



**COMSPHERE  
3800 SERIES MODEMS  
MODEL 3830  
USER'S GUIDE**

Document No. 3830-A2-GB91-20



**COMSPHERE**  
**3800 Series Modems**  
**Model 3830**

User's Guide  
3830-A2-GB91-20

3rd Edition (November 1996)

Changes and enhancements to the product and to the information herein will be documented and issued as a new release or a limited revision of this manual.

For the Model 3830 standalone modem, the Universal Service Order Code (USOC) for Permissive mode is RJ11C and for Programmable mode is RJ41S or RJ45S. The Canadian equivalent to the USOC is CA11 for RJ11C, and CA41A and CA45A for RJ41S and RJ45S, respectively.

FCC Registration number:	(See label on modem)
Ringer Equivalence number (REN):	0.8B
Canadian Certification number:	(See label on modem)
Canadian DOC Load number:	7



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- **Via the Internet:** Visit the Paradyne World Wide Web site at <http://www.paradyne.com>
- **Via Telephone:** Call our automated call system to receive current information via fax or to speak with a company representative.
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  - International, call 813-530-2340

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## Important Safety Instructions

1. Read and follow all warning notices and instructions marked on the product or included in the manual.
2. This product is intended to be used with a three-wire grounding type plug – a plug which has a grounding pin. This is a safety feature. Equipment grounding is vital to ensure safe operation. Do not defeat the purpose of the grounding type plug by modifying the plug or using an adaptor.

Prior to installation, use an outlet tester or a voltmeter to check the ac receptacle for the presence of earth ground. If the receptacle is not properly grounded, the installation must not continue until a qualified electrician has corrected the problem.

If a three-wire grounding type power source is not available, consult a qualified electrician to determine another method of grounding the equipment.

3. Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.
4. Do not allow anything to rest on the power cord and do not locate the product where persons will walk on the power cord.
5. Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous high voltage points or other risks. Refer all servicing to qualified service personnel.
6. General purpose cables are provided with this product. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.
7. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.

8. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are **interconnected**, the voltage potential may cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action prior to interconnecting the products.

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- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- Do not use the telephone to report a gas leak in the vicinity of the leak.

## Notices

### WARNING

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 WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

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LE PRÉSENT APPAREIL NUMÉRIQUE N'ÉMET PAS DE BRUITS RADIOÉLECTRIQUES DÉPASSANT LES LIMITES APPLICABLES AUX APPAREILS NUMÉRIQUES DE LA CLASSE A PRESCRITES DANS LE RÈGLEMENT SUR LE BROUILLAGE RADIOÉLECTRIQUE ÉDICTÉ PAR LE MINISTÈRE DES COMMUNICATIONS DU CANADA.

## Government Requirements and Equipment Return

Certain governments require that instructions pertaining to modem connection to the public switched telephone network be included in the installation and operation manual. Specific instructions are listed in the following sections.

### United States

#### Notice To Users Of The Public Switched Telephone Network

1. This equipment complies with Part 68 of the FCC rules. On the equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. The label is located on the bottom of the Model 3830 modem.
2. Page A of this manual contains the Universal Service Order Codes (USOC) associated with the services on which the equipment is to be connected.
3. The Ringer Equivalence (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the telephone company to determine the maximum RENs for the calling area.
4. If the Model 3830 modem causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

6. If you experience trouble with this equipment, please contact your sales or service representative (as appropriate) for repair or warranty information. If the product needs to be returned to the company service center for repair, contact them directly for return instructions using one of the following methods:
  - **Via the Internet:** Visit the Paradyne World Wide Web site at <http://www.paradyne.com>
  - **Via Telephone:** Call our automated call system to receive current information via fax or to speak with a company representative.
    - Within the U.S.A., call 1-800-870-2221
    - International, call 813-530-2340

If the trouble is causing harm to the telephone network, the telephone company may request that you remove the equipment from the network until the problem is resolved.

7. The user is not authorized to repair or modify the equipment beyond replacing the ac line fuse. Refer to the installation section of this manual for more information.
8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)
9. 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 such a message clearly contains, in a margin at the top or bottom of each transmitted page, or on the first page of the transmission, the date and time it is sent, and an identification of the business, or other entity, or other individual sending the message, and the telephone number of such business, or other entity, or individual.

In order to program this information, follow the steps outlined in the manual supplied with your fax software.

10. An FCC compliant telephone cord with modular plugs may be provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant.

## Canada

### Notice To The Users Of The Canadian Public Switched Telephone Network

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

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone line and internal metallic water pipe system, if present, are 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 electric inspection authority, or electrician, as appropriate.**

The Load Number for this equipment is listed on page A of this manual. The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device to prevent overloading. The

termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all devices does not exceed 100.

If your equipment is in need of repair, refer to the procedure in the *Government Requirements and Equipment Return* section.

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# Preface

## Objectives and Reader Assumptions

This manual describes how to install and operate the Model 3830 standalone modem. This manual assumes that you have a basic understanding of dial modems and their operation.

## How to Use this Manual

Chapter 1 provides information about the 3830 modem's hardware and software features, including the front panel and status indicators.

Chapter 2 provides instructions for installing the modem, selecting factory configuration options, recovering the ability to use AT™ commands, and using AT command initialization strings.

Chapter 3 provides general information about fax modem operation.

Chapter 4 provides instructions for displaying and changing AT commands and S-Registers. These commands control all aspects of the modem's operation.

Appendix A provides instructions for performing diagnostic tests when data communications problems occur.

Appendix B lists the technical specifications of the 3830 modem.

Appendix C provides EIA RS-232 pin assignments.

Appendix D provides V.25 bis dialing information.

The Glossary provides a description of terms used throughout this manual.

## Related Documents

Call your sales representative to order additional product documentation.

3810-A2-GB91 *COMSPHERE 3800 Series Modems, Models 3810, 3811, and 3820, User's Guide*

6700-A2-GY31 *COMSPHERE 6700 Series Network Management System User's Guide*

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## Overview

The Model 3830 modem is a member of the COMSPHERE® 3800 Series Modem product line. The Model 3830 modem is a high-speed dial modem that offers reliable asynchronous and synchronous operation over dial- or two-wire leased-line networks. The Model 3830's software defineability allows you to add enhancements and new features as they become available, with no further investment in hardware, no on-site personnel, and minimal downtime.

High-speed data transfer and reliable throughput at data rates as high as 19,200 bps (*V.32terbo*) over dial lines is guaranteed by employing the latest techniques in CCITT V.42 bis/MNP® Class 5 data compression and CCITT V.42/MNP error correction. In addition to fast line speeds, the modem can send data to the DTE at speeds as high as 115,200 bps.

The Model 3830 modem is extremely versatile when used in modem pooling environments; it allows multiple users to temporarily customize settings in the Model 3830, thereby permitting communication with the calling modem. Upon disconnection, the Model 3830 modem falls back to its original configuration settings and resumes normal operation.

The modem's compatibility with a number of dialing methods and protocols, such as asynchronous AT™ commands and CCITT V.25 bis dialing, permits the Model 3830 to be used in a variety of applications and environments while also allowing control over modem configuration, dialing, and diagnostics. The modem offers two preset factory configurations containing the most often used modem settings. These factory presets provide quick configuration for any asynchronous or UNIX® hardware-based dial environment.

## Features

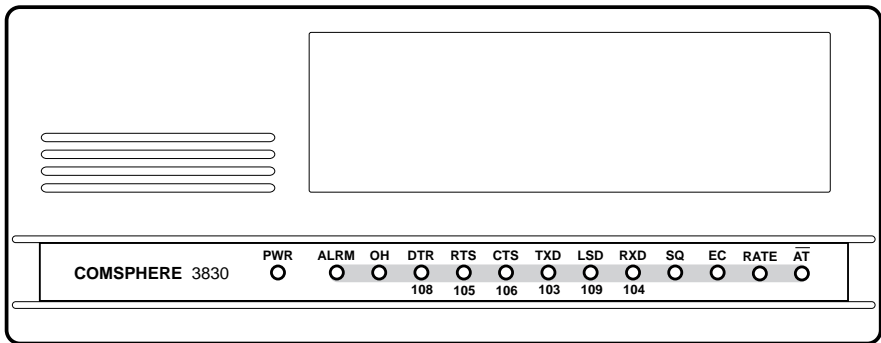
The 3830 modem has a wide variety of features, including:

- Dial-Line Modulations: V.32*terbo* (19,200 and 16,800 bps), CCITT V.32 bis (14,400, 12,000, 9600, 7200, and 4800 bps), V.32 (9600 and 4800 bps), V.22 bis (2400 bps), V.22 (1200 bps), V.21 (300 bps), Bell 212A (1200 bps), and Bell 103J (300 bps).
- Two-wire Leased-Line Modulations: V.32*terbo* (19,200 and 16,800 bps), V.32 bis (14,400, 12,000, 9600, 7200, and 4800 bps), and V.32 (9600 and 4800 bps).
- Optional Fax modulations: CCITT V.17 (14,400, 12,000, 9600, 7200 bps), CCITT V.29 (9600 and 7200 bps), and CCITT V.27 ter (4800 and 2400 bps).
- Convenient migration to new or optional features through software downloading.
- CCITT V.42 bis and MNP Class 5 data compression.
- Virtual error-free data integrity with CCITT V.42 and MNP Level 4 error control.
- Asynchronous dial DTE data rates from 300 bps – 115,200 bps.
- A unique Paradyne modem pooling feature that preserves the answering modem's permanent configuration, but allows multiple users to temporarily adapt parameters for individual requirements.
- Enhanced Throughput Cellular™, which improves reliability and speed over cellular links.
- Compatibility with the industry de facto standard AT Command set.
- High-speed transmission using asynchronous, synchronous, or UNIX devices over full- or half-duplex dial networks or 2-wire leased lines.
- Support as a remote device by the COMSPHERE 6700 Series Network Management System.

- Compatibility with COMSPHERE 3800 Series modems' Remote Access Mode, which allows users of 3810, 3811, and 3820 modems to view the configuration options of a 3830 modem from their front panel LCD displays.
- Storage of up to 10 telephone numbers to directory locations.
- Two factory-defined configurations and two user-defined configuration areas.

## COMSPHERE Model 3830 Modem Front Panel and Status Indicators

The front panel of the Model 3830 modem is equipped with a speaker and 13 LEDs (status indicators) that monitor modem activity (Figure 1-1).



496-14007-01

**Figure 1-1. Model 3830 Front Panel**

### Status Indicators (LEDs)

The Model 3830's status indicators continuously provide information on the modem's operating condition. Table 1-1 lists the label, color and functionality of each status indicator.

**Table 1-1**  
**(1 of 2)**  
**Model 3830 LEDs**

<b>Label</b>	<b>Color</b>	<b>Indicates</b>
<b>PWR</b>	green	Power ON. Power is on and the modem is capable of operating.
<b>ALRM</b>	red	Alarm Flashing The modem has detected an internal malfunction.
<b>OH</b>	green	Off-Hook ON. The modem is off-hook.  OFF. The modem is on-hook.
<b>DTR/108</b>	green	Data Terminal Ready The DTE has turned ON DTR or the modem has forced DTR ON.
<b>RTS/105</b>	green	Request-to-Send The DTE has data to send to the modem.
<b>CTS/106</b>	green	Clear-to-Send The modem is ready to receive data from the DTE.
<b>TXD/103</b>	green	Transmit Data The modem is receiving data from the DTE to transmit.
<b>LSD/109</b>	green	Line Signal Detect The modem has detected a valid carrier signal and is capable of transferring data to the DTE.
<b>RXD/104</b>	green	Receive Data Data is being transferred to the DTE.
<b>SQ</b>	yellow	Signal Quality The receive telephone line signal is degraded.
<b>EC</b>	green	Error Control Modem is in Error Control mode.

**Table 1-1**  
**(2 of 2)**  
**Model 3830 LEDs**

<b>Label</b>	<b>Color</b>	<b>Indicates</b>
<b>RATE</b>	yellow	Rate ON. The modem is connected at a data rate lower than the data rate it is configured for.  OFF. The modem is connected at its configured data rate.
<b>AT</b>	yellow	AT Command Set ON. The AT command set is disabled.  OFF. The AT command set is enabled.  Slow Flash. The modem will not respond to all AT commands due to the setting of the AT Command Mode configuration option (see S84 in Chapter 4). Or, the modem has been configured to reload settings from Active (Saved) to Active (Operating) upon a disconnect.

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## Overview

This chapter describes how to connect both provided and customer-supplied cables to the modem. In addition, it describes how to recover AT commands when the modem is in Dumb mode and how to enter initialization strings for unique applications.

## Model 3830 Modem Package

After opening the modem's package, check for damage and verify that the following items are present:

- Manual
- Model 3830 modem
- Power transformer
- One 6-position, 4-wire modular cord

- Two ferrite chokes and cable ties
- Fax software and documentation (if fax option installed)

If any hardware components are damaged, notify your service representative. Return equipment using the procedures described in the *Government Requirements and Equipment Return* section in the front of this book.

## Customer-Supplied Equipment

The following customer-supplied equipment is required to complete a data communications system using Model 3830 modem:

- A DTE with an available EIA-232-D serial port.
- A standard EIA-232-D male-to-female cable with a male DB-25-S connector at one end to attach to the modem.
- An ac line cord with an IEC 320 connector and appropriate wall plug if using the 220-240V power transformer.
- One of the following modular dial or leased network interfaces:
  - RJ45S for dial programmable applications
  - RJ11C for dial permissive applications
  - JM8 for leased-line applications only

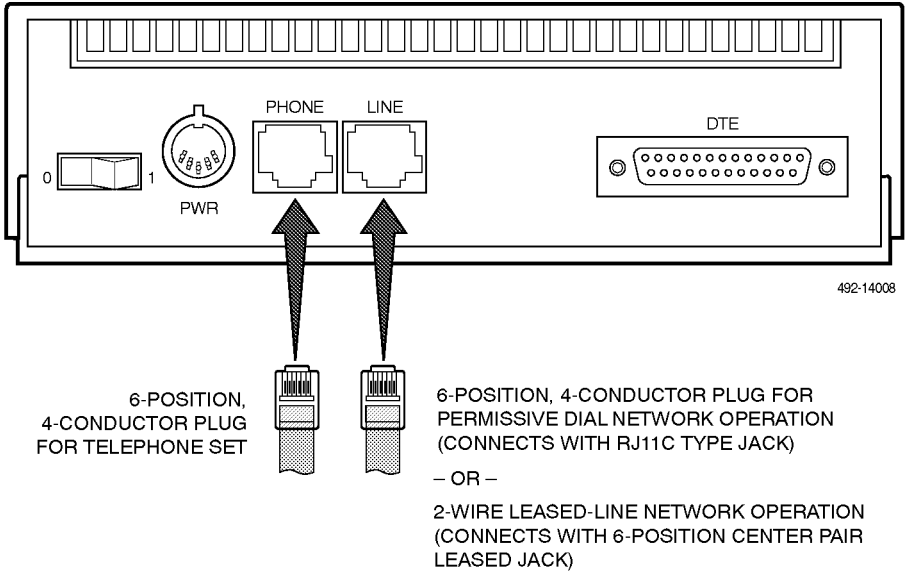
## Model 3830 Installation

Before installing your standalone modem, make sure your installation site is clean and well-ventilated. Allow space around the modem for installing cables and telephone cords, and make sure the modem is located within reach of the ac power outlet. The distance between your modem and DTE should be minimized if DTE data rates exceed 19,200 bps. Also, low capacitance cables may be necessary for speeds greater than 19,200 bps or distances greater than 50 feet.

The rear panel of the Model 3830 (Figure 2-1) modem has the following switches and connectors:

- An ON/Off power switch.
- A 5-pin DIN type power receptacle for ac power transformer.

- An 8-pin modular keyed jack for external telephone set use only.
- An 8-pin modular keyed jack for dial (PSTN) lines or 2-wire leased lines.
- A 25-pin DB-25-S receptacle for DTE interface.



**CAUTION**

Pins 3 and 6 of the modem's 8-position dial jack are reserved for MI/MIC dialing. To avoid equipment damage and violation of FCC Part 68 Rules, do not connect a 6-position, 4-conductor cable to a USOC RJ14C jack. This jack has a secondary dial line on Pins 2 and 5.

In this case, a 2-conductor cable, using Pins 3 and 4 of a 6-position plug, can be purchased from your local electronics store.

**Figure 2-1. Model 3830 Rear Panel**

## DTE Connection

Use the following procedures to connect the EIA-232-D cable and ferrite choke from the modem to the DTE:

1. Make sure the modem's rear panel power switch is Off.
2. Connect the DB-25-P (male) connector on the cable to the DB-25-S (female) connector labeled DTE (Figure 2-1) on the modem's rear panel. Use a small screwdriver to tighten the cable to the modem.
3. Connect the DB-25-P connector on the cable to the DB-25-S connector on the DTE. Use a small screwdriver to tighten the cable to the DTE.

To ensure compliance with FCC Part 15 Regulations, a ferrite choke must be installed on the EIA-232-D interface cable.

1. Open the ferrite choke, place it around the DTE cable as close as possible to the connector attached to the modem, and snap the ferrite choke shut.
2. Install a cable tie behind the ferrite choke to prevent it from sliding along the cable.

## Dial-Line Connection

Use the following procedures to connect a Model 3830 to the dial network interface. The feature/part number for a 7-foot, 6-position, 4-wire modular cord is 125-0067-0031:

1. Insert the 6-position, 4-conductor modular plug into the jack labeled LINE, Figure 2-1.
2. Insert the other end of the modular cord into the dial network interface.

## 2-Wire Leased-Line Connection

Use the following procedures to connect a Model 3830 modem to the 6-pin, center pair, leased-line network interface. (For 2-wire leased line connection to a JM8 network interface, refer to Appendix C.)

1. Insert the 6-position, 4-conductor modular plug into the jack labeled LINE, Figure 2-1.
2. Insert the other end of the modular cord into the leased-line network interface.

## Telephone Connection

Use the following procedures to connect the modem to a telephone:

1. Insert the 6-position, 4-conductor modular plug into the jack labeled PHONE.
2. Insert the other end of the modular cord into the telephone.

## AC Power Transformer Connection

Use the following procedures to connect the modem to an ac power outlet:

1. Make sure the modem's power switch is in the Off position.
2. Insert the power transformer's 5-pin DIN male connector into the modem's rear panel ac power receptacle (Figure 2-1).
3. For the 115V power transformer, insert the power transformer into a grounded ac power outlet.

For the 220–240V power transformer, insert the line cord's outlet connector into the power transformer's IEC 320 power outlet.

Next, insert the line cord wall plug into the appropriate grounded ac outlet.

To ensure compliance with FCC Part 15 Regulations, a ferrite choke must be installed on the power transformer cable.

1. Open the ferrite choke, place it around the power transformer cable as close as possible to the connector attached to the modem, and snap the ferrite choke shut.
2. Install a cable tie behind the ferrite choke to prevent it from sliding along the cable.

## Communications Software Installation

A personal computer commands and controls a dial modem through communications software. This software, which is installed on the PC, uses the AT command set to send instructions to the modem. A dumb asynchronous terminal, however, does not require this software since it can directly send AT commands.

The Model 3830 can be used with any major communications software. Refer to your software's user's guide for installation procedures. For an overview of how to use AT commands and a list of AT commands supported by the Model 3830, refer to Chapter 4, *AT Command Set and S-Registers*.

## Modem Power-Up

Once your modem is properly connected to the DTE, dial or leased lines, and ac outlet, press the modem's rear panel power switch to the ON position. The modem begins a power-up self-test in which all front panel LEDs momentarily light (note that this also occurs on a reset of the modem), and the Power LED remains ON. The state of other LEDs depends on your modem's configuration.

On initial power-up, the modem is in Command mode. To verify that the modem is connected and functioning properly, enter the following:

**TYPE:** AT

**PRESS:** Enter (Return)

The screen displays OK.

If the modem does not return OK, refer to Appendix A, *Troubleshooting*.

## Selecting Factory Configuration Options

After the modem passes the power-up self-test, it can be configured for operation using one of two factory preset configurations.

These factory preset templates contain the most commonly used configuration options (straps) for Asynchronous Dial and UNIX hardware network configurations. Your modem is shipped from the factory with the Async Dial default configuration options stored in memory. If UNIX Dial is more appropriate for your configuration, then you must change the factory setting as described as follows.

(The purpose of having preset configurations is so that you can have a “head start” in getting your modem operating and reducing the amount of time required to configure your modem.)

### NOTE

If you have already changed certain configuration options, you may have lost AT command control. For example, operating in Synchronous mode or disabling AT commands results in an inability to change configuration options. To regain AT command control, refer to the *Recovering AT Commands* section for these procedures.

To change a factory template, perform the following steps (for more information on changing factory templates using AT commands, refer to Chapter 4, *AT Command Set and S-Registers*).

1. Use the AT&F&W command to load the appropriate factory configuration to the appropriate storage area. Enter the following:

**TYPE:** AT&Fy&Wn

**Where:** y is one of the following Factory configurations:

0 for Async Dial  
3 for UNIX Dial  
5 for Cellular (Mobile)  
6 for Cellular (PSTN)

and

**Where:** n is one of the following storage areas:

0 for Active (Saved)  
1 for Customer 1  
2 for Customer 2

**NOTE**

These three configuration areas are nonvolatile memory locations. Active (Saved) contains the most recently saved changes to any configuration options. In the event of power loss, the modem retrieves these configuration options. Customer 1 and Customer 2 are user-defined configuration areas.

2. **PRESS:** Enter (Return)

The selected factory configuration is saved.

**NOTE**

When configuring your modem, keep a record of its configuration options as a future reference in case the modem must be replaced.

To establish a connection with a remote modem, use the D (Dial) command. Refer to Chapter 4, *AT Commands and S-Registers*, for more information.

## Recovering AT Commands

AT commands are issued from asynchronous terminals and personal computers. Certain dialing methods, such as V.25 bis and synchronous operation, disable the use of AT commands and place the modem into a state known as Dumb mode. The Model 3830 is capable of normal operation when in Dumb mode. However, if the setting of a configuration option must be changed, it can only be accomplished using an AT command.

The AT Recovery command (AT\*\*\*) places the modem into a temporary state that restores AT commands. When in this state, the modem's previous settings are retained except for the following configuration options:

- The DTE Dialer Type configuration option (&M and &Q) is set to AT
- The Async/Sync Mode configuration option (&M and &Q) is set to Async
- The DSR Control configuration option (&S) is set to Forced On
- The LSD Control configuration option (&C) is set to Forced On

If these settings are not appropriate, then change them to a setting compatible with your current application.

The procedures for an AT recovery using an asynchronous terminal or personal computer are listed in the following section. Read through these procedures before performing a recovery:

1. Turn the modem Off and then ON. The modem performs a power-up self-test in which all LEDs light. While this is running, repeatedly press the A key of your DTE's keyboard (or keep the key depressed if your keyboard automatically repeats characters that way). Keep doing this until A's (or a's) appear on your DTE screen. (You may use all uppercase or all lowercase characters.)

At least three consecutive A's must be entered within a 2-second time interval.

If these characters are not echoed back to the DTE screen after the power-up self-test is complete, then the modem is still in Dumb mode and maintains its current configuration. Turn the modem Off and then ON again, and repeat Step 1.

2. Once the characters are echoed back to the DTE,

**TYPE:** T\*\*\*

(The case of this character must be consistent with the case used in Step 1. Mixed case prefixes such as aT or At are not recognized.)

This must be entered within 10 seconds after receiving the echoed characters.

**PRESS:** Enter

The screen displays OK.

The modem is now in AT Recovery mode, and remains in this state until a Save or power reset occurs. While in this mode, you can use AT commands to make any necessary changes to configuration options.

Keep in mind that the &C command is changed to Forced On (&C0), the &M and &Q commands are changed to Async mode with AT commands enabled (&M0 and &Q0), and the &S command is changed to Forced On (&S0). If these settings are not appropriate, then reset them to a desired choice before exiting AT Recovery mode.

3. To save changes, use the &W command:

**TYPE:** AT&Wn

**Where:** n is one of the following storage areas:

- 0 for Active (Saved)
- 1 for Customer 1
- 2 for Customer 2

**PRESS:** Enter

The modem exits AT Recovery mode and returns to its previous application environment.

## Initialization Strings

An initialization string contains several AT commands that are entered at once to program the modem for a specific application.

The following initialization strings identify essential AT commands that directly impact modem operation for a particular application. If you need to modify these strings for your application, make sure additional commands are inserted somewhere in the middle of the initialization string. Whenever an &L command is used, it must appear at the end of an initialization string.

### V.25 bis Applications

For V.25 bis HDLC dial-line operation, create an initialization string with the following commands. Note that the character format can be 8 data bits, no parity, and 1 stop bit; 7 data bits, odd parity, and 1 stop bit; or 7 data bits, even parity, and 1 stop bit:

**TYPE:** AT&F &D1 &S1 &M234 &W

**PRESS:** Enter

For V.25 bis Bisync operation, create an initialization string with the following commands. Note that the character format must be 7 data bits, odd parity, and 1 stop bit:

**TYPE:** AT&F &D1 &S1 &M233 &W

**PRESS:** Enter

## Synchronous Leased-Line Applications

For synchronous leased-line operation, create the following initialization string with the following commands:

**TYPE:** AT&F &D1 &S1 S44=n S45=n S82=n &M1 &Ln  
&W

**Where:** *n* is the value for the AT command. Refer to either Table 4-2 or Table 4-3 in Chapter 4 to determine the best possible values for these commands.

**PRESS:** Enter

## AT&T Exclusive Dialing for DATAKIT Applications

For AT&T exclusive dialing for DATAKIT™ applications, create an initialization string with the following commands:

**TYPE:** AT&F &C5 &D1 &S3 &R0 \D3 \Q1 \G1 S85=1  
&M235 &W

**PRESS:** Enter

---

# Fax Operation **3**

Overview .....	3-1
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## Overview

The procedures for sending and receiving facsimile documents with your modem depend on the fax software you use. This chapter does not contain specific procedures, but rather information that may make it easier for you to use the documentation that came with your fax software.

## Fax Operation

With the fax option installed, your modem, in combination with your computer and fax software, is capable of emulating the functions of a fax machine. You can use it to send and receive fax files in communication with another fax modem, or with a standard fax machine. These fax files are images turned into the sort of data that can be stored in your computer.

Fax machines and fax modems use special protocols different from those used by standard modems. The device you intend to communicate with must be compatible with your modem, which means that it must be capable of using the same protocol. Your 3830 modem supports the EIA/TIA-592 standard for Class 2 fax modems.

Before you can send or receive a fax, the following must be true:

- Your modem must be online with a compatible fax modem or fax machine.
- You must have fax software installed on your computer.
- Your fax software must support Class 2 fax.

- You must have configured your modem according to the specifications of your fax software manual. For example:
  - Some fax software requires that the modem have Auto-Answer disabled. You can set this with the AT S0=0 command.
  - Some fax software requires that the modem use software flow control. You can set this with the AT Q1 command.
  - DTR Action should be set for standard RS232-D operation. Use the AT &D2 command.
  - LSD (Line Signal Detect) Control should be set for standard RS232-D operation. Use the AT &C1 command.
  - Data should be buffered during Error Control (EC) negotiation. Use the AT /C1 command.

If your fax software requires that you change the configuration of your modem, see the appropriate sections of Chapter 4, *AT Commands and S-Registers*.

Your fax software uses AT commands to tell the modem what to do. These commands, and the replies your modem makes (such as “OK”) may be displayed on your computer terminal during fax operation, but this depends on your software. You do not have to issue AT commands yourself, unless you use AT commands to configure the modem.

For more information about fax operation, see the manual that came with your fax software.

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# AT Command Set and S-Registers **4**

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## Overview

This chapter discusses guidelines necessary to operate AT commands as well as listing all AT commands supported by the Model 3830 modems. AT commands are issued from asynchronous DTEs.

## Operating Modes

The Model 3830 modem has two operating modes: Command mode and Data mode. Before a modem goes online (establishes a successful connection with a remote modem), it is considered to be in Command mode, an idle state where you can modify its operating parameters or issue modem commands. (Any command issued is acknowledged with a response in either words or digits known as result codes. Refer to Table 4-1 for a listing of result codes.)

Once the modems are online, either by answering or originating a call, they automatically switch to Data mode. Data mode is a state where any entries made from the DTE are considered data and are transmitted and received between modems. The modems remain in Data mode until the connection is broken or until they are forced into online Command mode using the escape sequence (+ + +).

## Switching Between Data Mode and Online Command Mode

Sometimes it is necessary to change operating parameters while the modems are online. The Escape Sequence allows you to toggle the modem between Data mode and online Command mode while maintaining a connection with the remote modem. This is accomplished using the escape sequence (+ + +) to exit Data mode and the O command to return to Data mode.

### *Escape Sequence and Escape Guard Time*

The escape sequence is only issued when the modem is online and in Data mode. The Model 3830 modem uses three consecutive plus (+) characters as the escape sequence. (To change this value, refer to S-Register S2 discussed later in Table 4-3 in the *S-Register List* section.)

To prevent the modem from interpreting an embedded + + + in data as an escape sequence, the Escape Guard Time value determines the idle time required before and after the escape sequence is issued. The Model 3830 uses a 1-second pause as the Escape Guard Time. (To change this value, refer to S-Register S12 discussed later in Table 4-3 in the *S-Register List* section.)

To enter online Command mode while in Data mode, enter the following sequence:

**TYPE:**     + + +

Use the O command to return to Data mode from online Command mode. Enter the following command:

**TYPE:**     ATO

**PRESS:**    Enter

## Command Guidelines

Review the following guidelines before using any AT Commands.

- The escape sequence (+ + +) is used to enter online Command mode from Data mode.
- The asynchronous character format for the AT command set must be one of the following:
  - 8 data bits + no parity + 1 stop bit.
  - 7 data bits + no parity + 2 stop bits.
  - 7 data bits + parity + 1 stop bit (parity can be odd, even, mark, or space).
- All commands (except A/ (repeat last command) and (+ + +) must begin with the characters AT and end by pressing the Enter key. The AT (or at) prefix clears the command buffer and matches the modem speed and parity to that of the DTE. Commands can be upper- or lowercase, but the modem will not recognize mixed case prefixes (At or aT).
- Commands can be entered one at a time or in strings. Strings can have up to 40 characters after the AT prefix. You can use spaces, hyphens (-), and parentheses ( ) as fillers to make the commands easier to read; the modem ignores these fillers and they are not counted among the characters which make up the command string. Commands must be entered on one line and end with the carriage return character (Enter key).
- Commands with the suffix n have several options associated with them. For example, in the Ln command, L1 sets the speaker volume to Low and L3 sets the speaker volume to High. If no value is entered for the n suffix, the modem assumes a zero (0) value.
- The A/ command (without pressing the Enter key) causes the modem to repeat the last command entered.
- Valid commands are acknowledged with numeric or word result codes (unless the result codes have been disabled using the Q1 command).

Table 4-1 lists all available result codes with numeric and word equivalents.

## Result Codes

Table 4-1 lists all valid result codes for the Model 3830 modem. Refer to the *Vn* and *Xn* commands for more on result codes.

**Table 4-1  
(1 of 3)  
Result Codes**

Numbers (1)	Numbers (2)	Word	Description
0	0	OK	Command executed
1	1	CONNECT	Modem connected to line
2	2	RING	Modem receiving a ring voltage from the VF line
3	3	NO CARRIER	Modem lost or does not detect carrier signal, or does not detect answer tone
4	4	ERROR	Invalid command
5	5	CONNECT 1200*	Connection at 1200 bps
6	6	NO DIALTONE*	No dial tone detected
7	7	BUSY*	Busy or trunk busy signal detected
8	8	NO ANSWER*	No "quiet" answer (@)
10	10	CONNECT 2400*	Connection at 2400 bps
11	11	CONNECT 4800*	Connection at 4800 bps
12	12	CONNECT 9600*	Connection at 9600 bps
13	16	CONNECT 12000*	Connection at 12,000 bps
14	13	CONNECT 14400*	Connection at 14,400 bps
15	14	CONNECT 19200**	Connection at 19,200 bps
<p>* Appears when the Extended Result Codes configuration option is enabled.</p> <p>** Appears when the Extended Result Codes configuration option is set for Use DTE Rate. This displays the DTE data rate instead of the line rate.</p>			

**Table 4-1  
(2 of 3)  
Result Codes**

<b>Numbers (1)</b>	<b>Numbers (2)</b>	<b>Word</b>	<b>Description</b>
16	15	CONNECT 7200*	Connection at 7200 bps
17	17	CONNECT 16800*	Connection at 16,800 bps
19	1	CONNECT 300*	Connection at 300 bps
20	10	CONNECT 2400/ EC***	Connection at 2400 bps with error control
21	11	CONNECT 4800/ EC***	Connection at 4800 bps with error control
22	12	CONNECT 4800/ EC***	Connection at 4800 bps with error control
23	16	CONNECT 12000/ EC***	Connection at 12,000 bps with error control
24	13	CONNECT 14400/ EC***	Connection at 14,400 bps with error control
25	17	CONNECT 16800/ EC***	Connection at 16,800 bps with error control
26	15	CONNECT 7200/ EC***	Connection at 7200 bps with error control
27	5	CONNECT 1200/ EC**	Connection at 1200 bps with error control
28	28	CONNECT 38400**	Connection at 38,400 bps
29	14	CONNECT 19200/ EC***	Connection at 19,200 bps with error control
<p>* Appears when the Extended Result Codes configuration option is enabled.</p> <p>** Appears when the Extended Result Codes configuration option is set for Use DTE Rate. This displays the DTE data rate instead of the line rate.</p> <p>*** Appears when the Extended Result Codes configuration option is set for Add/EC. If this configuration option is set for Add/V42, MNP, then either V42b, V42, MNP5, MNP4, MNP3, MNP2, or NoEC appears.</p>			

**Table 4-1**  
**(3 of 3)**  
**Result Codes**

<b>Numbers (1)</b>	<b>Numbers (2)</b>	<b>Word</b>	<b>Description</b>
30	30	CONNECT 57600**	Connection at 57,600 bps
32	32	CONNECT 76800**	Connection at 76,800 bps
34	34	CONNECT 115200**	Connection at 115,200 bps
** Appears when the Extended Result Codes configuration option is set for Use DTE Rate. This displays the DTE data rate instead of the line rate.			

## AT Command List

AT commands are issued from an asynchronous DTE, such as a PC, and control the modem's operation and software configuration. AT commands are only applicable when the DTE Dialer Type configuration option is set for AT. (See *&Mn* and *&Qn* commands.)

AT commands are entered while the modem is in Command mode and use the following format:

**TYPE:**     ATXn

**Where:**    X is the AT command and n is the specific value for that command.

**PRESS:**    Enter

Table 4-2 lists all AT commands supported by the Model 3830 modem. The Async Dial factory default is listed in bold.

**Table 4-2**  
**(1 of 22)**  
**Model 3830 AT Commands**

**\*\*\* — AT Command Recovery Mode**

Allows the modem to remain in Asynchronous data mode so that AT commands can be used to change the modem's current configuration. Use this command when AT commands are disabled or the modem is operating in Synchronous data mode.

This command can only be executed after the completion of a power-up self-test. Refer to the *Recovering AT Commands* section in Chapter 2 for procedures and guidelines on this command.

**A/ — Repeat Last Command**

Reexecutes the last command string. (Not to be preceded with AT or followed by pressing the Enter key.)

**A — Answer Mode**

Allows the modem to go off-hook and attempts to establish a connection without waiting for a ring.

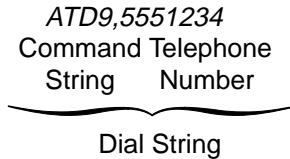
**Table 4-2**  
**(2 of 22)**  
**Model 3830 AT Commands**

**Dn — Dial**

Begins the dialing sequence. The dial string *n* (modifiers and telephone number) is entered after the D command.

Any digit 0–9, \*, #, A, B, C, D, may be dialed as a DTMF tone. Only the digits 0–9 can be dialed in Pulse Dial mode.

The following example shows how to dial through a PBX. The dial string consists of the command string and the telephone number:



Modifiers include the following parameters:

T – Tone (DTMF) dial. Any digit 0–9, \*, #, A, B, C, or D can be dialed as tone.

P – Pulse dial. Only the digits 0–9 can be dialed in Pulse Dial mode.

**NOTE:** Once a dialing method (tone or pulse) has been specified, it will remain active only until the end of that dial string. The factory setting is Tone dial.

, – Pause. Causes the modem to pause before processing the next character in the dial string. The length of this pause is determined by the value held in S-Register S8, the Pause Time configuration option.

W – Wait for dial tone. Modem waits for a second dial tone before processing the dial string. This can be the initial dial tone or a second tone received when dialing through a tandem PBX (for example, 9W555-6789), or when invoking special features (for example, 70#W555-6789, where 70# is the local telephone company command that disables Call Waiting).

**Table 4-2**  
**(3 of 22)**  
**Model 3830 AT Commands**

**Dn**, continued

**R** – Reverse Dial mode. Causes the originating modem to send out an answertone once it no longer detects ringback. (Ringback is the ring you hear at the originating site when making a call.) The R parameter must be the last character in the dial string. For correct operation, at least one ringback must be detected; therefore, the remote modem should be configured to answer on the second ring or subsequent rings.

**@** – Quiet answer. Wait for five seconds of silence after dialing the number. If the silence is not detected, the modem sends a NO ANSWER result to the DTE.

**!** – Hook flash. This causes the modem to go on-hook for 0.5 seconds, then return to off-hook.

**;** – Return to Command mode. Modem returns to Command mode after dialing a number without disconnecting the call. This is useful when the number exceeds 40 characters, or when the wait time between parts of a dial string is unknown.

Space, **-**, and **( )**. These characters are ignored by the dial string and can be included in the dial string to enhance readability.

**DS=n** — Dial Stored Number

Dials the number stored in Location *n* (1–10). (To store a telephone number, refer to the **&Zh=x** command.)

**En** — Command Character Echo

Controls whether or not characters are echoed back to the DTE when the modem is in Command mode.

**E0** Disables echo to the DTE.

**E1** Enables echo to the DTE.

**Hn** — Hook Switch Control

Allows the modem to go off-hook or on-hook.

**H** or **H0** Modem goes on-hook.

**H1** Modem goes off-hook.

**Table 4-2**  
**(4 of 22)**  
**Model 3830 AT Commands**

**In — Identification**

Provides useful information when upgrading or servicing the product.

- I0 Displays product code (default is 144).
- I1 Displays 3-digit firmware revision number.
- I2 Performs an EPROM check.
- I3 Displays serial number.
- I4 Displays model number.
- I5 Displays hardware part number.
- I6 Displays software part number.
- I9 Displays 3-digit firmware revision number (same as I1).
  
- I10 Allows you to change the value displayed by I0:
  - I10=0 causes I0 to display 144 (default).
  - I10=1 causes I0 to display 240.
  - I10=2 causes I0 to display 480.
  - I10=3 causes I0 to display 960.
  - I10=4 causes I0 to display 120.
  
- I11 Displays the program memory checksum.
- I19 Displays the entire firmware revision number.

**Ln — Speaker Volume**

- L0 Selects low volume.
- L1 Selects low volume.
- L2** Selects medium volume.
- L3 Selects high volume.

**Mn — Speaker On/Off**

- M0 Speaker always Off.
- M1** Speaker on until carrier signal is detected.
- M2 Speaker always ON.

**O — Return to Online or Data Mode**

Returns modem to Data mode from Online Command mode.

**P — Pulse Dial**

Sets the modem for Pulse Dial mode. See D command.

**Table 4-2**  
**(5 of 22)**  
**Model 3830 AT Commands**

<p><b>Qn — Result Codes</b> Result codes are informational messages (such as Connect and Ring) sent from the modem and displayed on the asynchronous DTE terminal. Refer to Table 4-1 for a list of result codes.</p> <p><b>Q0</b> Enables modem to send result codes to the DTE.</p> <p><b>Q1</b> Disables modem from sending result codes to the DTE.</p> <p><b>Q2</b> Enables in Originate mode only for modem to send result codes to the DTE. Required for most UNIX® applications.</p>
<p><b>Sn=r — Change S-Register</b> Changes the contents of an S-Register, where <i>n</i> is the S-Register, and <i>r</i> is the new value.</p>
<p><b>Sn? — Display S-Register</b> Displays the value of an S-Register, where <i>n</i> is the S-Register number.</p>
<p><b>T — Tone Dial</b> Sets the modem for Tone (DTMF) dial mode. See D command.</p>
<p><b>Vn — Result Codes Format</b> Controls whether or not result codes appear as words or as numeric codes. Some DTEs do not recognize result codes as words; therefore, numbers are required. The Numbers (2) format is required for some modem pooling applications. Refer to Table 4-1 for a list of result codes.</p> <p><b>V0</b> Displays result codes in Number (1) format (digits).</p> <p><b>V1</b> Displays result codes as text.</p> <p><b>V2</b> Displays result codes in Number (2) format (digits).</p>

**Table 4-2  
(6 of 22)  
Model 3830 AT Commands**

**Xn — Extended Result Code, Dial Tone Detect, and Busy Tone Detect**

The Xn command sets three configuration options simultaneously:

	<i>Ext Result Code</i>	<i>Dial Tone Detect</i>	<i>Busy Tone Detect</i>
X0	Disable	Disable	Disable
X1	Enable	Disable	Disable
X2	Enable	Enable	Disable
X3	Enable	Disable	Enable
<b>X4</b>	Enable	Enable	Enable
X5	Add/EC	Enable	Enable
X6	Add/V42,MNP	Enable	Enable
X7	Use DTE Rate	Enable	Enable

**EXTENDED RESULT CODE**

Informational messages such as VF (line) connect rate and Error Control are displayed with the result codes.

**Disable.** Displays basic result codes: OK, CONNECT, RING, NO CARRIER, and ERROR.

**Enable.** Displays basic result codes in addition to the CONNECT rate message (for example, CONNECT 14400).

**Add/EC.** If error control is negotiated, attaches the /EC suffix to the CONNECT rate message.

**Add/V42,MNP.** Attaches the V42b, V42, MNP5, MNP4, MNP3, MNP2, or NoEC suffixes to the CONNECT rate message.

**Use DTE Rate.** Displays DTE data rate instead of line CONNECT rate message.

**DIAL TONE DETECT**

Sets the modem for dial tone detection (enable) or blind dialing (disable).

**Disable.** Sets the modem for blind dialing.

**Enable.** Sets the modem for dial tone detect.

**Table 4-2**  
**(7 of 22)**  
**Model 3830 AT Commands**

**Xn**, continued

**BUSY TONE DETECT**

Sets the modem to monitor for Busy Tone (Enable) or ignore Busy Tone (Disable).

Disable. Modem ignores busy tone.

**Enable.** Modem monitors for busy tone.

**Yn — Long Space Disconnect**

Determines the modem's response to a continuous spacing condition sent from the remote modem when it goes on-hook. Issuing a long space is one method of disconnecting a call.

Y0 Disable. Ignores long space.

Y1 Enable. Disconnects if long space is detected. Enables transmission of a long space.

**Zn — Reset and Load Active**

Z0 Loads configuration options from Active (Saved) to Active (Operating).

Z1 Loads configuration options from Customer 1 to Active (Operating). Z2

Loads configuration from Customer 2 to Active (Operating).

Z3 Loads configuration options from Active (Saved) to Active (Operating) and performs a reset.

Z9 Performs a full modem reset as if the modem were powered off and on.

**Table 4-2**  
**(8 of 22)**  
**Model 3830 AT Commands**

**&Cn — LSD Control**

Line Signal Detect (LSD) is a signal indicating that the carrier signal is being received from the remote modem. It is normally turned Off to the DTE when the power level of the received carrier signal drops below the carrier detect threshold.

&C0 Forced On. LSD ON at all times.

&C1 Standard RS232. LSD is ON when the remote modem's carrier signal is detected. LSD is Off when carrier signal is not detected.

&C2 Wink When Disconnect. LSD normally forced ON, turns Off for approximately one second upon disconnecting.

&C3 Follows DTR. State of LSD follows state of DTR.

&C4 Simulated Control Carrier. State of LSD follows state of remote modem's RTS via V.13 simulated control carrier signaling. Note that the remote modem's RTS Action configuration option must be set to Simulated Control Carrier.

&C5 DTR/Disconnect Off. State of LSD follows state of DTR except upon a disconnect where LSD always turns Off. DTR must then toggle Off and ON to turn LSD ON. Use this setting for AT&T DATAKIT applications. Note that to use this configuration option, the DTR Action configuration option must be set to Stndrd\_RS232 (&D1 or &D2).

&C6 Bridge Retrain. LSD behaves as if it were set for Standard RS232, except that it is turned Off when a retrain condition lasts longer than 10 seconds, and turned ON when no retrain condition is detected for 10 seconds.

**Table 4-2**  
**(9 of 22)**  
**Model 3830 AT Commands**

**&Dn — DTR Action**

Data Terminal Ready (DTR) is a signal from the DTE to the modem indicating that the DTE is connected and ready for operation.

**&D0 Ignore.** Modem ignores the true status of DTR and treats it as always ON.

**&D1 Off=Command Mode.** Modem enters online Command Mode if connected when DTR switches off.

**&D2 Standard RS232.** DTR Signal is controlled by the DTE.

**&D3 Off=Reload Strap.** Follows Standard RS232 operation, except that when DTR switches Off, the modem loads the Active (Saved) area into the Active (Operating) area.

**&D4 Controls On-Hook.** Follows Standard RS232 operation, except that modem does not disconnect until DTR is lowered by the DTE.

**&Fn — Select Factory Default Configuration Options**

Loads factory configuration options into the Active (Operating) area. The &F5 and &F6 options invoke the Enhanced Throughput Cellular™ (ETC™) feature.

- &F0 Async Dial
- &F3 UNIX Dial
- &F5 Cellular (Mobile)
- &F6 Cellular (PSTN)

**Table 4-2  
(10 of 22)  
Model 3830 AT Commands**

**&Fn — Select Factory Default Configuration Options (cont'd)**

If your modem is attached to a cellular telephone, use the &F5 command to configure the modem for cellular communications. &F5 sets the following configuration options:

<u>Option</u>	<u>AT Command Value</u>
Maximum Frame Size	\A4
Error Control Mode	\N4
Auto-Answer Rings	S0=3
No Answer Timeout	S7=120
No Carrier Disconnect	S10=100
V.32 bis Train	S43=1
V.32 bis Autorate	S76=3
V.42 ARQ Window Size	S89=9
Cellular Enhancements	S91=1

If your modem is attached to a normal dial telephone line but sometimes communicates with a modem that is attached to a cellular phone, use the &F6 command. &F6 (Cellular(PSTN)) sets the following configuration options:

<u>Option</u>	<u>AT Command Value</u>
Transmit Level	&I100
Error Control Mode	\N4
No Answer Timeout	S7=120
No Carrier Disconnec	S10=100
V.32 bis Train	S43=1
V.42 ARQ Window Size	S89=9
Cellular Enhancements	S91=1

**&Gn — V.22 bis Guard Tone**

Determines whether the V.22 bis guard tone is disabled, set to 550 Hz, or set to 1800 Hz.

**&G0 Disable.**

&G1 550 Hz.

&G2 1800 Hz.

**Table 4-2**  
**(11 of 22)**  
**Model 3830 AT Commands**

**&In — Dial Transmit Level for Cellular Auto**

When Dial Transmit Level Type is set to Permissive, &In sets Dial Transmit Level to a value between -10 and -32 dBm. &I99 and &I100 causes the level to be varied automatically according to conditions for Enhanced Throughput Cellular (ETC) operation. &J0 overrides this command.

&I10 -10 dBm

&I11 -11 dBm

•           •  
•           •

&I32 -32 dBm

&I99 Automatically adjusted according to the ETC1.0 specification. Use only with remote modems set to &I99, and limit the data rate to 4800 bps (S41=5).

&I100 Automatically adjusted according to the ETC1.1 specification. Set by &F6.

**&Jn — Dial Transmit Type**

Sets the power output level of the transmit signal over dial lines.

&J0 Permissive (-9 dBm).

&J1 Programmable.

**&Ln — Leased Mode**

Sets the modem for 2-wire leased-line operation in Answer mode (receiving a call) or in Originate (initiating a call) mode.

&L0 Disables leased-line operation.

&L1 2-wire originate leased-line operation.

&L3 2-wire answer leased-line operation.

The &L command will cause the modem to reset before entering or exiting Leased-Line mode. Therefore, it must be entered as the last command in an initialization string.

**Table 4-2**  
**(12 of 22)**  
**Model 3830 AT Commands**

**&Mn or &Qn — Async/Sync Mode and DTE Dialer Type**

Sets the modem for either asynchronous or synchronous operation and selects the type of dialing method the modem uses.

**&M0, &Q0** Modem operates in Asynchronous data mode and uses AT Command protocol.

**&M1, &M3, &Q1, &Q3** Modem operates in Synchronous data mode and uses AT Command protocol.

**&M2, &Q2** Modem operates in Synchronous data mode and dials the telephone number stored in directory location 1 when the DTR signal turns Off and then ON.

**&Q4** Modem operates in Asynchronous data mode with AT commands and Hayes AutoSync enabled. (NOTE: There is no &M4 command.)

**&M231, &Q231** Modem operates in Asynchronous data mode and disables any type of AT command dialing protocol.

**&M232, &Q232** Modem operates in Asynchronous data mode and uses V.25 bis asynchronous dialing.

**&M233, &Q233** Modem operates in Synchronous data mode and uses V.25 bis bisynchronous dialing.

**&M234, &Q234** Modem operates in Synchronous data mode and uses V.25 bis HDLC dialing.

**&M235, &Q235** Modem operates in Asynchronous data mode and enables a subset of the AT&T command set. This is required for AT&T DATAKIT dial-out applications.

The **&M2, &M231 through &M235, &Q2, and Q231 through Q235** commands disable the use of AT commands and force the modem into Dumb mode. The only way to regain control of the modem is to recover AT Commands as described in the *Recovering AT Commands* section in Chapter 2.

**Table 4-2**  
**(13 of 22)**  
**Model 3830 AT Commands**

**&Rn — RTS Action** Request-to-Send (RTS) is a signal from the DTE to the modem indicating the DTE has data to send to the modem.

**&R0** Standard RS232. DTE controls RTS to the modem in normal EIA-232-D operation. RTS must be ON for the DTE to transmit to the modem.

**&R1** Ignores RTS. Modem assumes RTS is always ON. Use this selection when the DTE does not provide RTS to the modem.

**&R2** Simulated Control Carrier. RTS input controls the remote modem's LSD signal. This is used for DTEs that require Line Signal Detect (LSD) to toggle ON and Off to simulate half-duplex operation.

**&R3** Control Carrier. Not valid for Model 3830 operation.

**Table 4-2**  
**(14 of 22)**  
**Model 3830 AT Commands**

**&Sn — DSR Control**

Data Set Ready (DSR) is a signal from the modem to the DTE indicating the modem is connected and ready for operation.

**&S0 Forced On.** Forces DSR output ON constantly. This is usually used for leased-line applications and when the DTE requires DSR to always be ON.

**&S1 Standard RS232.** Modem controls DSR to the DTE. The modem raises DSR when it begins the handshake process. DSR lowers upon disconnect. The modem is not ready to receive data until DSR, CTS, and LSD are active.

**&S2 Wink When Disconnect.** DSR is normally forced ON, but is turned Off for 1 to 2 seconds upon a disconnect.

**&S3 Follows DTR.** When the modem receives DTR from the DTE, it sends DSR to the DTE.

**&S4 On Early.** DSR is low when the modem is in the idle state. DSR goes high immediately upon a command to enter Data mode. This setting is required for some modem pooling applications.

**&S5 Delay to DTE.** Operation is similar to the Standard RS232 setting except that DSR does not turn ON until the modem enters Data mode. Normally, the modem raises DSR when it begins the handshaking process.

**&S6 Dial Backup Toggle.** DSR is turned Off during a dial backup attempt in Leased mode, and on when a dial backup attempt is completed. DSR is also turned Off when a disconnect begins, and ON when the disconnect is complete.

**Table 4-2**  
**(15 of 22)**  
**Model 3830 AT Commands**

**&Tn — Tests**

&T0 Abort. Stops any test in progress.

&T1 Local Analog Loop.

&T2 Pattern. Transmits and receives a 511 Bit Error Rate Test (BERT).

\*&T3 Local Digital Loopback test.

&T4 Enables Receive Remote Loopback Response configuration option.

&T5 Disables Receive Remote Loopback Response configuration option.

\*&T6 Remote Digital Loopback test.

\*&T7 Remote Digital Loopback with Pattern.

&T8 Local Loopback with Pattern.

&T9 Self-Test.

To start a test, set the S18 register to a desired test duration in seconds (for example, 30 seconds), and then issue the &T command. Test results display as the number of errors sent or received over the number of blocks sent or received.

\* The modem must be online and in Direct mode for this test to work properly.

**Table 4-2**  
**(16 of 22)**  
**Model 3830 AT Commands**

**&Vn — View Configuration Options**

Displays each configuration group within the Active (Operating), Active (Saved), Customer 1, and Customer 2 configuration areas as well as the telephone numbers stores in directory locations 1–10.

&V0 Active (Operating) configuration options.

&V1 Active (Saved) configuration options.

&V2 Customer 1 configuration options.

&V3 Customer 2 configuration options.

&V4 Directory locations 1–10.

**&Wn — Write (Save to Memory)**

Saves the current configuration options in Active (Operating) to one of three configuration areas:

&W0 Saved to Active (Save).

&W1 Saved to Customer 1.

&W2 Saved to Customer 2.

**&Xn — Transmit Clock Source**

Determines the source of timing for synchronous data transmitted from the DTE.

&X0 Internal. Modem provides transmit clock source for synchronous data (Pin 15).

&X1 External. Modem derives external transmit clock source provided on Pin 24 for synchronous data.

&X2 Receive Clock Loop. Modem derives transmit clock source from receive signal for synchronous data (Pin 17).

**Table 4-2**  
**(17 of 22)**  
**Model 3830 AT Commands**

**&Zn=x — Store Telephone Numbers**

Modem saves the telephone number and dial command modifiers (if any) entered for *x* (up to 40 characters in length) in Directory Location *n* (1–10). The DS command dials numbers stored this way.

For example, the command AT&Z1=5551234 stores the telephone number 555–1234 into directory location 1.

To clear a telephone number from a memory location, issue the &Zn command without entering a telephone number.

**\An — Maximum Frame Size**

Sets the maximum frame size for V.42 and MNP. For V.42, 128 is the maximum value; if a larger value is specified, it will default to 128. For MNP, the minimum value is 64; if a smaller value is specified, it will default to 64.

\A0	64
\A1	128
\A2	192
<b>\A3</b>	256
\A4	32
\A5	16

&F5 sets this to \A4.

**Table 4-2**  
**(18 of 22)**  
**Model 3830 AT Commands**

**\Cn — Error Control Negotiate Buffer**

Determines if the answering modem buffers the data that it received from the remote modem during an interval in which the modem attempts to establish a connection using error control. Online changes to this configuration option do not take effect until a disconnect occurs.

**\C0** Disable.

**\C1** Enable.

**\C2** Disable and Switch. Modem automatically switches to Buffer mode if it receives an error control fallback character (an ASCII carriage return — see %A command) during error control negotiation.

**\Dn — CTS Control**

Clear-to-Send (CTS) is a signal from the modem to the DTE indicating that it can accept data from the DTE.

**\D0** Forced On. Forces CTS to always ON.

**\D1** Standard RS232.

**\D2** Wink When Disconnect. CTS is turned Off for 1 to 2 seconds upon a disconnect.

**\D3** Follows DTR. The state of CTS follows the state of DTR.

**\Gn Modem to Modem Flow Control**

If a modem's buffers begin to fill due to data it is receiving from the remote modem, but is not passing the data on to the DTE, it can issue XON/XOFF flow control characters to the remote modem. This only applies during Buffer mode connections where the remote modem also has modem-to-modem flow control enabled. If Error Control mode is enabled, flow control between the modems will happen automatically, regardless of the setting of this configuration option.

**\G0** Disable.

**\G1** Enable.

**Table 4-2**  
**(19 of 22)**  
**Model 3830 AT Commands**

**\Kn — Buffer Control, Send Break Control, Break Forces Escape**

The \Kn command sets three configuration options simultaneously:

	<i><b>Break Buffer Control</b></i>	<i><b>Send Break Control</b></i>	<i><b>Break Forces Escape</b></i>
\K0	Discard Data	Break First	Enable
\K1	Discard Data	Break First	Disable
\K2	Keep Data	Break First	Enable
\K3	Keep Data	Break First	Disable
\K4	Keep Data	Data First	Enable
<b>\K5</b>	Keep Data	Data First	Disable
\K6	Discard Break	Not Applic.	Disable

**BREAK BUFFER CONTROL**

Determines if data stored in the modem's buffer is saved or discarded when the DTE issues a break sequence.

**SEND BREAK CONTROL**

Determines what is sent from the modem first, data or break if a break sequence is sent from the DTE.

**BREAK FORCES ESCAPE**

Determines whether or not the modem should enter Command mode when it receives a break character from the DTE.

**Table 4-2  
(20 of 22)  
Model 3830 AT Commands**

**\Nn — Error Control Mode**

Determines the type of error control used by the modem. In most cases, V42/MNP or Bfr is the best choice. If V.42 bis and MNP are enabled, then the modem uses the following priority for error control negotiation: V.42 bis, V.42, MNP 5 and below. Online changes do not take effect until a disconnect occurs.

- \N0 Buffer Mode.
- \N1 Direct Mode.
- \N2 MNP or Disconnect.
- \N3 MNP or Buffer.
- \N4 V.42/MNP or Disconnect.
- \N5** V.42/MNP or Buffer.

&F5 and &F6 (Cellular) set this to \N4.

**\Qn — Flow Control of DTE, Flow Control of Modem**

The \Qn command controls two configuration options simultaneously:

	<i>Flow Control of DTE</i>	<i>Flow Control of Modem</i>
\Q0	Disable	Disable
\Q1	XON/XOFF	XON/XOFF
<b>\Q2</b>	CTS to DTE	Disable
\Q3	CTS to DTE	RTS to Modem
\Q4	XON/XOFF	Disable
\Q5	Disable	XON/XOFF
\Q6	Disable	RTS to Modem

**FLOW CONTROL OF DTE**

Determines how the modem controls the flow of data from the DTE.

**FLOW CONTROL OF MODEM**

Determines how the DTE controls the flow of data from the modem.

**Table 4-2**  
**(21 of 22)**  
**Model 3830 AT Commands**

**\Tn — No Data Disconnect Timer**

Forces the modem to disconnect if no data is transmitted or received within a specified amount of time.

**\T0** Disable.

**\Tn** Where *n* is a value from 1 to 255 in 1-minute increments.

**\Xn — XON/XOFF Passthrough Flow Control**

The way this configuration option functions depends on how the modem is configured for flow control.

When the modem is configured for XON/XOFF flow control (see **\Qn**, Flow Control of DTE), this configuration option determines if flow control characters received from the local DTE will be passed on to the remote modem.

If configured for modem-to-modem flow control (see **\G** – Modem to Modem Flow Control), this configuration option determines if flow control characters received from the line will be passed on to the DTE.

**\X0** Disable.

**\X1** Enable.

**%An — Error Control Fallback Character**

This configuration option allows you to enter the ASCII value of the error control fallback character. This provides the remote modem with the ability to end the error control link negotiating (handshaking) sequence by sending this character. The modems will connect in Buffer mode (no error control). Online changes do not take effect until a disconnect occurs.

**%An** Where *n* is an ASCII value from 0 to 127. Factory default is 013 (ASCII carriage return).

**%Cn — MNP5 Data Compression**

Determines if the modem uses MNP Class 5 data compression. It can be set independently of V.42 bis data compression. Online changes do not take effect until a disconnect occurs.

**%C0** Disable.

**%C1** Enable.

**Table 4-2**  
**(22 of 22)**  
**Model 3830 AT Commands**

**“Hn — V.42 bis Compression**

Enables or disables V.42 bis data compression.

“H0 Disable.

“H1 Transmit only.

“H2 Receive only.

“H3 Enable.

## S-Register List

S-Registers affect the operating parameters of the Model 3830 modem. These registers are applicable only when the DTE Dialer Type configuration option is set for AT. (See &Mn and &Qn commands.)

S-Registers can be displayed and/or modified when the modem is in Command mode. To display the value of an S-Register, issue the following command:

**TYPE:**     *ATS*n*?*

**Where:**     *n* is the register number.

**PRESS:**     Enter

To modify the value of an S-Register, issue the following command:

**TYPE:**     *ATS*n*=*r**

**Where:**     *n* is the register number, and *r* is the new value.

**PRESS:**     Enter

Table 4-3 lists all S-Registers supported by the Model 3830.

**Table 4-3**  
**(1 of 15)**  
**Model 3830 S-Registers**

**S0 — Auto-Answer Ring Number**

Determines the number of rings the modem will count before automatically answering a call.

Enter zero (0) if you do not want the modem to automatically answer any calls. Otherwise, enter a value from 1–255 for the number of rings to count before answering. Note that if disabled, the modem can only answer with an ATA command.

Factory setting is **1**.

**S2 — AT Escape Character**

Determines ASCII value used for escape sequence (+++) to enter Command mode from Data mode.

Enter a value from 0 to 127 for the escape character. Any value greater than 127 causes the modem to disable the escape sequence. When the escape sequence is disabled, the modem cannot return to Command mode until the call is disconnected.

Factory setting is **43** (ASCII + key).

**S3 — Carriage Return Character**

Determines ASCII value used as the carriage return (Enter key). This character is used to end command lines and result codes.

Enter a value from 0 to 127 for the command end character.

Factory setting is **13** (ASCII carriage return).

**NOTE:** The &W command used to save this change must be on a separate line. This ensures both that the change is intentional, and that the DTE can enter the new character.

**S4 — Line Feed Character**

Determines ASCII value used as the line feed character.

Enter a value from 0–127 for the line feed character.

Factory setting is **10** (ASCII line feed).

**Table 4-3**  
**(2 of 15)**  
**Model 3830 S-Registers**

**S5 — Backspace Character**

Determines ASCII value used as the backspace (Backspace key). This character moves the cursor to the left and erases the previous character.

Enter a value from 0–127.

Factory setting is **08** (ASCII backspace).

**S6 — Blind Dial Pause**

Determines how long (in seconds) the modem waits after going off-hook before dialing a telephone number if using result code X0, X1, or X3.

Enter a value from 2–255 seconds.

Factory setting is **2** seconds.

**S7 — No Answer Timeout**

Determines how long (in seconds) an originating modem waits before abandoning a call when no answer tone is received.

Enter a value from 1–255 seconds.

Factory setting is **45** seconds.

**S8 — “,” Pause Time for the Dial Modifier**

Determines how long (in seconds) the modem pauses when it encounters a comma (,) in the Dial command string.

Enter a value from 0–255 seconds.

Factory setting is **2** seconds.

**S10 — No Carrier Disconnect**

Determines how long (in tenths of seconds) the modem allows the carrier signal to be Off before disconnecting the call.

Enter a value from 0–254 in 0.1 second increments. (A value of 255 disables this register.)

Factory setting is **20** (2 seconds).

**Table 4-3**  
**(3 of 15)**  
**Model 3830 S-Registers**

**S12 — Escape Guard Time**

Sets the value (in 20-millisecond increments) for the required pause before and after the escape sequence is issued. The guard time prevents the modem from interpreting data as the escape sequence characters.

Enter a value from 0–255 in 20-millisecond increments. For example, the factory setting of 50 equals 1000 milliseconds or one second. Factory setting is **50** (1 second).

**S18 — Test Timeout**

Sets the duration (in seconds) for the modem tests. This automatically cancels any test in progress after the time of this register expires. Any test can be manually canceled by issuing the escape sequence (+++) followed by the &T0 command.

Enter a value from 0–255 seconds. (A value of 0 disables this register.)

Factory setting is Disable (**0**).

**S26 — RTS-to-CTS Delay**

Sets the length of time (in 10-millisecond increments) the modem waits after receiving RTS before issuing CTS to the DTE.

Enter a value from 0–255.

Factory setting is **0** milliseconds.

**Table 4-3**  
**(4 of 15)**  
**Model 3830 S-Registers**

**S36 — Rate Auto Originate**

Initiates a dial backup call, using the phone number in directory location 1, when the leased-line rate of the modem falls back to or below a certain speed.

Register has the following values:

- 0 = Disable
- 1 = On fallback to 4,800
- 2 = On fallback to 7,200
- 3 = On fallback to 9,600
- 4 = On fallback to 12,000
- 5 = On fallback to 14,400
- 6 = On fallback to 16,800

**NOTE:** Rate Auto-Originate is valid only when V.32 bis Autorate is enabled (S76=0).

**S37 — Auto Redial**

Works in conjunction with the Bad Lines Auto Originate and Rate Auto Originate options. It allows repeated automatic dial backup attempts by specifying the range of Directory Locations that can be tried. The modem must be in Originate mode.

Register has the following values:

- 0 = Use Directory Location 1
- 1 = Use Directory Locations 1–2
- 2 = Use Directory Locations 1–3
- 3 = Use Directory Locations 1–4
- •           •
- •           •
- 9 = Use Directory Locations 1–10

**NOTE:** The modem must be in Originate mode to perform an automatic dial backup.

**Table 4-3**  
**(5 of 15)**  
**Model 3830 S-Registers**

**S39 — Receive Buffer Disconnect Delay**

Determines the maximum amount of time the modem can continue to send data in its Receive Buffer to the DTE after the modem is commanded by the DTE to disconnect, or after the modem detects a line disconnect.

Register has the following values:

0 = Disable (Immediate disconnect)

1 = 1 second

2 = 2 seconds

•                   •  
•                   •

255 = 255 seconds

**S41 — Dial-Line Rate**

Determines the modem's highest data rate and modulation scheme for operation on dial lines.

Register has the following values:

1 = 14,400 (V.32 bis)

2 = 12,000 (V.32 bis)

3 = 9600 (V.32 bis/V.32)

4 = 7200 (V.32 bis)

5 = 4800 (V.32 bis/V.32)

6 = 2400 (V.22 bis)

7 = 1200 (V.22)

8 = 1200 (212A)

10 = 0–300 (V21)

11 = 0–300 (103J)

12 = 1200/75 (V.23)

13 = 75/1200 (V.23)

**20** = 19,200 (V.32*terbo*)

21 = 16,800 (V.32*terbo*)

Factory setting is 19,200 (V.32*terbo*).

**Table 4-3**  
**(6 of 15)**  
**Model 3830 S-Registers**

**S43 — V.32 bis Train**

Register controls the modem's train time for V.32 bis/V.32 mode.

Register has the following values:

**0** = Long (A long train is required for satellite links which have long roundtrip delays.)

**1** = Short

Factory setting is Long.

**S44 — Leased-Line Rate**

Determines the modem's highest data rate and modulation scheme for operation on 2-wire leased lines in either Answer or Originate mode.

Register has the following values:

**0** = 14,400 (V.32 bis)

**1** = 14,400 (V.32 bis)

**2** = 12,000 (V.32 bis)

**3** = 9600 (V.32 bis)

**4** = 7200 (V.32 bis)

**5** = 4800 (V.32 bis)

**6** = 2400 (V.22bis)

**18** = 19,200 (V.32*terbo*)

**19** = 16,800 (V.32*terbo*)

Factory setting is 19,200 (V.32*terbo*).

**S45 — Leased Line Transmit Level**

Level Determines the modem's transmit power output level over leased lines.

Enter a value from 0–15 dBm.

Factory setting is **0** dBm.

**Table 4-3**  
**(7 of 15)**  
**Model 3830 S-Registers**

**S48 — Leased Line Carrier On Level**

Determines if the modem disconnects if the carrier signal on leased lines falls below  $-26$  dBm or  $-43$  dBm.

Register has the following values:

**0** =  $-43$  dBm

**1** =  $-26$  dBm

Factory setting is  $-43$  dBm.

**S49 — Transmit Buffer Disconnect Delay**

Determines the maximum amount of time the modem can continue to send data in its Transmit Buffer to the remote modem after it is commanded by the DTE to disconnect.

Register has the following values:

**0** = Disable (Immediate disconnect)

**1** = 1 second

**2** = 2 seconds

•                   •  
•                   •

**255** = 255 seconds

Factory default is **10** seconds.

**S51 — DTE Remote Loopback (CT140)**

Determines if the modem performs a remote digital loopback if it receives a CT140 signal from the DTE.

Register has the following values:

**0** = Disable

**1** = Enable

Factory setting is Disable.

**Table 4-3**  
**(8 of 15)**  
**Model 3830 S-Registers**

**S52 — DTE Local Loopback (CT141)**

Determines if the modem performs a local analog loopback if it receives a CT141 signal from the DTE.

Register has the following values:

**0** = Disable

**1** = Enable

Factory setting is Disable.

**S55 — Access from Remote**

Determines whether the 3830 modem's configuration options can be accessed by a remote 3800 Series modem via a dial-line or leased-line connection.

**0** = Enable

**1** = Disable

Factory default is Enable.

**S61 — CT111 Rate Control**

Determines if CT111 Rate is disabled, set for Fallback 1 or Fallback 2.

CT111 Rate allows the DTE to control modem rate via Pin 23 of the EIA-232-D interface. This configuration option determines the effect of the DTE Rate Control signal. It is only valid in Async Direct mode and Synchronous mode. For proper operation, disable the V32 bis Autorate (S76) and V32 bis Automode (S78) configuration options.

Register has the following values:

**0** = Disable

**1** = Fallback 1

**2** = Fallback 2

Factory setting is Disable

**Table 4-3**  
**(9 of 15)**  
**Model 3830 S-Registers**

**S62 — V.25 bis Coding**

Identifies to the modem the type of coding used by the DTE while in V.25 bis mode.

Register has the following values:

**0** = ASCII  
**1** = EBCDIC

Factory setting is ASCII.

**S63 — V.25 bis Idle Character**

Identifies to the modem the type of idle fill used by the DTE while in V.25 bis mode.

Register has the following values:

**0** = Mark  
**1** = Flag

Factory setting is Mark.

**S64 — V.25 bis New Line Character**

Identifies to the modem the type of line terminator used by the DTE while in V.25 bis mode.

Register has the following values:

**0** = Carriage Return and Line Feed  
**1** = Carriage Return  
**2** = Line Feed

Factory setting is carriage return and line feed (CR + LF).

**Table 4-3**  
**(10 of 15)**  
**Model 3830 S-Registers**

**S65 — Line Current Disconnect**

Determines if the modem disconnects if an interruption in loop current greater than 8 milliseconds or 90 milliseconds occurs.

Register has the following values:

- 0 = Enable (8 msec)
- 1 = Enable (90 msec)
- 2 = Disable

Factory setting is Enable (8msec).

**S67 — Directory Location 1 Callback**

Determines if the modem uses the single number callback function.

Register has the following values:

- 0 = Disable
- 1 = Enable

Factory setting is Disable.

**S69 — Make Busy Via DTR**

Determines if the modem goes off-hook (busy) when DTR is Off.

Register has the following values:

- 0 = Disable
- 1 = Enable

Factory setting is Disable.

**Table 4-3**  
**(11 of 15)**  
**Model 3830 S-Registers**

**S76 — V.32 bis Autorate (Dial Line)**

Determines if the Autorate function is used on dial lines when connected in V.32 bis mode. Autorate allows the modem to adjust line speed due to noise.

Register has the following values:

- 0 = Enable
- 1 = Disable
- 2 = Start at 4800 bps
- 3 = Start at 9600 bps

Factory setting is Enable.

**S77 — DTR Alarm Reporting**

Register determines whether an alarm is sent to the 6800 Series Network Management System controller when the DTR signal has been Off for more than 10 seconds.

Register has the following values:

- 0 = Disable
- 1 = Enable

**Table 4-3**  
**(12 of 15)**  
**Model 3830 S-Registers**

**S78 — V.32 bis Automode (Dial Line)**

If enabled, automode permits the modem to automatically connect to a remote modem using any supported modulation scheme.

If disabled, the modem only supports the modulation scheme selected by the S41 register (Dial-Line Rate).

If the modem is in a modem pool attached to a System 85 Private Branch Exchange (PBX), S78 should be set to 2. This modifies parameters used during connection to the PBX.

Register has the following values:

- 0 = Enable
- 1 = Disable
- 2 = System 85

Factory setting is Enable.

**S80 — No Data Disconnect Trigger Signal**

Register determines whether Pin 2 (transmit data) or Pin 3 (receive data) of the modem's RS-232 serial interface is monitored so that the modem can disconnect the call if there is no activity for a certain period. (See the \T command.)

Register has the following values:

- 0 = Transmit or Receive
- 1 = Transmit only
- 2 = Receive only
- 3 = Transmit and Receive

Factory setting is 3.

**Table 4-3**  
**(13 of 15)**  
**Model 3830 S-Registers**

**S82 — V.32 bis Autorate (Leased Line)**

Determines if the Autorate function is used on leased lines when connected in V.32 bis mode. Autorate allows the modem to adjust line speed due to noise.

Register has the following values:

- 0 = Enable
- 1 = Disable

Factory setting is Enable.

**S83 — MI/MIC Dialing**

Determines if MI/MIC control leads can be used to force the modem into the originate handshake after first dialing a call.

Register has the following values:

- 0 = Disable
- 1 = Enable

Factory setting is Disable.

**S84 — AT Command Mode**

Determines how the modem responds to valid and invalid AT commands. The selections No ERROR and No Strap or ERROR permit installation into applications that are customized for a different modem.

Register has the following values:

- 0 = Normal.
- 1 = No ERROR. The modem executes all valid commands, ignores invalid commands, and never issues an ERROR message.
- 2 = No Strap or ERROR. The modem ignores all configuration commands, but always issues an OK response message.

Factory setting is Normal.

**Table 4-3**  
**(14 of 15)**  
**Model 3830 S-Registers**

**S85 — Fast Disconnect**

Allows the modem to disconnect immediately after receiving a disconnect command from a local DTE or its own diagnostic control panel.

Register has the following values:

0 = Disable

1 = Enable

Factory setting is Disable.

**S88 — Straps When Disconnected**

Determines if configuration options in the Active (Saved) configuration area are loaded to Active (Operating) when the modem disconnects.

Register has the following values:

0 or 231 = No Change

1 or 232 = Reload

Factory setting is No Change.

**S89 — V.42 ARQ Window Size Increase**

Register allows the V.42 Automatic Request for Transmission (ARQ) window size to be set to a value from 6 to 15 frames to accommodate satellite delays.

Register has the following values:

0 = 6 frames (default)

1 = 7 frames

2 = 8 frames

3 = 9 frames

•           •

•           •

9 = 15 frames

This command applies only to connections made using V.42 bis data compression or V.42 error control.

Factory setting is 6 frames.

**Table 4-3**  
**(15 of 15)**  
**Model 3830 S-Registers**

**S90 — DTE Rate = VF Rate**

Register forces the DTE (computer) data rate to be equal to the VF (telephone line) data rate.

Register has the following values:

**0** = Disable

**1** = Enable

Factory setting is Disable.

**S91 — Cellular Enhancements**

Register determines whether parameters are set to improve performance over a cellular link. Should be enabled when the remote modem is using a cellular connection.

Register has the following values:

**0** = Disable

**1** = Enable

Factory setting is Disable; &F5 and &F6 set S91 to Enable.

**S93 — RJ11 Cellular Adapt**

Register controls support for an RJ11 connection, including generation of the ETC 1.1 Calling Tone during call origination.

**0** = Disable

**1** = Enable

Factory setting is Disable.

---

# Troubleshooting **A**

Overview ..... A-1

## Overview

This appendix points out basic problems that can occur when operating a 3830 modem. Use Tables A-1 through A-5 to check out these problems. If you are having data communication difficulties, such as periodic character loss, random errors, or constant format errors, use the loopback tests associated with the &T command. With these tests you can usually isolate the fault in your system by using the process of elimination. If problems continue to occur, contact your service representative.

**Table A-1  
Modem Health**

<b>Symptom</b>	<b>Action</b>
Modem did not pass power-up self-test	Contact your customer service representative.
Power LED does not light	<p>Make sure the modem's ON/Off switch is in the ON position.</p> <p>Make sure the ac power transformer is connected to the ac power receptacle.</p> <p>If the Power LED does not operate, contact your customer service representative.</p>
A problem is suspected after the power-up self-test	<p>Perform a self-test using the AT&amp;T9 command.</p> <p>Perform a local analog loopback with a Pattern test. If the modem consistently registers errors, contact your customer service representative.</p> <p>If the modem passes the above tests and a problem still exists, then the problem is likely not with your modem.</p>

**Table A-2**  
**Modem – DTE Connection**

<b>Symptom</b>	<b>Action</b>
Modem does not accept or echo back AT commands	<p>Verify that the cable between the Async port of the DTE and the modem is a standard RS-232 cable. If the cable is bad, replace it. (Null modem cables, also known as crossover cables, do not work in this application.)</p> <p>Reload the Async Dial factory configuration area to guarantee that all configuration options are returned to their proper setting. Refer to the <i>Recovering AT Commands</i> section in Chapter 2.</p> <p>Make sure that all AT commands are terminated with a carriage return.</p> <p>Verify that the DTE has a valid character format. Valid format consists of 8 data bits with no parity or 7 data bits with even, odd, mark or space parity.</p> <p>Verify that the DTE's data rate is set to a level supported by the modem (115,200 bps–300 bps).</p> <p>If using a PC, verify that the modem is attached to the correct communications port.</p>

**Table A-3  
(1 of 4)  
Modem – VF Connection**

<b>Symptom</b>	<b>Action</b>
Modem does not receive a dial tone	<p>Attach the telephone directly to the wall outlet to verify that a dial tone exists.</p> <p>Make sure the VF line is connected to the modem's rear jack labeled Dial.</p>
Modem does not go off-hook and answer an incoming call	<p>Verify that the Auto-Answer Ring Count configuration option (S-Register 0) is set to a value other than 0 (disable).</p> <p>Verify that the DTE is providing DTR to the modem.</p> <p>If the DTE does not provide DTR to the modem, verify that the modem's &amp;D command (DTR Action configuration option) is set for Ignore (&amp;D0).</p> <p>Verify that all cables are attached to the correct connectors on the rear of the modem.</p>
Modem goes off-hook, answers, but does not connect	<p>Perform a Local Analog Loopback test and verify that data entered at the DTE is echoed back to the DTE.</p> <p>Verify that the originating modem is compatible.</p> <p>Verify that originating modem recognizes your modem's answer tone.</p>

**Table A-3**  
**(2 of 4)**  
**Modem – VF Connection**

Symptom	Action
Modem goes off-hook, answers, but does not connect (continued)	<p>Verify that originating modem supports your modem's modulation schemes. The 3830 modem recognizes V.32 <i>terbo</i>, CCITT V.32 bis, V.32, V.22 bis, V.22, V.21, Bell 212A, and Bell 103J. The 3800 Series modem does not support other vendors' proprietary modulation schemes.</p> <p>Use the S41 register to force your modem to operate at the same modulation scheme as the originating modem.</p>
Originate Mode	<p>Verify that the modem's DTE Dialer configuration option is set to the correct setting: either AT, DTR Dialing, V.25 bis Async, V.25 bis Bisync, or V.25 bis HDLC.</p>
Modem does not go off-hook and begin dialing	<p>If using AT Dialing, refer to the Table A-2, Modem — DTE Connection.</p> <p>If using DTR Dialing, verify the telephone number stored in directory location 1, and verify that the DTE is raising DTR from Off to ON to initiate a dial.</p> <p>If using V.25 bis Async, verify that the correct character format is set to 7 data bits with even parity and 1 stop bit, and the carriage return and line feed are used as command terminators.</p> <p>If using V.25 bis Bisync, verify that the correct character format uses two synchronous control characters and a start-of-text control character before the text block and an end-of-text control character after the text block.</p>

**Table A-3**  
**(3 of 4)**  
**Modem – VF Connection**

<b>Symptom</b>	<b>Action</b>
Modem does not go off-hook and begin dialing (continued)	If using V.25 bis HDLC, verify that the correct character format uses flag, address, and control characters before the text block and a frame sequence check and flag after the text block.
Modem dials but does not connect	<p>If the modem is operating behind a PBX, verify if a 9 and comma are needed before the telephone number.</p> <p>Verify whether Tone or Pulse dialing is needed.</p> <p>Verify if one modem is configured for Error Control or Disconnect and the other modem is configured for no Error Control. Try calling in Buffer mode.</p> <p>If both modems use V.32 bis or V.32 modulation, set the modem's V.32 bis Train configuration option to Long.</p>
Intermittent disconnects, high error rates, or excessive retransmissions	Use the &T7 command to perform a remote digital loopback test with pattern test.
Modem establishes and disconnects a call	<p>You may have a poor VF connection. Disconnect and dial again.</p> <p>The remote modem may have encountered an EC Disconnect, where the modem is configured to establish a call using error correction.</p> <p>If the modems cannot negotiate EC, then a disconnect occurs.</p>

**Table A-3**  
**(4 of 4)**  
**Modem – VF Connection**

<b>Symptom</b>	<b>Action</b>
Modem establishes and disconnects a call (continued)	The remote modem may be in a forced Error Control mode (disconnect if there is no error control). Reconfigure your modem to V.42/MNP or Buffer and try again.  Perform a Local Analog Loopback test to check the modem's hardware operation.
High error rates occur when running a local loopback or self-test.	Incoming rings can cause data errors during a loopback test. Abort the test, disconnect the modular VF cord, and restart the test.

**Table A-4**  
**Online Operation**

<b>Symptom</b>	<b>Action</b>
Data scrambled or unreadable	Verify that the character format (data bits, parity, and stop bits) is set to the same value in both modems.
Missing data during a transfer	Verify that you are using the same method of flow control for both the modem and the DTE.  If using XON/XOFF flow control, verify that the modem's parity matches the DTE's parity.

**Table A-5**  
**Leased-Line Operation**

<b>Symptom</b>	<b>Action</b>
Modems do not train-up on leased lines	Verify that the correct cabling is used for your application. Refer to Chapter 2 for modem installation instructions.  Verify that one modem is configured for Answer mode and the other is configured for Originate mode.

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# Technical Specifications **B**

Technical Specifications ..... B-1

## Technical Specifications

Table B-1 shows the technical specifications for the Model 3830 modem.

**Table B-1**  
**(1 of 4)**  
**Model 3830 Technical Specifications**

<b>Specifications</b>	<b>Description</b>
<b>APPROVALS</b> (115 Vac, 60 Hz only)	
FCC Part 15	Class A
FCC Part 68	Registration Number: (See label on modem)
UL	Listed to UL 1950
CSA	Certified to CSA C22.2 No. 950
DOC CS-02 and CS-03	Certification Number: (See label on modem)

**Table B-1**  
**(2 of 4)**  
**Model 3830 Technical Specifications**

Specifications	Description
<b>COMPATIBILITY</b>	<p>DIAL-LINE MODULATIONS</p> <p>V.32<i>terbo</i> (19,200, 16,800 bps)            CCITT V.32 bis (14,400, 12,000, 9600, 7200, 4800 bps)            CCITT V.32 (9600, 4800 bps)            CCITT V.22 bis (2400 bps)            CCITT V.22 (1200 bps)            CCITT V.21 (300 bps)            Bell 212A (1200 bps)            Bell 103J (300 bps)</p> <p>LEASED-LINE MODULATIONS</p> <p>V.32<i>terbo</i> (19,200, 16,800 bps)            CCITT V.32 bis (14,400, 12,000, 9600, 7200, 4800 bps)            CCITT V.32 (9600, 4800 bps)</p> <p>FAX MODULATIONS (Optional)</p> <p>CCITT V.17 (14,400, 12,000, 9600, 7200 bps),            CCITT V.29 (9600, 7200 bps)            CCITT V.27 ter (4800, 2400 bps)</p>
<b>ENVIRONMENT</b>	
Operating Temperature	32°F (0°C) to 122°F (50°C)
Relative Humidity	5% to 90% (noncondensing)
Shock and Vibration	Withstands normal shipping
Storage Temperature	-4°F (-20°C) to 158°F (70°C)
<b>DTE INTERFACE</b>	
25-pin D-subminiature connector	EIA-232-D/CCITT V.24
<b>AC POWER REQUIREMENTS</b>	115 Vac ± 10%, 60 Hz 220 – 240 Vac ± 10%, 50 – 60 Hz

**Table B-1**  
**(3 of 4)**  
**Model 3830 Technical Specifications**

Specifications	Description
<b>POWER CONSUMPTION</b>	5.25 watts (typical, including power transformer, speaker off)
<b>DIMENSIONS</b>	
Weight	2.5 pounds (1.14 kg) (not including power transformer)
Height	2.1 inches (5.4 cm)
Width	7.6 inches (19.4 cm)
Depth	12.1 inches (30.8 cm)
<b>TRANSMIT LEVEL</b>	
Dial Line	Permissive (–9 dBm) Programmable (transmit level defined by TELCO)
Leased Line	0 through –15 dBm (in 1 dBm decrements)
<b>TELEPHONE INTERFACE</b>	
Dial-Line Connectivity	RJ11C Permissive RJ45S Programmable
Leased-Line Connectivity	6-pin center pair leased jack (For JM8 connection, refer to Appendix C for JM8 conversion cable pinouts.)
<b>VOICE FREQUENCY LINE REQUIREMENTS</b>	2-wire dial (PSTN) or 2-wire leased line

**Table B-1**  
**(4 of 4)**  
**Model 3830 Technical Specifications**

<b>Specifications</b>	<b>Description</b>
<b>DATA RATES</b>	
Dial Line	19,200, 16,800, 14,400, 12,000, 9600, 7200, 4800, 2400, 1200, or 300–0 bps.
Leased Line	19,200, 16,800, 14,400, 12,000, 9600, 7200, or 4800 bps
Fax	14,400, 12,000, 9600, 7200, 4800, or 2400 bps
DTE	115,200–300 bps
<b>ERROR CONTROL</b>	CCITT V.42 MNP 4-2
<b>DATA COMPRESSION</b>	CCITT V.42 bis MNP Class 5

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# Pin Assignments **C**

EIA-232-D Pin Assignments .....	C-1
VF Connector Pin Assignments .....	C-3

## EIA-232-D Pin Assignments

Table C-1 lists the EIA-232-D pin assignments for the modem.

**Table C-1**  
**(1 of 3)**  
**EIA-232-D Pin Assignments**

RS-232 Pin	Name	EIA Circuit	CCITT	Signal Source	Circuit Function
1	–	AA	101	–	Shield
2	TXD	BA	103	DTE	Transmit Data
3	RXD	BB	104	DCE	Receive Data
4	RTS	CA	105	DTE	Request-to-Send
5	CTS	CB	106	DCE	Clear-to-Send
6	DSR	CC	107	DCE	Data Set Ready
7	SG	AB	102	–	Signal Ground
8	LSD	CF	109	DCE	Line Signal detect

**Table C-1**  
**(2 of 3)**  
**EIA-232-D Pin Assignments**

<b>RS-232 Pin</b>	<b>Name</b>	<b>EIA Circuit</b>	<b>CCITT</b>	<b>Signal Source</b>	<b>Circuit Function</b>
9	+10V	–	–	–	Reserved for test purposes (may be used to drive one RS-232 load)
10	–10V	–	–	–	Reserved for test purposes (may be used to drive one RS-232 load)
11	–	–	–	–	Unassigned
12	CT112	CI	112	DCE	Data Signal Rate Select
13	–	–	–	–	Reserved for future function
14	–	–	–	–	Reserved for future function
15	TXC	DB	114	DCE	Transmit Clock
16	–	–	–	–	Reserved for future function
17	RXC	DD	115	DCE	Receive Clock 18
18	CT141	LL	141	DTE	Local Loopback
20	DTR	CD	108	DTE	Data Terminal Ready
21	CT140	RL	140	DTE	Remote Loopback

**Table C-1**  
**(3 of 3)**  
**EIA-232-D Pin Assignments**

RS-232 Pin	Name	EIA Circuit	CCITT	Signal Source	Circuit Function
22	R1	CE	125	DCE	Ring Indicator
23	CT111	CH	111	DTE	Data Rate Selector
24	XTXC	DA	113	DTE	External Clock
25	TEST	TM	142	DCE	Test Mode

## VF Connector Pin Assignments

For 2-wire leased-line connections to a JM8 network interface, an 8-position to 6-position conversion cable (see Figure C-1) must be used according to the following FCC requirements:

*“The RJ series of jacks should not be used for connecting data equipment to nonswitched private line networks – specifically, the service equivalents of the pre-divestiture Series 3002 (Category II, Tariff #260) service. There is a substantial difference in transmit levels permitted in the private line service and those permitted in the public switched network. The industry standard is now an 8-pin keyed modular jack known as the USOC JM8 (Bellcore Technical Reference: TR-EOP-000242, Issue 1, released May 1985.) When ordering the installation of the USOC JM8, specify the appropriate wiring options:*

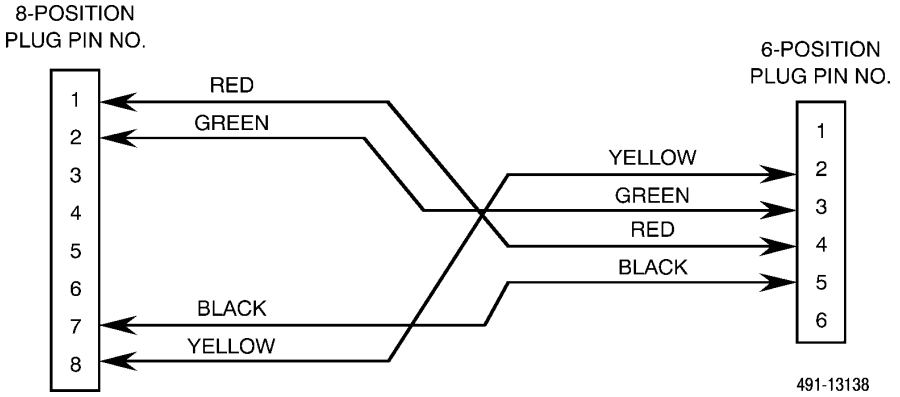
- (1) 2-wire operations*
- (2) 4-wire operations w/o TEK leads*
- (3) 4-wire operations with TEK leads*

*TEK leads are for loopback purposes.*

*A 50-pin version is being considered for multiple line connections.”*

The Model 3830 provides the 2-wire leased-line signals on the same leads used for Tip and Ring when in Dial mode. To connect the modem to a standard JM8 leased-line jack, a conversion cable (125-0054-1531) must be used. Note that for 2-wire leased-line operation, the yellow and black leads are not used.

The wiring of this cable is illustrated in Figure C-1.



**Figure C-1. Wiring Diagram – 8-Position to 6-Position Conversion Cable**

Table C-2 illustrates the connector pin assignments for Model 3830 modular jacks as well as the pin assignments for the leased-line jacks.

**Table C-2**  
**VF Connector Pin Assignments for Leased Lines**

Connector Pin No. 6-pin/8-pin		Model 3830 Phone Connector (J6)	Model 3830 Line Connector (J7)	Type Of Leased-Line Jack	
				JM8	6-pin Center Pair Leased
	1	–	–	Ring 1	Not Used
1	2	–	–	Tip 1	Not Used
2	3	–	Mode Indication	Loopback Indication	Tip 1
3	4	Phone-Ring	2-wire leased line/Dial-Ring	Not Used	Ring
4	5	Phone-Tip	2-wire leased line/Dial-Tip	Not Used	Tip
5	6	–	Mode Indication Common	Loopback Indication	Ring 1
6	7	–	Program Resistor	Tip	Not Used
	8	–	Program Resistor Common	Ring	Not Used

The feature/part number for an 8-position to 6-position conversion modular cord is 125-0054-1531.

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# CCITT V.25 bis Dialing Commands and Response **D**

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## Overview

CCITT V.25 bis is an international dialing protocol that permits direct and stored number dialing using DTEs in either Asynchronous, Bisynchronous, or HDLC operating mode. The Model 3830 modem supports V.25 bis request and answer commands that initiate and cancel dialing, program commands that allow you to create and enter telephone numbers to memory, and list commands that display all telephone numbers stored in directory locations. As commands are entered from the DTE, the 3800 Series modems issue a response to the DTE which indicates if the call failed or connected, or if the command is valid or invalid.

The following section discusses those V.25 bis commands supported by the Model 3830 modem and the responses to those commands. Tables D-1 and D-2 in the *Command Response* section list the V.25 bis command and response and the analogous AT command.

**NOTE**

The Model 3830 modem must be configured for V.25 bis dialing. Refer to the &M or &Q commands listed in Chapter 4.

**NOTE**

The character format for Asynchronous Dialing mode is 7 data bits, even parity, and 1 stop bit.

The character format for Bisynchronous Dialing mode is 7 data bits, odd parity, and 1 stop bit.

The character format for HDLC Dialing mode can be 8 data bits, no parity, and 1 stop bit; 7 data bits, odd parity, and 1 stop bit; or 7 data bits, even parity, and 1 stop bit.

Character format is determined by the DTE. The modem detects this format when an AT prefix is entered from the DTE.

## Call Request Commands

Call Request commands are issued from the DTE to the modem and are responsible for initiating any dial calls. Call Request commands include Call Request with Number Provided (CRN), Call Request with Stored Memory Address Provided (CRS).

## Call Request with Number Provided (CRN)

The CRN command dials the telephone number entered from the DTE. CRN is similar to the ATD command.

The CRN command format is:

*CRNn*

**Where:** *n* is the dial string. The following characters are permitted:

<b>T</b>	DTMF Dialing
<b>P</b>	Pulse Dialing
<b>0–9</b>	DTMF Tones or Pulse Dialed Digits
<b>* # A B C D</b>	DTMF Tones
<b>R</b>	Reverse Dial
<b>:</b>	Wait for Dial Tone
<b>, or &lt;</b>	User-Defined Pause
<b>&amp;</b>	Flash Hook
<b>= or &gt;</b>	Delimiters

## Call Request with Stored Memory Address Provided (CRS)

The CRS command dials the telephone number stored in the request directory location. CRS is similar to the ATDS command.

The CRS command format is:

*CRSx*

**Where:** *x* is directory location 1–10.

The modem responds to the command with either a VAL (valid) or INV (invalid) response followed by a call progress report such as connect (CNX) or failure (CFI).

## Call Response

A Call Response indicates if the command was accepted by the modem. Call Response includes Call Failure Indication (CFI) and Call Connecting (CNX).

## Call Failure Indication (CFI)

The CFI response is issued to the DTE if the modem fails a CRN or CRS command. CFI is similar to the AT result codes BUSY, NO ANSWER, NO CARRIER, NO DIALTONE, and ERROR.

The CFI response format is:

*CFIxx*

**Where:** *xx* is

<b>ET</b>	Engaged tone
<b>NS</b>	Number not stored
<b>CB</b>	Local DCE busy
<b>RT</b>	Time-out on ring tone
<b>AB</b>	Abort call on time-out
<b>NT</b>	Answer tone not detected
<b>FC</b>	Forbidden call

ET is similar to the Call Failure Messages Busy Signal and Trunk Busy and the result code BUSY.

NS is similar to the Common Operational Message Invalid Number and the result code ERROR.

CB is similar to the Call Failure Messages Dial Line in Use and No Dial-Test and the result code ERROR.

RT is similar to the Call Failure Message No Answer Tone and the result code NO CARRIER.

AB is similar to the Call Failure Messages No Dial Tone and No Dial-DTR and the result code NO DIALTONE and ERROR.

NT is similar to the Call Failure Message No Quiet Answer and the result code NO ANSWER.

## Call Connecting (CNX)

The CNX response informs the DTE that the modem has connected to the remote modem. CNX is similar to the AT result code CONNECT.

The CNX response format is CNX.

## Call Answer Commands

Call Answer commands disable or enable the modem's AutoAnswer function. These commands are issued from the DTE. Call Answer commands include Incoming Call (INC), Disregard Incoming Call (DIC) and Connect Incoming Call (CIC).

### Incoming Call (INC)

The INC response informs the DTE that the modem has detected a ring tone. At this point, the DTE can issue the DIC command to disable the modem from answering the call. INC is similar to the AT result code RING.

### Disregard Incoming Call (DIC)

The DIC command prevents the modem from answering an incoming call. This command is only valid once the DTE receives an incoming call (INC) response from the modem. A DIC must be issued within 5 seconds after receiving an INC.

The DIC command format is DIC.

If DIC is issued within 5 seconds, the modem sends the VAL response to the DTE. If DIC is issued after 5 seconds, INV is returned.

### Connect Incoming Call (CIC)

The CIC command forces the modem to cancel any DIC commands and answer an incoming call. This command is only valid when the DTE issues a DIC command. CIC must be issued within 10 seconds after sending a DIC. CIC is similar to the ATA command.

The CIC command format is CIC.

If CIC is issued within 10 seconds, the modem sends the VAL response to the DTE. If CIC is issued after 10 seconds, INV is returned.

## Program Normal (PRN)

The Program Normal (PRN) command allows the DTE to enter and store a telephone number to a specific directory location. PRN is similar to the AT&Z command.

The PRN command format is:

PRNx;n

**Where:** *x* is the directory location 1–10;  
*n* is the telephone number.

## Request List of Stored Numbers (RLN)

The Request List of Stored Numbers (RLN) command displays telephone numbers stored in the modem's directory location. If the RLN command is entered without specifying a directory location, then all directory locations and telephone numbers are displayed. If a directory location is entered, then only that telephone number is displayed.

The RLN command format is:

RLN

which displays all directory locations, or:

RLNx

**Where:** *x* is a directory location.

## List Stored Number Response (LSN)

LSN is a response to an RLN command issued by the DTE. If a directory location is specified, then the telephone number for that location is displayed. If no directory location is specified, then all telephone numbers stored in memory are displayed.

The LSN response format is:

LSNx;n

**Where:** *x* is the directory location.  
*n* is the telephone number.

## Command Response

A Command Response indicates that the command entered was a valid or invalid entry. Command Response includes Valid (VAL) and Invalid (INV).

### Valid (VAL)

The VAL response indicates that the modem has accepted the V.25 bis command issued by the DTE. VAL is similar to the AT result code OK.

### Invalid (INV)

The INV response indicates that the modem has received an incorrect V.25 bis command from the DTE. INV is similar to the AT result code ERROR.

The INV response format is:

INV $_{xx}$

**Where:**  $_{xx}$  is

**CU** command unknown  
**MS** message syntax error  
**PS** parameter syntax error  
**PV** parameter value error

Table D-1 lists V.25 bis commands supported by the Model 3830 modem.

**Table D-1  
V.25 bis Commands**

<b>V.25 bis Command</b>	<b>Description</b>	<b>AT Command/ S-Register Equivalent</b>
<b>CALL REQUEST COMMANDS</b>		
CRN	Call Request with Number Provided	ATD
CRS	Call Request with Memory Address	ATDS
<b>CALL ANSWER COMMANDS</b>		
INC	Incoming Call Indication	RING
DIC	Disregard Incoming Call	NONE
CIC	Connect Incoming Call	ATA
<b>PROGRAM COMMAND</b>		
PRN	Program Normal	AT&Z
<b>LIST REQUEST</b>		
RLN	Request to List Stored Number	NONE

Table D-2 lists V.25 bis response messages supported by the Model 3830 modem.

**Table D-2**  
**V.25 bis Response Messages**

<b>V.25 bis Command</b>	<b>Description</b>	<b>AT Command/Result Code Equivalent</b>
<b>CALL RESPONSE</b>		
CFI	Call Failure Indication	BUSY, NO ANSWER, NO CARRIER, NO DIAL TONE, ERROR
CNX	Call Connecting Indication	CONNECT
<b>LIST RESPONSE</b>		
LSN	List Stored Number	NONE
<b>COMMAND RESPONSE</b>		
VAL	Valid Command	OK
INV	Invalid Command	ERROR

---

# Glossary

<b>Active (Operating)</b>	A configuration area containing configuration options currently in use by the modem. When a power cycle occurs, a reset is performed, or a save is issued, this area is updated with the contents of Active (Saved).
<b>Active (Saved)</b>	A nonvolatile configuration area containing the most recently saved configuration options. Any changes made to configuration options can be saved by issuing an AT&W0 command.
<b>analog loop</b>	See local analog loop.
<b>analog signal</b>	A signal, such as a voice, that varies continuously.
<b>Answer mode</b>	The modem is in a state where it is ready to receive an incoming call. For example, an ATA (Answer) command has been issued to place the modem into online answer mode. The modem has been forced off-hook and is generating an answer tone, beginning the handshaking process with the calling modem.
<b>ASCII</b>	This code (American Standard Code for Information Interchange) is a 7-bit code which establishes compatibility between data services. ASCII is the standard for data transmission over telephone lines. The ASCII code consists of 32 control characters (nondisplayed) and 96 displayed characters.
<b>Async Dial</b>	A factory preset configuration area containing the configuration options most often used in asynchronous dial networks.

<b>asynchronous transmission</b>	A data transmission that is synchronized by a transmission start bit at the beginning of a character (five to eight bits) and one or more stop bits at the end.
<b>AT command set</b>	A group of commands, issued from an asynchronous DTE, that allow control of the modem while in Command mode. All commands must begin with the characters AT and end with a carriage return.
<b>AT prefix</b>	A prefix issued before every AT command (except A/ and +++) which identifies the DTE's data rate, parity, and character length.
<b>autobaud</b>	Modem automatically determines the asynchronous DTE data rate when using AT commands.
<b>automatic answer</b>	A capability to respond to a call received over a dial line.
<b>baud</b>	A unit of signaling speed that is equal to the number of symbols per second. This is not necessarily the same as bits per second, although the terms are frequently interchanged.
<b>Bisync</b>	Binary Synchronous Communications. An IBM® communications protocol that has become an industry standard. It uses a defined set of control characters and control character sequences for synchronized transmission of binary-coded data between stations in a data communications system.
<b>bit</b>	A contraction of binary digit. A bit, which is the smallest unit of information, represents a one or a zero (sometimes called mark or space).
<b>bps</b>	Bits per second. Indicates the speed at which bits are transmitted across a data connection.

<b>buffer</b>	A storage device used to compensate for differences in the data flow rate when transmitting data from one device to another.
<b>byte</b>	A sequence of successive bits (usually eight) handled as a unit in data transmission.
<b>CCITT</b>	An advisory committee (Consultative Committee on International Telephone and Telegraph) established by the United Nations to recommend communications standards and policies.
<b>CCITT V.17</b>	A fax communications standard for modems operating half-duplex with synchronous data at 14,400 bps.
<b>CCITT V.22</b>	A standard for modems operation full-duplex with asynchronous or synchronous data at 1200 bps over the dial network (PSTN).
<b>CCITT V.22 bis</b>	A standard for modems operating full-duplex with asynchronous or synchronous data at 1200 or 2400 bps over the dial network (PSTN).
<b>CCITT V.25 bis</b>	A dialing protocol that permits direct and stored-number dialing in asynchronous, bisynchronous, or HDLC modes.
<b>CCITT V.27 ter</b>	A fax communications standard for modems operating half-duplex with synchronous data at 2400 and 4800 bps.
<b>CCITT V.29</b>	A fax communications standard for modems operating half-duplex with synchronous data at 7200 and 9600 bps.
<b>CCITT V.32</b>	A standard for modems operating full-duplex with asynchronous or synchronous data at 4800 or 9600 bps on switched (dial) or leased telephone lines.

<b>CCITT V.32 bis</b>	A standard for modems operating full-duplex with asynchronous or synchronous data over dial networks (PSTN) or leased lines at 14,400, 12,000, 9600, 7200, or 4800 bps.
<b>CCITT V.42</b>	CCITT standard for error control protocol.
<b>CCITT V.42 bis</b>	CCITT standard for data compression.
<b>CCITT V.54</b>	CCITT standard for local and remote diagnostic loopback tests.
<b>character</b>	A letter, figure, number, punctuation, or other symbols.
<b>character echo</b>	A way to check the accuracy of data transmission by sending (displaying) all the characters being transmitted to the monitor.
<b>Class 1 fax</b>	A fax modem standard. Under Class 1 computer software handles most of the protocol, compression, and conversion tasks.
<b>Class 2 fax</b>	A fax modem standard. Under Class 2 the modem handles most of the protocol, compression, and conversion tasks as well as modulation, leaving the computer free for other work.
<b>command line</b>	Contains the command(s) instructing the modem to perform a function. Command lines begin with the AT prefix (unless disabled), and are executed when you press the Return key.
<b>Command mode</b>	One of two general modem operating modes. When in Command mode, the modem accepts commands instead of transmitting or receiving data.
<b>configuration option</b>	Modem software that sets specific operating parameters for the modem. Sometimes referred to as straps.
<b>connector</b>	An outlet on equipment and cables that provides a connection.

<b>CSA</b>	Canadian Standards Association.
<b>CTS</b>	Clear-to-Send. A signal indicating that the modem is ready for the DTE to transmit data.
<b>Customer 1</b>	A user-defined configuration area containing customized configuration options for a specific application.
<b>Customer 2</b>	A user-defined configuration area containing customized configuration options for a specific application.
<b>data carrier</b>	A continuous frequency signal that can be modulated by another signal that contains information to be transmitted.
<b>data compression</b>	The elimination of empty fields, redundancies, and gaps in order to reduce storage capacity needs and the amount of data to be transmitted. Anything that is eliminated is restored after the data is received.
<b>Data mode</b>	One of two general modem operating modes. When in Data mode, the modem transmits and receives data instead of accepting commands.
<b>DB-25 connector</b>	A 25-pin connector that is used to connect a cable which enables communications between two devices.
<b>dBm</b>	A decibel referenced to one milliwatt. This unit measures relative signal power.
<b>DCE</b>	The equipment (Data Communications Equipment or Data Circuit Terminating Equipment) that provides the functions required to establish, maintain, and end a connection. This equipment also provides the signal conversion required for communication between the DTE and the telephone line. A modem is a DCE.
<b>demodulation</b>	The process of recovering data from a modulated carrier wave.

<b>dial command modifiers</b>	A modifier used in the dial string that instructs the modem how to process a dialed telephone number.
<b>dial line</b>	A communications circuit that is established by a switched circuit connection in the dial network.
<b>dial network</b>	See PSTN.
<b>dial string</b>	A series of characters that consists of numbers and modifiers used to dial a telephone number.
<b>digital signal</b>	A signal composed of only two discrete values, representing the binary digits 0 and 1.
<b>directory location</b>	Nonvolatile memory that stores up to ten telephone numbers. Each directory location can have up to 40 characters entered.
<b>DOC</b>	Canadian Department of Communication.
<b>download</b>	A process that transfers modem firmware from a locally attached PC to a modem or allows the cloning of firmware from a local modem to a remote modem. Also, the process of moving data from a host computer to an attached computer.
<b>DTE</b>	The equipment (Data Terminal Equipment), such as a computer or terminal, that provides data in the form of digital signals.
<b>EIA</b>	Electronic Industries Association. This organization provides standards for the data communications industry.
<b>EIA-232-D</b>	An Electronic Industries Association's standard defining the 25-position interface between data terminal equipment and data communications equipment.
<b>EIA RS-366-A</b>	An Electronic Industries Association's standard defining the 25-position interface between data terminal equipment and data communications automatic calling equipment.

<b>EPROM</b>	Erasable programmable read-only memory.
<b>error control</b>	An algorithm used to correct data transmission errors.
<b>escape sequence</b>	Default setting is +++. This sequence lets you switch your modem from Data mode to Command mode.
<b>extended result codes</b>	An asynchronous message (in either numbers or words) that includes VF data rate and error control information the modem sends to the DTE after executing or trying to execute a command.
<b>fax modem</b>	A modem capable of emulating some features of a fax machine. Working under the control of fax software, a fax modem can communicate with a fax machine or with another fax modem.
<b>fax software</b>	A program or system of programs installed on a computer that allow a fax modem to send and receive facsimile images.
<b>FCC</b>	Federal Communications Commission. Board of Commissioners that regulates all interstate and foreign electrical communication systems that originate from the United States.
<b>full-duplex</b>	Simultaneous, two-way communications.
<b>Group III</b>	A fax standard that specifies a rate of transmission of about one page per minute.
<b>half-duplex</b>	Two-way data communications allowed in only one direction at a time.
<b>handshaking</b>	The exchange of predetermined codes and signals (tones) to establish a connection between two modems.
<b>host</b>	A computer attached to a network that shares its information and devices with the rest of the network.

<b>HDLC</b>	High-Level Data Link Control. A communications protocol defined by ISO.
<b>Hz</b>	A unit of frequency (hertz) that equals one cycle per second.
<b>JM8</b>	A jack used for leased-line networks. Pins 1 and 2 are the transmit pair and Pins 7 and 8 are the receive pair.
<b>leased line</b>	A private line connection exclusively for the user. No dialing is necessary.
<b>LED</b>	Light-Emitting Diode. A light or status indicator on the DCP that glows in response to the presence of a certain condition (e.g., Alrm).
<b>local analog loopback</b>	The modem's transmit VF signal is looped to its receiver.
<b>long space disconnect</b>	A disconnect can occur if the modem receives an extended space from a remote modem; for example, when a remote modem is commanded to disconnect, it transmits a continuous space to the modem before disconnecting.
<b>loopback test</b>	Any test that verifies a device's integrity by connecting the device's output of one direction to the device's input of the other direction, then checking the received signal for errors.
<b>LSD</b>	Line Signal Detect. A signal between the DTE and modem indicating energy exists on the transmission circuit.
<b>MNP</b>	This protocol (Microcom Networking Protocol) detects and corrects data errors caused by telephone line noise and signal distortion. MNP5 includes data compression.
<b>modem</b>	(Modulator/DEModulator). A device that transforms signals from digital to analog form and vice versa.

<b>modulation</b>	The process of varying some characteristics (usually amplitude, frequency, and/or phase) of a carrier wave to form data transmissions.
<b>off-hook</b>	A telephone or modem is being used.
<b>on-hook</b>	A telephone or modem is not being used.
<b>Originate mode</b>	The modem is in a state where it is ready to transmit a call. In a dial network, it is the modem that makes the call. In a leased-line network, it is one of two sides of the network that is selected to be the originating modem.
<b>parity</b>	A way of checking data accuracy by counting the number of bits that have a value of one.
<b>PBX</b>	Telephone switching equipment (Private Branch Exchange) dedicated to one customer. A PBX connects private telephones to each other and to the public dial network.
<b>permissive interface</b>	A dial modem operating mode characterized by a fixed output power level of $-9$ dBm. It is one of two possible modes of operation for modems connected to dial lines (see programmable interface).
<b>power-up self-test</b>	A test that checks most hardware components when the modem is powered-on.
<b>programmable interface</b>	A dial modem operating mode characterized by an output power level ( $-12$ to $0$ dBm) set by a programming resistor in the jack. It is one of two possible modes of operation for modems connected to dial lines (see permissive interface).
<b>product code</b>	A three-digit code indicating the modem's highest VF data rate.
<b>protocol</b>	The rules for timing, format, error control, and flow control during data transmission.

<b>PSTN</b>	Public Switched Telephone Network. A network shared among many users who can use telephones to establish connections between two points. Also known as dial network.
<b>pulse dialing</b>	One of two dialing methods, in which telephone numbers are sent as pulses (brief changes in voltage or current intensity) across the telephone line. Rotary telephones use pulse dialing.
<b>register</b>	A part of the modem's memory that contains values that determine the modem's operating characteristics.
<b>remote loopback</b>	A test that sends a signal to the remote modem to test the local modem, the remote modem, and the circuit between them.
<b>result code</b>	An asynchronous message (in either numbers or words) that the modem sends to the DTE after executing or trying to execute a command.
<b>RJ11</b>	A type of 6-position jack normally used with permissive dial networks and telephone sets.
<b>rotary</b>	A TELCO service whereby multiple lines to a customer premise share a common telephone number.
<b>S-Registers</b>	Registers that contains information affecting the modem parameters. All S-Registers must be preceded by the AT prefix.
<b>serial transmission</b>	A way of transmitting data in which bits are sent sequentially one at a time.
<b>Sync Dial</b>	A factory preset configuration area containing configuration options most often used in synchronous dial networks.
<b>synchronous transmission</b>	Data transmission that is synchronized by timing signals. Characters are sent at a fixed rate. This type of transmission is more efficient than asynchronous transmission.

<b>tone dialing</b>	One of two dialing methods, in which telephone numbers are sent as tones across the telephone lines.
<b>training</b>	A process where two modems try to establish a connection over the VF line.
<b>UL</b>	Underwriter's Laboratories, Inc.
<b>UNIX Dial</b>	A factory preset configuration area containing the configuration options most often used in a UNIX® dial network.
<b>USOC</b>	Universal Service Ordering Codes.
<b>VF</b>	Voice Frequency. The part of the audio frequency range used to transmit voice sound (usually 300 Hz to 3400 Hz). This band is used by the modem for its modulated signal.
<b>XOFF</b>	A character that tells the DTE or modem to stop transmitting data.
<b>XON</b>	A character that tells the DTE or modem to start or resume transmitting data.

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