defective unit.

Terms

For warranty repair replacements, the customer pays freight charges incurred for sending the defective modem to Zypcom. Zypcom pays freight charges (destinations in the continental United States only) for sending replacement units. Replacements and/or repairs are performed at no charge to the customer.

For non-warranty repairs, charges vary according to the specific model of the modem being repaired. Repair charges are estimated before an RO number is issued. Customer prepays all freight and repair charges by means of credit card or C.O.D. terms. Zypcom can accept prepayment by company check.

FCC Part 15: Radio/Television Interference

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on, the user is encouraged to try to correct the interference by one or more of the following measures.

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION: *Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

CAUTION: *Shielded interface cables, if any, must be used in order to comply with emissions limits.*



FCC Part 68: Requirements For End Users

Type of Service

Your RX-Series modem can be used on standard telephone lines. The RX-Series connects to the telephone line with a standard USOC RJ11C 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 that 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 ensure proper service from the telephone company. In some cases, a 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 their equipment, with the attached warnings, to end users.

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 will be informed of your right to file a complaint with the FCC.

All repairs on your RX-Series modem should be performed by Zypcom, Inc. or an authorized representative of Zypcom, Inc. For more information contact:

Customer Service
Zypcom, Inc.
2301 Industrial Parkway West, Bldg. 7
Hayward, CA 94545
(510) 783-2501

Statement of Fax Branding

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone fax machine unless the message clearly contains a margin at the top or bottom of each transmitted page or on the first page of the transmission; the date and time the message is sent; an identification of the business, other entity, or individual sending the message; and the telephone number of the sending machine, business, other entity, or individual.

Canadian Department of Communications— Requirements For End Users

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, the user should ensure that connection to the line is allowed by the local telecommunications company. The equipment must also be installed by 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 Zypcom, Inc. 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.

CAUTION: *Users should not attempt to make such connections themselves, but should contact the appropriate electrical inspection authority, or electrician, as appropriate.*

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 and Canadian certification number are listed on the modem label. The Canadian DOC connector codes supported are CA11A, CA41A, and CA45A. For internal modems on which 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 in which the modem is installed.

Repairs

Inquiries regarding Canadian repair centers should be addressed to:

Customer Service
Zypcom, Inc.
2301 Industrial Parkway West, Bldg. 7
Hayward, CA 94545
(510) 783-2501



Description

The Zypcom Z34-RX modem is a versatile, very high-speed, asynchronous/synchronous modem that allows data and facsimile transmission between your host computer or network and other remote host computers, networks (LANs), or facsimile machines. The Z34-RX, Z32t-RX and Z32b-RX can operate in full- or half-duplex on dial-up or on two- or four-wire leased lines, and feature a variety of compatibilities and capabilities. In this manual, Z34, Z34-Series, RX-Series, and Z34-RX, Z32t-RX and Z32b-RX are used interchangeably.

Features

- ❑ Dual rackmount modem card
- ❑ 230,400 bps to 300 bps DTE operation
- ❑ Software upgradeable via flash memory
- ❑ Z34-RX supports line rates from 33,600 bps to 300 bps compatible with V.34+, V.34, V.32*terbo*, V.32*bis*, V.32, V.22*bis*, V.22, V.23, 212A/103, V.21, and Group 3 fax
- ❑ Z32t-RX supports line rates from 19,200 bps to 300 bps compatible with V.32*terbo*, V.32*bis*, V.32, V.22*bis*, V.22, V.23, 212A/103, V.21, and Group 3 fax
- ❑ Z32b-RX supports line rates from 14,400 bps to 300 bps compatible with V.32*bis*, V.32, V.22*bis*, V.22, V.23, 212A/103, V.21, and Group 3 fax

- ❑ Asynchronous and synchronous full- and half-duplex operation (HDX simulated with V.13 switched carrier)
- ❑ Hayes AT autodialing and Dial-on-DTR
- ❑ V.25bis asynchronous and synchronous autodialing
- ❑ CCITT V.42 and MNP Class 2-4 error control
- ❑ CCITT V.42bis and MNP 5 data compression for throughput up to 195,000 bps on the Z34-RX and 125,000 bps on the Z32t-RX
- ❑ Class 1 and 2 facsimile command compatibility with Group III fax machines at 14.4 Kbps (V.17), 9600 bps (V.29), and 4800 bps (V.27ter)
- ❑ Two-wire dial-up and two- or four-wire leased line operation with autodial backup
- ❑ Remote modem control and security
- ❑ Zscript auto-logon
- ❑ Prestored modem configurations for 12 popular applications
- ❑ Memory and configuration security
- ❑ Automatic speed conversion and eight types of flow control
- ❑ V.54 diagnostics and V.13 switched carrier
- ❑ Nonvolatile memory for storing up to four telephone numbers and logon sequences
- ❑ Manual and automatic dialing and answering
- ❑ Built-in diagnostics that let you test the entire communications link
- ❑ Caller I.D. and distinctive ring supported
- ❑ Hardware DIP switches for manual operation

Functional Capabilities

The Z34-RX with its state-of-the-art technology SNMP network management adds unmatched versatility to your data communications network. The modem operates with any computer terminal that uses 8 to 11-bit ASCII characters and has a serial port. Since these two standards are well established, you can use the RX-Series for most applications requiring data communication.

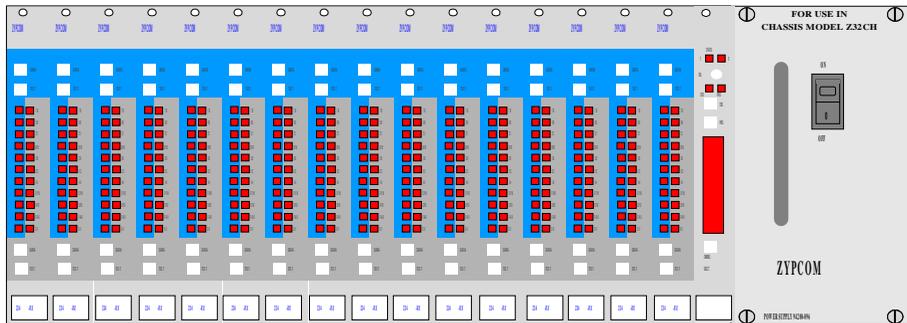
The RX-Series is compatible with the Hayes AT command set and with communications software that employs the AT command set. In addition, the RX-Series supports asynchronous and synchronous versions of the V.25bis autodialer. This autodialer works well with computers such as the IBM AS/400 and with bridge/router products, which provide V.25bis autodialing capability for dial backup of dedicated links or bandwidth on demand.

The Z34-RX modem will suit most styles of data communication. It provides high-speed connectivity for IBM PCs and compatibles, Macintosh computers, and UNIX workstations. It also supports facsimile transmission in conjunction with EIA 578/592 Class 1- or 2-compatible fax software, as well as synchronous dialing for dial-up minicomputer communications. The Z34-RX operates on two- and four-wire leased lines with dial backup for multiplexer links.

The RX-Series also supports full manual operation: connect the telephone, pick up the handset, dial the number, and press the <DATA> key on the multifunctional front panel. All the advanced functions you need can be viewed from the indicator lights. In addition, the RX-Series supports fully automatic "hands off" operation, putting unmatched flexibility and performance into your dial-up and leased line communication links.

Physical Capabilities

The RX-Series are dual modem rackmount cards. Operator inputs are through the serial port using the AT or V.25*bis* command sets. Additionally, operations such as redialing from memory location 0, complete resetting of modem options and memory, forcing of EIA options, testing, and manual dialing/answering can be performed from the front panel. The operation of the modem and DTE can be monitored using the extensive LED display (see Figure 1-1) or the network management system (requires optional Z3200E card).



The Zypcom rack mount modem card has two modems per card. The front panel of the modem has a blue modem (on the left) which is modem A, and a gray modem (on the right) which is modem B.

The chassis rear panel (see Figure 1-2) contains four 50 pin RJ27X connectors to provide telco connections. Telco connector 1-4 provides connections for chassis slots one to four. Up to four Zypcom telco cables (P/N 91009-200) are used on one chassis, one cable per RJ27X connector. Thirty-four serial port connectors for the DTE interface cables are labeled 1A, 1B, 2A, 2B, ... through 17A, 17B. The "A" connectors are for the blue modems (front label color) and are located on the upper-half of the panel; The "B" connectors are for the gray modems and are located on the lower-half. 32 connectors are for the modems; 2 connectors are for the selector card. On the front of the chassis is a power ON/OFF rocker switch; a modem selector switch; and a knob for manual volume control.

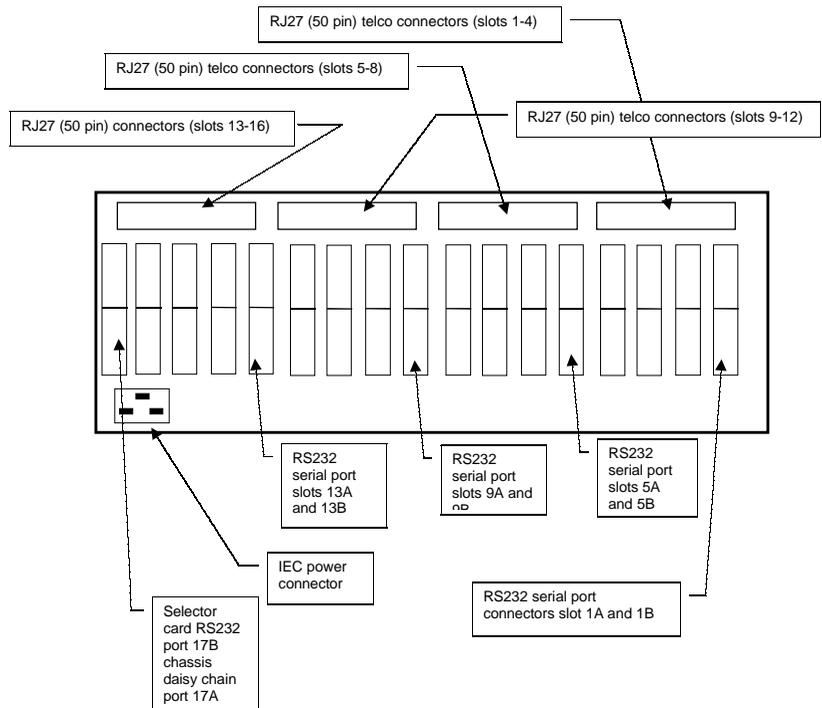


Figure 1-2. Z32CH Rear Panel

Specifications

The RX-Series specifications are listed in Appendix A.

Options Selection

There are four methods of selecting or changing modem options. A large portion of this manual consists of descriptions for using each method. You should concern yourself only with the sections that pertain to the method you've selected. The most comprehensive and easiest to use is the AT command set. In addition, there are V.25*bis* autodialer commands to option the modem, a 10-position DIP switch for changing the modem's functional operation, and the front-panel keys for limited control of modem options.

AT Commands

The AT-compatible command set can be used to select telephone line type and modem options, to dial a telephone number, to hang up a call, and to store telephone numbers and user profiles into memory locations (see Chapters 5 and 6).

V.25bis Commands

The RX-Series supports V.25*bis* operation of the modem in both synchronous and asynchronous communication. A V.25*bis* command extension—CNL (configuration local)—allows access to AT commands for configuring, viewing, and testing the modem in V.25*bis* autodialing (see Chapter 7).

Front-Panel Keys and DIP Switches

The front-panel <DATA> and <TEST> keys and the DIP switches (switch S3 for modem A, switch S6 for modem B) on the modem control a variety of modem options. Using these keys and switches is simple and straightforward and requires little technical experience. However, the keys do not allow full control of modem features.

Chassis Controller Cards

The Z3200 and Z3200E use an LCD-equipped chassis controller card in slot 17, instead of a selector card. In addition, the Z3200E chassis controller card is SNMP- and WWW-managed. These chassis controller cards allow you to transcend manual control.

Single and Dual AC and DC Power Supplies

The Z32CH chassis optionally offers AC and DC input. It also offers dual power supplies in slots 18 and 19 (P/N 94200-098 for 110/220VAC or 94200-099 for 48VDC), or a larger single power supply that occupies both slots 18 and 19 (P/N 94200-096 for 110/220VAC or 94200-097 for 48VDC). Mixing the large single and half-height dual power supplies in one chassis is not possible.

Software Programs

An extensive variety of communications software is already available, but advanced computer users can write their own software programs to interact with RX-Series memory, selecting options using either AT or V.25bis commands. The RX-Series is an EIA 578/592 Class 1- and 2-compatible device that will work with any off-the-shelf fax communications program that supports Class 1 or 2 fax commands. However, software programming methods for option selection in data or fax modes are not discussed in this manual. If you don't already own data communications or facsimile software, you should purchase the packages already preconfigured for the RX-Series modems (see Appendix B).

Quick Startup Procedure

A quick startup procedure in Chapter 2 provides information for quickly getting your RX-Series modem online. Otherwise, refer to Chapters 4, 5 and 6 for complete information about installation and the Hayes AT command set.

How to Use This Manual

This manual contains operating instructions for the RX-Series of modems. Most users will be using the RX-Series on a personal computer or workstation running communications software in asynchronous data format. Appendix B discusses communications software compatibility and the RX-Series modem. Carefully read through that information before proceeding with your installation, as it will provide you with a basic understanding of the modem's requirements and operation. For those using the RX-Series in synchronous communication, you'll find the essential information in Chapters 7 and 8. When using the RX-Series in asynchronous communication, you'll probably find it useful to review the details and operating instructions in Chapters 4, 5 and 6.

Conventions

In this manual, the < > symbols are used to designate the name of a key on the modem or on your computer or terminal keyboard. For example, when you see <ENTER>, it means *press the ENTER key*. Bold characters are used to specify a command sequence sent to the RX-Series. For example, an instruction to dial a telephone number would appear like this:

type **ATDT9,510 783 2538** <ENTER>

1

Introduction

Introduction

The Zypcom RX-Series is an advanced dual rackmount modem card with many powerful features for communicating into the twenty-first century. The more you know about your modem, the more you can do with it. But like most people, you are probably anxious to get your modem online as soon as possible and will consult the manual only as necessary. This chapter, therefore, contains only the information you'll need to get the RX-Series up and running on an asynchronous data dial-up communication link.

You'll learn about the communication software you might need, how to connect the RX-Series to your terminal or computer, and how to run basic tests. You'll also be presented with some setup tips, dialing commands, and other ready information. Once the RX-Series is operational, you can browse through the rest of the manual at your leisure.

Your Data Terminal Equipment

Before beginning the installation, you must first determine what kind of communications connector your data terminal equipment (DTE) has. Most likely your DTE will be a communications server, workstation, or host computer. Consult the manual that came with your DTE or look on the back panel to determine what kind of communications interface is there. Terminals are generally outfitted with a serial interface port and do not require any special interface software. Most desktop computers are equipped with one, but if yours isn't, you might have to purchase an *asynchronous communications* or *serial* card. This is a circuit board that fits into a slot on your computer's internal bus. It should have a connector to which you can attach a cable for a serial printer, modem, or other device.

An interface cable is not supplied with the RX-Series because different computers have different interface connectors. You can buy a pre-wired serial cable (normally called a modem cable) from a computer store. There are cables for many common computers. A shielded cable should be used with the RX-Series to maintain FCC Class A operation. The cable end that connects to your computer should have whatever connector—DB25, DB9 or DIN—is suitable for that equipment. The end that connects to the RX-Series should terminate in a male DB25-type connector. Cable length should not exceed 50 feet.

PC Software for Modem Communication

Terminals don't usually require communications software, but most personal computers and workstations do. Brands such as Carbon Copy, COMit, Crosstalk, PROCOMM, QModem and many others are based on the AT command set and are supported by the RX-Series. Most of them can emulate different terminals and let you issue AT commands directly from the keyboard, but you can also place the modem entirely under the control of the communications software for more "transparent" operation.

For the operation you require, consult the installation procedure for the communications software you have chosen. If your software doesn't have a RX-Series modem listed in the modem setup menu, try the following initialization string for a standard async answer application. Select your modem type as custom or other, whichever is available to you that allows for a custom initialization sequence, and enter this command string to set up your software for 230,400, 115,200 or 57,600 bps transmission and hardware flow control:

```
AT&F0&C1&D2&S1&K3&Q6E0Q2S7=90S0=1<ENTER>
```

Modem Connections

Detailed installation instructions are found in Chapter 3. For quick setup of the Z32CH, refer to Figure 2-1 and follow these easy steps:

1. Plug the RJ27 end of the telco cable (part no. 91009-200) into the jack marked "Telco 1-4" on the back of the Z32CH. Plug the telco cable ends labeled 1A-Dial and 1B-Dial into the telephone wall jacks of your office.

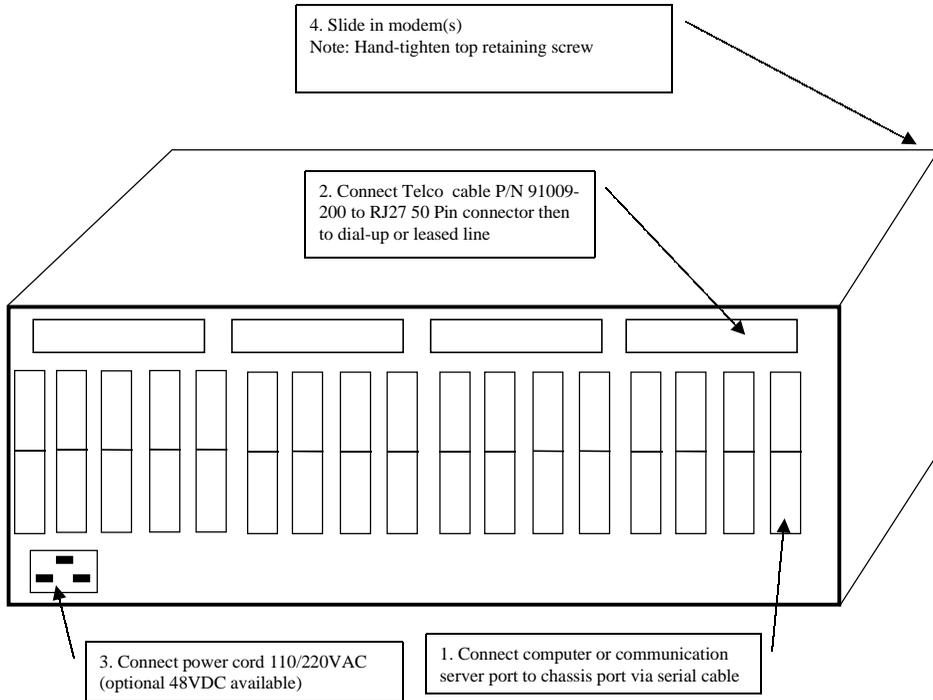


Figure 2-1. Connecting the Z32CH Chassis

2. Plug the serial cable into the 25-pin male connector of the Z32CH port marked 1A and 1B. Plug the other end of the serial cable outfitted for your particular computer into its connector. (*This cable is not supplied by Zypcom.*)
3. Plug the IEC end of the power cord into the socket marked "INPUT VOLTAGE" on the Z32CH chassis. Plug the three-pronged end into a 1105/230VAC outlet and turn on the modem's power switch (located on the front).
4. Slide the Z34-RX modem into slot one (1) (far left side) and be sure the modem is firmly seated. Refer to Figure 2-2.

NOTE: Do not cover the vented tops of the Z32CH chassis, as this could obstruct the airflow and cause overheating.

Computer/Terminal Setup

For existing applications, all you need to do is change the speed of your DTE to 230,400, 115,200, 57,600 or 38,400 bps, whichever is the highest speed supported by your DTE. For new applications, set your DTE's data bits per character and parity to whatever is required by the remote connection and set flow control to RTS/CTS (hardware).

The RX-Series is now ready to use. (Consult Chapter 8 if you'll be using the RX-Series in a leased-line configuration.)

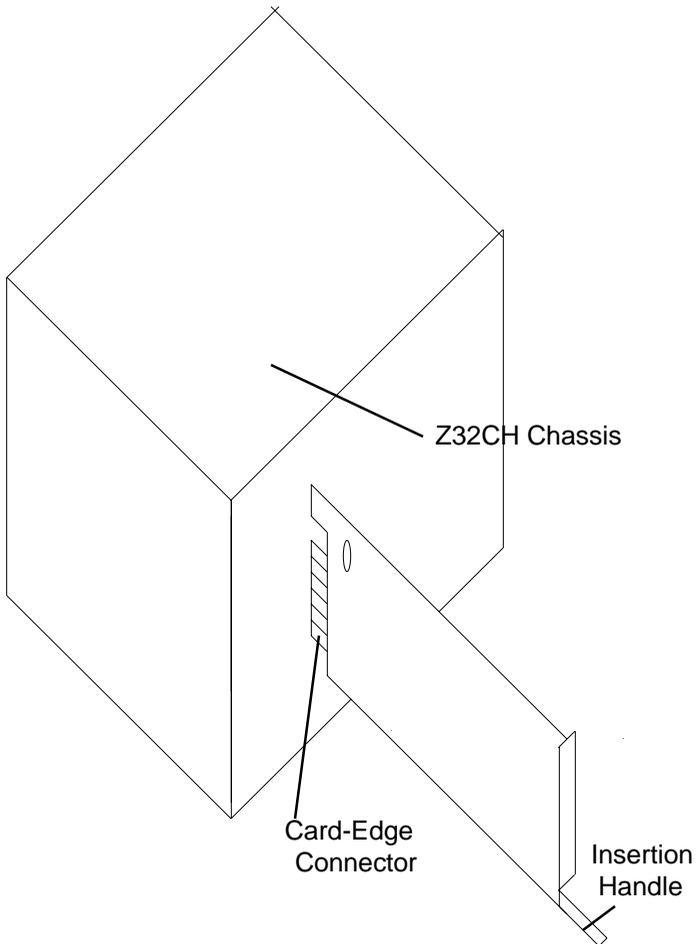


Figure 2-2. Sliding the Z34-RX Modem into the Z32CH Chassis

Powering Up and Checking Out Your RX-Series

Turn on your computer and RX-Series. If any LED flashes frequently, refer to Chapter 10, "Troubleshooting and Testing." A quick way to ensure that your RX-Series and most of its critical components are functional is to perform an analog loopback (ALB) data test, which checks the RXs transmitter, receiver, and interface to the DTE. The RX-Series will perform this test with or without speed conversion if you are using the keyboard of a DTE. To start the ALB data test, type:

AT&T1<Enter>

The RX-Series responds with a CONNECT XXXX message, where XXXX varies according to the setting of the W and N commands and register S37. During an ALB test, characters you type from the keyboard go to the RX-Series and are sent back to the DTE screen. If correctly modulated and demodulated, the same characters you type will appear on the screen. If a problem occurs during modulation and demodulation or on the interface to the DTE, characters different from what you typed will appear. In this case, refer to Chapter 3, "Installation," and Chapter 10, "Troubleshooting and Testing."

To exit an ALB test, type:

+++

Wait for the OK message and then type:

AT&T0<ENTER>

Wait for the OK message. If the ALB data test was successful, then the RX-Series is functioning normally and you can proceed with using the modem for dialing.

This checkout procedure assumes your communications software can allow terminal emulation so that direct communication with the serial port of the modem is possible.

Dialing

Dialing From a Computer or Terminal

You can dial a number from your computer or terminal keyboard. If you are a PC user and have not already done so, begin by loading your communications software. Before entering terminal emulation mode, set your software (or DTE) for its highest speed and select RTS/CTS (hardware) flow control. The RX-Series supports serial port speeds from 230.4bps to 300 bps. If this is your first time communicating, make sure your data bits and parity are also set correctly. If you do not know how to invoke the terminal emulation mode, refer to the documentation for your communications software.

With the communications software (or DTE) in terminal emulation mode, type:

AT <ENTER>

If the PC or terminal is correctly set up, you will get an OK message. To begin dialing, type:

ATDT telephone number <ENTER>

The RX-Series dials the number you entered. The AT in the above commands means "attention." This alerts the RX-Series that more commands are on the way. The D is the dial command, and the T following the D forces

the modem into tone dialing.

To automatically redial the number, type:

ATDL <ENTER>

The RX-Series retrieves the number from its “dialed last” buffer and dials it.

Note that you can enter commands in either lower- or uppercase. It is not necessary to enter spaces or punctuation, but you are permitted to do so as they are ignored. For example, if you wanted to call (510) 783-2538, the format would typically be:

ATDT 1 510 783 2538<ENTER>

or

atdt 1 510 783 2538<ENTER>

If you are calling another modem, you’ll hear it answer through the Z32CH’s internal speaker on the modem selector card (slot 1 modem A must be selected). It will send a high-pitched tone to which the RX-Series responds with a like tone. During this handshaking, the highest common speed is detected unless the RX-Series is configured to force a selected speed (by means of N0 and the setting of register S37). The speaker turns off, and a CONNECT XXXX message appears on the terminal or computer screen. You can obtain additional messages that tell you the error control, data compression, and port speed status by entering an

ATW1 command prior to dialing. You can dial telephone numbers of any combination of characters, to a maximum of 68 characters, including digits 0 through 9, *, #, A, B, C, D, and dial modifiers (,), @, !, ;, W, R, T, and P.

You can adjust the speaker volume by turning the volume control knob on the front of the chassis.

Dialing From a Telephone

To manually dial a number, insert a telephone T-adaptor in-line with the telco cable and install a telephone in the extra opening. Pick up the telephone's handset, listen for dial tone, dial the telephone number, press the <DATA> key on the modem's front panel immediately after dialing the telephone number, and quickly return the telephone handset to the cradle. If the handset isn't returned to the cradle quickly, it can cause a faulty handshake to occur. The RX-Series will connect to the remote modem and issue a CONNECT XXXX message to the DTE, where XXXX equals the speed of the last autobaud. Note that when you first unpack your RX-Series, it is set for autobaud at 230,400 bps. If your DTE doesn't support 230,400 bps, you must send the *AT<ENTER>* command to the modem so that it can match the speed you've selected for your DTE, or you must use the %X command to set a new speed before manually dialing a call.

Storing a Telephone Number

You can store a maximum of four telephone numbers in nonvolatile memory. For example, to store a telephone in memory location 1, type:

```
AT&Z1=1 510 783 2538 <ENTER>
```

1 is the number of the memory location, which can be from 0 to 3, and 1 510 783 2538 is a telephone number (68 characters maximum). This command stores the telephone number in memory, where it remains even if power is off.

Dialing a Stored Number

To dial a stored number, simply use the ATDSn command, where S tells the modem to dial the number stored in location n, and n can be from 0 to 3. For example:

ATDS1<ENTER>

The modem dials the number stored in location 1, and the screen displays:

1 510 783 2538

Automatic Answering

If your modem does not answer incoming calls, you can enable it to automatically answer by typing:

ATS0=n <ENTER>

This command sets the RX-Series to answer a call after n (1-255) rings. The RX-Series answers an incoming call, determines the speed of the remote modem, and prepares to communicate data. For example, if you type

ATS0=1<ENTER>

the RX-Series answers a call after one ring. When the modem is set to automatically answer, the LED indicator over AA is on. Issuing `ATSO=0<ENTER>` disables auto answer.

Line Speed, Port Speed, and Error Control Negotiations

Line Speed

The RX-Series can have two basic types of line speed negotiations. Type 1 can be faster, equal to, or slower than the speed of the last autobaud and is determined by the maximum speed of the remote modem. Type 2 can only be equal to or slower than the speed of the last autobaud.

The RX-Series supports many line speeds; therefore, flow control should always be enabled on your DTE and modem. RTS/CTS (hardware) flow control is preferred when both your DTE and modem can support it.

The RX-Series operates automatically (in default mode) and will attempt to send data at the highest possible rate. During handshaking (link negotiation), the RX-Series will automatically match the highest common data transmission rate of the remote modem. The sequence of data transmission rates it will seek is 33,600, 31,200, 28,800, 26,400, 24,000, 21,600, 19,200, 16,800, 14,400, 12,000, 9600, 7200, 4800, 2400, 1200 and 300 bps, no matter what the speed of the last autobaud (AT command).

The RX-Series can be optioned to begin its handshake negotiations at the speed selected by you with commands N1 and S37=1 to 36. These commands tell the RX-Series to start the handshaking at the selected speed and connect at the highest common speed available.

In addition, the RX-Series can be optioned to force a particular line speed with the N0 command and with S37 set to equal a desired line speed. These commands tell the modem to connect only at the speed of register S37.

Serial Port Speed

The RX-Series has asynchronous speed conversion (&Bn) that will automatically convert the modem line speed to match the DTE's, based on the speed of the last AT command. In its default setting (&B1), the RX-Series converts from the last autobaud (set at the factory to 115,200 bps) to the line speed of the modem to which it connects.

Error Control (EC) Negotiations

The &Qn command controls how the RX-Series negotiates an error controlled link. In its default setting, the RX-Series automatically attempts the highest possible error control level. The priority is V.42 first, MNP second, and normal buffered asynchronous operation third. The default setting (&Q6) causes the RX-Series to first attempt a V.42 negotiation. If that fails, an MNP negotiation is attempted. If that fails, the RX-Series establishes a buffered asynchronous link. The &Q5 command eliminates the V.42 negotiation and attempts an MNP negotiation first. If that fails, it establishes normal buffered asynchronous operation. The &Q7 command eliminates the MNP negotiation. If that fails, it establishes normal buffered asynchronous operation. &Q0 establishes a normal buffered asynchronous operation.

When communicating with lots of different types of modems, it is important to understand how the line speed, port speed, and error control negotiations occur in the RX-Series modem. Select the line speed, port speed, and error control negotiations required for your application; you can then begin using the RX-Series.

The RX-Series monitors the condition of the phone line at initial handshake and during the call to ensure that data can be sent with few errors at the fastest speed. If it senses that data integrity could be compromised by line conditions, it will fall back to the next lower transmission rate. The RX-Series will negotiate a higher data transmission rate when conditions improve.

Testing the RX-Series

The RX-Series performs an automatic self-test whenever power is applied and the modem is in idle mode (not transmitting or receiving). This procedure ensures proper operation of the modem's major components. If the modem fails the self-test, it will busy the telephone line out and will flash the SI LED.

After following the connection procedure and applying power (remember to flip the ON/OFF switch on the side), look at the front panel of the RX-Series. If any LED flashes, the modem has failed self-test and will not operate correctly. If this happens regularly, contact Zypcom Customer Service, listed in the front of this manual.

Unpacking the RX-Series

The Z34 package comes with a modem and a manual. Inspect the modem and carton to make sure that they have not been damaged. Return the box and modem to your dealer or shipping carrier if you suspect any damage.

Items That You Must Provide

You must provide the following items to install a RX-Series modem:

- A Zypcom chassis: model Z32CH (has 16 slots, holds 32 modems)
- A male 25-pin D-type RS-232 interface cable that connects the modem to the computer or terminal. Check with your dealer for the correct interface cable for the computer or terminal you are using. Normally, a modem cable will include pins 1 through 8, as well as pins 15, 17, 20, and 22. You can also make your own interface cable based on the pinout information supplied in Table 3-1.
- A Zypcom telco cable (P/N 91009-200) for dial-up and leased lines. This cable connects the chassis to the telephone line.
- A telephone line jack that accepts RJ11 connector for dial-up lines and RJ45 connector for leased lines.

Modem Card Options

If you are going to use leased lines or caller ID, you must set these options before installing your modem. For modem A (the blue modem), set dip switch 3 and jumper number JP1. For modem B (the gray modem), set dip switch 6 and jumper number JP2. For an explanation of these features, refer to Chapter 4. For an illustration of these features on the modem card, see Figure 3-1 below.

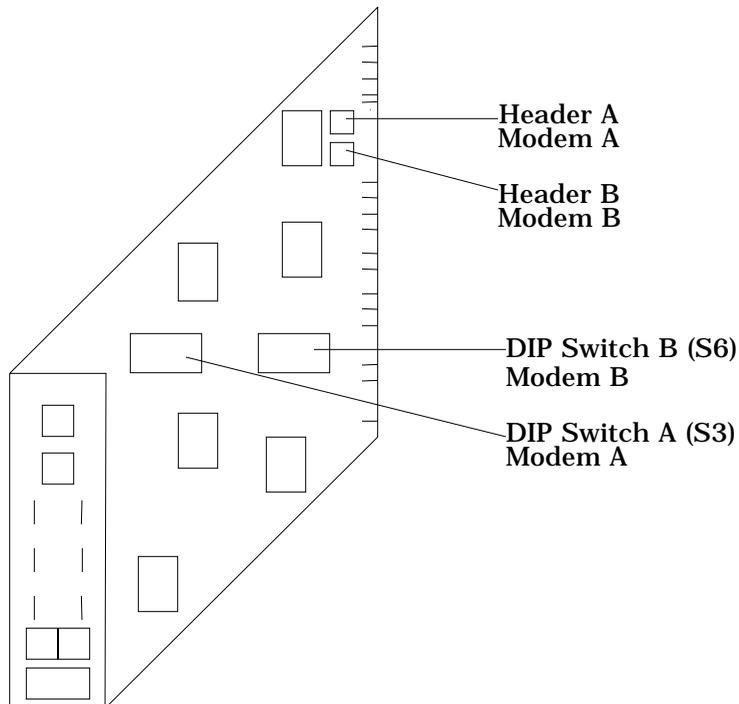


Figure 3-1. Modem Card

Connecting the Z32CH Chassis

This section shows how to connect the Z32CH to the AC power, to the telephone line, and to the computer, terminal, or other data terminal equipment (DTE) device with a serial port.

Figure 3-2 shows the back of the Z32CH and the connections that go to it. Refer to this figure when following procedures in this section.

Thirty-two RS232 for serial data ports

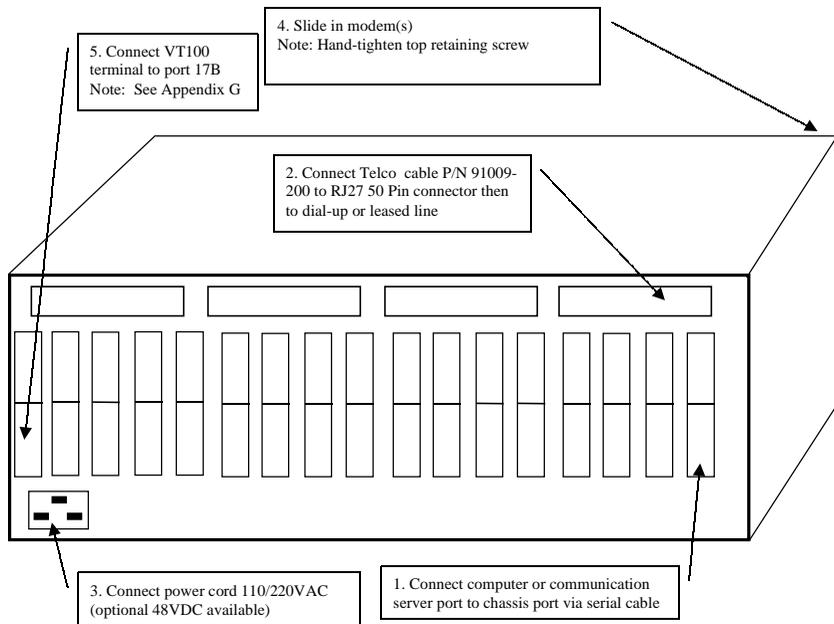


Figure 3-2. Z32CH Chassis Connections

Chassis AC Power

First, check that the AC power supply (P/N 94200-096-single or 94200-098-dual) is installed in the Z32CH chassis with the on/off switch set to off. The power supply will accept input voltages from 90 to 130 VAC and 180 to 250 VAC and will auto-select to the appropriate voltage. The operating frequency range is 47 to 63Hz. Connect the IEC power cord to the chassis and then to the AC outlet.

Chassis DTE Connection

Each slot on the Z32CH chassis has two (2) DTE connectors. For slot one (1), they are labeled 1A and 1B. For slot two (2), the DTE connectors are labeled 2A and 2B, etc. DTE connector 1A connects to modem A (identified by the RX-Series's front panel blue section). DTE connector 1B connects to modem B (identified by the RX-Series's front panel gray section).

As shown in Figure 3-1, plug the male connector of the interface cable into the female connector on the back of the RX-Series labeled "TERMINAL." Tighten the retaining screws on each side of the connector to ensure a good connection. Plug the other end of the interface cable into the serial port of your DTE and tighten the retaining screws, if any.

Table 3-1 lists the assignment of each port on the Z32CH chassis.

TABLE 3-1. Z32CH SERIAL PORT (PORTS 1B/1A TO 17B/17A) PIN ASSIGNMENTS

PIN	ZYPCOM DESIG.	EIA/BELL DESIG.	DESCRIPTION	SIGNAL GROUND	MODEM DTE TO TO DTE	DTE TO MODEM
1	FG	AA	Protective Ground	X		
2	TXD	BA	Transmitted Data			X
3	RXD	BB	Received Data		X	
4	RTS	CA	Request to Send			X
5	CTS	CB	Clear to Send		X	
6	DSR	CC	Data Set Ready		X	
7	SG	AB	Signal Ground	X		
8	CXR	CF	Carrier Detect		X	
9	+V	+P	+12 V Testing Voltage		X	
10	-V	-P	+12 V Testing Voltage		X	
11			No Connection			
12			No Connection			
13			No Connection			
14			No Connection			
15	SCT	DB	Serial Transmit Clock		X	
16			No Connection			
17	SCR	DB	Serial Receive Clock		X	
18			No Connection			
19			No Connection			
20	DTR	CD	Data Terminal Ready			X
21			No Connection			
22	RI	CE	Ring Indicator		X	
23			No Connection			
24	SCTE	DA	External Serial Transmit Clock		X	
25			No Connection			

Chassis Telephone Line Connection

The telephone cable for the Z32CH chassis is optional and must be ordered separately from the chassis and modem (P/N 91009-200). One telco cable supports four (4) slots or eight (8) modems in both dial-up or leased-line operation.

The Z32CH accommodates permissive dial-up and two- or four-wire leased-line connections. It doesn't support programmable connections on the public switched telephone network. When connected to a programmable jack, the transmit level is -10 dBm. See Table 3-2 for pin assignments of the chassis RJ27 telco connectors (Telco 1-4, Telco 5-8, Telco 9-12, and Telco 13-16). See Figure 3-3 for dial-up line pin outs.

TABLE 3-2. CHASSIS RJ27X CONNECTORS AND TELCO CABLE (RJ27X TO RJ11 & RJ45)

TELCO 1-4 (RJ27X) SLOT/MODEM	DIAL-UP PINS		LEASED LINE PINS		4W-TXC Tip(2-W TX)	4W-TX RING(2-W RX)
	TIP	RING	4W-RX RING	4W-RXC TIP		
1A	Pin 27	Pin 2	Pin 26	Pin 1	Pin 28	Pin 3
1B	30	5	29	4	31	6
2A	33	8	32	7	34	9
2B	36	11	35	10	37	12
3A	39	14	38	13	40	15
3B	42	17	41	16	43	18
4A	45	20	44	19	46	21
4B	48	23	47	22	49	24

91009-200 CABLE (RJ27X TO RJ11)	RJ11C CONNECTOR PIN No.	COLOR	SIGNAL
<i>Dial-up</i> RJ11C connector to wall jack	1		No Connection
	2		No Connection
	3	Green	Tip
	4	Red	Ring
	5		No Connection
	6		No Connection

91009-200 CABLE (RJ27X TO RJ45)	RJ45S CONNECTOR PIN No.	COLOR	SIGNAL
<i>Leased Line (2/4-wire)</i> RJ45S connector to wall jack	1	Yellow	4-wire RX
	2	Black	4-wire RXC
	3		No Connection
	4		No Connection
	5		No Connection
	6		No Connection
	7	Green	4-wire TXC (or 2-W TX)
	8	Red	4-wire TX (or 2-W RX)

NOTE: RJ11/RJ45 pin 1 is on the left if the clip is up and connector is facing you.

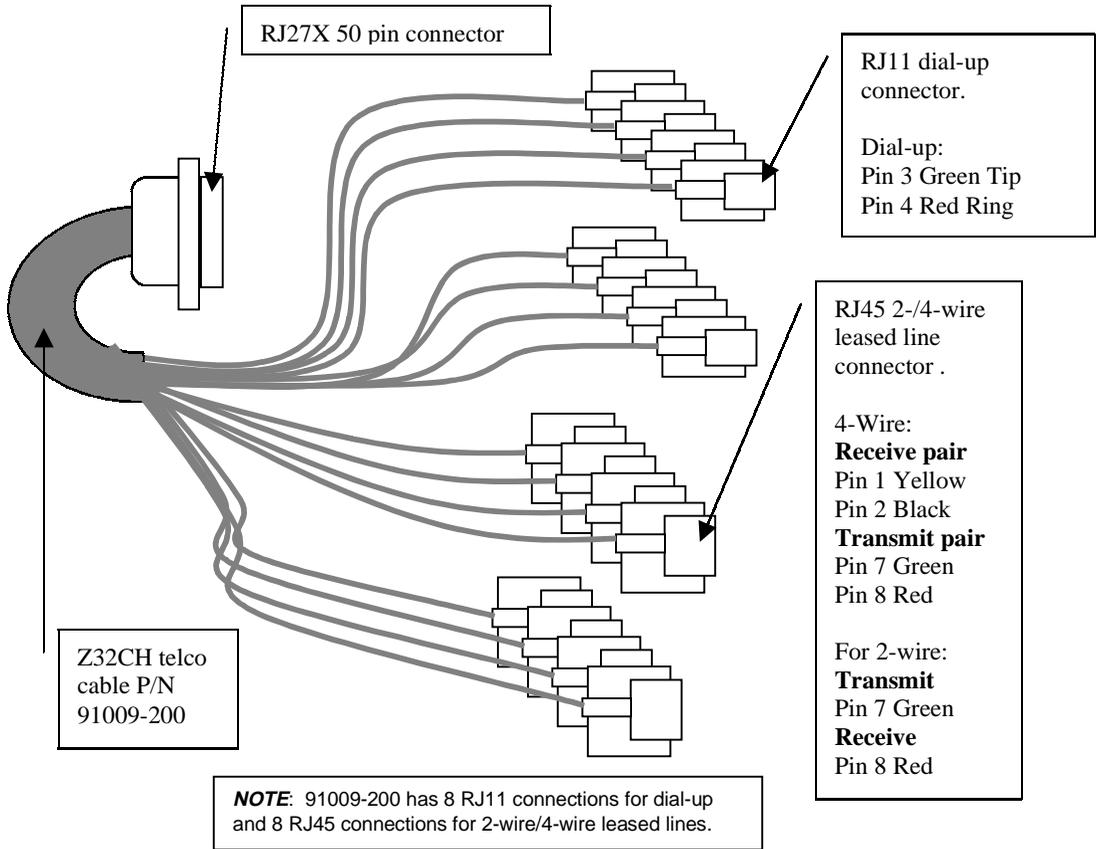


Figure 3-3. Dial-up, 2-/4-Wire Telco Cable Pin Outs

Permissive Connection

Most offices use the two-wire dial-up line called a “permissive” connection, where a cord terminated with a modular 6-pin plug carries the signals from the modem to the wall jack. This is the simplest type of connection and is used on most standard telephones. The RX-Series transmits over this type of line at a fixed level of $-10\text{dBm} \pm 1\text{dB}$. Signal loss between the modem and the central office is not controlled in permissive connections.

Permissive cables terminate in modular 6-pin RJ11C-type plugs that can fit into RJ11C, RJ12C, RJ13C, RJ16X, RJ41S or RJ45S wall jacks. Ordered separately from the Z34-RX is a 10-foot cable (Zypcom part no. 91009-200) with a 50-pin RJ27X connector on one end and on the other end eight (8) RJ11C connectors for Z32CH slots 1 to 4 (or slots 5-8, 9-12 and 13-16). (The cable also has eight RJ45 connectors discussed in the leased line section.) The pinout information in Table 3-2 shows how to wire the modular jacks that receive the Zypcom telco cable ends.

NOTE: Do not interrupt the data connection with voice communication. Voice communication destroys the flow of data, causing errors. Sometimes it can force the modem to break the connection. Picking up any other telephone connected to the same telephone line, such as an extension telephone, can cause data errors.

NOTE: The interrupt signal from the telephone company can break the connection or cause errors in the data. Turn off call waiting, if possible. If not, consider canceling the feature or installing a second telephone line.

**Leased Line
Connection**

Leased lines (private lines) are installed at your site by the phone company and may be two- or four-wire connections. These lines are dedicated to data communication.

Leased line cables terminate in modular 8-pin RJ45S-type modular connectors that can fit into RJ41S or RJ45S wall jacks. Ordered separately from the Z34-RX is a 10-foot cable (Zypcom part no. 91009-200) with a 50-pin RJ27X connector on one end and on the other end eight (8) RJ45S connectors for Z32CH slots 1 to 4 (or slots 5-8, 9-12 and 13-16). The pinout information in Table 3-2 shows how to wire the modular jacks that receive the Zypcom telco cable ends.

Powering Up

Turn the chassis and the computer equipment on. As the modem(s) power(s) up, it will start a self-test diagnostic. The RX-Series will continually flash one of several LEDs if errors occur. Regular occurrence of LED flashes while the modem is powering up while on-hook indicates a problem (refer to Chapter 10).

Upon power up with default options (&F0), you should see the CTS, DSR, CXR, and AA LEDs on. If the LEDs do not turn on, then make sure your modem is firmly seated into the chassis. If you still have a problem, then remove the modem and reinstall while pressing <DATA> and <TEST> keys.

Checking Your Connections

There are several quick steps that you can follow to ensure that your modem and computer are properly connected to the telephone network.

Checking the Telephone Line

Press the <DATA> key momentarily and then release it. The modem will go off-hook and connect you to the telephone line. You should hear a dialtone from the chassis speaker, even on a PBX line. (The modem number must match the number displayed on the chassis selector switch.) If you don't hear dialtone, your line is probably not active and you need to change to another line. Once you hear dialtone, you can be assured that you have a functioning line. Press the <DATA> key again and the RX-Series will go back on-hook.

Checking Your Computer to Modem Link

To check the asynchronous link between the DTE and RX-Series, you must set up your DTE's communication parameters, the most important of which are data type, speed, character length, parity, and flow control. Match the requirements of the remote computer or use these settings for installation checkout: DTE speed = 230,400 or 115,200 bps, character length = 8 bits, parity = none, stop bits = 1, and flow control = RTS/CTS (hardware). The serial cable must have pin 4 to operate properly with the default flow control (RTS/CTS).

Once you have set the communication parameters, enter terminal emulation mode if you are using a PC, and from your keyboard type:

AT<ENTER>

The modem should respond with an OK message. If it doesn't, you may have encountered a common problem (see the section in this chapter entitled "Common Problems and Solutions"). On the other hand, if you receive the OK message, your computer-to-modem link is working.

Checking Your RX-Series

A quick way to ensure that your RX-Series is functioning properly is to perform a diagnostic called an analog loopback (ALB) data test. To start this test, type:

AT&T1<ENTER>

After several seconds, the RX-Series responds with CONNECT XXXX, which indicates the RX-Series has entered test mode. (The SI LED will flash when the modem is in test mode.) Now send data from your DTE keyboard. What you send to the modem should be echoed back to the DTE screen if your RX-Series is working properly. If the RX-Series passes this test, you can begin using it with confidence. To exit ALB, type:

+++

Wait for the OK message and then type:

AT&T0<ENTER>

Wait for the second OK message. You are now back in command mode and the RX-Series may be used for dialing.

If the RX-Series didn't perform the ALB data test correctly, there is probably a simple problem that needs correcting. Review "Common Problems and Solutions" in this chapter first. If that doesn't correct the problem, then refer to Chapter 10, "Troubleshooting and Testing."

Common Problems and Solutions

Problems

During setup and checkout, the following items can cause the RX-Series to function improperly:

1. Your communications software doesn't have terminal emulation mode with which to check the modem.
2. The communications software may be set to the wrong COM port.
3. The cable linking the modem to the computer is the wrong type.
4. Some modem options may be preventing you from communicating properly.

Solutions

If your communications software doesn't provide terminal emulation, set your software to 230,400 bps. Press the <TEST> key on the RX-Series to put the modem into an analog loopback test (ALB), indicated by

a flashing SI LED. When the RX-Series is ready to be tested, it issues a CONNECT 230400 message. Once you see this message on your screen, you should be able to type anything from your keyboard and see the exact characters echoed from the modem back to your terminal screen. If this occurs, you have successfully checked your modem-to-DTE connection.

However, if you get garbage instead of a CONNECT XXXXXX message, then the speed of your communications port is set incorrectly and you need to correct it. If your software will not operate at 230,400 bps, then set it to the maximum speed setting. Type AT<ENTER> to indicate to the modem the speed at which you will be operating. The modem will respond with OK. To stop the ALB test, press the <DATA> key one time. The SI LED will go off.

The second problem can be easily solved by changing the COM port in your communications software. Once you have verified that you have the proper COM port setting and you still don't see AT echoed onto your screen as you type it, check to see if you have encountered the third problem.

To verify that the modem cable is the correct one (with at least straight-through pins 1 through 8 and 20), see RS232-D pin assignments in Table 3-2. You can verify that the pins are straight-through with an ohmmeter. The most common cable problems are:

1. A cable that does not support RTS (pin 4).
2. Using a crossover cable (typically used for printers) when a straight through cable is needed.

Once you verify that you have the proper cable, check for the next problem.

To determine whether or not you have an option setting problem, start by typing any keyboard character repeatedly and watch the TXD LED on the modem. If it's flashing faintly, your keyboard is communicating with the modem. The RXD LED should also be flashing simultaneously. If it isn't, type *ATE1<ENTER>*. With your TXD and RXD lights now flashing as you repeatedly strike a keyboard character, you should see the character on your screen. If you don't, you probably have an EIA option incorrectly set. Be sure that pin 4 (RTS) is in your modem cable. To force on the modem's EIA signals (CTS, DSR, CXR, DTR, SO=1), press the <DATA> and <TEST> keys on the front panel for five seconds. Type *AT<ENTER>*. You should see the modem's OK message. If you continue to have problems, refer to Chapter 10.

Setting Up Communication Software

Once you can send AT commands to your modem and receive modem response messages and result codes back, you will probably want to set up your software for automatic modem control. This will entail building initialization, dialing, and automatic answer script files to control the RX-Series modem automatically. Call your software supplier and ask for the RX-Series or any of the Z32b-SX, Z32t-SX or Z34-SX initialization files. Most software companies have had access to Zypcom modems and will probably have script files already completed. If your software vendor doesn't have these files already developed, try a generic Hayes setting. If that setting fails, try to set up a user-defined (custom) script using information in Chapter 2 and Appendix B.

General

The RX-Series can be operated in three primary ways:

- Manual operation
- V.25bis* commands
- AT commands

The AT command set, the industry standard for full duplex modems, operates using asynchronous data at speeds from 230,400 bps to 300 bps. The AT command set allows for automatic dialing and control by software applications. It has robust option setting capabilities and provides detailed call progress and monitoring and testing.

The *V.25bis* command set is a CCITT standard that functions in asynchronous and synchronous communications. Asynchronous communication is primarily used in international applications. Domestically the *V.25bis* dialer is used primarily in synchronous communication for minicomputer dial-out applications, bridge router dial backup applications, and other synchronous dial-up applications.

The *V.25bis* command set provides for dialing capabilities as well as some call progress features. The standard does not specify modem option capabilities. Many modem manufacturers who supply *V.25bis* dialers have extended the *V.25bis* command set to include modem option capabilities. The Zypcom RX-Series provides for modem options using the CNL command in either synchronous or asynchronous communication.

The RX-Series can also be operated manually using a combination of front-panel switches and DIP switches on the modem. In some cases, both DIP switches and AT commands have to work in conjunction, for example, in leased line operation with dial backup enabled.

Autodialing Command Sets

The RX-Series supports the industry-standard AT command set and also provides some extended AT commands. These extended AT commands control capabilities not found in Hayes modems. The *V.25bis* standard is an internationally recognized standard for serial automatic call origination and answering. The *V.25bis* autodialer incorporated in the RX-Series encompasses the *V.25bis* recommendation, as well as a great number of extensions that allow you to store and dial telephone numbers, option the modem, or automatically dial a previously stored telephone number. The protocols supported by the *V.25bis* dialer are asynchronous, character-oriented synchronous (bisynchronous), and bit-oriented synchronous (HDLC).

Important Communication Parameters

Before sending data to a remote computer or terminal, set your modem to match the parity of the remote site. The speed setting for your computer or terminal should be set for the maximum speed supported, as long as you are in asynchronous communication and have speed conversion enabled (see AT command `&Bn`). Common communication settings are 8N1 (8 data bits, no parity, and 1 start bit and 1 stop bit) or 7O1 (7 data bits, odd parity, and 1 start bit and 1 stop bit). The RX-Series automatically matches the speed and parity settings of your computer or terminal after an autobaud (`AT<ENTER>`).

Chassis Power Switch

There's a black power switch located on the front of the chassis that is used to turn the chassis on and off. Each time you turn on the chassis, all modems will run a series of diagnostics. After completing these diagnostics successfully, each modem loads the active profile parameters from nonvolatile memory.

Front-Panel Keys

The RX-Series has two front-panel switches (keys) that allow you to control several modem functions.

DATA Key

Press the <DATA> key and immediately hang up. Pressing the <DATA> key when you are online disconnects the data link and places the modem back on-hook. Pressing the <DATA> key for three seconds or longer causes the RX-Series to dial the telephone number stored in memory location 0. The <DATA> key can also be pressed immediately after the <TEST> key to initiate the self-test capability when &Q0 is set. In this case, the RX-Series generates a self-test pattern to be transmitted and received while the test is in progress. The modem flashes the EC LED each time an error is detected.

TEST Key

This key causes the RX-Series to enter test mode. If <TEST> is pressed while the modem is on-hook, the RX-Series enters an analog loopback (ALB) test. If the modem is online, pressing this key causes the modem to initiate a remote digital loopback test in all speeds except 300 bps.

**Modem Control
Signals Forced On**

Pressing the <DATA> and <TEST> keys simultaneously for three seconds or longer forces the RX-Series to turn on its CXR, DSR, CTS and DTR leads. Also, the modem will activate auto-answer (S0=1), enabling communication with DTEs that otherwise could not communicate with the RX-Series in its last configuration. Pressing these keys causes the active profile in the AT command set to force on the previously mentioned signals. If you wish to save these settings, you must write them to a stored profile with the &Wn command.

Recall Factory Options

To reset the RX-Series to factory settings, type:

AT&F0&W<ENTER>

If the RX-Series was previously optioned for synchronous dialing (*V.25bis*/bisynchronous) or dumb mode, then it will not accept command strings. To reset factory settings, perform a manual power reset. Remove the RX-Series from the chassis, then press the <DATA> and <TEST> keys while reinstalling the modem. After several seconds release both keys.

Front-Panel Lights (LEDs)

The RX-Series has two rows of eleven front-panel LEDs to indicate the status of each modem and the data link. LEDs in the left blue section are for modem A; LEDs in the right gray section are for modem B. The status of the LEDs indicates the status of the RX-Series, not necessarily the status of EIA options or the data link. For example, AT&C0 forces the CXR signal lead high, even if the RX-Series is on-hook and not receiving valid carrier from a remote modem. In this case, the CXR LED would be controlled by the modem. The LEDs indicate modem configuration of a particular EIA signal, except DTR. For the LEDs to indicate true status of the RS-232 port, turn CXR and DSR to the normal setting.

TXD (Transmit Data)

TXD light goes on when the computer or terminal transmits data to the RX-Series through the serial cable. The RX-Series may be on-hook and processing dialing commands such as *ATDT (telephone number) <ENTER>*, or it may be online and transmitting data to the remote modem and computer. At high speeds of more than 38,400 bps, the LED is very faint.

RXD (Receive Data)

The RXD light goes on when the computer or terminal receives data from the RX-Series. For example, if you send an *ATDT<ENTER>* command from your computer keyboard to the RX-Series, the modem echoes the command by displaying it on your computer screen.

CTS (Clear To Send)

The CTS lead indicates to the terminal that it is okay to send data to the RX-Series. The factory default setting specifies that CTS is on. This signal is an output of the modem. RTS/CTS flow control can temporarily override any setting of CTS.

DTR (Data Terminal Ready)

This LED indicates the modem's detection of its DTE's DTR signal. When DTR is on, the RX-Series assumes that the DTE is operating properly. The RX-Series requires DTR to auto-answer and can be optioned to assume that DTR is forced on. The status of the DTR signal at the serial port is indicated by the LED. The DTR LED does not indicate the modem's internal DTR option.

CXR (Carrier Detect)

If the &C0 option forces carrier on (default setting), the CXR LED will remain on at all times. If normal CXR is set, CXR is on when the modem detects a carrier signal from the remote modem, and CXR is off when the RX-Series loses remote carrier.

EC (Error Control)

EC goes on if the RX-Series is online using error control and data compression. Also, EC flashes with each retransmission when a self-test is initiated from the front panel.

AA (Auto Answer)

AA goes on when the RX-Series is set to answer incoming calls automatically. If AA is off, the modem will not answer incoming calls. AA flashing indicates an incoming ring. When the RX-Series is online, AA indicates originate/answer status, where AA on is answer and AA off is originate.

SYN (Synchronous)

SYN is on if the RX-Series is optioned for synchronous operation and off if the modem is set for asynchronous operation.

SPD (Speed)

SPD indicates the type and speed of data transmission, as described below.

TABLE 4-1. OPERATION OF SPD LED

STATUS SPD	CONNECTION	ONLINE SPEED	DTE AUTOBAUD SPEED
Green	V.34	33.6, 31.2, 28.8, 26.4, 24, 21.6, 19.2Kbps	230,400, 115,200, 57,600 or 38,400
	V.32 <i>terbo</i>	19.2, 16.8Kbps	
	V.32 <i>bis</i>	14.4 or 12Kbps	
Red	V.32	9,600 or 7,200 or 4,800 bps	19,200 or 9,600 or 4,800 bps
Off	V.22 <i>bis</i> , 212/V.22, 103/V.21	2,400 - 300 bps	2,400 or 1,200 or 300 bps

While the RX-Series is on-hook (not online), SPD LED indicates the speed of the last autobaud. If the autobaud is above 38,400 bps, SPD LED will be green. A 9,600 bps autobaud turns SPD LED red, and a 2400 bps autobaud causes SPD LED to go off.

FAX (Facsimile)

The FAX LED is on when the RX-Series is optioned to or operating in facsimile mode or when the fax Terminate and Stay Resident (TSR) program is active. FAX is off when the RX-Series is in normal data operation.

SI (Status Indicator)

SI is on when the modem is online and/or off-hook. SI is off when the modem is on-hook in command mode. SI is flashing when the modem is in test mode or is in a busy out condition (due to a self-test failure or a drop of DTR, if so optioned).

Manual Operation

Manual Dialing

To dial manually, you must connect a telephone T-adaptor in-line with the telco cable in order to have a jack for the telephone. To call a remote modem from the telephone:

1. Pick up the telephone and dial the remote modem's telephone number.
2. Press the <DATA> key while you still hear ringing, then hang up the telephone quickly. The remote modem answers the call and sends a steady, high-pitched answer tone. The modems are connected and ready to communicate data when the CONNECT message is sent to the DTE or when the CXR LED is on (if CXR is set to &C1).
3. When the CXR LED goes on, the modems are online. If CXR is set to &C0 (which is the default), then listen for the modems' handshaking tones. To listen to the modems' handshaking tones, select that modem with the selector switch on the front of the chassis. When the tones go off, the modem should be online.

Manual Answering

To answer manually, connect a telephone to the telco cable as indicated above and disable the automatic answer (AA) capability. To do this, you may need to option the modem by means of the *ATS0=0* <ENTER> command. To manually receive a call from another modem:

1. Listen for the attached telephone to ring or look for the AA LED to flash on the RX-Series. Press the DATA key within 8 seconds of the last ring. Note that the link speed will be the speed of the last autobaud up to 28.8 Kbps.
2. If you answer the call and have a voice conversation before going to data communication and later want to manually answer the modem, issue an `ATA<ENTER>` command from your terminal.

Manual Disconnect (Go Back On-Hook)

While online in data mode or in test mode, press the <DATA> key to drop carrier and disconnect the RX-Series.

Front-Panel Dialing

Store telephone number in memory location 0 using the `&Z0=telephone number<ENTER>` command. After the number is stored, press the DATA key for three (3) or more seconds to cause the RX-Series to dial that telephone number.

Reset Modem to Factory Defaults

To set the modem back to the factory default settings for all options and S registers and to clear the modem memory, remove the modem from the chassis. Press the <DATA> and <TEST> keys and reinstall the modem. Release the front-panel keys after a few seconds.

Changing Modem Speeds

Review SW3 and SW4 operation in asynchronous and synchronous modes. For software control, review the N command and the settings for register S37.

Setting DIP Switches

The RX-Series has two 10-position DIP switches. The switch marked S3 is for modem A (blue section on front panel) and the switch marked S6 is for modem B (gray section on front panel). The table below indicates various manual options that are available.

TABLE 4-2. DIP SWITCH SETTINGS (DIP SWITCH S3 IS FOR MODEM A, S6 IS FOR MODEM B)

OPTION NAME	SWITCH No.		SETTING			
CONFIGURATION CONTROL	SW1					
	ON		Hardware (switch controlled)			
	OFF		Software (AT command control)			
DATA TYPE	SW2					
	ON		Synchronous (&Q3 version of sync)			
	OFF		Asynchronous (&Q6 version of async)			
DTE INTERFACE SPEED				Z34-RX	Z32t-RX	Z32b-RX
			ASync	Sync	Sync	Sync
	ON	ON	19.2	14.4	14.4	14.4
	OFF	ON	38.4	19.2	19.2	N/A
	ON	OFF	57.6	24.0	N/A	N/A
	OFF	OFF	115.2	28.8	N/A	N/A

OPTION NAME	SWITCH No.	SETTING
ANSWER/ORIGINATE MODE	SW5	DIAL-UP
	ON	Auto Answer On
	OFF	S0=0
LEASED LINE		Answer Mode
		Originate Mode
LINE CONNECTION	SW6	
	ON	Leased Line (2- or 4- wire)
	OFF	Dial-up
LINE TYPE	SW7	
	ON	4-Wire
	OFF	2-Wire
V.25BIS DIALING	SW8	
	ON	Enabled
	OFF	Disabled
V.25BIS DATA FORMAT	SW9	
	ON	Character-oriented (BSC-NRZ)
	OFF	Bit-oriented (HDLC)
DTE TYPE	SW10	
	ON	Dumb Mode (AT autodialer disabled)
	OFF	Smart Mode (AT autodialer and call progress messages enabled)

Hard Strap Options

The RX-Series has two three-prong headers. JP1 is for modem A and JP2 is for modem B. JP1 and JP2 perform the same function but for different modems. The following options are enabled or disabled by push-on headers on the printed circuit board (PCB). Table 4-3 indicates the operation of header JP1 and JP2.

TABLE 4-3. HARD STRAP SETTINGS

OPTION NAME	JUMPER NUMBER	STRAP SETTING	
		A (TOP 2 PINS)	B (BOTTOM 2)*
Modem A Caller ID/LL	JP1	Caller ID	Leased line*
Modem B Caller ID/LL	JP2	Caller ID	Leased line*

NOTE: Asterisk (*) denotes default setting.

Automatic Answering

The RX-Series is set to automatically answer, that is, it answers all incoming calls, determines at what speed the remote modem is transmitting, and establishes a data link at the highest possible speed. It also automatically negotiates error control and data compression in asynchronous operation. To enable automatic answer (AA LED must be on), issue an *ATSO=1<ENTER>* command or hold down the DATA and TEST keys for three (3) seconds or longer. If you want the RX-Series to answer after a specified number of rings, set the register S0 to equal that number. When the AA and DTR LEDs are on (&D2 is set), the RX-Series automatically answers all incoming calls. However, if you're sharing a voice line with your data line and expect voice calls, make sure the AA LED is off by entering an *ATSO=0<ENTER>* command.

Communication Software for Your Computer

If you are using a computer with your RX-Series modem, you may need a communications software program. You may purchase one with the RX-Series (see Appendix B). Otherwise, there already exists a great variety of software packages, the simplest of which makes the computer function like a dumb terminal (that is, the device sends information to and receives information from a remote computer, but has little intelligence or computing power

of its own).

The more sophisticated communications packages provide more advanced features, allowing you to emulate terminals, perform file transfers, and combine automatic and delayed operations with logon and security procedures through script files. Whatever software package you purchase, make sure it is compatible with the AT command set. Modems such as the RX-Series that have the AT command set and AT responses will allow you to be compatible with an extensive variety of communications programs (for example, Carbon Copy,[™] COMit,[™] pcANYWHERE,[™] PROCOMM,[™] QModem,[™] and QModem SST[™]). Follow exactly the installation procedures for your particular software package.

Prestored Modem Profiles

The RX-Series modem contains twelve prestored profiles that address an extensive range of popular applications. The application you select will determine the type of profile. You can select the prestored configurations for many popular profiles and, which will set a myriad of modem options with a single keystroke. AT&F0 loads the factory modem configuration. AT&F1 through F11 loads one of eleven profiles designed to fit popular modem applications. To view the specific settings for each command and S register, load the prestored profile desired (for example, AT&F2), then use the *AT&V<ENTER>* command to display the profile on your screen. In Appendix D, each profile and its accompanying options and S registers are listed.

Nonvolatile Memory Organization

The active profile stored in the Z34's random access memory (RAM) defines the current operating characteristics of the modem. The factory profiles are permanently stored in read-only memory (ROM). This configuration contains options in S registers used most commonly for asynchronous data communications. To restore and write the Z34's default profile to memory, enter an *AT&F0&W<ENTER>* command from your terminal or PC keyboard.

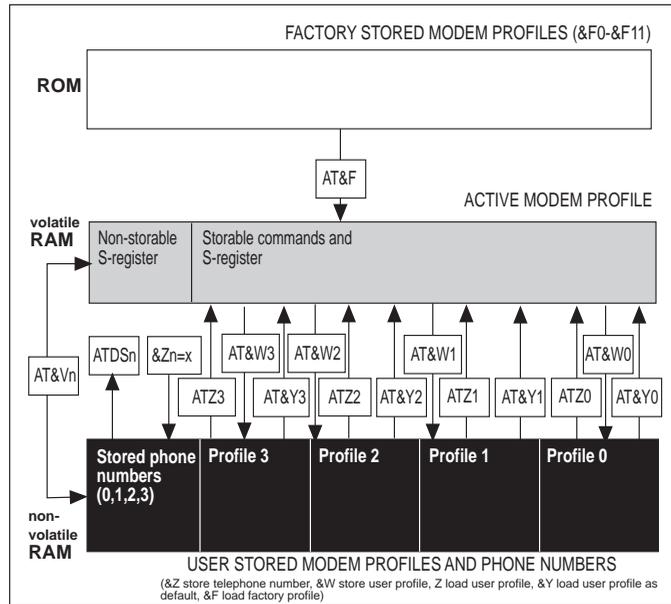


Figure 4.1 Memory Management

Active Profile

The modem's active profile shows the current active settings for AT commands and S registers. The profile is temporary. Issuing a specific command to change the profile, resetting the RX-Series to its factory options, or cycling power to the RX-Series also changes the active profile.

Stored Profiles

The modem's stored profiles consist of four user-specified profiles and 12 factory-stored profiles. Any

one of these can be recalled as the active configuration when you reset the modem. Upon power up, the stored user profiles can be loaded automatically (&Y).

User-Specified Profiles

If you find that the prestored modem profiles are not suitable to your particular application, you can create up to four user-defined profiles. Different combinations of AT command options and S register settings can be defined in these four profiles.

Determine the communication requirements for your remote system and local DTE. Specify the AT command options and S register settings that will customize your configuration and allow you to communicate with your remote computer. When you recall this user-specified profile (Z or &Y), its settings will replace the previous active profile.

The commands used to save, recall, view and adjust the four user-specified profiles are described below.

Save User Profile (AT&Wn)

The &W n command, where n equals 0 through 3, saves AT commands and S register settings (also known as parameters) of the active profile into the Z34's memory. The current settings for stored commands and S registers are written to a user profile that can be recalled and used later. AT&W0 stores settings to user profile 0, AT&W1 stores settings to user profile 1, and so forth. The speed at which the AT&W command is sent to the modem when storing operational parameters will also govern the modem's operating speed when this configuration is in use.

**Recall a Profile
(ATZn)**

The ATZn command is used to perform a soft reset and recall a stored user-specified profile. ATZ0 recalls user-specified profile 0, ATZ1 recalls user-specified profile 1, and so forth.

**View Profile
(AT&Vn)**

Use AT&V0 to display the active configuration and the parameters stored in user-specified profiles 0 and 1. You can use AT&V1<ENTER> to display user configurations stored in profiles 2 and 3, as well as all four stored telephone numbers.

**Select Power-on
Profile (AT&Yn)**

Any one of the four user-specified profiles can be designated as the power-up configuration. The AT&Y1<ENTER> command causes user-specified profile 1 to become the power-up modem configuration, AT&Y3<ENTER> causes user-specified profile 3 to become the power-up configuration, and so on.

**Factory Profiles
(AT&Fn)**

AT&Fn (where $n = 0$ through 11) recalls the selected Z34's factory profile. AT&F0 replaces all current parameter settings in the Z34's active profile.

Creating User-Specified Profiles

The steps below describe how to create an active profile from a prestored profile and how to create a user-specified profile from a prestored factory profile.

Prestored Profile to Active Profile

Issue `AT&F3<ENTER>` to recall prestored profile 3 to the active profile. `AT&F3` replaces all active settings with the prestored settings for each option and S register.

Prestored Profile to User Profile

Set your terminal or communications software data rate to 230,400 bps or any other appropriate speed. The speed specified when you store the user profile settings will be the speed at which the profile will be recalled.
Type:

`AT&F0<ENTER>`

This command causes the prestored factory profile to be written to the active profile. If your application requires AT commands and S registers to be modified as described below, you would then type:

`AT&D2 &C1 &S1 E0 Q2 S0=1 &W0<ENTER>`

This command string sets DTR normal (&D2), carrier normal (&C1), DSR normal (&S1); turns echo off (E0) and messages on in originate mode (Q2) ; and enables auto answer (S0=1). &W0 saves these parameters to user profile 0.

The AT&W0 profile will be recalled automatically to the active profile whenever the RX-Series is powered up or reset with the *ATZ<ENTER>* command, assuming AT&Y0 is set.

CHAPTER 5

AT Command Set

A Hayes AT-compatible modem operates with standard commands that enable a computer to operate and configure the modem. The RX-Series has a standard set AT commands, in addition to an expanded set of commands to control options not found in Hayes modems.

RX-Series Capabilities

Many communications software packages use AT commands for autodialing, selecting options, and disconnecting a call. The RX-Series also has an extended set of AT commands to control the following operations:

- Remote modem access
- Four-wire leased line operation with autodial backup
- Simulated half-duplex operation (V.13)
- V.25*bis* autodialing
- Group 3 facsimile operation
- Auto-logon and callback/pass-through security
- Network management

The extended AT command set also provides easy access to eleven prestored factory configurations for common applications, advanced diagnostics, and analog performance measurements. Certain modem options are dependent on or restricted by the RX-Series operation. For example, autodial backup options are available only in leased line operation. Fax options are only available in fax operation.

Functional Modem States

During asynchronous AT operation, the RX-Series functions in one of these three modes:

- Command mode
- Online data mode
- Online command mode

Command Mode

When the RX-Series is powered up, it enters command mode and is ready to receive AT commands to dial a telephone number or to have the RX-Series go off-hook to answer an incoming call. The RX-Series does not enter command mode upon power up if it is configured for dumb operation (DIP switches 1 and 10 set to the ON position or if S49 is optioned). If you've configured the RX-Series for dumb mode and wish to reset it, set all DIP switches the OFF position and reinstall RX-Series modem while pressing-in the <TEST> and <DATA> keys.

Online (Data) Mode

When the RX-Series connects to a remote modem, it acquires carrier from the remote modem, then negotiates its error control and data compression features. At this point, the RX-Series goes online (data mode) and can transmit data to the remote modem using the telephone line. In online (data) mode, the RX-Series can send and receive data, but cannot execute any command instructions. To be able to execute commands while online, the RX-Series must be in online command mode.

Online Command Mode

When an online RX-Series receives the +++ escape sequence (or as otherwise defined by register S2) from the attached computer, it enters online command mode, maintaining the data communications link but suspending data transmission. At this point, commands sent to the modem are executed as they would be in normal command mode. The RX-Series implements a TIES (time independent escape sequence) escape sequence. To return to online data mode, use the *ATO<ENTER>* command or the *ATH<ENTER>* command to disconnect. If you enter an incorrect AT command while in this mode, the RX-Series automatically returns to online data mode.

Basics of the AT Command Set

An AT command consists of the AT prefix followed by a string of command characters. These command characters, which can be either upper- or lowercase but not a mixture of both, tell the modem what to do. For example, to dial a telephone number, type:

ATDT1-510-783-2538<ENTER>

ATDT is either all uppercase or all lowercase, AT is the prefix, D is the dialing command, T is the dial modifier that enables tone dialing, and 1-510-783-2538 is the telephone number to be dialed. <ENTER> is the end-of-line flag that tells the modem to process the command entered.

The AT command prefix has a threefold purpose: to get the modem's attention, allow it to detect the speed at which the computer is sending data, and to recognize the character format (parity).

Command Messages

When you issue an AT command and end of line flag (<ENTER>) to the RX-Series, your DTE screen should display an OK message. If the RX-Series does not recognize a command or command parameter, the screen displays ERROR. Tables 5-2, 5-3 and 5-4 list all the messages for both words and digits.

The above messages are word response messages. When writing applications programs, programmers sometimes prefer character responses. To select the type of message to be sent by the RX-Series and displayed at the DTE, use the *ATV*<ENTER> command. *ATV0* specifies single-character response messages; *ATV1* specifies verbose (English) response messages.

AT Command Summary

The RX-Series modem supports the commands listed in this chapter.

AT commands must always begin with the AT prefix and end with <ENTER>, unless you issue an *A/* (Repeat) command or the *+++* escape sequence. When using the AT commands to dial, you may add spaces, hyphens or periods to enhance readability. These characters are ignored.

The notion (*n*) in the command description represents a numeric option. For example, in the *&Fn* command, *n* is a number from 0 through 11. If you issue a command without a number, the RX-Series assumes 0. For example, if you type ATM, the RX-Series assumes ATM0.

AT Command Buffer

When you send the *AT<ENTER>* command to the RX-Series, it determines the DTE's serial port speed and bits per character. The RX-Series supports these character formats:

- ❑ 8,N,1
- ❑ 7,E,1
- ❑ 7,O,1
- ❑ 7,N,2
- ❑ 7,MARK,1
- ❑ 7,SPACE,1

After receiving a command followed by <ENTER>, the RX-Series returns a response message indicating whether or not the command was accepted. An OK message indicates acceptance of a valid command string. ERROR indicates an invalid command string or command parameter. To clear each command parameter from the command buffer, do one of the following:

1. Type *AT<ENTER>* or lower DTR to reset the command buffer.
2. Use the <BACKSPACE> key to move backward or the <DELETE> key to erase the last character.

Multiple commands can be entered into the 255-character command buffer. You can control EIA signals, set answer mode, change speaker volume, select response messages, and turn off echo all in one command string—as long as you do not exceed the 255-character limit.

Table 5-1 shows a list of valid AT commands and provides a reference for more detailed descriptions of each command.

TABLE 5-1. AT COMMAND SET

COMMAND	GENERAL DESCRIPTION	REFERENCE
+++	Escape sequence	5-9
A	Manual answer	5-9
A/	Re-execute last command	5-9
AT	Attention command	5-10
B	CCITT/Bell compatibility	5-10
D	Dial command	5-10
E	Command character echo	5-12
H	Switch hook control	5-12
I	Memory and firmware status	5-13
L	Speaker volume control	5-13
M	Speaker control	5-14
N	Handshaking	5-14
O	Return to data mode	5-15
Q	Result codes transmission	5-15
V	Result codes type	5-16
W	Connection result codes	5-16
X	Basic result codes	5-20
Y	Long space disconnect	5-20
Z	Recall user-specified profile	5-21
&A	V.42 error control	5-21
&B	Speed conversion	5-22
&C	CXR control	5-22
&D	DTR control	5-23
&E	Automatic modem retrain	5-25
&F	Recall factory-designed profile	5-26
&G	Guard tone control	5-27
&I	Break signal control	5-28

COMMAND	GENERAL DESCRIPTION	REFERENCE
&K	Modem flow control	5-29
&L	Line type select	5-31
&N	Automatic error control abort	5-31
&O	Error control buffer	5-32
&P	Pulse dial make/break ratio	5-32
&Q	Communication protocol select	5-33
&R	CTS control	5-35
&S	DSR control	5-35
&T	Diagnostic tests	5-36
&U	Data compression control	5-36
&V	Display profiles	5-37
&W	Write active configuration	5-38
&X	Synchronous clock control	5-38
&Y	Recall user configuration	5-39
&Z	Store telephone number	5-39
%A	Auto-reliable abort character	5-40
%B	11 bit	5-40
%C	Data compression	5-40
%D	Hang-up buffer delay	5-41
%K	V.42 sliding window size	5-41
%L	DSP measurements	5-41
%P	V.42 negative ADP	5-42
%Q	Dial interrupt control	5-42
%R	V.42 checksum length	5-43
%V	Autodialer select	5-43
%Y	MNP packet format	5-44
%X	Serial port speed	5-44
^E	Read remote EIA signals	5-45
^R	Remote modem access control	5-45

COMMAND	GENERAL DESCRIPTION	REFERENCE
^S	Secondary channel control	5-45
#B	Busyout control	5-46
#C	Caller ID control	5-46
#L	Serial Port Speed Lock	5-46
*H	Hardware Reset	5-47
\A	V.42 block size	5-47
\B	Break length control	5-48
\C	Auto-reliable buffer	5-48
\G	Modem-to-modem flow control	5-49
\K	Break signal control	5-49
\L	Line probe control	5-50
\N	Online data mode operation	5-50
\P	Modem security password control	5-52
COMMAND	GENERAL DESCRIPTION	REFERENCE
\S	Display active profile	5-52
\V	Extended result messages	5-53
\Y	Error control link request	5-53
\Z	MNP abort error control link	5-53

AT Command Descriptions

AT commands normally have a number of possible parameters or values. In instances where a command has multiple parameters, the default is the parameter set at the factory to work with most applications. Default values for each command are marked with an asterisk (*).

+++ (Escape Sequence)

Directs the RX-Series to enter online command mode from online (data) mode (TIES implementation).

A (Manual Answer)

Selects manual answering and switches from voice to data communication, forcing the RX-Series to go off-hook (connect to the telephone line) and send answer tone. In default mode, the RX-Series will connect at the highest speed supported by the calling modem.

A/ (Re-execute Last Command)

Re-executes the last entered command, which is stored in the RX-Series command buffer, without requiring it to be retyped. Does not require the AT prefix or the <ENTER> end-of-command flag.

AT (Attention)

Prefix that precedes all commands except the +++ escape sequence and the A/ command. Type AT<ENTER> to see if the RX-Series is ready to receive commands from your computer or terminal. The RX-Series should respond with an OK message (or 0 if set for character response).

B (CCITT/Bell Compatibility)

Selects the answer tone frequency transmitted by the RX-Series. The CCITT specification for V.22 has an answer tone frequency of 2100 Hz, while the Bell 212A specification calls for a frequency of 2225 Hz. At speeds above 1200 bps, there is no conflict in answer tone frequency. Use the ATB1 command for domestic calls and ATB0 for international calls when communicating below speeds of 2400 bps.

COMMAND	DESCRIPTION
Bn	CCITT/Bell modulation compatibility
B0	Uses CCITT modulation schemes (V.22 at 1200 bps and V.21 at 300 bps)
B1*	Uses Bell modulation schemes (Bell 212A at 1200 bps and Bell 103 at 300 bps)*

D (Dial)

Instructs the modem to dial a specified telephone number. Pressing <ENTER> at the end of the command string causes the RX-Series to begin dialing. The telephone number, including dial modifiers, punctuation, and any additional commands can be up to 255 characters long. Can also be used in conjunction with a telephone handset to manually dial a telephone number. After dialing the number, simply type *ATD* <ENTER> and quickly hang up the telephone.

MODIFIERS	DESCRIPTION
nn	Specifies a telephone number (up to 68 digits)
T	Selects tone dialing
P	Selects pulse dialing

,	Inserts a pause of two seconds (or the value in seconds of register S8)
R	Forces the RX-Series to dial a call in answer mode
W	Causes the RX-Series to wait for dial tone for a period equal to the value of register S7
!	Switch hook flash = 0.5 seconds duration
@	Waits for 5 seconds of silence before continuing
;	Returns to command mode after dialing
L	Redials the last telephone number
S	Dials one of the four stored telephone numbers (each with a maximum of 68 characters), i.e., DSn , where n = locations 0 through 3

The RX-Series automatically redials upon call failure if register S41 is set to a value other than 0. If S41 is set to 0, the RX-Series does not automatically redial.

E (Command Character Echo)

Controls whether or not the RX-Series echoes the command characters it receives. At power-on, the default setting for local echo is enabled. If you type AT and your personal computer or terminal screen shows AT, then the option is set correctly. If your screen displays AATT, you need to disable local echo. If your screen shows no characters whatsoever, you may have local echo improperly configured or there may be additional connection problems. If local echo is improperly configured, issue an *ATE1<ENTER>* command to enable it.

COMMAND	DESCRIPTION
<i>En</i>	Command character echo
<i>E0</i>	Disables echo
<i>E1*</i>	Enables echo*

H (Switch Hook Control)

Makes the RX-Series go on- or off-hook, depending on the numerical value that follows H. Typically this command is used to terminate a call.

COMMAND	DESCRIPTION
<i>Hn</i>	Switch hook control
<i>H0</i>	Makes the RX-Series go on-hook (equivalent to disconnecting from the telephone line and placing the modem in command mode)
<i>H1</i>	Makes the RX-Series go off-hook, enabling dial tone transmission

When the RX-Series is in error correction mode, register S38 or the %D command dictates the delay between issuing the on-hook command and actually going on-hook.

I (Memory and Firmware Status)

Requests a three-digit product code stored in the RX-Series modem. Some software communications programs send ATIO and read the product code result, setting the speed accordingly. This command has been expanded beyond the product code capabilities to include information about the read-only memory (ROM), the firmware revision level, and the revision levels of the data pump.

COMMAND	DESCRIPTION
<i>In</i>	Memory and firmware status
I0	Requests product code
I1	Requests checksum on EPROM
I2	Compares EPROM checksum value against a stored value
I3	Requests product firmware version
I5	Requests revision of RX-Series data pump
I6	Requests RX-Series serial number

L (Speaker Volume Control)

Sets the speaker volume when the speaker is on. To manually control volume, leave L at its default value of 2 (medium volume) and use the manual control on the Z32CH selector switch to raise or lower the volume.

COMMAND	DESCRIPTION
<i>Ln</i>	Speaker volume control
L0	Sets low volume
L1	Sets low volume
L2*	Sets medium volume*
L3	Sets high volume

M (Speaker Control)

Controls operation of the speaker.

COMMAND	DESCRIPTION
<i>Mn</i>	Speaker control
M0	Sets speaker always off
M1*	Sets speaker on until RX-Series detects carrier*
M2	Sets speaker always on
M3	Turns the speaker on until RX-Series detects carrier and then momentarily off during the dialing sequence

N (Handshaking)

Selects whether a connection will be forced to a specific speed or allowed to negotiate the highest speed possible.

COMMAND	DESCRIPTION
<i>Nn</i>	Handshaking
N0	Forces handshake to line speed selected by register S37, even after a retrain
N1*	Starts handshake at a line speed selected by register S37*

When N1 and S37 = 0, you can autodial at a DTE speed of 19,200 bps and call a remote 33,600 bps modem. The RX-Series connects at 33,600 bps even though the serial port is 19,200 bps. To set a maximum line speed and still allow for line speed fallback use N1 and S37=nn. To force a line speed use N0 and S37=nn. These speed commands (N1, N0, S37) apply to leased lines, dial-up lines and dial backup mode.

O (Return to Data Mode)

Returns to data mode from online command mode. The RX-Series returns to the same mode—either originate or answer—from which +++ was last issued. After returning to online data mode, the screen displays a CONNECT message. You can also manually originate if you issue an *ATH1O<ENTER>* command.

COMMAND	DESCRIPTION
<i>On</i>	Return to data mode
O0	Returns the RX-Series to online data mode
O1	Returns the RX-Series to online data mode and establishes an equalizer retrain for speeds above 2400 bps

Q (Result Codes Transmission)

Defines whether or not the RX-Series will issue result codes to the DTE during normal operation. These codes can cause confusion to some host computer applications and may need to be disabled.

COMMAND	DESCRIPTION
<i>Qn</i>	Result codes transmission
Q0*	Enables transmission of result codes to terminal*
Q1	Disables transmission of result codes to terminal
Q2	Enables transmission of result codes to terminal in originate mode only

V (Result Codes Type)

Controls whether the screen displays result codes as words or as single-digit characters (see Tables 5-2, 5-3 and 5-4 for a complete list of result codes). A combination of commands controls result codes from the RX-Series: Q, X, W, or \V (which is the same as W).

COMMAND	DESCRIPTION
Vn	Result code type
V0	Selects single-digit responses
V1*	Selects verbose (word) responses*

W (Connection Result Codes)

Defines the type of result codes to be returned to the DTE. V.34 modems can have transmit and receive speeds which differ. Zypcom uses the receive speed for DCE speed reporting for W1 and W2. For software compatibility, the RX-Series also supports \V command. \V0 is the same as W0 and \V1 is the same as W2.

COMMAND	DESCRIPTION
Wn	Connection result codes
W0*	Reports DTE speed as connect speed*
W1	Reports DCE speed in a three-line format
W2	Reports DCE speed in a one-line format
W3	Reports both transmit and receive line speeds in a one-line format

TABLE 5-2. AT RESULT MESSAGE VALUES WHEN ATW0 IS SET

MESSAGES WORDS	DIGITS	MESSAGE SELECTION						
		X0	X1	X2	X3	X4	X5	X6
OK	00	On	On	On	On	On	On	On
CONNECT	01	On	Off	Off	Off	Off	Off	Off
RING(Ans)	02	On	On	On	On	On	On	On
NO CARRIER	03	On	On	On	On	On	On	On
ERROR	04	On	On	On	On	On	On	On
CONNECT 1200	05	On	On	On	On	On	On	On
NO DIALTONE	06	Off	Off	On	Off	On	Off	On
BUSY	07	Off	Off	Off	On	On	On	On
NO ANSWER (see note)	08	On	On	On	On	On	On	On
CONNECT 75TX/ 1200RX	62	Off	On	On	On	On	On	On
CONNECT 1200TX/ 75RX	63	Off	On	On	On	On	On	On
CONNECT 2400	10	Off	On	On	On	On	On	On
CONNECT 4800	11	Off	On	On	On	On	On	On
CONNECT 7200	60	Off	On	On	On	On	On	On
CONNECT 9600	12	Off	On	On	On	On	On	On
CONNECT 12000	61	Off	On	On	On	On	On	On
CONNECT 14400	13	Off	On	On	On	On	On	On
CONNECT 19200	14	Off	On	On	On	On	On	On
CONNECT 38400	15	Off	On	On	On	On	On	On
CONNECT 57600	16	Off	On	On	On	On	On	On
CONNECT 115200	17	Off	On	On	On	On	On	On
CONNECT 230400	19	Off	On	On	On	On	On	On
RINGING(Org)	18	Off	Off	Off	Off	Off	On	On
AUTO LOGON FAILED	90	Off	On	On	On	On	On	On

NOTE: The NO ANSWER message is sent only when the dial string contains an at sign (@) dial modifier.

TABLE 5-3. AT RESULT MESSAGE VALUES WHEN ATW2 IS SET

MESSAGES (NOTE 1) WORDS (NOTE 1)	DIGITS	MESSAGE SELECTION							
		X0	X1	X2	X3	X4	X5	X6	
CONNECT 300/ (feature negotiation)	20	Off	On						
CONNECT 1200/	22	Off	On						
CONNECT 2400/	23	Off	On						
CONNECT 4800/	31	Off	On						
CONNECT 7200/	32	Off	On						
CONNECT 9600/	33	Off	On						
CONNECT 12000/	34	Off	On						
CONNECT 14400/	35	Off	On						
CONNECT 16800/	36	Off	On						
CONNECT 19200/	37	Off	On						
CONNECT 21600/	38	Off	On						
CONNECT 24000/	39	Off	On						
CONNECT 26400/	40	Off	On						
CONNECT 28800/	41	Off	On						
CONNECT 31200/	88	Off	On						
CONNECT 33600/	89	Off	On						
CONNECT 75TX 1200 RX/	25	Off	On						
CONNECT 1200TX/ 75RX/	26	Off	On						

NOTE 1: ATW2<ENTER> enables Microcom-formatted connect messages that include link negotiation levels. These messages replace only the connect messages listed in Table 5-2. (The other messages in Table 5-2 are valid.)

NOTE 2: Feature negotiation messages always follow connect messages if ATW2 is set. For example, you might see CONNECT 14400/V42BIS, where /V42BIS indicates that the connection negotiation is a V.42bis handshake. Possible feature negotiation messages are V42BIS, V42, REL 2, REL 3, REL 4 or REL 5. Please note that the digit result messages do not report feature negotiation.

TABLE 5-4. AT RESULT MESSAGE VALUES WHEN ATW1 IS SET

MESSAGES (NOTE) WORDS	DIGITS	MESSAGE SELECTION						
		X0	X1	X2	X3	X4	X5	X6
CARRIER 300	40	Off	On	On	On	On	On	On
CARRIER 1200	46	Off	On	On	On	On	On	On
CARRIER 75TX/ 1200RX	64	Off	On	On	On	On	On	On
CARRIER 1200TX/ 75RX	65	Off	On	On	On	On	On	On
CARRIER 2400	47	Off	On	On	On	On	On	On
CARRIER 4800	48	Off	On	On	On	On	On	On
CARRIER 7200	49	Off	On	On	On	On	On	On
CARRIER 9600	50	Off	On	On	On	On	On	On
CARRIER 12000	51	Off	On	On	On	On	On	On
CARRIER 14400	52	Off	On	On	On	On	On	On
CARRIER 16800	53	Off	On	On	On	On	On	On
CARRIER 19200	54	Off	On	On	On	On	On	On
CARRIER 21600	24	Off	On	On	On	On	On	On
CARRIER 24000	27	Off	On	On	On	On	On	On
CARRIER 26400	28	Off	On	On	On	On	On	On
CARRIER 28800	29	Off	On	On	On	On	On	On
CONNECT 31200	38	Off	On	On	On	On	On	On
CONNECT 33600	39	Off	On	On	On	On	On	On
PROTOCOL: NONE	70	Off	On	On	On	On	On	On
PROTOCOL: V.42	77	Off	On	On	On	On	On	On
PROTOCOL: REL	79	Off	On	On	On	On	On	On

NOTE: ATW1<ENTER> enables Hayes-formatted connect messages. The additional messages detail a call's carrier speed (line speed), error control level, and connect speed (DTE speed). These messages supplement the ones listed in Table 5-2.

X (Basic Result Codes)

Requests certain messages to be displayed or suppressed. You can choose from seven sets of messages. (Tables 5-2, 5-3 and 5-4 explain the messages for each X_n command setting and accompanying W_n command.)

COMMAND	DESCRIPTION
X_n	Basic result codes control
X0	Disables detection of call progress tones and omits speed connection messages
X1	Enables CONNECT XXXX (speed) messages
X2	Enables detection of dialtone
X3	Enables detection of busy tone but not dialtone
X4*	Enables detection of busy tone, dialtone, and CONNECT XXXX (speed) messages*
X5	Enables all messages except dialtone detection
X6	Enables automatic selection of pulse or tone dialing and all other messages

Y (Long Space Disconnect)

Some computer systems end a data session by sending or receiving a continuous break signal. This capability works only when the RX-Series is online with no error control. When the long space disconnect is enabled, the RX-Series detects the incoming break and signals the remote modem to hang up.

COMMAND	DESCRIPTION
<i>Yn</i>	Long space disconnect
<i>Y0*</i>	Disables long space disconnect*
<i>Y1</i>	Enables long space disconnect

The RX-Series modem disconnects when it receives 1.6 or more seconds of a continuous break signal. In addition, when the RX-Series receives a break signal from the DTE, it transmits 4 seconds of break signal to the remote modem before hanging up.

Z (Recall User-Specified Profile)

Recalls one of the four user-specified profiles and loads it into the RX-Series active configuration.

COMMAND	DESCRIPTION
<i>Zn</i>	Recall user-specified profile
<i>Z0</i>	Recalls profile 0 to active configuration
<i>Z1</i>	Recalls profile 1 to active configuration
<i>Z2</i>	Recalls profile 2 to active configuration
<i>Z3</i>	Recalls profile 3 to active configuration

&A (V.42 Error Control)

When the RX-Series has been set for auto-reliable operation, this command determines whether or not the RX-Series sends the V.42 handshake (ODP) and whether or not it detects the V.42 handshake (ADP) from the answer modem.

COMMAND	DESCRIPTION
&An	V.42 error control
&A0*	Disables transmission of the V.42 handshake to the remote modem and detection of the V.42 handshake from the remote modem*
&A1	Enables transmission of V.42 handshake

NOTE: Use &A only when the standard V.42 link requests are failing.

&B (Speed Conversion)

Determines the speed at which data is transmitted to the DTE when the line speed is different from the speed of the last autobaud.

COMMAND	DESCRIPTION
&Bn	Speed conversion
&B0	Sets speed conversion off
&B1*	Sets speed conversion on*

The default speed upon power-up of the RX-Series serial port is 230,400 bps. For communications software compatibility, the RX-Series supports the \J command, where \J0 is the same as &B1 and \J1 is the same as &B0.

&C (CXR Control)

Determines how the RX-Series handles CXR on the DTE interface (pin 8). Most computers operate with CXR set to follow true carrier from the remote modem. Most terminals operate with CXR forced on; some answer-side host computers operate with the CXR port contender option.

COMMAND	DESCRIPTION
&Cn	CXR control
&C0*	Forces CXR (DCD) always on*
&C1	Sets CXR to follow true carrier (note 1)
&C2	Port contender sets CXR on until the RX-Series goes online. CXR then follows the status of true CXR (note 2)
&C3	Sets CXR to follow remote RTS based on the V.13 data pattern. &C3 allows for transmission of the V.13 pattern controlled by RTS and reception of the V.13 pattern that controls CXR
&C4	Enables transmission only of the V.13 pattern controlled by the RTS signal
&C5	Enables reception only of the V.13 pattern to control CXR

NOTE 1: When the RX-Series is set for non-error control, CXR goes high when true carrier is acquired from the remote modem. When the RX-Series is set for error control, CXR goes high after true carrier is acquired and the error control handshake is completed.

NOTE 2: CXR is high while the RX-Series is in data mode. When true carrier goes away and the modem hangs up, the RX-Series lowers CXR for four seconds, after which CXR goes high again.

NOTE 3: &C3, &C4 and &C5 control operation of the V.13 pattern, commonly referred to as switched carrier or simulated half duplex. See Chapter 9 for a detailed explanation of V.13 operation.

&D (DTR Control)

Determines how DTR is interpreted by the RX-Series. &D operates differently in asynchronous and synchronous communication and works in conjunction with register S25 in asynchronous communication.

COMMAND	DESCRIPTION IN ASYNCHRONOUS OPERATION
&D0*	RX-Series assumes DTR is forced on at all times*
&D1	Causes the RX-Series to assume that DTR is forced on at all times; however, an on-to-off transition for a period of time equaling register S25 causes the RX-Series to go from data mode to online command mode
&D2	Sets DTR normal, whereby the RX-Series disconnects and disables auto-answer when DTR goes from on to off (per CCITT 108.2 (see note))
&D3	When DTR transitions from on to off, &D3 causes the RX-Series to disconnect and disable auto-answer, resetting the active profile as specified by the &Y command
&D4	When DTR transitions from off to on, &D4 causes the RX-Series to dial the number stored in memory location 0. An on-to-off DTR transition causes a modem hang up and disables auto-answer (per CCITT 108.2 (see note)). Data mode will

depend on the setting of &Q command. Do not use &Q2 with this option. &Q2 is used for PCs. The &D4 option is used for dial-up multiplexers and dial backup links for DSUs and other similar applications which cannot halt data transmission while the modem is dialing. (For more information see Chapter 7, "Software Setup of Synchronous Operation.")

NOTE: DTR drops for the period, in 1/100 seconds, set by register S25 while the RX-Series is online. The call immediately terminates.

&DN	&QN	DESCRIPTION IN SYNCHRONOUS OPERATION
&D0-4	&Q1	If &D1 is set, an on-to-off transition of DTR causes the RX-Series to enter asynchronous online command mode (even though it is in synchronous data communication). If &D0, &D2, &D3 and &D4 hang up are set, an on-to-off transition of DTR causes the RX-Series to hang up.
&D0-3	&Q2	Ignores all &D settings. An off-to-on transition of DTR while the RX-Series is off-line causes the telephone number stored in memory location 0 to be dialed. An on-to-off transition of DTR while the RX-

Series is in data mode causes the RX-Series to hang up. No calls are answered if DTR is low. PCs use &Q2&D2 for dialing on a DTR transition (off-to-on); other devices should use the options below (&D4&Q3).

&D0-4	&Q3	<p> Ignores all &D settings. An on-to-off transition of DTR while the RX-Series is online causes the RX-Series to hang up (per CCITT 108.1). No calls are answered if DTR is low. Once &Q3 is selected, the modem is in synchronous mode and no longer responds to asynchronous AT commands. The only way to reset the modem after it enters the &Q3 sync mode is with a power reset.</p>
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&E (Automatic Modem Retrain)

Enables the RX-Series to monitor line conditions continuously. When those conditions deteriorate, the RX-Series suspends data transmission and initiates a retrain sequence on the line.

COMMAND	DESCRIPTION
&En	Automatic modem retrain
&E0	Disables automatic retrain capability
&E1*	Enables automatic retrain capability*

&F (Recall Factory-Designed Profile)

Recalls one of the twelve factory-designed profiles stored in ROM and loads it into the active profile (see Appendix D). After recalling a factory profile, you may customize the parameters, except for &F2, &F3, &F6 and &F10. (AT autodialer is disabled.)

COMMAND	DESCRIPTION
&Fn	Recall factory-designed profile
&F0	Selects asynchronous dial-up communication with speed conversion, auto-negotiated error control, and data compression; sets EIA signals for a terminal. (For a PC, you must change &C0 to &C1.)
&F1	Selects same operation as &F0 except that EIA signals are set for normal and echo is off (allowing call progress messages on the answer side)
&F2	Selects manual originate dialing (<DATA> key) in asynchronous communication (AT autodialer disabled)
&F3	Selects traditional asynchronous answer-side communication for host computers, PBX, and terminal servers (AT autodialing disabled)
&F4	Selects synchronous dialing of the contents of memory location 0 upon detection of an off-to-on transition of DTR; accepts AT commands when the RX-Series is on-hook
&F5	Selects V.25bis synchronous dial-up communication (HLDC-NRZ); accepts AT commands

- &F6 Selects dial-up synchronous manual originate dialing; AT autodialer disabled
- &F7 Selects four-wire, leased-line, synchronous originate communication (no dial backup); accepts AT commands when the RX-Series is on-hook
- &F8 Selects four-wire, leased-line, synchronous originate communication with dial backup. Upon leased line failure, the RX-Series dials the number stored in memory location 3; accepts AT commands when the RX-Series is on-hook
- &F9 Selects four-wire, leased-line, synchronous answer side communication with auto-answer dial backup; accepts AT commands when the RX-Series is on-hook
- &F10 Selects dial-up synchronous answer side communication for computers, PBXs and terminal servers; AT autodialer disabled
- &F11 Selects four-wire, leased line, synchronous answer communication (no dial backup); accepts AT commands when the RX-Series is on-hook

See Appendix D for detailed descriptions of factory-designed profiles. Profiles &F0 or &F2 are used with &F1 or &F3; &F10 with &F4, &F5, or &F6; &F7 with &F11; and &F8 with &F9.

&G (Guard Tone Control)

Defines how the RX-Series will handle guard tone. Guard tone is a frequency generated by the answer-side modem.

COMMAND	DESCRIPTION
&Gn	Guard tone control
&G0*	Selects no guard tone*
&G1	Selects 550 Hz guard tone on the answer-side modem
&G2	Selects 1,800 Hz guard tone on the answer-side modem

&I (Break Signal Control)

Defines how the RX-Series handles a break received from the DTE. The break can be processed as it is received (non-expedited) or put ahead of data in the transmit buffer (expedited), and can be destructive or non-destructive.

COMMAND	DESCRIPTION
&In	Break signal control
&I0*	Transmits a break in sequence with the received data (non-expedited and non-destructive)*
&I1	Immediately transmits a break signal without buffering (non-destructive and expedited)
&I2	Immediately handles a break signal and is destructive to data in the buffer (destructive and expedited); causes the modems at both ends to clear the buffers

The RX-Series also supports the \K command. \K1 functions the same as &I2, \K3 the same as &I1, and \K5 the same as &I0.

&K (Modem Flow Control)

Defines how the RX-Series handles flow control on the serial port, as well as between modems for non-error controlled connections. Two types of flow control exist: in-band (XON/XOFF) and hardware (RTS/CTS). With the in-band type, there are three versions: local, pass-through and internal.

In local mode, the local modem will receive and act on the XON/XOFF characters received from the local DTE and will not pass them to the remote modem. In addition, the modem can send flow control to the local DTE.

In pass-through mode, XOFF/XON characters received by the RX-Series from the local DTE are acted upon by the local modem and passed through to the remote modem.

Internal mode (referred to as modem-to-modem) is used between modems for non-error controlled connections with buffered serial ports (&B). In this flow control mode, the RX-Series will accept an XOFF from the remote RX-Series modem when it fills its transmit buffer and will also send flow control to the remote modem when the local receive buffer fills. Modem-to-modem flow control received from the remote modem is not passed on to the local DTE. &K20 flow control will protect the DTE-to-DTE communications link, while &K16 protects only the DCE-to-DCE communications link.

When you can choose between in-band and hardware flow control, always select the hardware type for error controlled connections because it will not present any application sensitivity. Note that when the RX-Series flow controls the local DTE, it is called *local send flow control*; when the RX-Series receives flow control from the local DTE, it is called *local receive flow control*.

When the RX-Series sends receive flow control to the remote modem, it is called *pass-through flow control*.

COMMAND	DESCRIPTION
&Kn	Modem flow control
&K0	Sets flow control off
&K3*	Selects hardware (RTS/CTS) flow control for error controlled connections*
&K4	Selects in-band (XON/XOFF) flow control with local send and receive and no pass-through of XON/XOFF for error controlled connections
&K8	Selects in-band (XON/XOFF) flow control with local receive-only and pass-through of XON/XOFF for error controlled connections
&K12	Selects in-band (XON/XOFF) flow control with local send and receive and pass-through for error controlled and non-error controlled connections
&K16	Selects in-band (XON/XOFF) internal flow control for non-error controlled connections
&K20	Selects in-band (XON/XOFF) internal flow control with local send and receive and pass-through for non-error controlled connections

The preferred method of flow control is RTS/CTS. However, if a computer does not have control of these signals and you want to use error control and/or buffered asynchronous protocol, you must use XON/XOFF flow control.

Use &K4 for error controlled communication and &K12 for non-error controlled communication. If the &K12 setting does not work for your application, first try &K20 and then &K16. On error controlled connections, you can mix in-band and hardware flow control for respective local and remote modems.

&L (Line Type Select)

Provides software control of the dial-up or leased line function. (Note that for leased line applications, it is best to use the DIP switches described in Chapter 8).

COMMAND	DESCRIPTION
&Ln	Line type select
&L0*	Selects software control for dial-up lines*
&L1	Selects 2-wire leased line operation
&L2	Selects 4-wire leased line operation

Jumpers must be set accordingly, as described in Chapter 4. To select answer side in 4-wire leased line operation, use the &L2S0=1 setting. To select originate side in 4-wire leased line operation, use the &L2S0=0 setting. Refer to Chapter 8 for more information.

&N (Automatic Error Control Abort)

Selects whether or not automatic error control aborts if the character specified in register S46 is received during error control negotiations.

COMMAND	DESCRIPTION
&Nn	Automatic error control abort
&N0*	Disables automatic abort of error control*
&N1	Enables automatic abort of error control

&O (Error Control Buffer)

Selects the type of buffering to be performed during an error control handshake. Normally data received from the remote modem during the error control handshake is discarded. With this command, the data can be buffered and sent to the local DTE after negotiation is successful or after the timeout occurs.

COMMAND	DESCRIPTION
&On	Error control buffer
&O0	Discards data received from remote modem during error control negotiations
&O1*	Buffers data received from the remote modem during error control negotiations; aborts data sent to the DTE after successful error control negotiations or a timeout*

&P (Pulse Dial Make/Break Ratio)

Sets the make/break ratio to be used when pulse dialing.

COMMAND	DESCRIPTION
&Pn	Pulse dial make/break ratio
&P0*	Selects 39%/61% ratio used for U.S. and Canada*
&P1	Selects 33%/67% ratio used for United Kingdom

&Q (Communication Protocol Select)

Selects the RX-Series communication mode. There are five asynchronous (&Q6, &Q7, &Q5, &Q4 and &Q0) and three synchronous (&Q1, &Q2 and &Q3) modes. In addition, in the asynchronous modes the process of error control negotiations can be controlled with register S36.

COMMAND	DESCRIPTION
&Q <i>n</i>	Communication protocol select
&Q0	Selects normal buffered asynchronous communication
&Q1	Selects synchronous communication whereby asynchronous command mode switches to synchronous data mode after remote carrier is acquired. In data mode, the RX-Series ignores DTR for a period equaling the value of register S25 in seconds. After a disconnect, the RX-Series returns to asynchronous command mode. RX-Series sends call progress messages and will echo commands with &Q1.
&Q2	Selects synchronous communication whereby an off-to-on transition of DTR causes the RX-Series to dial the telephone number stored in memory location 0. When the RX-Series detects an on-to-off transition of DTR, it hangs up and returns to asynchronous command mode. RX-Series sends call progress messages and will echo commands with &Q2.
&Q3	Selects normal synchronous communication whereby the user manually dials a telephone number and switches the RX-Series to data mode by pressing the <DATA> key. When remote carrier is lost or DTR transitions on-to-off, the RX-Series hangs up and remains in synchronous mode. DTR must be present

- when &Q3 is used if the modem is to answer an incoming ring. &Q3 is also used for synchronous leased line operation. Call progress messages and command echo are always disabled with &Q3. V.13 switched carrier operation is used exclusively with &Q3. Power reset is required to return modem to default.
- &Q4 Selects non-buffered asynchronous communication. &Q4 is used only for special 8, 9 and 11-bit applications.
- &Q5 Selects MNP error control, whereby the automatic feature negotiation attempts an MNP handshake first and, if unsuccessful, falls back to buffered asynchronous communication
- &Q6* Selects V.42 error control, whereby the automatic feature negotiation attempts a V.42 handshake and, if unsuccessful, attempts MNP. If unsuccessful again, falls back to buffered asynchronous communication.*
- &Q7 Selects V.42 error control, whereby the automatic feature negotiation attempts a V.42 handshake first and, if unsuccessful, falls back to buffered asynchronous communication

Register S36 can be used to modify the &Q command. For example, if you want to force an error-controlled link, use &Q6 S36=0 for either V.42 or MNP, use &Q7 S36=0 for V.42 only, and use &Q5 S36=0 for MNP only.

NOTE: Call progress messages (Q1) should be off when &Q4 is used and the line speed (N0S37=nn) must set to equal the DTE speed (%X=nn.n)

&R (CTS Control)

Controls the Clear to Send (CTS) signal in synchronous communication.

COMMAND	DESCRIPTION
&R <i>n</i>	CTS control
&R0	Sets CTS to follow RTS after a delay defined by register S26
&R1*	Forces CTS on at all times*
&R2	Sets CTS to follow true carrier (CXR)

&S (DSR Control)

Defines how the RX-Series handles the DSR signal.

COMMAND	DESCRIPTION
&S <i>n</i>	DSR control
&S0*	Forces DSR on at all times*
&S1	Sets DSR for compatibility with CCITT recommendations (DSR normal)
&S2	Sets port contender DSR option, whereby DSR is on until the RX-Series hangs up. Upon a disconnection, DSR goes off for 4 seconds and then goes on again

&T (Diagnostic Tests)

Refer to Chapter 10, "Troubleshooting and Testing," for a complete description of all RX-Series tests.

COMMAND	DESCRIPTION
&Tn	Diagnostic tests
&T0	Terminates test in progress. Run test, enter the +++ escape sequence, wait for the OK message to be displayed on your screen, then issue <i>AT&T0<ENTER></i>
&T1	Initiates analog loopback test (per CCITT V.54)
&T3	Initiates local digital loopback test
&T4	Allows the RX-Series to respond to a remote digital loopback test (RTRT)
&T5	Disables RTRT
&T6	Initiates remote digital loopback test (IRT per CCITT V.54)
&T7	Initiates remote digital loopback test with self-test data pattern (IRT/ST)
&T8	Initiates analog loopback test with self-test data pattern (per CCITT V.54)

&U (Data Compression Control)

Controls RX-Series data compression. A V.42 link operates with V.42*bis* data compression, which allows a 4:1 compression ratio. An MNP error control link operates with MNP level 5 data compression, which allows for a compression ratio of 2:1. This command functions only when &Q5, &Q6, or the equivalent \N command parameters are set.

COMMAND	DESCRIPTION
&Un	Data compression control
&U0	Disables data compression
&U1*	Enables data compression*

The %C command can also be used to enable or disable data compression: %C0=disabled and %C1=enabled.

&V (Display Profiles)

Causes the RX-Series to display its current configuration as well as other stored profiles and telephone numbers. When displaying remote RX-Series options, use the &V0 command to display active profile of the remote modem. To maintain communications software compatibility, the RX-Series also supports the \S command: \S0 is the same as &V0 and \S1 is the same as &V1.

COMMAND	DESCRIPTION
&Vn	Displays active configuration and user-stored profiles
&V0	Displays active profile and user-stored profiles 0 and 1
&V1	Displays user-stored profiles 2, 3, and the four telephone numbers stored in memory

&W (Write Active Configuration)

Enables the RX-Series active configuration to be written to a user-stored profile in nonvolatile memory.

COMMAND	DESCRIPTION
&Wn	Writes active configuration to user-specified profile
&W0	Writes active configuration to user profile 0
&W1	Writes active configuration to user profile 1
&W2	Writes active configuration to user profile 2
&W3	Writes active configuration to user profile 3

&X (Synchronous Clock Control)

Defines the source of the transmit clock used in synchronous communication.

COMMAND	DESCRIPTION
&Xn	Synchronous clock control
&X0*	Selects internal clock*
&X1	Selects external clock
&X2	Selects slave (receive) clock, whereby the RX-Series uses the receiver-derived clock to synchronize the transmitter clock

&Y (Recall User Configuration)

Recall a user-stored profile into the active configuration upon power up.

COMMAND	DESCRIPTION
&Yn	Recall user configuration upon power up
&Y0*	Designates user profile 0 as the active configuration upon power up*
&Y1	Designates user profile 1 as the active configuration upon power up
&Y2	Designates user profile 2 as the active configuration upon power up
&Y3	Designates user profile 3 as the active configuration upon power up

&Zn=x (Store Telephone Number)

Stores telephone number x in location n , where $n = 0$ through 3. The maximum length of each stored telephone number is 68 characters (including the automatic logon sequence). Storing telephone numbers with this command retains them in the RX-Series memory even during power loss.

COMMAND	DESCRIPTION
&Zn=x	Stores telephone number x to nonvolatile memory location n (where $n = 0$ through 3)
&Zn?	Displays the telephone number stored in memory location n

For example, to store a telephone number in location 3, issue this command:

AT&Z3=T9,783 2538<ENTER>

**%A (Auto-Reliable
Abort Character)**

Sets the ASCII character (from 0 to 127) that, if sent during an error control negotiation, aborts error control negotiation and causes the RX-Series to return to standard (buffered) asynchronous communication.

COMMAND	DESCRIPTION
<i>%An</i>	Defines auto-reliable abort character, where <i>n</i> = ASCII character 0 through 127 (has the same effect as changing register S46). <i>Default = 13.</i>

%B (11 Bit)

Sets the number of bits per byte. The %B2 (10 bit) setting is mandatory if error controlled or AT auto-dialing is required.

COMMAND	DESCRIPTION
<i>%B0</i>	8 bits
<i>%B1</i>	9 bits
<i>%B2</i>	10 bits
<i>%B3</i>	11 bits

%C (Data Compression)

Controls RX-Series data compression. A V.42 link operates with V.42*bis* data compression, which allows a 4:1 compression ratio. An MNP error control link operates with MNP level 5 data compression, which allows a compression ratio of 2:1. This command functions only when &Q5 or &Q6 are set (and when equivalent \N commands are set).

COMMAND	DESCRIPTION
%C <i>n</i>	Data compression control
%C0	Disables data compression
%C1*	Enables data compression*

The &U command can also be used to enable or disable data compression: &U0=disabled and &U1=enabled. Users with software designed around the &U command may be able to maintain compatibility using the RX-Series.

%D (Hang-up Buffer Delay)

Determines how long the RX-Series will wait after receiving a hang-up command to clear data in its receive buffer.

COMMAND	DESCRIPTION
%D <i>n</i>	Hang-up buffer delay
%D0	Hangs up without clearing receive buffer
%D= <i>n</i> *	Attempts to clear receive buffers within <i>n</i> seconds, where <i>n</i> can be from 001 to 999. <i>Default = 020 (seconds)*</i>

%K (V.42 Sliding Window Size)

Sets the number of V.42 error control packets that can be outstanding without acknowledgment, where n can equal from 1 to 15 possible windows. The maximum of 15 should be set for most applications to allow for maximum throughput. (&V does not display this command.) *Default = 15.*

%L (DSP Measurements)

Measures multiple analog parameters: the receive level in decibels (dBm) and the data pump line status, i.e., signal quality, near- and far-end echo, and round trip delay. This command must be issued while the RX-Series is in online command mode.

COMMAND	DESCRIPTION
%Ln	Reports analog DSP performance measurements
%L0	Measures signal level of the received carrier in dBm
%L1	Reports data pump's line status and receive level

%L1 reports receiver level, signal quality, near-end echo, far-end echo, round trip delay, and modulation statistics for the local modem. To report statistics for the remote modem, you must first enable secondary channel operation (^S1), set remote modem access (^R1), then enter %L1 to download the remote DSP's statistics. Enter ^R0 to disable the secondary channel.

%P (V.42 Negative ADP)

Controls the issuance of a negative ADP packet for V.42 error control.

COMMAND	DESCRIPTION
%Pn	V.42 negative ADP
%P0*	Disables V.42 negative ADP*
%P1	Enables V.42 negative ADP

%Q (Dial Interrupt Control)

Controls whether or not the modem can be interrupted (by RXD data) once it has begun answering an incoming call. Applications such as dial-on-DTR and leased line dial back-up, and other applications that cannot stop data traffic while the modem is answering incoming ring, require this command to be disabled.

COMMAND	DESCRIPTION
%Qn	Dial interrupt control
%Q0*	Enables dial interrupt control*
%Q1	Disables dial interrupt control

%R (V.42 Checksum Length)

Controls the length of the checksum on V.42 error-controlled data packets. Normally, the longer the checksum, the more precise the error checking.

COMMAND	DESCRIPTION
%Rn	32-bit checksum
%R0*	Selects 16-bit checksum*
%R1	Selects 32-bit checksum

%V (Autodialer Select)

Selects between the AT command set and various forms of the V.25bis autodialer. To enable any synchronous form of V.25bis, the &Q2 or &Q3 option must also be enabled.

COMMAND	DESCRIPTION
%Vn	Autodialer select
%V0*	Selects asynchronous AT commands*
%V1	Selects asynchronous V.25bis commands
%V2	Selects synchronous V.25bis (character-oriented-BSC)
%V3	Selects synchronous V.25bis NRZ (bit-oriented-HDLC)
%V4	Selects synchronous V.25bis NRZI (bit-oriented-HDLC)

%Y (MNP Packet Format)

Selects the data format used in MNP error control packets. MNP error control packets which are synchronous (default setting) are more efficient and result in higher throughput.

COMMAND	DESCRIPTION
%Yn	Async MNP packets
%Y0*	Disables asynchronous MNP packets*
%Y1	Enables asynchronous MNP packets

This command should not be used unless you are sure of your application requirements, as throughput will degrade.

%X= (Serial Port Speed)

Selects the modem's serial port speed. Used to set modem port speed for answer-only (dial-in) applications. This command automatically updates Registers S23 and S39. This command is commonly used during a remote modem control session.

COMMAND	DESCRIPTION
%X= <i>n</i>	Serial port speed select
%X=	Port speed decimal value .3 - 230.4 (Ex. 57.6, 9.6, 2.4)

NOTE: An autobaud (AT<ENTER>) will also update the %X= command. For example, AT%X=115.2<ENTER> sets the serial port of your modem to 115,200 bps. A subsequent autobaud (AT<ENTER>) to the modem at a terminal speed of 9600 bps will override the %X=115.2 and change it to %X=9.6.

^E (Read Remote EIA Signals)

Reports the status of the remote EIA signals for RXD, TXD, RTS, CTS, DSR, DTR and CXR, where signal = 1 indicates on status and signal = 0 indicates off status.

COMMAND	DESCRIPTION
^E0	Reports remote EIA signals to the local DTE

To read remote EIA signals, you must first enable secondary channel operation (if it is not already enabled) by using the ^S1 and ^R1 commands in online command mode.

^R (Remote Modem Access Control)

Selects the modem to be accessed using the secondary channel control option (see Chapter 9).

COMMAND	DESCRIPTION
^Rn	Remote access control
^R0*	Sets local modem access*
^R1	Sets remote modem access

^S (Secondary Channel Control)

Controls the secondary channel used in remote modem access. The ^Sn command must be issued when the RX-Series is in online command mode, which can be entered from data mode using the +++ escape sequence.

COMMAND	DESCRIPTION
^Sn	Secondary channel control
^S0*	Disables secondary channel operation*
^S1	Enables secondary channel operation

#B (Busyout Control)

Selects the method used to busyout the modem.

COMMAND	DESCRIPTION
#Bn	Modem busyout control
#B0*	Disables busyout operation*
#B1	Push test switch to busyout modem
#B2	DTR off will busyout modem
#B3	Push test switch while modem is online and modem will busyout after current call terminates

#C (Caller ID Control)

Selects the type of caller ID message sent to the DTE. The caller ID jumper (JP1 or JP2) must be enabled for this option to work properly.

COMMAND	DESCRIPTION
#Cn	Caller ID control option
#C0*	Caller ID disabled*
#C1	Formatted caller ID message which includes DATE= , TIME= , and CID=
#C2	Unformatted (single line) caller ID message

#L (Serial Port Speed Lock)

Locks the modem's port speed (in both AT command mode and data mode) to the setting of the %X command. Once the #L1 command is given, the modem will function properly only when AT commands are issued and when data is sent at the locked rate (i.e., at the setting of %X). This option prevents the modem from inadvertently changing serial port speeds and causing a speed mismatch between the computer and the modem. The command #L0 (the default setting) will unlock the serial port and allow for full autobaud from 300 bps to 230,400 bps.

COMMAND	DESCRIPTION
#L0*	Port unlocked allows for AT & data at any speed*
#L1	Port locked allows for AT & data at one speed (%X)

***H (Hardware Reset)**

Initiates hardware reset to check watchdog reset circuit. Once the command is used, the modem will flash the FAX LED, which is the positive indication that the reset circuit is operational. If the modem cannot reset, it should be returned to the factory for repair.

\A (V.42 Block Size)

Selects the transmit block size for error-controlled connections. On cellular connections a smaller block size increases overall throughput.

COMMAND	DESCRIPTION
\An	Select block size for error control packets
\A0	Sets error control packet to 64 characters
\A1	Sets error control packet to 128 characters
\A2	Sets error control packet to 192 characters
\A3*	Sets error control packet to 256 characters*

\B (Break Length Control)

Instructs the RX-Series to transmit a break signal to the remote end. The break signal (a constant space condition) can vary in length, from 100 to 900 ms. From data mode, issue the +++ escape sequence, wait for the OK message, and issue an AT*Bn* command, where *n* represents from 1 to 9—with each increment representing 100 ms of break signal. (&V does not display this command.)

COMMAND	DESCRIPTION
\B	Break length control
\B0*	Transmits a break signal of 300 ms*
\B <i>n</i>	Transmits a break signal of <i>n</i> , where <i>n</i> can equal 1 through 9

\C (Auto-Reliable Buffer)

Determines whether or not the RX-Series buffer receives data while it attempts to negotiate error-controlled communication with an originating modem without error control. Use this command when the RX-Series is set for error control and is expected to answer a call from a non-error control modem.

COMMAND	DESCRIPTION
\C <i>n</i>	Auto-reliable buffer
\C0	Does not buffer data during error control negotiation and will not recognize abort character (as specified by %A or S46)
\C1*	Buffers up to 128 characters received and does not recognize abort character*
\C2	Buffers up to 128 characters and detects error control abort character

\C0 is the same as &N0 and &O0. \C1 is the same as &N0 and &O1. \C2 is the same as &N1 and &O1.

\G (Modem-to-Modem Flow Control)

Controls modem-to-modem flow control on a non-error controlled link when using buffered asynchronous communications (&Q0) with RX-Series modems only. When this command is enabled, the local modem will flow control the remote modem once the local receive buffer fills; this in turn causes the remote modem to buffer data in its transmit buffer until it is full. When the remote transmit buffer is full, data will be lost. This command is used only for special applications.

COMMAND	DESCRIPTION
\Gn	Modem-to-modem flow control
\G0*	Disables modem-to-modem flow control*
\G1	Enables modem-to-modem (software XON/XOFF) flow control

\G1 is the same as &K16.

\K (Break Signal Control)

Defines how the RX-Series handles a break received from the DTE. The break can be processed as it is received, put ahead of data in the transmit buffer, and be destructive or non-destructive.

COMMAND	DESCRIPTION
\Kn	Break signal control
\K1	Immediately handles a break signal and is destructive to data in the buffer. Causes the modems at both ends to clear the buffers, and immediately passes the break (destructive and non-expedited)
\K3	Immediately transmits a break signal without buffering (non-destructive and expedited)
\K5*	Transmits a break in sequence with the received data (non-expedited and non-destructive)*

The RX-Series also supports the &I command to maintain compatibility with existing communications software packages. &I2 functions the same as \K1, &I1 the same as \K3, and &I0 the same as \K5.

\L (Line Probe Control)

Instructs the modem to find the fastest error free speed the line can support immediately after completing the modem handshake. Use when the modem should compensate for dirty dial-up and leased line connects.

COMMAND	DESCRIPTION
\Ln	Line probe control
\L0*	Line probe disabled*
\L1	Line probe enabled

\N (Online Data Mode Operation)

Selects how the RX-Series operates when it enters online data mode. The \Nn command is similar to the &Q command and is incorporated in the RX-Series modem to maintain communications software compatibility.

COMMAND	DESCRIPTION
\Nn	Online data mode operation
\N0	Selects normal asynchronous communication (no error control) where data is buffered
\N1	Selects direct operation (no error control) where data is not buffered
\N2	Forces MNP error control and, if unsuccessful, causes RX-Series to hang up
\N3	Selects automatic MNP and, if unsuccessful, causes the RX-Series to fall back to buffered asynchronous communication
\N4	Forces V.42 (lapm) operation
\N5	Selects automatic V.42 (lapm) operation and, if unsuccessful, falls back to buffered asynchronous communication
\N6	Forces reliable V.42 (lapm) or MNP operation and, if unsuccessful, hangs up (S36=0)
\N7*	Selects automatic V.42 or MNP operation and, if unsuccessful, causes the RX-Series to fall back to buffered asynchronous communication*

When forced, the RX-Series must enter the mode selected. If unable to enter that mode, the RX-Series hangs up rather than falls back. When set to automatic

operation, the RX-Series first attempts the mode selected and, if unsuccessful, falls back to a secondary mode of operation. If unsuccessful again, it attempts a third mode of operation.

Note that \N0 is the same as &Q0, \N1 as &Q4, \N2 as &Q5 and S36=0, \N3 as &Q5 and S36=1, \N4 as &Q7 and S36=0, \N5 as &Q7 and S36=1, \N6 as &Q6 and S36=0, and \N7 as &Q6 and S36=1.

\P (Modem Security Password Control)

Controls the password for modem security for local and remote access. When this option is enabled, you must issue the proper password before using the AT commands to dial, option, or view memory locations. The option can be enabled remotely, but can be disabled only locally.

COMMAND	DESCRIPTION
\Pn	Modem security password control
\P0*	Disables local security password. Remote access security remains on*
\P1	Enables local security password. (When ^R1 is issued before \P1, \P1 refers to the remote modem's security password.)
\P2	\P2? displays the password. \P2=xxxxxxx is used to set the password, where xxxxxxx can be up to 7 alphanumeric, case-independent characters

\S (Display Active Profiles)

Causes the RX-Series to display its current profile as well as other stored profiles and telephone numbers. To maintain communications software compatibility, the RX-Series also supports the &V command. &V0 is the same as \S0 and &V1 is the same as \S1. (&V does not display this command.)

COMMAND	DESCRIPTION
\Sn	Displays active configuration and stored profiles
\S0	Displays active configuration and stored profiles 0 and 1
\S1	Displays stored profiles 2 and 3, as well as the four telephone numbers stored in memory

\V (Extended Result Messages)

Controls whether extended result messages (reporting error control and data compression status) are returned to the DTE. For software compatibility, the RX-Series also supports the Wn command. \V0 is the same as W0 and \V1 is the same as W2.

COMMAND	DESCRIPTION
\Vn	Extended result messages
\V0*	Does not report extended (error control) result messages*
\V1	Reports one-line (Microcom-type) codes

\Y (Error Control Link Request)

Causes the RX-Series to attempt to establish error-controlled communication, even though the RX-Series has already made a normal (&Q0) or direct (&Q4) connection.

\Z (MNP Abort Error Control Link)

Forces the RX-Series to attempt to switch to normal operation, even though MNP error-controlled communication has already been established. Also causes the remote modem to attempt to switch, and any data in the buffer at this time is lost.

Zscript Command Language

Modem instructions added at the end of a stored telephone number can enable the RX-Series to automatically log into a remote computer system or provide for system security features such as automatic pass-through or callback.

The set of instructions that makes up the script command language called Zscript can be used to cause the modem to send an ASCII string, receive an ASCII string, or execute an AT command. The RX-Series is able to store a Zscript sequence in nonvolatile memory and will execute any Zscript instruction that follows the stored telephone number when originating a call. When automatically answering a call, the RX-Series will execute the Zscript sequence selected by register S32.

The Zscript capability of the RX-Series consists of programmed transmit and receive fields as well as one command field. The transmit fields tell the RX-Series what to send to the remote end, and the receive fields tell the RX-Series what to receive from the remote end. In addition, the command field—always the last field—specifies what the RX-Series should do if the last transmit or receive command successfully executes.

Zscript Commands

These commands are used by the RX-Series for automatic modem operation.

COMMAND	MODEM RESPONSE	DESCRIPTION
<CONTROL>T	(Transmit):	Enter data to be transmitted
<CONTROL>R	(Receive):	Enter data to be received
<CONTROL>C	(Command):	Enter the command field (always last in the Zscript sequence)
<CONTROL>A	(Return)	Equivalent to <ENTER>
<CONTROL>P	(Pause)	Causes the modem to pause for 2 seconds before continuing to process Zscript commands
<ENTER>	OK	Completes the Zscript sequence

After receiving a <CONTROL>T, <CONTROL>R, or <CONTROL>C command, the RX-Series echoes to the screen a carriage return and line feed (<ENTER><LF>) before the (Transmit):, (Receive):, or (Command): prompts.

Storing Zscript Commands for Automatic Logon

The RX-Series can automatically log onto a remote computer by programming the modem with Zscript command language. The logon sequence below, for example, instructs the RX-Series to dial a stored telephone number, wait for a connection, and receive a Logon prompt. If LOGON: is successfully received, the RX-Series transmits the logon information (ZYPCOM<CR>). The RX-Series waits to receive the PASSWORD: prompt and then transmits the password (SCOTT<CR>).

The Zscript command sequence that follows illustrates commands and modem responses as they would appear on your terminal screen, except for the <CONTROL> characters (^P, ^R, and ^T) which are typed but not seen.

AT&Z0=T783 2538^R

(Receive): **LOGON:^T**

(Transmit): **ZYPCOM^A** (Return)^R

(Receive): **PASSWORD:^T**

(Transmit): **SCOTT^A** (Return) <ENTER>

The AT&Z0 command stores the telephone number and Zscript sequence to memory location 0. To interrogate this location, issue the AT&Z0?<ENTER> command to view the contents of memory location 0. If you enter an AT&V1 command, the RX-Series does not display the Zscript commands and shows the memory locations as blank.

Zscript Commands for Callback or Pass-through Security

To store a Zscript sequence for callback security or pass-through, enable auto-answer (S0=1) and set register S34 to the Zscript sequence for security. For example, if the Zscript sequence is stored in memory location 2 (&Z2), set register S34 to equal 3.

STEP	TYPED BY USER	ECHOED TO THE SCREEN
1.	ATS0=1<ENTER>	ATS0=1
2.	ATS34=3<ENTER>	ATS34=3
3.	AT&Z2=<CONTROL>T	AT&Z2= (Transmit):
4.	PASSWORD?<CONTROL>R	PASSWORD? (Receive):
5.	SCOTT<CONTROL>C	SCOTT (Command):
6.	H,,DT9,7832538<ENTER>	ATH,,DT9,7832538 OK

Step 1 sets the RX-Series to answer on the first ring. Step 2 instructs the RX-Series to use the Zscript sequence stored in memory location 2 when answering a call. Step 3 begins the Zscript sequence for storage in memory location 2. Step 4 Zscript sequence begins with transmitting PASSWORD? to the remote modem. Step 5 specifies SCOTT as the desired password. If pass-through security is needed instead of callback, then press <ENTER> after SCOTT instead of <CONTROL> C. Step 6 instructs the RX-Series to execute the AT command H,,DT9,7832538. The RX-Series then goes on-hook, pauses for 4 seconds, goes off-hook, tone dials 9,7832538, and ends the Zscript sequence.

Helpful Hints for Auto-Logon

If the first Zscript field is a transmit field, it is transmitted and the RX-Series looks for a response corresponding to the first receive field. When the response is received, the next transmit field (if any) is transmitted. The procedure can be repeated. If the first Zscript field is a receive field, the RX-Series waits for a message to be received before transmitting the first transmit field.

If you make a mistake in a transmit or receive field, use the <Backspace> key to erase and retype it again. To return to a field to correct it, you must first type <ENTER>, then the AT&Z*n* command to start from the beginning of the script again.

In originate mode, the Zscript sequence can be executed using only the ATDS*n* command, where *n* is the desired stored sequence. When the telephone number has been dialed and the call is connected, the RX-Series will enter the Zscript sequence. To cause the RX-Series to use the Zscript sequence when answering a call, register S34 must be set to the required stored sequence (ATS34*n*, where *n* = 0 to 4). Typing ATS34=0 disables any Zscript sequence for answer operation. Therefore, there are only four Zscript sequences available in answer mode, as well as in originate mode—each with a maximum length of 68 characters. In answer mode, the RX-Series ignores the stored telephone number associated with a chosen memory location.

The RX-Series does not wait indefinitely to receive a required message. If the expected message is not received within 30 seconds, the RX-Series sends an AUTOLOGON FAILED message to the local terminal and disconnects the call.

Host computers sometimes miss the first few characters transmitted. If you have trouble with your remote computer, try inserting a pause in the first transmit instruction.

Sending your logon ID and your password in one string will expose your password to others, as your password is echoed by the host. (This applies to many, but not all, computers.) To prevent a password from being echoed back to the terminal by a host system, program the Zscript instruction to transmit the password response after receiving the PASSWORD? prompt from the host computer.

Description

The RX-Series modem has over 30 status registers—commonly referred to as S registers—that can be used to control specific modem functions in AT and V.25*bis* autodialing. S registers are memory locations that hold values for various parameters, for example, for counters, timers, and specific ASCII characters used to configure and operate the modem. S registers impact the way a variety of modem settings operate. S registers control options that determine the manner in which the modem dials, what features and speeds the modem will negotiate with remote modems, and how and when the call will disconnect.

There are three different types of S registers:

- Storable
- Nonstorable
- Bit-mapped

A storable S register is one whose value can be permanently saved with the &W<ENTER> command (see Table 6-1).

TABLE 6-1. STORABLE S REGISTERS

S REGISTER	DESCRIPTION
S0	Auto-answer
S2	Escape character
S6	Dial tone delay
S7	Wait time for carrier/silence
S8	Comma delay
S9	Valid carrier detect
S10	Lost carrier disconnect
S11	Touch tone timer
S13	Rate adaption bias
S18	Test duration
S23	Serial port speed 300 to 57,600 bps (bit-mapped)
S25	DTR detect timer
S26	RTS/CTS delay
S32	Side channel timer
S34	Answer logon sequence
S35	Leased line transmit level
S36	Error control negotiation fallback
S37	DCE line speed
S38	Hang-up delay
S39	Serial port speed 230,400 bps (bit-mapped)
S40	Inactivity timer
S42	Dial backup (bit-mapped)
S46	Error control abort character
S47	XON character
S48	XOFF character
S49	Dumb modem modem
S53	Dial retry interval

A nonstorable S register resets to its factory setting upon receipt of an ATZ<ENTER> command or whenever power is cycled (see Table 6-2).

TABLE 6-2. NONSTORABLE S REGISTERS

S REGISTER	DESCRIPTION
S1	Ring count
S3	Carriage return character
S4	Line feed character
S5	Backspace character
S41	Dial retry
S44	Error control mode
S45	Disconnect reason

Bit-mapped registers are complicated S registers that hold multiple option settings. These registers are normally used for advanced programming purposes only, and therefore are not completely identified in this manual. Should you require information on all the bit-mapped registers, please contact Zypcom Customer Service and ask for the bit-map register specification. Bit-mapped registers S23, S39, S42 and S49 are listed in this manual. Appendix F has a decimal-to-binary conversion chart for those unfamiliar with bit-map registers.

Operation

Displaying Values

To display a list of the S registers, as well as all current register settings, type:

AT&V<ENTER>

To display the value of a single S register, type:

ATSn?<ENTER>

where *n* is the number of the register you wish to have displayed. For example, if you wish to know the current setting of S0, type:

ATS0?

If auto-answer is disabled, the RX-Series returns this message:

```
000  
OK
```

To display multiple S register values with one command, type:

ATS0?S2?S7?<ENTER>

You would see a message like this on your screen:

```
000  
043  
030  
OK
```

Setting Values

You can assign new values to S registers with the `ATSn=x<ENTER>` command (where *n* is the number of the register and *x* is the value you want assigned). For example, if you want the RX-Series to hang up if there is no activity for one minute, type:

```
ATS40=1<ENTER>
```

The RX-Series responds with this message after it executes this command:

```
OK
```

Storing Values

Values for the storable registers listed in Table 6-1 can be saved in nonvolatile memory using this command:

```
AT&W <ENTER>
```

The RX-Series responds with the OK message. Once saved, these values are protected—even if the RX-Series loses power or is reset by means of the `ATZ<ENTER>` command.

Resetting Values

To reset all S registers to their factory values, type:

```
AT&F<ENTER>
```

To save the factory settings in nonvolatile memory, type:

```
AT&F&W<ENTER>
```

S registers that can't be written to nonvolatile memory return to their factory settings whenever the `ATZ<ENTER>` command is issued.

Reading Last Register Changed

To review the contents of the last S register accessed, type:

AT?<ENTER>

If the RX-Series has no record of the last register, then this command reads the contents of register S0.

Escaping to Command Mode

You can use the +++ escape sequence to go from data mode to online command mode without dropping your connection with the remote modem. Once the RX-Series successfully processes the escape code sequence, it remains in online command mode. If you enter *ATO<ENTER>*, the RX-Series re-enters data mode. If you enter *ATH<ENTER>*, the RX-Series hangs up. If neither command is issued, the RX-Series will hang up whenever it loses remote carrier or when the local DTE lowers the DTR signal (if &D2 is set). *Note that the escape character can be redefined by setting register S2 to another value.*

If the first AT command issued after an escape sequence is an unrecognizable AT command, the RX-Series returns to data mode and does not send an error message to the DTE.

Register Settings

Auto Answer **(S0=0-255)**

Register S0 controls the auto-answer option. S0=0 disables auto answering. S0=n (where *n* can be a value from 1 through 255) specifies the number of rings before the RX-Series automatically answers an incoming call. (DTR must be on.) When S0 is not set to 0, the AA LED is on, on the modem's front panel. *Default = 1.*

Ring Count **(S1)***

Register S1 counts the number of rings the RX-Series receives during an incoming call. When S1 matches the value set for S0, the RX-Series answers the call. S1 resets to 0 if no ring occurs for 8 seconds. *Default = 0.*

CAUTION: An asterisk (*) next to the S registers in this section indicates that it is nonstorable.

Escape Character **(S2=0-128)**

Register S2 defines an ASCII character as the escape character. Setting this register to a value higher than 127 disables the escape character entirely. It also disables the ATH<ENTER> command normally used to terminate a connection. In this case, you'll have to turn off DTR locally or press the <DATA> key on the front panel to hang up. *Default = 43 (+).*

Return Character
(S3=0-127)*

Register S3 defines the end-of-line character. Upon receiving this character, the RX-Series executes a command line. The end-of-line character is also appended to response messages. *Default = 13 (<ENTER>).*

Line Feed Character
(S4=0-127)*

Register S4 defines the ASCII character that follows the carriage return when the RX-Series is set to give verbose (word) responses (V1). *Default = 10 (ASCII LF).*

Backspace Character
(S5=0-255)*

Register S5 defines the ASCII character used as the backspace character. The backspace character causes the cursor to move backwards in a line, deleting the characters. If the backspace character is set to a value between ASCII 33 and 127 or a value greater than 127, the RX-Series does not recognize it. *Default = 8 (ASCII backspace).*

Dial Tone Delay
(S6=2-255)

Register S6 determines how long the RX-Series will wait after going off-hook before dialing the telephone number. The S6 register is in effect when the X command is set to 0, 1 or 3. When the X command is equal to 2 or 4, this register is ignored. Also, since the W modifier overrides S6, the RX-Series will wait the length of the failed call timer (S7) for dial tone when the W modifier is part of the dial command string. *Default = 2 (seconds)*

**Wait Time for
Carrier/Silence
(S7=1-255)**

Register S7 controls the wait time for carrier. If the at sign (@) is used in the dialing command string, register S7 also controls the wait time for silence. After dialing or answering the call, the RX-Series must receive a valid carrier signal within the specified wait time. If carrier is not received within that specified wait time, the RX-Series sends a NO CARRIER message to the DTE. This register should be set to at least 60 for international calls. *Default = 60 (seconds).*

**Comma Delay
(S8=0-255)**

Register S8 determines the length of the delay inserted with the pause command (.). For every comma in the dialing command string, the RX-Series looks at the S8 register and pauses for that value in seconds. *Default = 2 (seconds).*

**Valid Carrier Detect
(S9=1-255)**

Register S9 sets the amount of time that carrier must be received before it is determined to be a valid signal. Each number between 1 and 255 represents the number of tenths of a second that the RX-Series must see carrier before responding to it. If the setting is high, a false carrier signal will probably not be mistaken for a true carrier signal. *Default = 6 (0.6 seconds).*

**Lost Carrier
Disconnect
(S10=1-255)**

Register S10 determines the amount of time the RX-Series must wait to disconnect after losing carrier from the remote modem. If carrier remains absent for the time specified by the S10 register, the RX-Series disconnects the call and responds with a NO CARRIER message to the DTE. Each number between 1 and 255 represents the number of tenths of a second the RX-Series must wait before beginning the disconnect sequence. Cellular connections normally require register S10 to be set to at least 50. *Default = 14 (1.4 seconds).*

**Touch Tone Timer
(S11=50-255)**

Register S11 controls the length of time that tones are transmitted by the RX-Series. The default value is set to the telephone company's standard. Each number between 50 and 255 represents the number of milliseconds in which the tone will be sent. *Default = 95 (0.095 seconds).*

**Rate Adaption Bias
(S13=0-8)**

Register S13 affects V.34, V32terbo, V.32bis, and V.32 operation. S13 determines how aggressive or conservative the modem will be when determining the maximum line rate a PSTN or leased line circuit can support. At least one modem needs to have the S13 register set for it to control the line speed of a link. Zero bias is S13=4, maximum positive bias is S13=0, and maximum negative bias is S13=8. S13 range is 0 to 8. S13=4 is the default.

S13 VALUE	DESCRIPTION
0-8	Rate adaptation bias S-register
4*	Default setting for maximum sustainable line rate. Zero bias setting.*
0	Line rate is usually 2400bps higher than when S13=4. Positive bias, aggressive setting.
8	Line rate is usually 2400bps lower than when S13=4. Negative bias, conservative setting.

Test Duration (S18=0-255)

Register S18 sets the duration of the RX-Series diagnostic tests. When S18 is set to 0, the test continues indefinitely until stopped by the operator. To manually stop a test, you would enter the +++ escape sequence and from online command mode issue an *AT&T0<ENTER>* command. *Default = 0 (indefinite).*

Serial Port Speed to 57.6 Kbps (S23=bit- map)

Register S23 sets, among other things, the serial port speed of the RX-Series modem. The %X command also sets serial port speed and is easier to use than bit-

mapped registers for most users. The last autobaud speed is contained in this register or in register S39, depending on the autobaud speed. The last autobaud speed can be overridden by changing the value of S23 and S39. See Appendix F for more information on setting bit-map registers.

- Bit 0 Detect RDLB (&T4 and &T5 command)
 0 = Deny RDLB request (&T5)
 1 = Accept RDLB (&T4)*
- Bit 3,2,1 Serial port speed of the RX-Series
 0 = 300 bps
 1 = 57,600 bps
 2 = 1200 bps
 3 = 2400 bps
 4 = 4800 bps
 5 = 9600 bps
 6 = 19,200 bps*
 7 = 38,400 bps

Note: bits 3,2,1 are valid only if S39 bit 3=0.

- Bit 5,4 Parity
 0 = Even
 1 = Space*
 2 = Odd
 3 = Mark/none

- Bit 7, 6 Not used

DTR Detect Time (S25=0-255)

Register S25 determines the amount of time the RX-Series will wait before detecting a change in the DTR signal. When the modem is configured for synchronous operation (&Q) in command mode, the value between 0 and 255 is measured in seconds. Once the modem is online—whether in synchronous or asynchronous autodialing—the value is measured in 1/100 seconds. *Default = 5 (0.05 or 5 seconds).*

**RTS/CTS Delay
(S26=0-255)**

Register S26 determines the delay from the time RTS is raised to when CTS is raised in the RX-Series. The value is measured in 1/100 seconds. *Default = 1 (0.01 seconds).*

**Side Channel Timer
(S32=0-255)**

Register S32 determines the amount of time (in seconds) to wait, after remote carrier is received, until the RX-Series will send or receive the side channel enable pattern (^S1). S32=0 sends side channel request immediately, S32=255 disables side channel operation. *Default = 0.*

**Answer Logon
Sequence
(S34=0-4)**

Register S34 controls the answer logon sequence. If S34=0, then no logon sequence is valid in answer mode. S34=1 enables the logon sequence in memory location 2, S34=2 enables the logon sequence in memory location 3, and so forth. Logon sequences are developed using the Zscript command language. *Default = 0.*

**Transmit Level
(S35=0-20)**

Register S35 controls the transmit level for leased line operation. *Default = 0 (decibels).*

**Error Control
Negotiation Fallback
(S36=0-1)**

Register S36 clarifies what the RX-Series should do when it is unsuccessful in establishing error control link negotiations as determined by &Q or \N. When S36 is set to 0, the RX-Series will disconnect and hang up. When S36 = 1, the RX-Series will connect in buffered asynchronous mode. *Default = 1.*

**DCE Line Speed
(S37=0-36)**

Register S37 controls the maximum line speed at which the modem will attempt to connect to the remote modem. S37 works in conjunction with the Nn command. To force a specific line speed, set the S37 register to the desired value and the N command to N0. To set the maximum connect speed, set the S37 register to the desired value and the N command to N1. S37 in conjunction with N1 sets the initial maximum connect rate and allows fallback if line conditions warrant. *Default = 0.*

COMMAND	S37 SETTING	DESCRIPTION
N1*	0*	This setting lets the modem determine maximum line rate and allows for a lower line rate if conditions warrant (default setting). Line rate can be higher or lower than DTE speed.
N1	1-36	This setting lets register S37 determine maximum line rate and allows for a lower line rate if conditions warrant. Line speeds variables 1 to 36 are listed below.
N0	1-36	Connection line rate is forced by register S37. Modem cannot lower line speed if conditions warrant, but will retrain at speed set by register S37.
N0	0	This setting forces the line speed to equal the current DTE speed. Modem cannot lower line speed if conditions warrant, but will retrain at DTE speed.

1	300 (Bell 103)
2	300 (Bell 103)
3	300 (Bell 103)
5	1200 (Bell 212)
6	2400 (CCITT V.22 <i>bis</i>)
7	4800 (CCITT V.32)
9	9600 (TCM V.32)
10	9600 (non-TCM V.32)
11	300 (V.21)
12	1200 (V.23)
15	4800 (V.32 <i>bis</i>)
16	7200 (V.32 <i>bis</i>)
17	9600 (V.32 <i>bis</i>)
18	12000 (V.32 <i>bis</i>)
19	14400 (V.32 <i>bis</i>)
20	16800 (V.32 <i>terbo</i> for Z34-RX and Z32t-RX)
21	19200 (V.32 <i>terbo</i> for Z34-RX and Z32t-RX)
22	21600 (V.34 for Z34-RX only)
23	24000 (V.34 for Z34-RX only)
24	26400 (V.34 for Z34-RX only)
25	28800 (V.34 for Z34-RX only)
26	Setting reserved
27	2400 (V.34 for Z34-RX only)
28	4800 (V.34 for Z34-RX only)
29	7200 (V.34 for Z34-RX only)
30	9600 (V.34 for Z34-RX only)
31	12000 (V.34 for Z34-RX only)
32	14400 (V.34 for Z34-RX only)
33	16800 (V.34 for Z34-RX only)
34	19200 (V.34 for Z34-RX only)
35	31200 (V.34+ for Z34-RX only)
36	33600 (V.34+ for Z34-RX only)
37-254	Settings reserved

**Delay Before
Hang Up
(S38=0-254)**

Register S38 controls the amount of time the RX-Series will wait in asynchronous mode before going back on-hook after it has received a hang-up command (same as %Dn). The S38 register allows the RX-Series to empty its receive buffers before going back on-hook when it is in error controlled communication or in buffered asynchronous communication (same as %D command).
Default = 20 (seconds).

**Serial Port 115.2
Kbps (S39=bit-map)**

Register S39 sets, among other things, the serial port speed of the RX-Series modem to 115,200 bps. The %X command also sets serial port speed and is easier to use than bit-mapped registers for most users. The last autobaud speed is contained in this register or in register S23, depending on the autobaud speed. The last autobaud speed can be overridden by changing the value of S39 and S23 or by using the %X command. See Appendix F for more information on setting bit-map registers.

Bit 1,0	Stored profile recalled upon power-up (&Y command) 0 = Stored profile 0* 1 = Stored profile 1 2 = Stored profile 2 3 = Stored profile 3
Bit 2	Not used
Bit 3	Serial port speed of the RX-Series 0 = Speed according to register S23* 1 = Speed set to 115,200 bps

Bit 5,4	Break handling (&I command) 0 = Non-destructive and non-expedited* 1 = Non-destructive and expedited 2 = Destructive and expedited
Bit 6	Not used
Bit 7	Automatic retrain (&E command) 0 = Disable 1 = Enable*

Inactivity Timer (S40=0-255)

Register S40 controls the amount of time the RX-Series will wait for activity before automatically hanging up. S40=0 disables the inactivity timer. The number between 1 and 255 represents a value in minutes. Inactivity must occur on both the transmit and receive data pins. *Default = 0 (minutes).*

Dial Retry (S41=0-10)*

Register S41 defines the number of times the RX-Series will attempt to redial a telephone number after a NO ANSWER, BUSY, NO CARRIER or NO DIALTONE condition. To abort the redial process, press any key. When S41=0, no retry occurs. *Default = 0.*

**Dial Backup Enable
and Fall-back/
Forward (S42 = bit-
map)**

Register S42 is a bit-mapped register that changes value depending on various settings. To enable dial backup for your configuration, determine the current value of register S42, add 2 to the result, and store the new number. To enable fall-back and fall-forward for your configuration, determine the current value of register S42, add 4 to the result, and store the new number. For example, on dial backup, interrogate register S42:

ATS42?<ENTER>

If the value returned is 0, type:

ATS42=2&W<ENTER>

to enable dial backup (see Chapter 8 and Appendix F for more information.)

Note that in the sample command string above, &Wn writes the command setting to memory. If you don't specify memory location *n* (where *n* can be 0, 1, 2 or 3), the RX-Series assumes 0.

Error Control Mode
(S44=0-7)*

Register S44 indicates the type of error control used on the modem link. To determine what error control, if any, is in effect for an incoming call, send the +++ escape sequence, then interrogate the register with *ATS44?<ENTER>*. To return to online data mode, issue an *ATO<ENTER>* command. *Default = none.*

S44 VALUE	DESCRIPTION
0	No error control
2	MNP Class 2
3	MNP Class 3
4	MNP Class 4
5	MNP Class 5
6	V.42
7	V.42bis

Disconnect Reason
(S45=0-6)*

Register S45 stores code that indicates the reason for the last modem disconnect. You can interrogate the RX-Series after a disconnected call with the *ATS45?<ENTER>* command. Note that register S45 is disabled if *AT&V0<ENTER>* has been issued. *Default = none.*

S45 VALUE	DESCRIPTION
0	Loss of carrier
1	User interrupted
2	Modem training failure
3	Modem retrain failure
4	Inactivity timed out register S40
5	Long space disconnect
6	Error control negotiation failure

**Error Control Abort
Character (S46=0-
127)**

Register S46 stores the selected ASCII value of the error control abort character. This feature is used when an originating modem does not have error control and calls a RX-Series modem. If the RX-Series has been configured to auto-negotiate error control, it will attempt to do so for 6 seconds before timing out. If the error control abort character is sent by the originating DTE during this waiting period, the RX-Series will enter buffered asynchronous communication immediately. *Default = 13 (ASCII <RETURN>).*

**XON Character
(S47=0-127)**

Register S47 defines the ASCII character sent by the RX-Series as the XON character. *Default = 17 (DC1).*

**XOFF Character
(S48=0-127)**

Register S48 defines the ASCII character sent by the RX-Series as the XOFF character. *Default = 19 (DC3).*

**Dumb mode (S49 =
bit-map)**

Register S49 is a bit-mapped register that changes value depending on various settings. To enable dumb mode add 64 to current value. To enable AT mode, perform a power reset again. For example, on dial backup, interrogate register S49:

```
ATS49?<ENTER>
```

If the value returned is 3, type:

```
ATS49=67&W<ENTER>
```

**Redial Interval
(S53=0-15)***

Register S53 defines the interval in minutes between redialing a telephone number (number of times the modem will redial is define by S41). When S53=1 the modem will redial every minute until the S41 counter is reached. *Default = 1.*

CHAPTER 7

V.25*bis* Autodialing and Synchronous Dial-Up Operation

General

V.25*bis* is an international standard set by the Consultative Committee for International Telephone and Telegraph (CCITT) that defines how to automatically initiate serial communication synchronously or asynchronously over the public switched telephone network.

The RX-Series supports three V.25*bis* data formats:

- ❑ 7 or 8 bits with odd, even or no parity for asynchronous devices
- ❑ 7-bit odd parity for character-oriented bisynchronous (BSC) protocol
- ❑ HDLC (SDLC-ASCII) bit-oriented synchronous protocol (NRZI or NRZ)

V.25*bis* autodialing is commonly used in international markets. Domestically, synchronous minicomputers (for example, IBM AS/400s), bridges and routers, and some PCs also use V.25*bis* autodialing. The RX-Series implementation of V.25*bis* supports all standard V.25*bis* commands, as well as several extensions for enhanced operation.

Once the RX-Series has been set for synchronous or asynchronous V.25*bis* autodialing, you can automatically dial numbers directly from your DTE or dial a telephone number previously stored in nonvolatile memory.

The RX-Series can be configured for synchronous communication with or without *V.25bis* using hardware switches or AT commands. Moreover, the RX-Series has four prestored profiles designed especially for common synchronous applications that can be activated with a single command. Five different methods for enabling *V.25bis* and/or synchronous operation are listed in this chapter. They are:

- Software (AT commands) setup of *V.25bis*
- Hardware setup of *V.25bis*
- Software (AT commands) setup of synchronous operation
- Software (AT commands) setup of prestored *V.25bis*/synchronous configurations
- Hardware setup of synchronous operation

V.25bis Autodialing

V.25bis autodialing can be set up in one of two ways. If you'll be using *V.25bis* exclusively, it is recommended that you follow the procedure outlined later in this chapter for hardware setup. If you'll be switching between synchronous *V.25bis* and asynchronous AT autodialing, you'll probably want to use the software setup procedures.

V.25bis Hardware Setup Introduction

The RX-Series has a 10-position DIP switch on it that can be used to select asynchronous, bisynchronous, or HLDC-NRZ *V.25bis* autodialing (refer to Figure 7-1 and Table 4-2). Once configured, the RX-Series can be returned to its factory default configuration by setting the switches back to their original positions and reinstalling the modem into the chassis.

**V.25bis Software
Setup Introduction**

The RX-Series can also be configured for V.25bis autodialing by using AT commands. However, once you select V.25bis with a particular data type, you must use that data type to issue the commands that will change options. To return the RX-Series to its default settings, use the data type selected and send a CNL&F0 command or power reset.

**Synchronous
Communication
Setup Introduction**

If you won't be using V.25bis autodialing in your synchronous application, skip "Software Setup of the V.25bis Autodialer" and refer directly to the "Software Setup of Synchronous Operation" section later in this chapter. If you will not be using AT commands to set up the RX-Series for synchronous communication, refer to "Hardware Setup of Synchronous Operation" at the end of this chapter.

V.25bis Autodialing

General

In asynchronous V.25bis applications, autodialer commands can be issued directly from an asynchronous DTE keyboard or with communications software. For synchronous V.25bis applications, commands can also be issued from a synchronous DTE by using the selected synchronous data format.

Dashes, parentheses, periods and spaces may be used within a *V.25bis* dial command string for clarity, but they are ignored by the RX-Series. If a left angle bracket (<)—the equivalent of a comma in AT autodialing—is inserted into the dial string, the RX-Series pauses for two seconds or for the value in seconds of register S8. Inserting an equal sign (=) into the dial string causes the RX-Series to pause twice as long as the value in seconds of register S8.

The RX-Series issues response messages for each entered command. If the command executes successfully, the RX-Series sends a VAL (valid) message to your screen. If a command string has errors—such as an unsupported command character, parity error, or out-of-range command parameter—the RX-Series sends an INV (invalid) message.

Execute V.25bis Command

The <ENTER> key is an end-of-line delimiter that tells the RX-Series to execute the command in *V.25bis* asynchronous format. The hexadecimal ETX character tells the RX-Series to execute the command in *V.25bis* bisynchronous format. The flag following the FCS field specifies *V.25bis* HDLC format.

***V.25bis* Commands**

Below is a list of *V.25bis* commands and response messages supported by the RX-Series. Several extensions to the *V.25bis* standard have also been added to enhance the modem's capabilities. These command set additions are thoroughly discussed in the "Command Set Extensions" section of this chapter.

**Connect Incoming
Calls
(CIC)**

Causes the RX-Series to go off-hook in answer mode, overriding any previously issued *DIC* command.

**Dial Command
(CRN)**

Directs the RX-Series to dial a telephone number. Upon receiving the command, the RX-Series goes off-hook, dials the specified number, and attempts to establish a remote connection.

MODIFIER	COMMENTS
0-9	Causes the RX-Series to dial digits in either DTMF or pulse mode, depending on what is indicated in the command string
*	Selects DTMF dialing of the star character
#	Selects DTMF dialing of the gate character
T	Specifies tone dialing of digits that follow in the dial string
P	Selects pulse dialing of digits that follow in the dial string
<	Causes the RX-Series to pause for the period specified by register S8 (same as the comma in the AT command set)
=	Causes the RX-Series to pause for twice the value (in seconds) of register S8
:	Causes the RX-Series to wait for dial tone before dialing the digits that follow
!	Causes the RX-Series to go on-hook for 0.5 seconds and then off-hook for 0.5

MODIFIER	COMMENTS
	seconds before dialing the next digit
@	Causes the RX-Series to wait for 5 seconds of silence before dialing the digits that follow
space, dash, period, parentheses	Space, dash, period, and parentheses are ignored, but may be used in the command string for clarity

Dial Stored Number (CRS)

Directs the RX-Series to dial a telephone number stored in one of four memory locations.

COMMAND	DESCRIPTION
CRSn	Dial stored telephone number
CRS0	Dial telephone number stored in memory location 0
CRS1	Dial telephone number stored in memory location 1
CRS2	Dial telephone number stored in memory location 2
CRS3	Dial telephone number stored in memory location 3

Disregard Incoming Call (DIC)

Causes the RX-Series to disregard an incoming call, even if the RX-Series has been configured for auto-answer. If DIC is issued when the RX-Series is not set for auto-answer, an INV (invalid) message is returned to the DTE. *This command must be entered for each incoming call you wish to disregard.*

**Program Number
(PRN)**

Causes the RX-Series to store a dial string into a specified memory location.

COMMAND	DESCRIPTION
PRNn	Program number
0-3	Identifies the memory location in which the dial string is to be stored, where 0 is memory location 0, 1 is memory location 1, and so forth
;	Serves as a separator between the memory address referenced and the dial string to be stored. For example, <i>PRN 1;1-510-783-2538</i> stores 1-510-783-2538 into memory location 1
space	Clears the memory location that follows it in the command string. For example, <i>PRN 0</i> clears memory location 0

**List Stored Numbers
(RLN)**

Lists the contents of one specified memory location or the contents of all four memory locations.

COMMAND	DESCRIPTION
RLNn	List stored numbers
0-3	Identifies the memory location whose contents are to be returned to the DTE, where 0 is memory location 0, 1 is memory location 1, and so forth
space	Causes the RX-Series to return the contents of all four memory locations to the DTE

Standard V.25bis Command Responses

For each command entered during V.25bis autodialing, the RX-Series returns one of the following responses. Response messages are sent in asynchronous, bisynchronous or HDLC format, depending on the data format selected. You can disable the messages using the *CNLQ1* command.

Call Failure Indication (CFI)

Sent after a call fails to establish a successful connection.

RESPONSE	DESCRIPTION
CFInn	Call failure indication
AB	Indicates dial tone not detected, expiration of failed call timer, or detection of answer tone but no carrier acquired
ET	Indicates detection of busy tone
NT	Indicates answer tone not detected, ringback detected, or call aborted
RT	Indicates expiration of failed call timer during ringback detection
NS	Indicates missing telephone number in specified memory location

Call Connections (CNX)

Sent to the DTE with a line rate indication. For example, after receiving a CRN command and successfully establishing a connection, the RX-Series issues to the DTE a CNX XXXXX message, where XXXXX reflects the connect speed, ranging from 1200 to 33600 bps for synchronous mode and 300 to 230,400 bps for asynchronous communication.

**Incoming Call
(INC)**

Sent by the RX-Series each time it detects an incoming ring signal.

**Invalid
(INV)**

Sent in response to a syntactical error in the command string or in response to other incompatibilities that make it impossible for the RX-Series to execute the command. For example, if you issue a CRS9 command to dial the telephone number stored in memory location 9, but there isn't a memory location 9, an INV message is returned. In general, INV indicates an unknown command, an error in command or parameter syntax, or a parameter value error.

**List Stored Number
(LSN)**

Sent in response to an RLN command requesting the contents of a specific memory location or the contents of all memory locations.

RESPONSE	DESCRIPTION
LSNn	List telephone number stored in memory
LSN 1;	Issued in response to RLN1; displays the contents of memory location 1
LSN 2:	Issued in response to RLN2; displays the contents of memory location 2
LSN 3:	Issued in response to RLN3; displays the contents of memory location 3
LSN 4;	Issued in response to RLN4; displays the contents of memory location 4

When RLN (space) is issued, the contents of all four memory locations are returned to the DTE and these messages precede the reading for each location.

Valid (VAL)

Sent to the DTE whenever the RX-Series successfully executes a command.

V.25bis Command Set Extensions

Zypcom has extended the V.25bis autodialing command set to provide the ability to configure the RX-Series in asynchronous or synchronous communication. Modem configuration is not defined by the V.25bis specification, but Zypcom has extended its command set to provide this capability. Additionally, Zypcom has further enhanced the RX-Series by designing it to recognize the +++ escape sequence in asynchronous V.25bis autodialing.

**Configuration Local
(CNL)**

CNL is a prefix that functions the same as AT and precedes the same command parameters available in the AT command set. For example, if you want to set your DTR and auto-answer options in asynchronous V.25bis autodialing, type:

```
CNL&D2S0=2<ENTER>
```

The RX-Series responds with a VAL message. Command strings not successfully executed cause the RX-Series to return an INV message to the DTE.

**V.25bis Escape
Sequence**

After receiving the +++ escape sequence, the RX-Series enters online command mode. If you issue a *CNLH* command, the modem goes back on-hook (hangs up). If you issue a *CNLZ* command, the RX-Series resets before going back on-hook.

DTE Adaption

The default speed of the RX-Series's serial port is 230,400 bps in asynchronous communication and 33,600 bps in synchronous communication. Upon receipt of the *CRN* command in asynchronous V.25bis communication, the RX-Series automatically autobauds to match the speed of the DTE. In synchronous communication, the RX-Series clocks commands at 33,600 bps and changes its clock rate to match the speed on the line after carrier is acquired. When asynchronously optioning the RX-Series for synchronous operation, set the DTE speed to 33,600 bps before typing AT commands.

V.25bis Framing Rules

All V.25bis commands must have the correct syntax and framing for the RX-Series to be able to properly interpret them. The V.25bis autodialer supports asynchronous, bisynchronous (BSC) and HDLC character formats. The framing of each is different and must be followed exactly.

Asynchronous Framing

The framing for asynchronous V.25bis autodialing is straightforward. Type the command string and end it with the <ENTER> end-of-line delimiter. The data rate at which commands can be issued to the RX-Series range from 230,400 to 300 bps.

An asynchronous V.25bis command field can have between 3 and 60 characters organized in one of the following ways:

- 7 data bits, odd parity, one start and one stop bit
- 7 data bits, even parity, one start and one stop bit
- 8 data bits, no parity, one start and one stop bit

Each field must contain only one command, but may be followed by as many parameters as will fill the 60-character limit. For example, a CNL command string can have a maximum of 57 additional characters, but may not contain CNL and CRN commands together. Commands with fewer than 3 characters or more than 60 are invalid.

HDLC Framing

An HDLC frame must consist of these elements:

- Flag character (HEX '7E')
- Address character (HEX 'FF')
- Control character (HEX '13')
- Message (command)
- FCS (two characters that make up a 16-bit cyclical redundancy check)
- End-of-frame flag (HEX '7E')

Message data must be organized in an 8-bit format between 3 and 60 characters long. The FCS characters will be a CRC calculated on the message data.

HDLC frames may be preceded and followed by additional HDLC flags. Frames with incorrect addresses, control characters, or FCS fields, as well as frames with more than 60 characters or fewer than 3 in the message field, are invalid. When the RX-Series receives a valid command frame, it ignores any subsequent command frame until it has completed sending its indication of successful or unsuccessful completion back to the DTE.

Bisynchronous (BSC) Framing

A BSC frame must consist of these elements:

- SYN (HEX '16')
- SYN (HEX '16')
- STX (HEX '02')
- Message (command)
- ETX (HEX '83')

Message data must be in 8-bit character format and may be between 3 and 60 characters long.

Frames can be followed or preceded by additional SYN characters. Frames with a parity error or with more than 60 characters or fewer than 3 in the message field are invalid. Once the RX-Series accepts a valid command frame, it ignores any subsequent command frame until the command is successfully processed and an indication is sent back to the DTE.

Software Setup of V.25bis

In synchronous V.25bis autodialing, you can configure the RX-Series for BSC (%V2), HDLC-NRZ (%V3) and HDLC-NRZI (%V4) formats, but &Q2 must also be enabled (consider prestored factory configuration &F5).

To select V.25bis-BSC autodialing, first asynchronously configure your RX-Series options as necessary (terminal speed at 38,400 bps). Use AT commands to set the line speed and any other capabilities you may need. Once the RX-Series has been configured properly, you can then enable the V.25bis autodialer. For example, if you want to select V.25bis-BSC, use an asynchronous terminal and type:

```
AT&Q2%V2&W<ENTER>
```

To return to asynchronous AT autodialing from *V.25bis*-BSC autodialing, you must first send the RX-Series a bisynchronous-formatted *CNL&Q6%V0* or *CNL&F0* command or power reset the RX-Series.

Disabling the V.25bis Autodialer

You can issue *CNL %V0<ENTER>* to disable the *V.25bis* autodialer as long as the command is in the proper data format. The *CNL&Q6* command returns the RX-Series to asynchronous (auto error control) communication. A power reset will also return the modem to default, disabling the *V.25bis* dialer. To perform the reset, depress both modem front panel keys and reinstall the modem into the chassis. After a few seconds, release the keys.

V.25bis Autodialing

V.25bis autodialing lets you dial through a serial port by using a selected communication protocol. A typical asynchronous dial command would look like this:

CRN(space)telephone number<ENTER>

The RX-Series goes off-hook and dials that number. In addition, telephone numbers can be stored in the RX-Series's memory locations, then dialed from those locations.

While the RX-Series is configured for *V.25bis* autodialing, you can still pick up the telephone handset attached to the modem, dial a telephone number manually, and press the <DATA> key to establish a data connection. In addition, pressing the <DATA> key for three or more seconds causes the RX-Series to redial the telephone number stored in memory location 0.

V.25bis Auto-Answering

Assuming the modem's AA and DTR LEDs are on, the RX-Series will automatically answer an incoming call. Should AA be out, configure the modem by using the appropriate synchronous framed message with the *CNLS0=1* command. If your synchronous DTE cannot send commands to a modem and you have already configured the RX-Series for synchronous V.25bis autodialing, perform a power reset. Asynchronously set auto-answer on (*S0=1*), then re-enable V.25bis (&Q2%Vn&W) again.

V.25bis Autodialing Procedures

Originating a Call

The following is an example of the commands and responses issued on a successful call. If you send this command to the RX-Series from your DTE,

CRN 1 510 783 2538

the RX-Series can send this response to the DTE:

VAL
CNX 33600

The message indicates that the RX-Series has successfully dialed the specified telephone and established a successful connection with a line speed of 33,600 bps.

**Storing a Telephone
Number in Memory**

To store a telephone number in memory location number 1, issue a PRN command followed by the selected telephone number. For example, send:

PRN 1;1 510 783 2538

The RX-Series stores the number and responds:

VAL

**Dialing a Stored
Telephone Number**

If you send

CRS 1

the RX-Series dials the telephone number stored in memory location 1 and returns a CNX (speed) message to the DTE:

VAL

CNX 33600

Auto-Answering

The RX-Series is normally preset to automatically answer. If auto-answer is disabled, it can be enabled by using the *CNLS0=1* command. This command causes the RX-Series to automatically answer on the first ring if DTR is present. If the DTE is unable to provide DTR, then you can also send a *CNL&D0* command that causes the RX-Series to assume that DTR is present.

Changing the RX-Series Configuration

To send several options to the RX-Series in one command string, use the CNL command. For example, issuing `CNLS0=1&DO` <ENTER> causes the RX-Series to assume DTR is present and to auto-answer on the first ring.

To change the RX-Series options, follow this example. Send:

CNL&C1&S1&D2S0=1&W

This particular field sets CXR, DSR and DTR normal, activates auto-answer upon detection of the first ring, and saves the configuration to memory.

The RX-Series returns this message:

VAL

Hardware Setup of V.25bis

You can also use the hardware DIP switches to set the modem for V.25bis autodialing. Follow the step-by-step instructions below.

1. Set SW1 ON to enable switches SW2 through SW10.
2. SW2 controls communication. Select ON for synchronous or OFF for asynchronous communication.
3. Select the line rate speed for synchronous data types and the DTE speed for asynchronous data format by setting switches 3 and 4 in combination. For the maximum speed, set SW3 and SW4 OFF. Refer to Table 4-2 for other speed options.

4. Set SW8 ON to enable *V.25bis* autodialing. When SW8 is ON options change, &C1, &D2, &R0, and &S1 are set.
5. SW9 controls data format and is applicable only if SW2 is ON. Select ON for character-oriented bisynchronous data format or OFF for bit-oriented HDLC data format. The bit-oriented HDLC protocol has two variations: NRZI and NRZ. SW9 OFF assumes NRZ.
6. Reinstall the RX-Series to activate the settings.

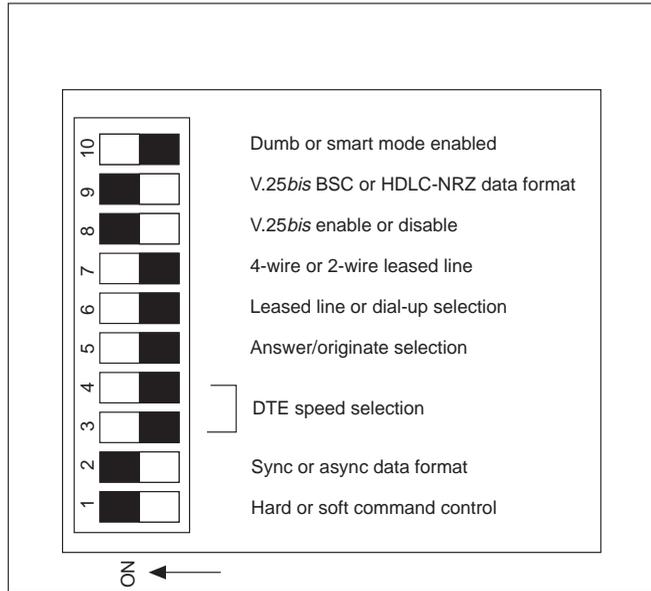


Figure 7-1. Using the DIP Switches to Select V.25bis

The rackmount modem card has two switches, one for each modem. Switch S3 operates features on modem A, and switch S6 operates features on modem B. When you view the rack modem from the front, modem A is the modem in the blue area, and modem B is the modem in the gray area.

In some cases, other RX-Series options will need to be changed. If synchronous *V.25bis* autodialing has been enabled and you can't send synchronous-formatted CNL commands but want to set an option:

1. Return SW1 to the OFF position and reinstall modem.
2. Connect an asynchronous terminal set to 38,400 bps to the RX-Series.
3. Issue the required AT commands and write them to memory (&W).
4. Return SW1 to its ON position, then reinstall the modem into the chassis.

Hardware Disabling of the V.25bis Autodialer

Return all DIP switches to their OFF position and reinstall the RX-Series modem.

Dialing

Once you've manually configured the RX-Series for *V.25bis* autodialing and selected your required data format, send:

CRN (space) telephone number<command delimiter>

The RX-Series executes the command by going off-hook and dialing the specified telephone number.

With manual *V.25bis* dialing enabled, you can also pick up the telephone handset attached to the RX-Series and

dial the telephone number yourself. Press the <DATA> key immediately after dialing to establish a connection. To dial the telephone number stored in memory location 0, press the <DATA> key for 3 seconds, then release.

Auto-Answering

To auto-answer once the RX-Series has been manually configured for V.25bis autodialing, set DIP SW1 and SW5 to the ON position. With SW5 on and DTR present, the RX-Series will automatically answer an incoming ring signal and put out CNX call progress messages on the answer side.

Synchronous Operation

The RX-Series modem can operate synchronously in full or simulated half duplex at 28.8K, 26.4K, 24K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, 9,600, 7,200, 4,800, 2,400 or 1,200 bps, in which case the SYN LED on the modem's front panel will be on. There are three ways to enable synchronous operation:

- Software (AT commands) setup of synchronous operation
- Software (AT commands) setup of prestored configurations (&F)
- Hardware setup of synchronous operation

For an AT enabled synchronous dial-on-DTR example, refer to the end of this chapter.

Software Setup of Synchronous Operation

The RX-Series can be asynchronously configured for synchronous communication (without V.25bis enabled) by using the &Q command from the AT command set. There are several variations of &Q (see command descriptions in Chapter 5).

- ❑ &Q1 allows you to dial a telephone number asynchronously, then go online in synchronous communication
- ❑ &Q2 allows you to dial a telephone number stored in memory location 0 by raising DTR and going online in synchronous communication. (Use only &Q2 if you can stop all data coming from the DTE while the modem is dialing; otherwise, use &D4&Q3. See example at end of this chapter.)
- ❑ &Q3 provides normal synchronous operation used for manual originate and leased line operation

In the &Q1 and &Q2 cases, when you lower DTR, the RX-Series hangs up and returns to asynchronous command mode. From there, you can configure the RX-Series asynchronously or return it to its factory settings. In the &Q3 case, the modem stays in a dumb synchronous mode and reconfiguration can occur only after a power reset.

Set the RX-Series for the speed and EIA options you require. The value in register S37 determines speed. The EIA settings for CTS, DSR, DTR, CXR and auto-answer should be reviewed for your application. Select the type of synchronous communication that will best suit your application and enable it with the AT&Qn <ENTER> command.

Software Disabling

Synchronous Operation

When the RX-Series is on-hook in command mode (even if it has been configured for synchronous communication with the &Q1 or &Q2 command), you can send an asynchronous *AT&F0<ENTER>* command and return the RX-Series to its factory settings. If you use the &Q3 command, you must perform a power reset to disable synchronous operation.

Dialing

There are several ways to dial a telephone number.

1. &Q1 allows you to dial asynchronously (ATDT) and go to synchronous communication when remote carrier is present.
2. &Q2 allows you to dial the number stored in memory location 0 (&Z0) after an off-to-on transition of DTR.
3. &Q3 allows you to go off-hook in originate mode by pressing the <DATA> key. Pick up the telephone attached to the RX-Series and dial a telephone number. Press <DATA> when you hear ringing and immediately return the handset to the cradle to establish a synchronous (&Q3) data connection.

Answering

In all cases, and as long as *ATS0=1* or more than 1, the RX-Series will answer in one or more rings as long as DTR is present.

Software Setup of Prestored Synchronous Configurations

There are four dial-up prestored synchronous configurations in the RX-Series modem. (See Chapter 8 for information about the prestored factory configurations for synchronous leased line operation.)

Recalling Prestored Synchronous Configurations

You can choose from three prestored configurations (described in Appendix D) for synchronous originate communication:

- Dial-on-DTR (&F4)
- V.25bis-HDLC/NRZ (&F5)
- Manual originate (&F6)

There is also one dialup synchronous auto-answer configuration (&F10). You may recall one of these prestored configurations by asynchronously typing your selection in this format:

AT&Fn<ENTER>

Should you need to revise selected parameters to conform with your particular application, you can, at this point (before dialing out for the first time), asynchronously configure the RX-Series by using the appropriate AT commands, except &F6.

COMMAND	DESCRIPTION
AT&F4	Allows dialing of a telephone number based on an off-to-on transition of DTR. Hangs up a call based on loss of remote carrier or an on-to-off transition of local DTR. The RX-Series connects—at anywhere from 33,600 bps to 1,200 bps (Z34-RX at 33,600 to 1,200 bps, Z32t-RX

- at 19,200 to 1200 bps, Z32b-RX 14,400 to 1200 bps)—depending on the maximum speed supported by the remote modem. To use this configuration, asynchronously store a telephone number into memory location 0, for example, by issuing `AT&Z0=T9,7832538<ENTER>`, then `AT&F4<ENTER>`.
- AT&F5** Supports V.25bis-HDLC autodialing. Issue `AT&F5<ENTER>` to activate the profile, then issue an HDLC-NRZ-formatted CRN command, followed by the telephone number you wish to autodial.
- AT&F6** Can be used to originate calls by using a telephone. Type `AT&F6<ENTER>`. Pick up the telephone handset, dial the telephone number, and press the <DATA> key once you hear ringing to establish a synchronous connection with the remote modem.
- AT&F10** Can be used when the RX-Series is attached to a host computer or similar device where the modem will be used exclusively to answer incoming calls. In this profile, auto-answer is enabled and all EIA signals are set to normal, with call progress messages disabled.

NOTE: The SPD LED on the RX-Series front panel indicates the connection speed in these four prestored configurations (see Chapter D). Speed—between 33,600 bps and 1,200 bps—is determined by the maximum supported by the remote modem.

See Appendix D for a complete description of each prestored (&Fn) configuration option and S-register setting. If one of the option settings in a prestored configuration is not appropriate for your application, you can change the parameter from an asynchronous terminal and store it into memory by using the &W

command, except &F6.

For example, let's assume you want to synchronously dial on DTR. Connect the RX-Series to an asynchronous terminal (38,400 bps), place a telephone number in memory location 0 (&Z0=), then use the *AT&F4&W<ENTER>* command to autodial the number. Some applications may require DSR to be high so that the DTE can recognize the attached modem. In that case, you would need to change the DSR option (&S). If you have not yet dialed out, type:

AT&S0&W<ENTER>

In this example, the RX-Series does not echo the AT command. To reset &F4 with an asynchronous terminal, type:

AT&F0<ENTER>

If you have dialed by using an &F profile, disable the profile with a power reset and restart the configuration process. This time, add the additional commands required before dialing out.

Disabling a Prestored Synchronous Configuration

After a prestored factory configuration is selected and used, the RX-Series will no longer allow an asynchronous terminal to configure it. In this case, perform a power reset to return the default configuration (&F0).

Hardware Setup of Synchronous Operation

You can set the modem for synchronous communication by using the 10 DIP switches on the modem. Hardware setup is preferred if you are manually originating calls or using synchronous leased line operation.

Enabling Synchronous Communication

Use the 10-position DIP switch to enable synchronous communication. The normal position for these switches is in the OFF position. SW1 must be in the ON position to enable the other switches (SW2 through SW10).

Turn SW1 and SW2 ON, then set your speed selection by using switches 3 and 4 (see Table 4-2). After selecting a speed so that the RX-Series will read the switches and activate the settings, reinstall the modem into the chassis.

Disabling Synchronous Communication

Set SW1, SW2, SW3 and SW4 to the OFF position, then reinstall the modem.

***Originating a Call
in Synchronous
Communication***

A common way to originate a call in dumb (no autodialer) synchronous communication is to pick up a telephone attached to the modem, dial the number, and press the <DATA> key. When you hear ringing, immediately return the handset to its cradle. This ensures that no modem handshaking is missed and that your connection will occur at the highest speed. The RX-Series goes off-hook at this point and establishes a connection with the remote modem. You may also press the <DATA> key for three or more seconds; the RX-Series then redials the telephone number stored in memory location 0. Once online, pressing the <DATA> key again causes the RX-Series to disconnect the call.

***Answering a Call in
Synchronous
Communication***

The RX-Series automatically answers an incoming call on the first ring when SW5 is ON and DTR is high. When configured properly, the AA (auto-answer) LED on the RX-Series front panel will be on.

Example: Synchronous Dial-on-DTR for 7400 Multiplexer

The example below configures the RX-Series for dial-on-DTR applications that cannot control data flow to the modem while the RX-Series is dialing a stored telephone number. For multiplexers and digital service units (DSUs), it is normally impossible to stop data flow while

the modem is dialing and handshaking. However, this sample setup will work for all devices that cannot control data flow before a communications link can be established.

1. Set up the answer side RX-Series with the following AT command string:

AT&C1&S1&R0&Q1S0=1%Q1E1Q0&W<ENTER>

2. Set up the originate side RX-Series with the following AT commands. First, store the telephone number:

AT&Z0=telephone number

then configure the modem with the following command string:

AT&C1&S1&R0&D4&Q3S0=0E1Q0&W<ENTER>

3. Connect the RX-Series to their respective devices and turn on the power to the DTEs. As the DTR lead goes high on the originating RX-Series, the modem will go off-hook and dial the telephone number stored in memory location 0.
4. To hang-up the call, lower DTR on the originating RX-Series modem. (Turn the power off to the DTE device.)
5. To return the RX-Series to its factory configuration, you must perform a power reset.

CHAPTER

8

Leased Line Operation

General

A leased line is a permanent connection between local and remote modems that provides full-time access for a fixed fee. Leased lines are also sometimes referred to as *dedicated*, *private*, or *3002* lines.

The Z34 requires none of the special conditioning that is available for leased lines. The Z34 can operate in full duplex in a point-to-point configuration on a two- or four-wire leased line. Upon leased line failure and if properly configured, the Z34 can support dial backup on the Public Switched Telephone Network (PSTN), providing guaranteed up-time of the communication link.

Considerations

When ordering a leased line from the telephone company, you need to decide what type of line to order. In some cases, within the LATA, it is cheaper to order a two-wire leased line than to order a four-wire leased line. Inter-LATA, normally two-wire and four-wire leased lines, are priced the same. (Four-wire leased lines are more common.) In most cases, you will not need to order any special line conditioning such as D4, D5, or D6.

Before choosing your line, consider these issues:

- Whether your application would be better served by a two- or four-wire leased line
- How the telephone company terminates the line (terminal block or modular connector)
- Which modem will be used for answering and which for originating
- Communication link speed and retrain speed
- For asynchronous communication, data bits, parity, and serial port speed
- For synchronous communication, V.13 switched carrier requirements, and dial backup

The Zypcom telco cable (P/N 91009-200) terminates in a RJ45S (8 pin modular connector) for leased line connections. This will require the phone company to install a modular JM8 block (or similar device) for mating up to the Zypcom leased line connector.

Setup Procedures

All leased line setups involve:

- Setting the Z34 for leased line operation by using the AT commands (software setup) or the appropriate DIP switches on the modem (hardware setup)

Mandatory Setup Procedures

Whether you'll be using AT commands or the DIP switches to put the Z34 in leased line communication, you must first make sure that JP1 (or JP2) is set for leased line operation.

1. Refer to Figures 8-1, 8-2, and 8-3, and set the JP1 jumper for leased line operation.
2. Install the chassis telco cable (P/N 91009-200) (10 feet in length) into the chassis telco connector (Telco 1-4 for slots 1-4, Telco 5-8 for slots 5-8, Telco 9-12 for slots 9-12, or Telco 13-16 for slots 13-16) on the back of the chassis.
3. Use the connectors marked "leased" for attaching the telco cable to the JM8 block. On the 91009-200 cable at the RJ45 connector end, red (TX pin 1) and green (TXC pin 2) are the transmit pair and black (RXC pin 7) and yellow (RX pin 8) are the receive pair for 4-wire leased line operation. For 2-wire leased line operation, use the red and green pair.

Once the jumpers have been set, reinstall the modem into the chassis. If you are using the DIP switches to set up leased line operation, set them before reinstalling the modem.

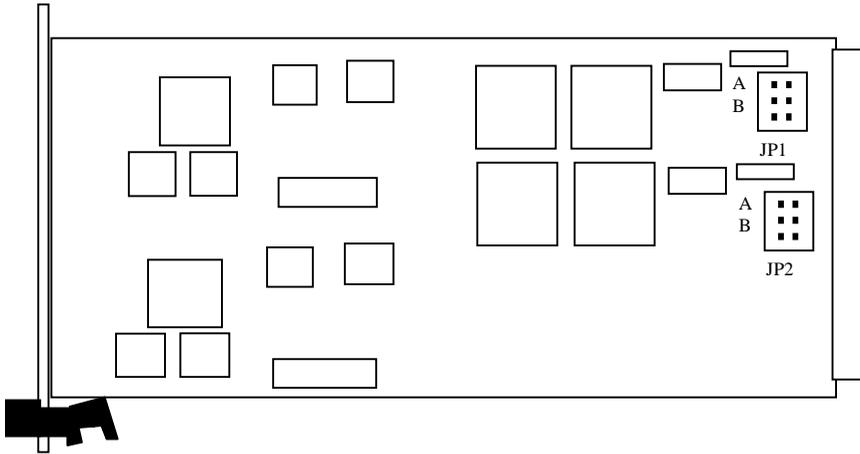
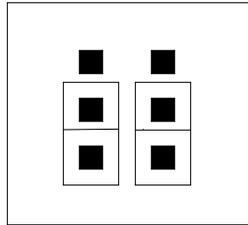


Figure 8-1. Printed Circuit Board Layout (PCB No. 81508-900)

Caller ID enabled
"A" position is on

A



Leased line enabled
"B" position is on

B

Push on header (hard strap). JP1 controls modem A and JP 2 controls modem B. The example above shows push on headers in the "B" position, which enables leased line operation.

Figure 8-2. Hard Strap Settings

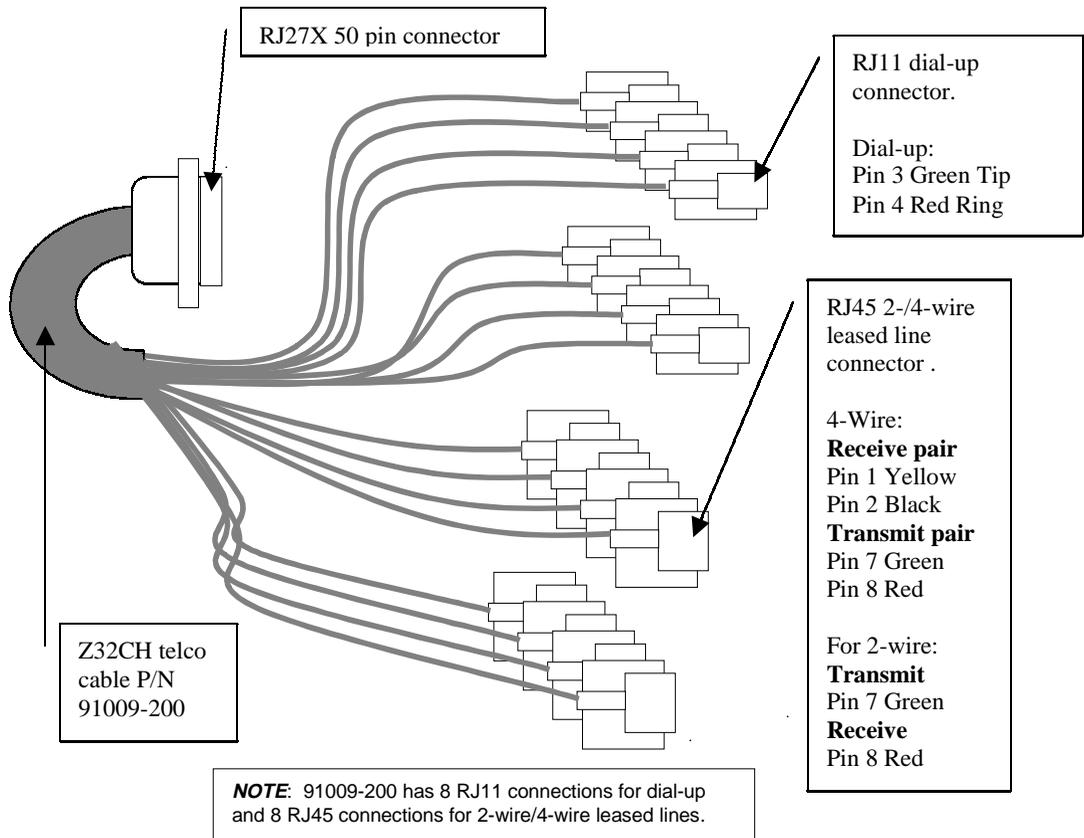


Figure 8-3. Leased Line and Dial (Backup) Cable Pinouts (P/N 91009-200)

At this juncture, you have two options for putting the Z34 into leased line operation: hardware setup using the DIP switches or software setup using AT commands. If you're using dial backup, you should use the AT commands. If you're not using dial backup, you should use the hardware setup procedures.

Hardware Setup Procedures

Before setting the DIP switches, you should first set the EIA options to whatever is required for your application. Normally, leased line communication requires CXR to be set to normal conditions. Other applications may require CTS to follow CXR and DTR to be set to normal conditions. Check your DTE to learn what requirements it may have and set those options accordingly. Once you have set all options not controlled by the DIP switches, write those options to stored profile 0 by using the *AT&W0<ENTER>* command.

Remove the modem from the chassis and begin setting the DIP switches according to the following step-by-step procedure.

1. Set SW1 to the ON position to enable the rest of the switches.
2. Select synchronous or asynchronous communication and set SW2 to match the data type of your DTE.
3. Set the serial port speed by using switches SW3 and SW4. Synchronous port speed is different from asynchronous port speed and depends on the setting of SW3 and SW4 (see Chapter 4).

4. Use SW5 to select which modem will originate and which modem will answer. Set SW5 to the OFF position on the originating Z34 and set SW5 ON on the answering Z34.
5. Set switch SW6 to the ON position to enable leased line operation.
6. Set switch SW7 to the ON position for four-wire leased line communication and OFF for two-wire leased line communication.

Once the switches have been set, reinstall the Z34-RX modem into the chassis. The 91009-200 cable should already be connected to the chassis and to the leased line termination point (see Mandatory Setup Procedures in this chapter).

When the Z34s are installed and the chassis is turned on, they automatically go off-hook (SI LED on) in 4 or 5 seconds. The answer-side modem begins sending answer tone for about 30 seconds. It then waits 4 or 5 seconds and repeats the process. The originate-side modem goes off-hook in originate mode, waiting to detect answer tone. If the leased line is installed properly, the modems will handshake and return a call progress message indicating the speed of the connection (if so optioned).

If call progress messages are not needed in your application, set DIP switch SW10 to the ON position to disable the messages and all other AT commands.

Software Setup Procedures

The Z34 can be configured for leased line operation by using AT commands; however, the terminal being used to configure the Z34 must be set for 28,800 or 38,400 bps. There are four prestored factory profiles for leased line operation (see Appendix D, configurations &F7-9 and &F11). These profiles allow multiple options and S-registers to be set with a single command. If your application cannot take advantage of the prestored configurations, set up the modem by using separate commands.

As in hardware setup procedures, configure the EIA options and any other options required for your application. Once those have been set and written to a specified memory location with the AT&Wn<ENTER> command, issue an &Ln command to select the type of leased line operation. Register S0 controls whether the Z34 is used for originating or answering.

Setup of the Answer-Side Z34

The following is a step-by-step procedure for setting the answer-side Z34. Note that in the following sample command strings, &Wn writes the command settings to memory. If you don't specify memory location *n* (where *n* can be 0, 1, 2 or 3), the Z34 assumes 0.

1. Set the EIA options and any other options required for your application. For example, set &Q3 for synchronous communication or &Q6 for asynchronous communication. Often CXR and DSR need to be set to normal conditions.
2. Issue the proper &Ln command and register S0 setting and write it to memory. For example, from a two-wire answer modem, type:

```
AT&Q3&C1&D2&S1&L1S0=1&Wn<ENTER>
```

From a four-wire answer modem, type:

AT&Q3&C1&D2&S1&L2S0=1&Wn<ENTER>

3. For asynchronous leased line communication (&Q6 replaces &Q3 above), disable echo and call progress messages with this command:

ATEOQ1&Wn<ENTER>

4. Remove and reinstall the Z34. (Be careful not to touch the front panel <DATA> and <TEST> keys when reinstalling.) After about five seconds, the commands take effect and the Z34 goes off-hook and begins sending answer tone.

Setup of the Originate-Side Z34

The following is a step-by-step procedure for setting the originate-side Z34. Note that in the following sample command strings, &Wn writes the command settings to memory. If you don't specify memory location *n* (where *n* can be 0, 1, 2 or 3), the Z34 assumes 0.

1. Set the EIA options and any other options required for your application. For example, set &Q3 for synchronous communication or &Q6 for asynchronous communication. Often CXR and DSR need to be set to normal conditions.
2. Issue the proper &Ln command and register S0 setting. For example, from a two-wire originate modem, type:

AT&Q3&C1&D2&S1&L1S0=0&Wn<ENTER>

From a four-wire originate modem, type:

AT&Q3&C1&D2&S1&L2S0=0&Wn<ENTER>

3. For asynchronous leased line communication (&Q6 replaces &Q3 above), disable echo and call progress messages with this command:

ATEOQ1&Wn<ENTER>

4. Remove and reinstall the Z34. (Be careful not to touch the front panel <DATA> and <TEST> keys when reinstalling.) After about five seconds, the commands take effect and the modem goes off-hook in originate mode, waiting to detect answer tone from the answer-side Z34.

When the modems have been properly connected to the leased line, they will handshake and go online (evidenced by the CXR LED going on). If CXR is not set to normal, the online connection is established once the chassis speaker turns off (to monitor the handshaking tones of a modem and to select that modem address with the selector switch).

Transmit and Receive Levels

When the Z34 is configured with AT commands or the DIP switches for leased line communication, the receive levels are set for a range of 0 dBm to -43 dBm. The transmit level can vary and depends on the setting of register S35. Typically, a transmit level of 0 dBm should be selected for leased line operation (S35=0) . For a transmit level other than 0 dBm, use S-register 35. This command must follow the &L to take effect, however.

Leased Line Dial Backup

The Z34 can be configured to restore the communication link upon failure of the leased line. This requires that each modem have working PSTN lines installed in the jacks marked "WALL" on the back of each modem. The originating Z34 (register S0=0) needs to have a telephone number for the remote Z34 stored in memory location 3. In addition, both modems must have dial backup enabled via register S42. The following are step-by-step procedures for enabling leased line operation with dial backup.

Two-/Four-Wire Leased Line with Dial Backup— Answer Side

The following procedure explains how to select dial backup from an answer-side Z34. Note that in the following sample command strings, &Wn writes the command settings to memory. If you don't specify memory location *n* (where *n* can be 0, 1, 2 or 3), the Z34 assumes 0.

1. Set the EIA options and any other options required for your application. For example, set &Q3 for synchronous communication or &Q6 for asynchronous communication. Often CXR and DSR need to be set to normal conditions.
2. Enable dial backup on the answer-side Z34. To do this, increment register S42 by two. First, interrogate the S42 register:

```
ATS42?<ENTER>
```

The Z34 should respond:

000
OK

Issue the enable dial backup command (increment S42 by 2) (see Chapter 6).

ATS42=2&Wn<ENTER>

3. Issue the proper &Ln command and register S0 setting and write it to memory. For example, for a two-wire answer modem, type:

AT&Q3&C1&D2&S1&L1S0=1&Wn<ENTER>

For a four-wire answer modem, type:

AT&Q3&C1&D2&S1&L2S0=1&Wn<ENTER>

4. For asynchronous leased line communication (&Q6 replaces &Q3 above), disable echo and call progress messages with this command:

ATEOQ1&Wn<ENTER>

5. Remove and reinstall the Z34. (Be careful not to touch the front panel <DATA> and <TEST> keys when reinstalling.) After about five seconds the commands take effect, and the Z34 goes off-hook and begins sending answer tone.

6. The Z34's serial port speed will match the line rate and adjust automatically in synchronous communication. In asynchronous communication, the serial port speed matches the speed of the last autobaud, as long as &B1 has been set. Therefore, if the terminal you are using is operating at 38,400 bps when you are setting the Z34 for asynchronous leased line communication, the line rate will be 28,800 or 14,400 bps and the serial port rate will be 38,400 bps. To obtain a different rate, adjust the rate of the DTE being used to configure the Z34 or use the %X command.

***Two-/Four-Wire
Leased Line with
Dial Backup—
Originate Side***

The following procedure explains how to set leased line operation with dial backup for the originate-side Z34.

1. Set the EIA options and any other options required for your application. For example, set &Q3 for synchronous communication or &Q6 for asynchronous communication. Often CXR and DSR need to be set to normal conditions.
2. Enable dial backup on the originate-side Z34. To do this, increment register S42 by two. First, interrogate the S42 register:

ATS42?<ENTER>

The Z34 should respond:

000
OK

Issue the enable dial backup command (increment S42 by 2) (see Chapter 6).

ATS42=2&Wn<ENTER>

3. Store the dial backup telephone number in memory location 3. For example, type:

AT&Z3=T9,7832535<ENTER>

4. Issue the proper &Ln command and register S0 setting (on originate-side S0=0) and write it to memory. For example, for a two-wire answer modem, type:

AT&Q3&C1&D2&S1&L1S0=0&Wn<ENTER>

For a four-wire answer modem, type:

AT&Q3&C1&D2&S1&L2S0=0&Wn<ENTER>

5. For asynchronous leased line communication (&Q6 replaces &Q3 above), disable echo and call progress messages with this command:

ATEOQ1&Wn<ENTER>

6. Remove and reinstall the Z34. (Be careful not to touch the front panel <DATA> and <TEST> keys when reinstalling.) After about 3 to 5 seconds, the Z34 goes off-hook, waits for answer tone—as long as DTR is present—and completes the modem handshake. (If &D0 had been set, the Z34 would not require DTR to perform this function.) The Z34's serial port speed will match the line rate and adjust automatically in synchronous communication. In asynchronous communication, the serial port speed matches the speed of the last autobaud, as long as &B1 has been set.

Upon leased line failure, the originating Z34 goes off-hook and dials the telephone stored in memory location 3. If the answering modem has been properly configured, it answers the call, initiating the handshaking sequence to restore communication.

When a leased line connection is broken or is bad (fails two modem retrains) and modem cannot retrain successfully, the CXR LED goes out. After about 20 to 30 seconds, the originate-side Z34 goes off-hook to connect to the PSTN line and dials memory location 3, attempting to re-establish the communication link. If the originate modem does not connect to the answer modem, the originate modem attempts a call every 45-60 seconds until successful or until the leased line is repaired.

The Z34 indicates a dial backup connection by the flashing of the SYN LED.

CAUTION: *Dial backup (SYN LED flashing) should be used only in environments where personnel can monitor the line. This will ensure that the modem does not go off-hook after a leased line failure on a Friday night, for example, and remain on the backup line throughout the weekend—when no one is actually using the connection.*

When the telephone company reports that the leased line is restored, you can switch from dial backup communication to leased line communication by pressing the <DATA> key or lowering DTR momentarily, or in asynchronous data mode, by issuing the +++ escape sequence followed by ATH<ENTER>. The Z34 goes on-hook temporarily, then off-hook to reconnect to the leased line.

Modem Speed and Retraining

In the case of leased line operation or dial backup operation when the modem encounters a low-quality line and the Z34 must retrain, the SPD LED will indicate the link speed (see Table 4-1). Normally, retrains will cause the modem to operate at a lower speed. However, a link speed (even after a retrain) can be forced by optioning the modem with the N0 and S37 commands.

Prestored Leased Line Configurations

The Z34 has four prestored leased line configurations, two for a four-wire leased line without dial backup and two for a four-wire leased line with dial backup. Any one of the profiles can be called into the active configuration with a single AT&Fn command, followed by cycling of power to the Z34.

4-wire Leased Line

In four-wire leased line operation without dial backup, the originate configuration is stored in the &F7 profile. To install this profile into your active configuration, type:

AT&F7&Wn<ENTER>

and cycle power. This profile enables the originate-side Z34 for synchronous, four-wire leased line communication. In all of these command strings, &Wn writes the command settings to memory. If you don't specify memory location *n* (where *n* can be 0, 1, 2 or 3), the Z34 assumes 0.

To install the answer-side complement of this configuration into another modem, type:

AT&F11&Wn<ENTER>

and cycle power. When power is restored to both modems and the leased line cables are plugged into the proper jacks in the back of the modems, the modems will go online.

4-wire Leased Line with Dial Backup

The synchronous four-wire leased line configuration with dial backup requires a telephone number to be stored in memory location 3 in the originate-side Z34. Type:

AT&Z3=T9,783 2535<ENTER>

When you receive the OK message, type:

AT&F8&Wn<ENTER>

and cycle power to install synchronous four-wire leased line communication with dial backup as the active configuration on the originate-side modem.

To enable its complement—answer-side four-wire leased line communication with dial backup—from the answer-side Z34, type:

AT&F9&Wn<ENTER>

and cycle power. With the leased line cable installed on the back of the Z34s and connected to the leased line termination block provided by the telephone company, the modems go off-hook, handshake, then go online.

Should the leased line fail (you can simulate leased line failure by removing one of the leased line connectors from the back of the Z34), the originating modem will attach itself to the PSTN telephone line after 10 to 15 seconds and dial the telephone number stored in memory location 3. The AA LED on the answer-side Z34 flashes as an incoming ring occurs. The Z34 answers the call, re-establishing the communication link.

The Z34 flashes the SYN LED whenever it is communicating in a dial backup link.

To drop this test of dial backup operation, press the <DATA> key. The modem will handshake and restore the leased line connection.

Refer to Appendix D for specific option settings of the &F7, &F8, &F9, &F11 leased line profiles and to Chapter 5 for details on the &F command.

8

Leased Line Operation

The RX-Series modem incorporates advanced features that can be used in special applications:

- V.13 (switched carrier) operation
- Remote modem control
- Network management with optional Z3200E
- LCD and VT100 control port with optional Z3200

Remote modem control is used in both asynchronous and synchronous environments and V.13 is used exclusively in synchronous environments. Network management is controlled via an optional chassis card called the Z3200E. The Z3200E supports SNMP and WWW management and is explained in detail in its own user guide. The non-managed version of the Z3200E is called the Z3200 and this optional card adds VT100 control port capability to the Z32CH chassis as well as a LCD screen for full front panel control of the modem cards in the chassis.

V.13 Operation

CCITT V.13 operation (&Cn command) allows for a full-duplex modem to operate in half-duplex or multi-drop environments. V.34 modems can be used only in point-to-point applications.

V.32*bis*, V.32*terbo*, and V.34 modems are full duplex; however, these full-duplex modems can operate with

network environments that require half-duplex transmission (where local RTS controls remote CXR) or multi-drop transmission (where a host modem's CXR is controlled by remote RTS and the remote modem's CXR is on constantly). In V.13 operation, a special pattern is sent to the remote modem. Upon reception of this pattern, the remote modem raises CXR. When the remote modem receives a V.13 idle pattern, it lowers CXR.

On the transmitting side, when the local modem detects an RTS off-to-on transition, it transmits a V.13 "carrier on" signal and raises CTS. When RTS goes low from the DTE, the modem transmits a "CXR off" idle pattern and lowers CTS.

Multi-drop Environments

The RX-Series can be used as a leased line segment of a multi-drop network or as dial backup of a DDS multi-drop segment. In both cases, have the modem closest to the host computer set for V.13 RXD transmission and the modem closest to the remote drop set for V.13 TXD transmission.

These settings will enable the modem closest to the host to have CXR turned on and off, based on the RTS signal from the remote location. CXR on the modem closest to the remote location will have CXR on all the time. This approximates how a multi-drop modem network would function. In this network, the master at the host location continues to broadcast carrier. This results in CXR being high at all the drops and having carrier low at the host location until one of the drops transmits a response, creating a CXR on at the host modem.

V.13 works only in synchronous communication (&Q3) from 28,800 bps to 2400 bps. It can only be configured by using the AT commands and will work in conjunction with dial-up or leased line operation.

When enabling V.13 operation with the &C command, you also have to enable several additional commands listed under the V.13 Setup section in this chapter.

V.13 Operation Setup

The following is a specific example of how to option the RX-Series for V.13 operation on a dial-up communications link. If you are using a leased line, you would have to set additional parameters (&L and S0). Also, the example below does not give consideration to operation of DSR and DTR. You must understand the requirements of your application regarding these signals and configure the RX-Series before issuing this command:

AT&Q3&R0S26=3&C3&X2&W<ENTER>

The command string can be issued to both the answer- and the originate-side modems.

- &Q3 selects synchronous communication
- &R0 sets CTS to follow RTS by the value specified in register S26
- &C3 sets RXD/TXD V.13 operation
- &X2 sets slave clock and is required for one modem; &X0 sets internal clock and is required for the other end modem
- &W writes the configuration to a user-stored profile. (If you don't define a location, the RX-Series assumes 0.)

Upon loss of power, the RX-Series will recall user-stored profile 0 into the active configuration (providing AT&Y0 is selected).

Should you need to re-option the RX-Series, issue a power reset and reoption the modem. (Depress the <DATA> and <TEST> keys on the modem front panel while reinstalling the modem into the chassis.)

When issuing the command string above to configure V.13 operation, calls should be initiated by using the front-panel <DATA> key. Pressing <DATA> for three or more seconds causes the RX-Series to dial the telephone number stored in memory location 0. Subsequently pressing <DATA> for a moment or so while the RX-Series is online causes the modem to drop the connection and go back on-hook.

Calls can also be initiated manually by dialing the telephone number from an attached telephone and pressing the <DATA> key for a moment after ringing is detected. Remember to immediately return the handset to the phone cradle.

If the modems are retraining when RTS is raised, the RX-Series raises CTS, but the V.13 on pattern is not sent. The modem that has V.13 enabled turns off CXR when it detects the V.13 idle pattern, loses carrier from the remote modem, is retraining, or is reset.

Remote Modem Access

Remote modem access lets the local DTE and modem view and change the configuration, as well as set security on the remote modem. This feature is extremely useful for troubleshooting modem problems and is always protected by password security (\P0).

The RX-Series provides remote modem access at any speed—from 1200 bps to 230,400 bps—with or without error control on the communications link. When you troubleshoot RX-Series modems set up for synchronous communication, you may take an asynchronous terminal and asynchronously option the RX-Series, and you may call into the synchronously optioned RX-Series modem to interrogate its configuration.

Commands

Several commands are used exclusively to enable and disable remote modem access. You must enable the secondary channel, then enable remote modem access to control the remote modem memory. You have to enable the ^S1 and ^R1 commands only once for each modem connection.

^S (Secondary Channel Control)

Starts the remote modem access session. The ^S1 command must be issued when the RX-Series is in online command mode, which can be entered from data mode by using the +++ escape sequence.

COMMAND	DESCRIPTION
^Sn	Secondary channel control
^S0*	Disables secondary channel operation*
^S1	Enables secondary channel operation

^R (Remote Modem Access Control)

Selects the modem to be accessed during the secondary channel operation.

COMMAND	DESCRIPTION
^Rn	Remote access control
^R0*	Sets local modem access*
^R1	Sets remote modem access

\P (Modem Security Password Control)

Controls the password for modem security. When enabled (\P1), the command prevents the modem from being used by the local DTE without a password. The modem will answer incoming calls when this option is enabled (\P1). When this option is enabled, you must issue the proper password before using the AT commands to dial, option, or view memory locations. The option (\P1 or \P2) can be enabled remotely, but can only be disabled (\P0) locally.

COMMAND	DESCRIPTION
\Pn	Modem security password control
\P0*	Disables local security password. Remote modem access security remains enabled*
\P1	Enables local security password. Remote modem access security is enabled
\P2	\P2? displays the password and \P2=xxxxxxx is used to set the password, where xxxxxxx can be up to 7 alphanumeric, case-independent characters

^E (Read Remote EIA Signals)

Reports the status of the remote EIA signals for RXD, TXD, RTS, CTS, DSR, DTR and CXR, where signal = 1 indicates on status and signal = 0 indicates off status.

COMMAND	DESCRIPTION
^E0	Reports remote EIA signals to the local DTE

To read remote EIA signals, you must first enable secondary channel operation (if it is not already enabled) by using the ^S1 and ^R1 commands in online command mode.

%L (Read Analog DSP Performance Measurements)

Measures multiple analog parameters: the receive level in decibels (dBm) and the data pump line status, i.e., signal quality, near- and far-end echo, and round trip delay. This command must be issued while the RX-Series is in online command mode.

COMMAND	DESCRIPTION
%Ln	Reports analog DSP performance measurements
%L0	Measures signal level of the received carrier in dBm
%L1	Reports data pump's line status and receive level

%L1 reports receive level, signal quality, near-end echo, far-end echo, round trip delay, and modulation statistics for the local modem. To report statistics for the remote modem, you must first enable secondary channel operation (^S1 command), set remote modem access (^R1), then enter %L1 to download the remote DSP's statistics. Enter ^R0 to disable the secondary channel.

Enabling Remote Modem Access

The RX-Series comes from the factory with remote modem access disabled. To enable the option:

1. Connect to the remote RX-Series modem.
2. After the CONNECT message appears on your screen, send the +++ escape sequence. Wait for the OK message.
3. Enable the RX-Series's secondary channel:

AT^S1<ENTER>

Wait for the OK message.

4. Enable remote modem access:

AT^R1<ENTER>

In about 10 to 20 seconds, the remote modem returns this message:

REMOTE PASSWORD?

5. Type your password. The default is:

ZYPCOM<ENTER>

If you make a mistake in typing the password, the RX-Series issues this message:

PASSWORD REJECTED
ERROR MESSAGE

If the password is accepted, the modem issues an OK message.

You are now interacting with the remote modem's memory. You may interrogate the remote modem's DSP status (%L1) or EIA signals (^E0), change the remote modem access password (\P2=), or display the remote modem's configuration and contents of its stored memory locations (&Vn).

NOTE: *AT&V0 or AT&V1 displays only the active configuration and the contents of the four memory locations of the remote modem.*

Note that modem action commands, for example, ATA and ATD, cannot function in remote modem access.

The only two action commands that function in remote modem access are the `&Fn` and `&Wn` commands. You can use the `&Zn` to store telephone numbers in the remote modem, as well as to change any option or S-register and save it to any memory location.

Disabling Remote Modem Access

To disable remote modem control:

1. After you have completed interrogating the remote modem, setting options, and storing telephone numbers and autologon sequences, type:

```
AT^R0<ENTER>
```

Wait for the OK message.

2. Type `ATH<ENTER>` to hang up or `ATO<ENTER>` to go back online.

Remote Access Examples

The following are several examples of how to use the remote modem control capability of the RX-Series modem to support your network.

Remote User is Having Problems Trying to Dial a Remote Location

If a user you support is having a modem dialing problem, you can call his modem to determine what the problem might be. (It does not matter if the remote modem is configured for asynchronous or synchronous operation.)

1. From the terminal attached to your local RX-Series modem, establish a connection with the modem experiencing problems.

2. Go online and issue the +++ escape sequence.

3. Type:

AT^S1<ENTER>

Wait for the OK message.

4. Type:

AT^R1<ENTER>

The remote modem responds with:

REMOTE PASSWORD?

5. Type the password of the remote modem, followed by <ENTER>. For example:

ZYPCOM<ENTER>

Wait for the OK message. At this point you are communicating with the remote modem.

6. Type:

AT^E0<ENTER>

The remote modem responds with the status of its EIA signals.

7. Type:

AT&V<ENTER>

The remote modem displays the active configuration. In reviewing the option settings, you may see that &C1 (carrier normal) is set. However, the remote modem is connected to a terminal that requires CXR to be high before the terminal can be interactive with the modem.

8. Type:

```
AT&C0&W<ENTER>
```

Wait for the OK message.

9. Type:

```
AT^R0<ENTER>
```

Wait for the OK, then hang up:

```
ATH<ENTER>
```

At this point, have the remote operator type AT from the keyboard. AT should be echoed back to the screen.

Interrogating the Remote Modem's Serial Number

Security is often an important element when planning to install modems in a computer network. Unauthorized access is something that can be avoided with some intelligent planning and the RX-Series modem. The RX-Series remote modem control capability can be used to ensure that only authorized users gain access to your network.

For example, a host computer can have a small application running in front of an end-user application that would interrogate the remote modem to ensure that it is in fact an authorized modem. All RX-Series are programmed at the factory with a unique serial number in ROM that cannot be altered.

When a remote operator originates a call to your answer side, this particular security application would start up after the CONNECT message is sent by the answer-side RX-Series. If call progress messages are disabled, the application starts up when the CXR lead goes high. The application would then send a +++ escape sequence.

Wait for the OK message and send this command to turn on the secondary channel:

AT^S1<ENTER>

Wait for the OK message and type:

AT^R1<ENTER>

Wait for the REMOTE PASSWORD? message. Send the correct password, wait for the OK message, then type:

ATI6<ENTER>

The RX-Series will respond with:

REMOTE SERIAL NUMBER: XXXXX

When the computer receives the serial number of the remote modem, it can check that serial number against the database of known modem serial numbers. If it accepts the serial number, it passes the connection on to the end-user application. If the serial number does not pass, it types:

AT^R0<ENTER>

then drops DTR to disconnect the link.

If the serial number does pass, the application sends:

AT^R0<ENTER>

Wait for the OK message and send:

ATO<ENTER>

Wait for the CONNECT message before passing off to the end-user application.

Many creative applications can be designed by using the remote modem control feature of your RX-Series modem, thereby simplifying user support, increasing security, and automating your data communications.

SNMP/WWW Network Management

The Z3200E control card will work with an existing UNIX based SNMP manager (OpenView, SunView, etc.) or the ZSNMP application software that Zypcom sells. Zypcom OEMed ZSNMP from CastleRock Computing which has the leading Win95 SNMP application platform. The ZSNMP application has had extensive graphical and management reporting additions that make the management task that much easier while taking advantage of all the unique RX-Series capabilities.

The Z3200E has an embedded SNMP agent MIB and can provide real-time status on the modem and chassis to any SNMP V2 compatible SNMP manager application that has compiled our modem MIB.

The Z3200E can be managed from the same LAN as the management console or if the management console is remote to the LAN the Z3200E is attached to it can call in to the chassis control card using a modem connection over a PPP link. Both SNMP and WWW management can be done over either the 10Base-T port or the remote PPP port.

The Z3200E and ZSNMP combine to provide the most powerful and easiest to use SNMP based modem management utilizing a point-and-click GUI. Of course because SNMP is used the same application can manage most of if not all your LAN/WAN devices.

If SNMP is not right for your company then utilize the embedded WWW server in the Z3200E. The Z3200E has a HomePage that displays the real-time status of the modems. In addition to status you can option them, run diagnostics or re-flash the memory.

Or begin using the Z3200E's VT100 control port and front panel LCD before utilizing the more advanced SNMP and WWW management functions.

LCD/VT100 Port Controller Card

A non-managed version of the Z3200E is also available and is called the Z3200. Like the Z3200E it has a LCD and VT100 control port. The LCD provides full front panel control of each modem in the chassis for configuration and diagnostics. The VT100 control port also provides these features as well as a basic real-time status display of each modem. This allows the operator to view an entire chassis at once and receive important modem alarms if and when trouble spots occur.

CHAPTER 10

Troubleshooting and Testing

General

Although the RX-Series default option settings are suitable for most terminals, a default option setting can cause problems if it is incorrect for your application. You can resolve many problems by checking the following settings on your DTE, making sure that the RX-Series is set to match the DTE:

- Parity (odd, even, or none)
- Character length (10 bits)
- Terminal speed
- COM port selection
- Synchronous or asynchronous transmission protocol
- Local echo on terminal (should be off)

If you encounter communication problems, run through the troubleshooting procedures and built-in data and self-tests to attempt to isolate the source of your trouble. In addition, refer to the quick checkout procedure in Chapter 2 for first-time modem installations.

Communication Problems

Type *AT<ENTER>*. The AT should be echoed back to the DTE, followed by OK from the modem. If these characters don't appear on your screen, follow the procedures described below to determine the problem.

Cable Connections

1. Check that the RX-Series and computer or terminal are plugged in and turned on. When the RX-Series has power, the DTR LED should be on. (DTR is provided by most DTEs.)
2. Check the modem cable. Make sure it is specifically wired for your DTE. Normally any modem cable would require pins 1 through 8, 15, 17, 20, and 22 and would be a straight-through cable (where pin 1 goes to pin 1 on each end).
3. Check the connectors at both ends of the cable. Make sure they are firmly attached and the screws are tightened.
4. Verify that the RX-Series is connected to the serial port on your terminal or computer with your communications software. Normally terminals and PCs for a selected port will have DTR on. This will also show on the modem. For example, if you set your modem software for COM1 and the RX-Series DTR LED is not on, your modem is probably attached to COM2.

**Terminal or
Computer Settings**

These are the most common problems involving terminal or computer settings.

1. Check that your computer or terminal operates at a speed the RX-Series can handle: 230,400, 115,200, 57,600, 38,400, 19,200, 9,600, 4,800, 2,400, 1,200 and 300 bps.
2. Make sure that your terminal or communications software is set for 10 bits per character. The total of

the data bits, parity bit, and start and stop bits must equal 10. The RX-Series automatically determines speed and parity for 10-bit characters. The most common settings are:

- 8N1 (8 data bits, no parity, 1 start bit, and 1 stop bit)
 - 7E1 (7 data bits, even parity, 1 start bit, and 1 stop bit)
 - 7O1 (7 data bits, odd parity, 1 start bit, and 1 stop bit)
3. Type *AT<ENTER>*. The SPD LED should reflect the speed of the attached DTE (as described in Chapter 4).

Win95 HyperTerminal Settings

If you are using HyperTerminal to configure your RX-Series modem, follow the directions below.

1. Start | Program | Accessories | Hyperterminal | Hypertrm.exe
2. Provide session name (for example, Direct COM2), then OK
3. Change "Connect using" to the COM port your using (1,2,3,4), then OK
4. Select your speed (115,200), etc., then click OK
5. Now wake up the modem *AT<enter>*, it should respond OK
6. If it doesn't type *AT&F<enter>*, if that doesn't wake the modem up verify that the DTR LED is on. If it isn't then switch COM port setting in HyperTerminal
7. Option the modem, if your unsure on the setup string see Chapter 2, quick setup.

Other Communication Software

If you are using a different communications software package, verify that the RX-Series's software settings match those of the communications software or terminal.

1. In the RX-Series's default setting, CXR is forced on. Some software packages need CXR to follow true carrier. In AT autodialing, you can control this option by using the AT&C*n* command.
2. Check the setting for DSR. The default setting is forced on, but it can be changed by using the AT&S*n* command in AT autodialing.
3. Verify flow control (RTS/CTS is &K3, Xon/off is &K4) compatibility
4. Set modem port speed (%X) and lock it (#L)
5. Check the response messages (Q2) and character echo (E0)

Other Common Problems

DTE Doesn't Display What You Type

When your RX-Series and computer or terminal are properly connected, the screen should display what you type. If it doesn't, enable local echo:

ATE1<ENTER>

by using another terminal to option the modem. If ATE1 was already set, check to see if the CXR and DSR LEDs are on. If not, set them on:

AT&C0&S0&Wn<ENTER>

Also, check to make sure that the modem cable you have contains RTS (pin 4).

DTE Displays Double Characters

If the DTE screen doubles every character you type, then the terminal and modem are both echoing characters. Try to disable your terminal's local echo option. If that's not possible, then disable local echo by using the *ATE0<ENTER>* command.

Communications Program Thinks the RX-Series is Online

If you receive an ONLINE message somewhere on your DTE screen but the RX-Series is not online, set CXR to normal conditions by using the *AT&C1&Wn<ENTER>* command (then store this command into the communications software's initialization string).

DTE Screen Displays Unusual Characters

If your DTE screen displays unusual characters, check the speed setting of your communications software or terminal and the character length and parity. Match to the system you are calling.

Another common problem involves error control. If your RX-Series is set for error control and the remote modem is not set for error control, you can see a lot of unusual characters on your screen. Disable error control by using the `AT&Q0<ENTER>` command, then redial the telephone number.

If your communications software program does not have the Zypcom modem listed in its modem setup menu and it is possible to define a custom modem, then type the following initialization string:

```
AT&F0&C1&D2&S1K3&Q6S7=90E0Q2S0=1<ENTER>
```

If you will be communicating with a non-error controlled modem, replace `&Q6` with `&Q0` in the initialization string.

Delays During V.42/ MNP Error- Controlled Communication

A small amount of character delay is normal for error-controlled communication links. Large file transfers normally call for a communications software file transfer protocol to be used. Zypcom recommends that a protocol with large data packets be used, such as Ymodem-G or Zmodem, for the best data throughput rates.

RX-Series Does Not Answer Incoming Calls

If the RX-Series does not answer incoming calls:

1. Verify that your terminal or computer supplies DTR. (The RX-Series's DTR LED should be on.) If not, force DTR on. Type:

AT&D0&Wn<ENTER>

2. Verify that the AA LED (automatic answer) is on. If not, while the RX-Series is in command mode, type:

ATS0=1&Wn<ENTER>

Note that &Wn in the command string writes the command settings to memory. If you don't specify memory location *n* (where *n* can be 0, 1, 2 or 3), the RX-Series assumes 0.

If the RX-Series does not automatically answer when connected to a minicomputer or mainframe and the DTR and AA LEDs are on, turn off the echo and response message options:

ATE0Q1&Wn<ENTER>

RX-Series Does Not Dial/Answer

If your DTE displays the NO DIALTONE message, the RX-Series is not receiving dial tone.

1. Select the modem on the suspected line using the selector card channel select key.

2. Push the data key on the modem and turn up the manual volume control on the selector card. If you here dialtone the line is good if not you probably have a faulty line. Call the telephone company.
3. If you hear dial tone but the RX-Series does not dial,answer change the X command setting from X4 to X1 as you probably have a nonstandard dial tone or ring cadence.

RX-Series Dials But Cannot Connect

If the RX-Series dials a telephone number but does not establish a communication link, something may be wrong with the remote modem. Try calling another system.

If unusual characters appear on your screen, check the settings for character length and parity. Consult your system manager for proper settings. If you still have problems, turn off error control and force a low line speed (9600). From command mode, type:

AT&Q0N1S37=9<ENTER>

Retry the call. If this works then raise the line speed in increments until you know the speed you telephone line and remote modem can accomodate.

***RX-Series Dials,
Connects but No
Data***

If the RX-Series connects in dial-up or leased line mode but you cannot get data from either modem or can get data from only one modem, it is probably because the modem has RTS/CTS flow control set (&K3), but the modem cable you are using does not have it installed. Get another modem cable or use Xon/Xoff flow control.

***RX-Series Dials,
Connects but
Garbage Characters***

If the RX-Series dials, connects to the remote modem, streams lots of garbage characters on to your screen, then possibly hangs up, force on error control (&Q6S36=0) or set the S13 register to 8. Also, check the serial port speed of the modem and that of your computer, perhaps there is a mismatch. Use %X to set the modems serial port speed.

Built-In Data and Self-Tests

The RX-Series has several built-in tests to help you isolate modem and line problems:

- A power-on self-test checks the RX-Series.
- Analog loopback (ALB) data and self-tests check the link between your DTE and the RX-Series.
- A digital loopback test, remote digital loopback test, and remote digital loopback self-test check the telephone line and the remote modem (on non-error controlled links).

Optional Test Timer

The test timer ends each test after a preset time, controlled by register S18. Before you start a local test, type:

ATS18=x<ENTER>

where *x* is a number from 1 to 255. For example, **ATS18=30** sets the test timer for 30 seconds.

Normally, the preset test time is indefinite (S18=000) and the timer is inactive.

1. To end tests that you have initiated with the <TEST> key, press the <TEST> key a second time.
2. For tests initiated using AT commands, issue the +++ escape sequence. Wait for the OK message, then issue **AT&TO<ENTER>**.

Power-on Self-Test

To execute an automatic self-test, turn the RX-Series's power off, then on. One or several LEDs might flash. If the flashing persists after power up, call Zypcom Customer Service.

Analog Loopback Self-Test

An analog loopback self-test (ALB) checks the modem's transmitter and receiver and counts the number of errors (see Figure 10-1):

1. The RX-Series's built-in test pattern generator sends a signal to the transmitter.
2. The transmitter modulates the signal, converting it to an analog signal, and sends it to the receiver.

3. The receiver demodulates the signal, converting it back into a digital test pattern.
4. The logic circuit compares the original test pattern to the demodulated signal.
5. If an error exists, the screen displays the number of errors when the test completes.

Note that the RX-Series does not answer calls during this test and the modem should be set to &Q0 mode. To execute an analog loopback self-test from command mode, type:

```
ATS18=60&T8<ENTER>
```

```
CONNECT 115200
```

The RX-Series tests itself until the preset timer expires, as indicated by the alternating of the SPD LED (red/green/red). If register S18 is set to 0, the test runs indefinitely until *AT&TO<ENTER>*, which ends the test.

After the test completes, the DTE screen displays a 3-digit count of errors and the OK message. For example, you might see:

```
000  
OK
```

If errors persist, call Zypcom Customer Service at the number listed in the front of this manual.

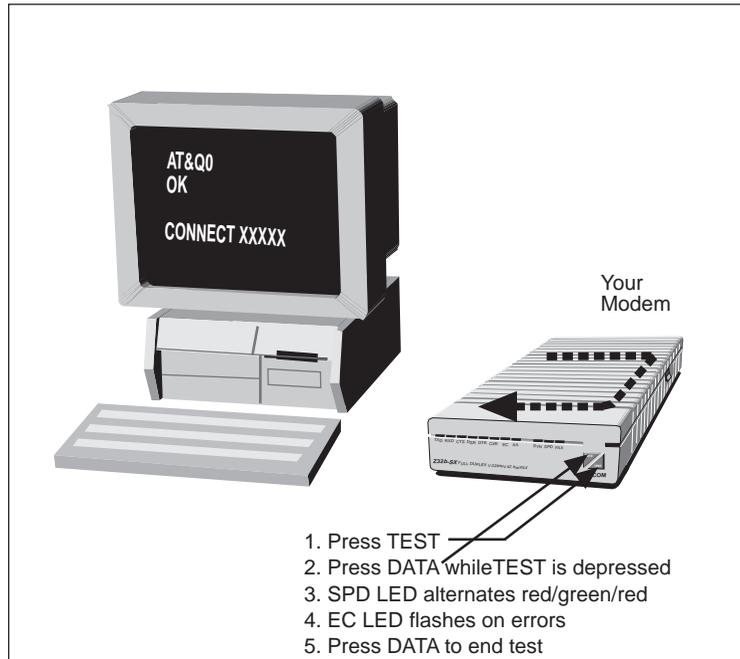


Figure 10-1. Analog Loopback Self-Test

Analog Loopback Data Test

This test checks the RX-Series's transmitter, receiver, and interface to the terminal or computer (see Figure 10-2). During an analog loopback data test:

1. Characters you type at the terminal keyboard are sent to the modem transmitter.

2. The transmitter modulates the digital signal, converting it into an analog signal.
3. The analog signal loops back to the receiver.
4. The receiver demodulates the analog signal, converting it back into a digital signal.

Mismatches between the characters sent and the ones received indicate a problem with the link between the modem and DTE or with the modem itself. Check the serial cable.

If it is connected properly, make sure that you have set your DTE to the proper settings. To execute an analog loopback data test:

1. Install the RX-Series into the chassis and turn on the chassis and your DTE.
2. Load the communications software, if necessary, and go to terminal emulation mode by using a personal computer.
3. Invoke the test:

AT&T1<ENTER>

CONNECT 115200

Wait for the alternating red/green/red SPD LED to indicate that the modem is in test mode.

4. Type characters from the keyboard. Compare the characters sent to the ones received. Mismatches indicate errors.

5. Issue the +++ escape sequence. Wait for OK. To end the test, type:

AT&T0<ENTER>.

If errors persist, call Zypcom Customer Service at the number listed in the front of this manual.

After checking the link between your DTE and modem by using the ALB tests, have the remote operator perform the same tests on the remote modem. If the remote system is functional, check the telephone line with one of the three online tests.

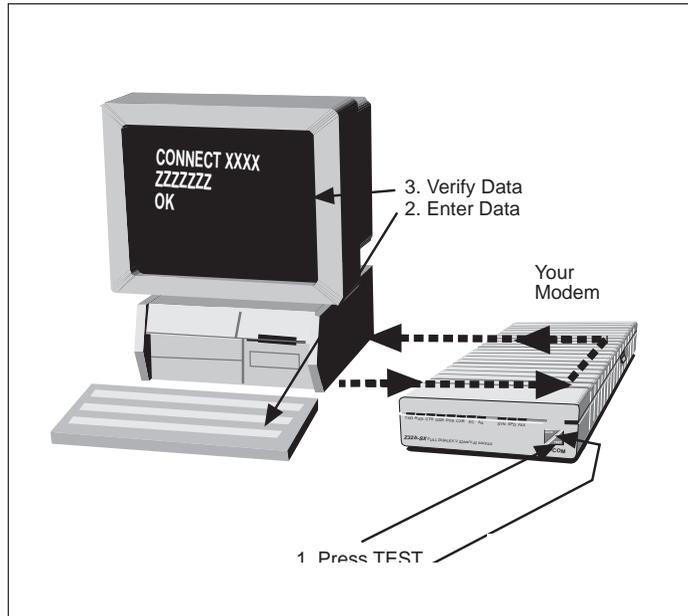


Figure 10-2. Analog Loopback Data Test

Online Tests

Online tests are performed on communications links with no error control. However, speed conversion is allowed. When the RX-Series enters test mode, its SPD LED will alternate red/green/red. An occasional error in an online test—an incorrect character or burst of characters on the screen—does not necessarily indicate a serious problem. Hang up and redial to get a different connection. If errors persist, call Zypcom Customer Service.

Local Digital Loopback Data Test

In a local digital loopback data test, the remote operator enters and monitors data to test the telephone line, both modems, and the link to the remote DTE (see Figure 10-3).

1. Establish a non-error controlled (&Q0) data link with the remote modem.
2. From your modem, type the +++ escape sequence and wait for the OK message.
3. Set the test timer value on your modem.
4. Invoke the test:

```
ATS18=60&T3<ENTER>
```

5. Have the remote operator type characters at the keyboard for 60 seconds.
6. Have the remote operator compare the characters returned to the ones typed. If both modems worked properly in the previously performed analog loopback tests, then a mismatch here normally indicates a problem with the telephone line.
7. On your DTE type:

```
AT&T0<ENTER>
```

OK

```
ATH<ENTER>
```

OK

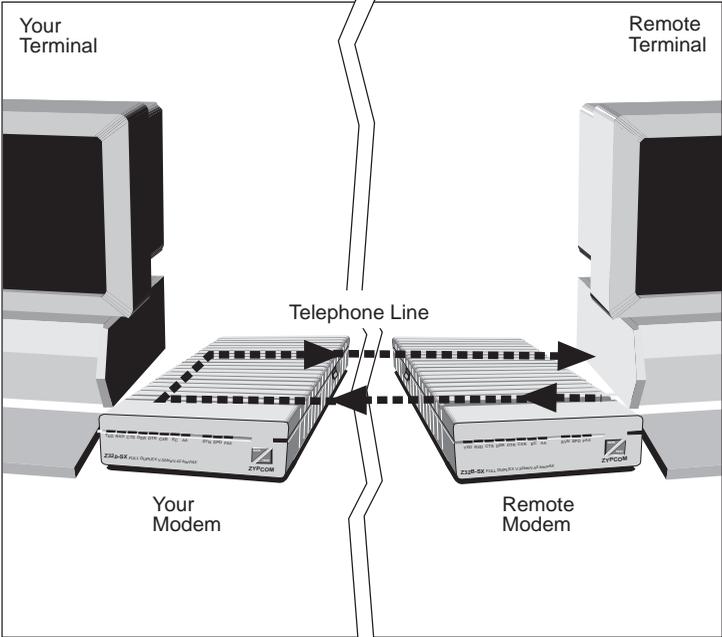


Figure 10-3. Local Digital Loopback Data Test

Remote Digital Loopback Data Test

In a remote digital loopback data test, data entered from the local DTE is used to test the telephone line, both modems, and the link to the local DTE (see Figure 10-4).

1. Have the remote operator type *AT&T4<ENTER>*.
2. Establish a non-error controlled (&Q0) data link with the remote modem.
3. From the local modem, type the +++ escape sequence and wait for the OK message.
4. Invoke the test:

AT&T6<ENTER>
5. Type characters at the keyboard.
6. Compare the characters returned to the ones typed. If both modems worked properly in the previously performed analog loopback tests and the local digital loopback data test, then a mismatch here normally indicates a problem with the telephone line.
7. Issue the +++ escape sequence. Wait for the OK message, type *AT&T0<ENTER>*, wait for OK, then hang up by using the *ATH<ENTER>* command.

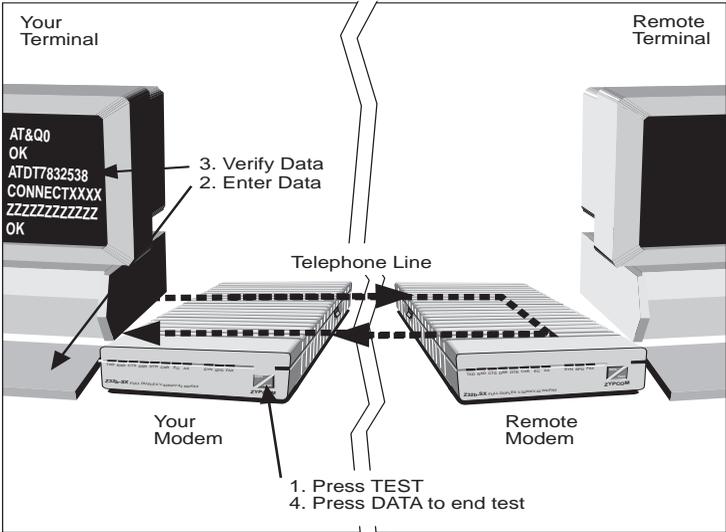


Figure 10-4. Remote Digital Loopback Data Test

**Remote Digital
Loopback Self-Test**

In a remote digital loopback self-test, the RX-Series tests the data link with a self-generated signal (see Figure 10-5).

1. Have the remote operator type `AT&T4>ENTER>`.
2. Establish a non-error controlled (&Q0) data link with the remote modem.
3. From the local modem, type the +++ escape sequence and wait for the OK message.
4. Set the test timer value on the local modem and invoke the test:

`ATS18=60&T7<ENTER>`

5. After the test timer expires, the DTE screen displays a 3-digit count of errors and the OK message. For example:

000

OK

6. If the error count is low, the modems are working properly. If the error count is high, the test indicates a potential problem with the telephone line (assuming that the ALB tests were successful).
7. Type `AT&T0<ENTER>`, wait for OK, then type `ATH>ENTER>`.

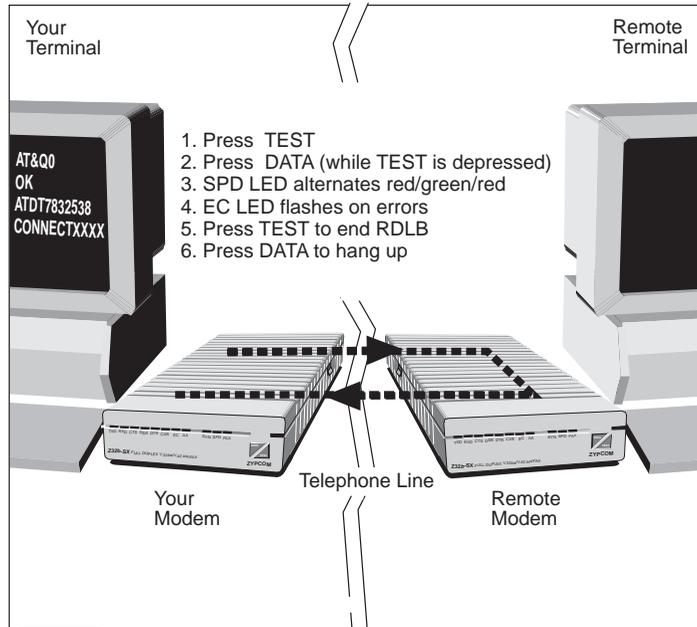


Figure 10-5. Remote Digital Loopback Self-Test

APPENDIX

A

Specifications

FEATURE	DESCRIPTION
Compatibility	CCITT V.32 <i>bis</i> at 14K, 12K, and 9600, 7200 and 4800 bps AT&T V.32 <i>terbo</i> at 19.2K and 16.8K CCITT V.34 at 33.6K, 31.2K, 28.8K, 26.4K, 24K, 21.6K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, 9600, 7200, 4800 bps CCITT V.32 at 9600 and 4800 bps CCITT V.23 at 1200/75 bps CCITT V.22 <i>bis</i> at 2400 bps CCITT V.22/Bell 212A at 1200 bps CCITT V.21/Bell 103 at 300 bps
DTE Rates (asynchronous)	230.4K, 115K, 57.6K, 38.4K, 19.2K, and 9600, 4800, 2400, 1200 and 300 bps; fixed speed or autobaud
Line Rates (synchronous DTE rates)	33.6K, 31.2K, 28.8K, 26.4K, 24K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, and 9600, 7200, 4800, 2400, and 1200 bps, asynchronous or synchronous 300 and 1200/75 bps, asynchronous only NOTE: Z32t-RX and Z32b-RX excludes 33.6K, 31.2K, 28.8K, 26.4K, 24.0K, 21.6K bps speeds. The Z32b-RX also excludes 19.2K and 16.8K bps speeds.

A

Specifications

Data Format	Asynchronous: 8, 9, 10 or 11 bits serial, binary Synchronous: serial, binary
Operation	Full-duplex over 2-wire dial-up lines or 2- or 4-wire leased lines NOTE: V.13 option for switched carrier applications; Automatic dial backup on leased line failure.
Modes	QAM at 33,600 to 4800 bps; echo canceling, full-duplex (Trellis coded or noncoded at 9600 bps) QAM at 2400 bps; bandsplit, full-duplex DPSK at 1200 bps; bandsplit, full-duplex FSK at 300 bps; bandsplit, full-duplex FSK at 1200/75 bps; bandsplit, half-duplex with reverse channel
Interface	Z32CH serial: Thrity-two RS-232D, CCITT V.24/V.28 Z32CH telco: Four 50 pin RJ27X connector used with Zypcom octopus cable P/N 91009-200
Line Requirements	Unconditioned leased line or dial-up
Transmit Timing	Internal, external, or slaved
Transmit Level	Leased line: selectable from 0 to -20 dBm Dial line: -10 dBm fixed
Carrier Detect Threshold	Leased line: -3 to -43 dBm Dial line: -10 to -43 dBm
Test Capabilities	Power on self-test, ALB, DLB, RDLB, V.54
AC Power	90-130 VAC @ max. 5A and 180-250VAC at max. 2.5A, 47-63Hz
Autodialer Protocols	Hayes AT, Dial on DTR, and V.25bis
Autodialer Type & Data	Type: tone, pulse, and automatic Data: asynchronous = AT and V.25bis 10 bit; synchronous = V.25bis HDLC or BSC

Answer Modes	Automatic and manual answer
Environmental	Operating temp: 32 to 122 degrees F Storage temp: -4 to 158 degrees F Humidity: 5% to 95% NC
Dimensions	Height: 7", Width: .75", Length: 14"
Weight	1.0 lbs
Configuration	Dual modem rackmount card
Error Control/Data Compression	V.42, V.42bis, MNP Classes 2-5
Facsimile Compatibility	CCITT Group 3 fax machines and fax modems CCITT V.17, V.29, V.27ter, V.21 Channel 2, T.30, T.4 EIA-578 Class 1 and EIA-592 Class 2 compatibility for fax software
Facsimile Operating Speeds	Send/receive: 14,400 bps to 2400 bps



Specifications

Modem Software

The RX-Series is compatible with all data communications software packages and devices that use the AT command set to dial and option the modem.

Specifically, Windows 95, Windows NT, Remote Access Services (RAS) servers, 3Com Access Builder 2000/4000/5000, Livingston Portmaster, Cisco 2500, etc.

If your software or hardware does not have a Zypcom RX-Series driver then use a Zypcom SX-Series or SE-Series driver.

If your software does not support any Zypcom modem, call your software/hardware customer support to see if a new modem entry has been developed for your Zypcom modem. If not, and you can store a custom modem initialization string in your software or hardware device, try the following:

```
AT&F&C1&D2&S1&K3&Q6S7=90E0Q2S0=1<ENTER>
```

If you can't find an existing Zypcom modem initialization string and your software does not have the capability to define a custom modem, try some of the other modem selections. Attempt to choose profiles that can operate at 33,600 bps (V.34) or 19,200 bps (V.32*terbo*), have V.42*bis* error control and data compression, and include the parameter settings incorporated in the command string above.

If you receive an ERROR message after selecting a modem entry and initialization string, try other modem entries until a successful initialization occurs. Then try dialing the telephone number of a remote modem. If this is unsuccessful call Zypcom technical Support.

Facsimile Software

The RX-Series modem is compatible with EIA specification 578 Class 1 fax modem devices and specification 592, which defines Class 2 devices. To operate the Z34's facsimile functions, your software must be compatible with these specifications. Zypcom is compatible with Delrina WinFax, Microsoft's fax manager, etc. Fax commands supported by the Z34 are listed in Appendix C.

Facsimile Commands

SERVICE CLASS IDENTIFICATION

+FCLASS=*n* Identity *n* = service class (where *n* = 0, 1, or 2 and 0 = data modem, 1 = class 1 fax, 2 = class 2 fax)

CLASS 1 COMMANDS

+FTS Stop transmission and wait
+FRS Receive silence
+FTM Transmit facsimile data
+FRM Receive facsimile data
+FTH Transmit HDLC facsimile data
+FRH Receive HDLC facsimile data

CLASS 2 COMMANDS

D Originate a call
A Answer a call
+FDT Transmit data
+FET=*n* Transmit page punctuation
+FDR Begin or continue phase C receive data
+FK Terminate session
+FAA Data/fax auto-answer and detection
+FBUG Debug HDLC frame
+FCQ Copy quality
+FHPS Handshake protocol
+FMINSF Minimum phase C speed

CLASS 2 DCE RESPONSES

+FCON	Facsimile connection response
+FDIS	Report remote identification
+FTSI	Report the transmit data identification
+FCSI	Report the called station identification
+FET	Post page message response
+FHR	Report HDLC frame
+FHT	Report transmitted HDLC frame

CLASS 2 SESSION PARAMETERS

+FMFR?	Identify manufacturer
+FDCC=	DCE capabilities parameters
+FDCS=	Current session results
+FLID=	Local identification string
+FCR=	Capabilities to receive
+FPTS=	Page transfer status
+FCHPTO	Phase C timeout
+FAXERR	Fax error value
+FBOR	Phase C data bit order

APPENDIX

D

Factory-Stored Profiles

Factory Default: AT&F0

AT COMMANDS

AT COMMAND	&F0
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	0
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0 - 1)	1
&C (0 - 3)	0*
&D (0 - 3)	0
&E (0 - 1)	1
&I (0 - 2)	0
&K (0,3,4,8,12,16,20)	3
&L (0 - 2)	0
&N (0 - 1)	0
&O (0 - 1)	1
&P (0 - 1)	0
&Q (0 - 6)	6
&R (0 - 1)	1
&S (0 - 3)	0
&U (0 - 1)	1
&X (0 - 2)	0
&Y (0 - 3)	0
%A (0 - 127)	13
%C (0 - 1)	1
%V (0-4)	0
\A (0 - 3)	3
\C (0 - 2)	1
\G (0 - 1)	0
\K (1,3,5)	5
\N (0 - 7)	7
\V (0 - 1)	0

*NOTE: For PCs set &C1

Async/Orig. & Ans. for Term/PCs

PARAMETERS

PARAMETER	SETTING &F0
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	300 bps
DTE speed	230,400 bps
Dialer in use	AT
Speed conversion	On
Data format	Asynchronous
V.42bis/MNP 2-5	Auto
Flow control	RTS/CTS
CTS	Forced
DSR	Forced
DTR	Forced
CXR	Forced
Auto answer	On
Call progress	On
Echo characters	On

S-REGISTERS

REGISTER	&F0	REGISTER	&F0
0	1	11	95
1	0	18	0
2	43	25	5
3	13	26	1
4	10	36	1
5	8	37	0
6	2	38	20
7	30	40	0
8	2	41	0
9	6	46	13
10	14	47	17
		48	19

D*Factory-Stored Profiles***Factory Default: AT&F1****AT COMMANDS**

AT COMMAND	&F1
B	1
E	0
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	0
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0 - 1)	1
&C (0 - 3)	2
&D (0 - 3)	2
&E (0 - 1)	1
&I (0 - 2)	0
&K (0,3,4,8,12,16,20)	3
&L (0 - 2)	0
&N (0 - 1)	0
&O (0 - 1)	1
&P (0 - 1)	0
&Q (0 - 6)	6
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	1
&X (0 - 2)	0
&Y (0 - 3)	0
%A (0 - 127)	13
%C (0 - 1)	1
%V (0-4)	0
\A (0 - 3)	3
\C (0 - 2)	1
\G (0 - 1)	0
\K (0 -)	5
\N (0 - 7)	7
\V (0 - 1)	0

Async/AutoAns. for BBS Computers**PARAMETERS**

PARAMETER	SETTING &F1
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	300 bps
DTE speed	230,400 bps
Dialer in use	AT
Speed conversion	On
Data format	Asynchronous
V.42bis/MNP 2-5	Auto
Flow control	RTS/CTS
CTS	Track RTS
DSR	Normal
DTR	Normal
CXR	Port contender
Auto answer	On
Call progress	On
Echo characters	Off

S-REGISTERS

REGISTER	&F1	REGISTER	&F1
0	1	11	95
1	0	18	0
2	43	25	5
3	13	26	1
4	10	36	0
5	8	37	0
6	2	38	20
7	30	40	0
8	2	41	0
9	6	46	13
10	14	47	17
		48	19

Factory Default: AT&F2**AT COMMANDS**

AT COMMAND	&F2
B	1
E	0
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0 - 1)	1
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&I (0 - 2)	0
&K (0,3,4,8,12,16,20)	3
&L (0 - 2)	0
&N (0 - 1)	0
&O (0 - 1)	1
&P (0 - 1)	0
&Q (0 - 6)	6
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	1
&X (0 - 2)	0
&Y (0 - 3)	0
%A (0 - 127)	13
%C (0 - 1)	1
%V (0-4)	0
\A (0 - 3)	3
\C (0 - 2)	1
\G (0 - 1)	0
\N (0 - 7)	7
\V (0 - 1)	0

Async/Manual Orig. for Term/PCs**PARAMETERS**

PARAMETER	SETTING &F2
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	300 bps
DTE speed	230,400 bps
Dialer in use	None
Speed conversion	On
Data format	Asynchronous
V.42bis/MNP 2-5	Auto
Flow control	RTS/CTS
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	On
Call progress	Off
Echo characters	Off

S-REGISTERS

REGISTER	&F2	REGISTER	&F2
0	1	11	95
1	0	18	0
2	43	25	5
3	13	26	1
4	10	36	1
5	8	37	0
6	2	38	20
7	30	40	0
8	2	41	0
9	6	46	13
10	14	47	17
		48	19

D*Factory-Stored Profiles***Factory Default: AT&F3****AT COMMANDS**

AT COMMAND	&F3
B	1
E	0
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0 - 1)	1
&C (0 - 3)	1
&D (0 - 3)	2
&E (0 - 1)	1
&I (0 - 2)	0
&K (0,3,4,8,12,16,20)	3
&L (0 - 2)	0
&N (0 - 1)	0
&O (0 - 1)	1
&P (0 - 1)	0
&Q (0 - 6)	6
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	1
&X (0 - 2)	0
&Y (0 - 3)	0
%A (0 - 127)	13
%C (0 - 1)	1
%V (0-4)	0
\A (0 - 3)	3
\C (0 - 2)	1
\G (0 - 1)	0
\N (0 - 7)	7
\V (0 - 1)	0

Async/AutoAns. for Host Computer**PARAMETERS**

PARAMETER	SETTING &F3
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	300 bps
DTE speed	230,400 bps
Dialer in use	AT
Speed conversion	On
Data format	Asynchronous
V.42bis/MNP 2-5	Auto
Flow control	RTS/CTS
CTS	Track RTS
DSR	Normal
DTR	Normal
CXR	Normal
Auto answer	On
Call progress	Off
Echo characters	Off

S-REGISTERS

REGISTER	&F3	REGISTER	&F3
0	1	11	95
1	0	18	0
2	43	25	5
3	13	26	1
4	10	36	1
5	8	37	0
6	2	38	20
7	30	40	0
8	2	41	0
9	6	46	13
10	14	47	17
		48	19

Factory Default: AT&F4**AT COMMANDS**

AT COMMAND	&F4
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	0
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	2
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	0
&P (0 - 1)	0
&Q (0 - 6)	2
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/Dial-on-DTR Orig. & Ans.**PARAMETERS**

PARAMETER	SETTING &F4
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	AT
Speed conversion	Off
Data format	Sync data
	Async command
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Normal
CXR	Normal
Auto answer	On
Call progress	On
Echo characters	On

S-REGISTERS

REGISTER	&F4	REGISTER	&F4
0	1	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

Factory Default: AT&F5**AT COMMANDS**

AT COMMAND	&F5
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	0
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	2
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	0
&P (0 - 1)	0
&Q (0 - 6)	2
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	3

Sync/V.25bis Orig. & Ans. AS/400**PARAMETERS**

PARAMETER	SETTING &F5
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	V.25bis HDLC-NRZ
Speed conversion	Off
Data format	Synchronous
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Normal
CXR	Normal
Auto answer	On
Call progress	On
Echo characters	On

S-REGISTERS

REGISTER	&F5	REGISTER	&F5
0	1	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

Factory Default: AT&F6**AT COMMANDS**

AT COMMAND	&F6
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	0
&P (0 - 1)	0
&Q (0 - 6)	1
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/Manual Orig. for Term/PCs**PARAMETERS**

PARAMETER	SETTING &F6
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	None
Speed conversion	Off
Data format	Synchronous
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	On
Call progress	Off
Echo characters	On

S-REGISTERS

REGISTER	&F6	REGISTER	&F6
0	1	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

D*Factory-Stored Profiles***Factory Default: AT&F7****AT COMMANDS**

AT COMMAND	&F7
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	2
&P (0 - 1)	0
&Q (0 - 6)	1
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/Originate 4-wire LL**PARAMETERS**

PARAMETER	SETTING &F7
Line type	4-wire leased line
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	AT
Speed conversion	Off
Data format	Sync data
	Async command
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	Off
Call progress	Off
Echo characters	On

S-REGISTERS

REGISTER	&F7	REGISTER	&F7
0	0	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

Factory Default: AT&F8**AT COMMANDS**

AT COMMAND	&F8
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-10)	0
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	2
&P (0 - 1)	0
&Q (0 - 6)	1
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/Orig. 4-wire LL with DBU**PARAMETERS**

PARAMETER	SETTING &F8
Line type	4-wire leased line
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	AT
Speed conversion	Off
Data format	Synch data
	Async command
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	Off
Call progress	Off
Echo characters	On

S-REGISTERS

REGISTER	&F8	REGISTER	&F8
0	0	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

D*Factory-Stored Profiles***Factory Default: AT&F9****AT COMMANDS**

AT COMMAND	&F9
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	2
&P (0 - 1)	0
&Q (0 - 6)	1
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/Answer 4-wire LL with DBU**PARAMETERS**

PARAMETER	SETTING &F9
Line type	4-wire leased line
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	AT
Speed conversion	Off
Data format	Sync data
	Async command
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	On
Call progress	Off
Echo characters	On

S-REGISTERS

REGISTER	&F9	REGISTER	&F9
0	1	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

Factory Default: AT&F10**AT COMMANDS**

AT COMMAND	&F10
B	1
E	0
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	0
&P (0 - 1)	0
&Q (0 - 6)	1
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&V (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/AutoAns for Host Computer**PARAMETERS**

PARAMETER	SETTING &F10
Line type	Dial-up
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	None
Speed conversion	Off
Data format	Sync data
	Async command
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	On
Call progress	Off
Echo characters	Off

S-REGISTERS

REGISTER	&F10	REGISTER	&F10
0	1	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

D*Factory-Stored Profiles***Factory Default: AT&F11****AT COMMANDS**

AT COMMAND	&F11
B	1
E	1
L (0 - 3)	2
M (0 - 3)	1
N (0 - 1)	1
Q (0 - 2)	1
V (0 - 1)	1
W (0 - 2)	0
X (0 - 6)	4
Y (0 - 1)	0
&A (0 - 1)	0
&B (0-1)	0
&C (0 - 3)	1
&D (0 - 3)	0
&E (0 - 1)	1
&K (0,3,4,8,12,16,20)	0
&L (0 - 2)	2
&P (0 - 1)	0
&Q (0 - 6)	1
&R (0 - 1)	0
&S (0 - 3)	1
&U (0 - 1)	0
&X (0 - 2)	0
&Y (0 - 3)	0
%V (0-4)	0

Sync/Answer 4-wire LL**PARAMETERS**

PARAMETER	SETTING &F11
Line type	4-wire leased line
Line speed (max)	33,600 bps
Line speed (min)	1200 bps
DTE speed	Line speed
Dialer in use	AT
Speed conversion	Off
Data format	Sync data Async command
V.42bis/MNP 2-5	Off
Flow control	None
CTS	Track RTS
DSR	Normal
DTR	Forced
CXR	Normal
Auto answer	On
Call progress	Off
Echo characters	On

S-REGISTERS

REGISTER	&F11	REGISTER	&F11
0	1	10	14
1	0	11	95
2	43	18	0
3	13	25	5
4	10	26	1
5	8	36	1
6	2	37	0
7	30	38	0
8	2	40	0
9	6	41	0

APPENDIX

E

ASCII Character/Decimal/ Hex Conversion Tables

General

These are binary equivalents of hexadecimal and decimal numbers:

BINARY	DECIMAL	HEXADECIMAL
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

Hexadecimal examples:

11111111 = FF hex
10011101 = 9D hex
00010001 = 11 hex

This table lists the ASCII decimal, hexadecimal and equivalent character values.



ASCII Conversion Tables

ASCII SYMBOL	DECIMAL	HEX	<CONTROL> <KEYBOARD
(NUL)	0	00	@
(SOH)	1	01	A
(STX)	2	02	B
(ETX)	3	03	C
(EOT)	4	04	D
(ENQ)	5	05	E
(ACK)	6	06	F
(BEL)	7	07	G
(BS)	8	08	H
(HT)	9	09	I
(LF)	10	0A	J
(VT)	11	0B	K
(FF)	12	0C	L
(CR)	13	0D	M
(SO)	14	0E	N
(SI)	15	0F	O
(DLE)	16	10	P
(DC1)	17	11	Q
(DC2)	18	12	R
(DC3)	19	13	S
(DC4)	20	14	T
(NAK)	21	15	U
(SYN)	22	16	V
(ETB)	23	17	W
(CAN)	24	18	X
(EM)	25	19	Y
(SUB)	26	1A	Z
(ESC)	27	1B	[
(FS)	28	1C	\
(GS)	29	1D]
(RS)	30	1E	^
(US)	31	1F	DEL

ASCII Character/Decimal/Hex Conversion Tables

ASCII			ASCII			ASCII		
SYMBOL	DECIMAL	HEX	SYMBOL	DECIMAL	HEX	SYMBOL	DECIMAL	HEX
(SP)	32	20	A	65	41	a	97	61
!	33	21	B	66	42	b	98	62
"	34	22	C	67	43	c	99	63
#	35	23	D	68	44	d	100	64
\$	36	24	E	69	45	e	101	65
%	37	25	F	70	46	f	102	66
&	38	26	G	71	47	g	103	67
'	39	27	H	72	48	h	104	68
(	40	28	I	73	49	i	105	69
)	41	29	J	74	4A	j	106	6A
*	42	2A	K	75	4B	k	107	6B
+	43	2B	L	76	4C	l	108	6C
,	44	2C	M	77	4D	m	109	6D
-	45	2D	N	78	4E	n	110	6E
.	46	2E	O	79	4F	o	111	6F
/	46	2F	P	80	50	p	112	70
0	47	30	Q	81	51	q	113	71
1	49	31	R	82	52	r	114	72
2	50	32	S	83	53	s	115	73
3	51	33	T	84	54	t	116	74
4	52	34	U	85	55	u	117	75
5	53	35	V	86	56	v	118	76
6	54	36	W	87	57	w	119	77
7	55	37	X	88	58	x	120	78
8	56	38	Y	89	59	y	121	79
9	57	39	Z	90	5A	z	122	7A
:	58	3A	[	91	5B	{	123	7B
;	59	3B	\	92	5C	|	124	7C
<	60	3C	]	93	5D	}	125	7D
=	61	3D	^	94	5E	~	126	7E
>	62	3E	_	95	5F	DEL	127	7F
?	63	3F	`	96	60			
@	64	40						



ASCII Character/Decimal/Hex Conversion Tables

APPENDIX

F

Decimal-to-Binary Bit-Map Register Conversion Table

General

Consider the factory setting of register S23. Look at the S23=29 row in Table F-1 and the Sum-of-bits row to see how the decimal value 29 converts to a bit pattern.

Bit number	7	6	5	4	3	2	1	0
Value	128	64	32	16	8	4	2	1
S23=29	0	0	0	1	1	1	0	1
Sum of bits	0 +	0 +	0 +	16 +	8 +	4 +	0 +	1 = 29

TABLE F-1. DECIMAL-TO-BINARY CONVERSION



Decimal-to-Binary Bit-Map Register Conversion Table

The S-register S23 represents three separate functions: RDLB detect, serial port speed, and modem parity. The default setting of S23 is RDLB accepted (1), the serial port speed is 19,200 bps (6), and the parity is space (1). Each of these functions is mapped onto different parts of the bit pattern and should be thought of as separate binary elements.

To determine the settings of the three variables controlled by register S23, convert the register's decimal number (ATS23?) into an 8-bit binary number, starting at bit 0. Then map that binary number into the appropriate bits for RDLB, serial port speed, and parity setting.

Bit 0 Detect RDLB (&T4 and &T5 command)
 0 = Deny RDLB request (&T5)
 1 = Accept RDLB (&T4)*

Bit 3,2,1 Serial port speed of the Z32
 0 = 300 bps
 1 = 57,600 bps
 2 = 1200 bps
 3 = 2400 bps
 4 = 4800 bps
 5 = 9600 bps
 6 = 19,200 bps*
 7 = 38,400 bps

NOTE: Bits 3,2,1 are valid only if S39 bit 3=0.

Bit 5,4 Parity

- 0 = Even
- 1 = Space*
- 2 = Odd
- 3 = Mark/none

Bit 7, 6 Not used

Example: To set the serial port speed to 38,400 bps, the decimal value of bits 3, 2, 1 of your 8-bit binary number must equal 7. (Serial port speeds are determined by three bits of information.) Starting at bit 0, the decimal number 7 is converted into the binary number 111 ($4 + 2 + 1 = 7$). Now take the number 111 and place it in bit locations 3, 2, 1. Convert your new binary number (old 00011101, new 00011111) to its decimal value (31) and set register S23 to that value (ATS23=31) . The serial port speed is now set to 38,400 bps.



Decimal-to-Binary Bit-Map Register Conversion Table

Z32CH Chassis Selector Card

General

The selector card is an integral part of the Z32CH chassis system. With the card installed, one can monitor and/or control chassis modems from a single RS-232 connector on the back of the Z32CH without disconnecting modem serial port cables. All the interface signals of any of the 32 RS-232 (DTE) connectors can be switched to the selector card's control port (17B). This port is useful for diagnostic equipment in trouble shooting or for a terminal/PC in simplifying modem configuration tasks.

The selected modem is indicated on the channel select LED display of the selector card. The selector card allows for monitoring the analog line connection of the selected modem via a speaker. In addition, with the card you can interrogate and change any of the modem's options. Moreover, with the selector card you can daisy-chain multiple chassis together and maintain a single RS-232 connection point for diagnostics and modem control.

For proper operation of the Z32CH chassis and RX-Series modems, each chassis must have a selector card installed in slot 17B, next to the power supply. The selector card can be installed while the chassis is powered on.

Card Installation

Remove the selector card from the shipping container and check for damage. If the card has been damaged, do not install it in the chassis but return it to your dealer. With the chassis powered ON or OFF, remove existing temporary slot 17B card and discard it. Insert the selector card into slot 17B (next to the power supply) and tighten down the thumb screw. The selector card will power up with modem 1A or 1B selected on the channel select LED and will be in pass-through (PASS) mode. If a modem is in slot 1B, the selector card will also turn on the STATUS 1 and STATUS 0 LEDs. Therefore, a successful power up of the selector card will have the following LEDs ON: PASS, STATUS 1 and STATUS 0.

Connections

Connect the DTE device (terminal or PC or data line monitor) via a straight through serial cable (pins 1-8 and 20) to the bottom RS-232 connector for slot 17B. **Set the terminal speed and data bits/parity to that used by your computer system's serial ports (usually 8N1 or 7O1).**

When connecting multiple chassis, follow the directions above for the first chassis. To daisy chain a second Z32CH chassis (or third, etc.) to the first, use a straight through serial cable from the first chassis' pass-through connector (17A) to the second chassis control connector (17B).

Front Panel

The selector card's front panel consists of three switches, four LEDs, and a volume control knob. The LEDs STATUS 1 and STATUS 0 will be ON when the selector card is addressing a good modem. (The channel select LED indicates the modem being addressed by the selector card.) If the STATUS 1 or 0 LEDs are out, you should power reset the indicated modem to see if the condition will clear. If the condition does not clear, call Zypcom Technical Support at 510-783-2501. The control (CNTL) and pass-through (PASS) LEDs are controlled by their respective switches. The selector card can be in control mode or pass-through mode or neither mode. Never have both control (CNTL) and pass-through (PASS) LEDs on at the same time. The channel select switch will cycle through all slots and modems. Each press of the switch will increment the selected modem from slot 1, modem A (modem A in blue part of front panel label) through slot 16, modem B (modem B in gray part of front panel label).

Rear Panel

The rear panel of slot 17 has two RS-232 connectors. The bottom connector (17B) is the control (diagnostic) port and the top connector (17A) is the pass-through (daisy chain) port.

Operation

To activate your DTE control device (terminal or device attached to the 17B connector) and to connect to a modem, you must turn the control (CNTL) LED ON by using the CNTL switch. When not using your DTE control device, make sure the control (CNTL) LED is OFF.

Single Chassis

To connect your DTE control device to a chassis, the control (CNTL) LED must be ON (PASS LED must be OFF) and the channel select LED must reflect the desired address (2b, for example). Type "AT<ENTER>" to communicate with the modem. The modem responds "OK" (assumes echo, verbose and response messages are on--AT E1 V1 Q0). You can option the modem or run diagnostics as indicated in other chapters of this manual. To return the modem back to service, be sure that each selector card has the control (CNTL) LED OFF.

Multiple Chassis

To connect to a modem in the second chassis, the first chassis pass-through (PASS) LED must be ON (first chassis' CNTL LED is OFF) and the second chassis control (CNTL) LED must be ON. Set the channel select of the second chassis to the desired modem position. (The channel select address on the first chassis does not matter.) Type "AT<ENTER>" to communicate with the modem. The modem responds "OK" (assumes echo, verbose and response messages are on--AT E1 V1 Q0). You can option the modem or run diagnostics as indicated in other chapters of this manual. To return the modem back to service, be sure that each selector card has the control (CNTL) LED OFF.

**Disable Selector
Card**

Disable the selector card by turning the control LED OFF.

Flash Memory Download

The modems Z34-RX, Z32t-RX and Z32b-RX are equipped with the ability to be completely reconfigured. These modems can receive updated DSP and controller firmware which is contained in flash memory. The new code can be downloaded into the modem through two methods. The first, local download, transfers the updated firmware using the modem's serial port. This method requires a user or service technician to perform the update locally by using an attached PC with communications software. The advantage to this method is speed. A local download can be completed in approximately three minutes.

The second method is remote download. This procedure allows a customer service engineer to remotely update a user's modem without intervention at the remote site. For security purposes, the process is initiated by using the auxiliary channel and is password protected. To effect the download, the remote modem utilizes the Xmodem protocol to interact directly with the customer service engineer's PC. This method allows the update to take place remotely without the need for technically trained people at the remote site. The disadvantage is speed. Depending on the line connect rate, the remote download will typically take about twenty minutes to complete.

The detailed procedure for both local and remote downloads follows. We recommend, with both methods, that Procomm be used to transfer the hex code file to the modem. However, other communications software will work, like Windows 95 Hyperterminal. A detailed procedure for a serial download using Windows 95 Hyperterminal is also provided.

Before trying to upgrade your modem's firmware verify that the modem is currently at a minimum of version 1.12. If your modem is not, then you should call Zypcom to obtain the necessary chips because your modem can not be flash downloaded using the methods below. Once the V1.12 or higher code is in your modem then the latest program file ".HEX" can be downloaded via the methods described in the next sections.

IMPORTANT: *The modem program files that have an extension ".HEX" **cannot** be loaded into RX-Series modems that use the ATMEL flash memory chips, only AMD or Motorola chips can be used correctly. Modems that have a serial number which begins with 6, 7, 8 or 9 will have the correct flash memory chips.*

IMPORTANT: *Program files with the ".HEX" extension can only be loaded into modems that do not have a "H" in the third digit of the serial number. Files with the ".HRD" extension are used for modems that have an "H" in the third digit of the serial number.*



Local Download Using Procomm

1. Copy the latest program file (Zypcom BBS 510-783-2580) into the Procomm upload sub-directory on the local PC (e.g. C:\PCPLUS\UPLOAD\).

Examples of BBS program files:

Z34R1_33.HRD is version 1.33 for the Z34-RX

Z34S1_31.HEX is version 1.31 for the Z34-SX/-SE

2. Connect the modem to the COM port of a PC and boot-up Procomm. Once Procomm has started, set the following options from the setup facility within the program:
 - a) Set the com port (AltP) to a speed of 57600, 8-data bits, N-parity, 1-stop bit.
 - b) Select the setup utility (AltS) and under Terminal Options set hardware flow control RTS/CTS: ON.
 - c) Within Protocol Options, select ASCII Protocol Options and set Character Pacing=0, Line Pacing=0, Pace Character=0, CR Translation=none, LF Translation=none. Then select General Protocol Options and set Abort Xfer if CD Lost=NO.
3. Once the Procomm (or other communications software) options have been set, send the following command:



AT&F&W<enter>resets modem

OK

ATI3<enter>

Z34-RX V 1.12 Modem current version

OK

ATI6

6KH101209 Serial number

Important: This modem will use a ".HRD" file

or, if a serial number without "H" is reported,

6K1100207 Serial number

Important: This modem will use a ".HEX" file

OK

AT*W64<enter>

The modem will respond:

FLASH READY !

UPLOAD FILE NOW !

4. Select file upload in Procomm by pressing the Page Up key. The program will prompt for file transfer protocol. Choose ASCII and press <enter>. Procomm will now prompt for the file name. Enter the path and filename of the new hex code (e.g. C:\PCPLUS\Upload\Z34R1_33.HRD or what ever is correct for your modem).



5. The file transfer should now proceed. Upon completion the modem will respond with the following message:

WRITTEN SUCCESSFULLY

AT&F&W<enter>

OK

AT*H<enter>

Note: The modem LEDs (lights) will go off then back on

6. This completes the procedure. The modem is now ready to be put back in service. The unit's original serial number is retained and automatically written into the updated program code. New firmware revision numbers will be presented in response to the ATi3 command.

Local Download Using Windows 95 HyperTerminal

1. Using Windows Explorer drag and drop the new flash code file (Zypcom BBS 510-783-2580) into the HyperTerminal sub-directory (C:\program files\accessories\hyperterminal) on your PC.

NOTE: Do not do a Win95 Hyperterminal download on 386/486 computers.

2. Connect the modem to the COM port of the Pentium PC. Start Hyperterminal (start | programs | accessories). Once the Hyperterminal window appears, double click on the hypertrm icon. Click cancel on the connection description screen. Go to the files menu and click on properties. On the new connection properties



screen click on connect using and select direct-to-com2 (select the COM port number the modem is attached to). Next click on configure and set 57600/8/N/1 and hardware flow control. Click OK and click OK again.

3. Once Hyperterminal options have been set, send the following command:

AT&F&W<enter>resets modem

OK

ATI3<enter>

Z34-RX V 1.12 Modem current version

OK

ATI6

6KH101209 Serial number

Important: This modem will use a ".HRD" file

or, if a serial number without "H" is reported,

6K1100207 Serial number

Important: This modem will use a ".HEX" file

OK

AT*W64<enter>

The modem will respond:

FLASH READY !

UPLOAD FILE NOW !



4. Select the transfer menu and click on send text file. Highlight the file you are going to send (Z34R1_3x.HEX or Z34R1_3x.HRD which ever is correct for your modem — see note on first page) to the modem and click on open.
5. The file transfer should now proceed (modem's TXD LED is on almost constantly). Upon completion the modem will respond with the following message:

WRITTEN SUCCESSFULLY

now type,

AT&F&W<enter>

OK

ATI3<enter>

Z34-RX V 1.3x

OK

AT*H <enter>

OK

after the modem's LEDs go off then back on, reconfigure the modem options for your application

6. This completes the procedure. The modem is now ready to be put back in service. The unit's original serial number is retained by the controller and automatically written into the updated flash memory.



Remote Download

1. The customer service engineer should contact the customer and instruct the user to unplug the modem from any DTE equipment and default the modem to factory settings. This can be accomplished by holding both the Test and Data switches on while powering-on the modem. The customer should then attach the modem to be upgraded to an outside dial-up telephone line. The service technician needs to obtain the telephone number of the unit.
2. The service engineer should then load Procomm on his PC and set the following options:
 - a) Set the COM port (AltP) to a speed of 57600, 8-data bits, N-parity, 1-stop bit.
 - b) Select the setup utility (AltS) and under Terminal Options set hardware flow control RTS/CTS: ON.
3. Once the communications software options have been set, send the following command. Type:

AT&F<enter>

AT*W128<enter>

The modem will respond: **OK**

Dial the telephone number of the remote user's modem. Once the communications link has been established, type the escape sequence: +++

The modem will respond: **OK**

Enable remote modem access by typing:

AT^S1<enter>



The modem will respond: **OK**

Type: **AT^R1<enter>**

The modem will respond: **REMOTE PASSWORD?**

Type factory default password for the remote modem. For example: **ZYPCOM<enter>**

Wait for the **OK** message. At this point, you are communicating with the remote modem. Type:

AT*W128<enter>

Once this message is sent and **OK** has been received, return the modem to normal operation by sending the following command string:

Exit remote modem access by typing:

AT^R0<enter>

The modem will respond: **OK**

Type: **ATO<enter>**

The modem will respond: **Connect 57600**

The modem will respond: **FLASH READY !**

UPLOAD FILE NOW !

4. Select file upload in Procomm by pressing the Page Up key. The program will prompt for file transfer protocol. Choose Xmodem and press <enter>. Procomm will now prompt for the file name. Enter the path and filename of the new hex code (e.g., C:\PCPLUS\Upload\Z34R1_3x.HRD).
5. The remote modem initiates the file transfer by sending a "C" character to Procomm fifteen seconds after returning to normal operation. The file transfer should now proceed. Upon completion, the modem will respond with the following message:

WRITTEN SUCCESSFULLY

6. This completes the procedure. The modem is now ready to be put back in service. The unit's original serial number is retained by the controller and automatically written into the updated flash memory. New firmware revision numbers will be present in response to the AT I commands. Reset modem options.