IBM

7855 Modem Model 10

GA33-0160-1

Guide to Operation

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Note

Before using this information and the product it supports, be sure to read:

- The general safety information and country specific regulatory agency material on pages xvii to xxiv
- The general information under "Special Notices" on page xxv.

Second Edition (April 1991)

Changes are made periodically to the information herein; any such changes will be reported in subsequent revisions and Technical Newsletters.

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About This Book

This book is for users of the IBM 7855-10 modem and contains the information you need to install, test, and operate the modem.

It is organized in parts, broadly by task, as follows:

- Part 1, "Description and Planning"
- Part 2, "Installation and Configuration"
- Part 3, "Operation"
- Part 4, "Problem Determination and Testing"
- Part 5, "Reference Information."

The contents for each part is the same color as this page.

Also, at the back of this book there is a list of abbreviations, a glossary, and an index. After the index are fold-outs displaying the complete configuration tree (see Part 7, "7855-10 Configuration Tree").

How to Use This Book

If...	
modems are new to you or if you will be using your modem in an unfamiliar way...	Start by reading the tutorial material in Chapter 2, "Basic Concepts and Terminology" to familiarize yourself with the concepts and terminology used in this book. Then you should read Chapter 1, "Introduction" and perhaps browse Chapter 8, "Basic Modem Operation" or Chapter 9, "Advanced Modem Operation" to understand what the IBM 7855-10 modem can help you accomplish. After that, you may want to return here or perhaps go to Chapter 4, "Installing Your Modem" to start installing the modem.
you are ready to install the modem...	Chapter 4, "Installing Your Modem" (on colored pages) will guide you.
the modem is installed, but...	If the modem is newly installed and end-to-end data flow is not working, usually one or more of the modem's configuration options needs to be changed to match the needs of the environment. Read Chapter 5, "Knowing Your Communication System" first and then browse Chapter 8, "Basic Modem Operation." If those two chapters do not provide an answer, read Chapter 6, "Configuration" to get a detailed description of the configuration menu structure.
you want to understand the modem's front panel messages...	There are two types of front panel message. For messages that appear while you are configuring the modem, see Chapter 15, "LCD Messages." For messages that appear during normal operation of the modem, see "Operational Messages" on page 7-2.
you want to test the modem...	See "Checking Out the Modem" on page 4-3 for a step-by-step procedure for testing the modem if it is being used for switched network operation. For a more complete test procedure that includes nonswitched operation, see Chapter 10, "Problem Determination." If you have a specific test in mind, see Chapter 11, "Diagnostic Tests."
you want to locate a specific modem function (for example, "reset") in this book...	Check the index, "Where to Find the Basic Configuration Parameters" on page 6-28 or "AT Commands Grouped by Operation" on page 12-60.

Terms Used in This Book

A list of abbreviations and glossary are provided at the back of this book.

On the modem, and therefore in this book:

Public switched telephone network (PSTN) and *public switched network (PSN)* are used to mean *any* switched network connection.

Leased line (LL) is used to mean *any* nonswitched line.

Related Publications

IBM Signal Converters: Power Supply and Telecommunication Connections, GA33-0054

IBM Telecommunication Products Safety Handbook, GA33-0126

NCP, SSP, and EP Resource Definition Guide, SC30-3447 (for NCP V5 or later)

NetView Operation, SC31-6019.

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General Safety

According to country requirements this product is equipped with an approved plug. For your safety this plug must be used in a properly grounded wall socket.

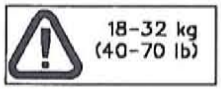
In addition, there are certain elementary safety principles that must be observed when installing and connecting products in a customer site. Refer to the *IBM Telecommunication Products Safety Handbook*, GA33-0126, for complete information if you are outside the USA. If you are in the USA, refer to the following guidelines.

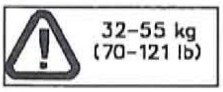
Handling Safety

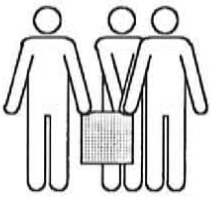
Guidelines

- Be careful, do not lift heavy loads without assistance.
- Products with casters are built to move on a smooth surface, without any obstacles.
- Do not use a ramp inclined at more than 10° (degrees).

Lifting and Carrying







Electrical Safety

Guidelines

- Electrical tasks must be performed by qualified personnel.
- Do not work alone under hazardous conditions.
- Locate the emergency power-off switch, or for small products the power plug. Someone must be there to turn OFF the power or unplug the power plug if it should become necessary.
- Check that the power cord, plug, and socket are in good condition.
- Make sure that all power has been removed from the product before operating on major components.
  - Unplug the power supply cord or have the supply disconnected from the branch circuit by qualified personnel.
  - Be aware that some IBM equipment may be powered from another source or by a remote control. Set the equipment to local mode where possible.
- Do not handle any kind of metallic connector before the power has been removed as previously indicated.
- Use one hand, whenever possible, to connect or disconnect signal cables to avoid a possible shock from touching two surfaces with different electrical grounds.

Ground Checking

For safety and proper machine operation:

- If the power cable has a plug with a ground pin[1] or contact, it must be connected to a socket outlet with a protective grounding contact.
- If the power cable is equipped with a green-yellow (Protective Earthing) conductor, it must be either:
  - Fitted with a plug having a ground pin or contact, or
  - Properly and permanently connected to the mains supply, including its associated protective conductor.

In addition, equipment to which the product will be connected must be properly grounded.

CAUTION:

Qualified electrical personnel must check for the lack of potentially hazardous voltages on the ground shield of cables, and on the product frame.

1 If the plug is not one of the national standard plugs proposed in the *Power Supply and Telecommunication Connections for IBM Modems*, GA33-0054.

Lightning Protection

CAUTION:

Avoid installation or reconfiguration work during lightning activity.

Lightning protection must be installed on the customer's side of the power source if either:

- The utility company installs lightning protectors on their side of the power source, or
- The area is subject to electrical storms or equivalent power surges.

Ask your electrician whether lightning protection is needed for your power distribution system.

Connection and Disconnection of Devices

Electrical current from power, telephone, and signal cables is potentially hazardous. Connect and disconnect cables as follows when installing, moving, or opening the covers of attached devices.

To Connect: Turn everything OFF (including the branch circuit switch). Then connect in the following sequence:

1. All cables at the device
2. The remote end of the signal cables[2]
3. The power cable at the outlet.

Then turn the branch circuit switch ON and set the device ON.

To Disconnect: Turn everything OFF (including the branch circuit switch). Then disconnect in the following sequence:

1. The power cable at the outlet[3]
2. The remote end of the signal cables
3. All cables at the device.

---

[2] In the UK, by law, the telephone line cable must be connected after the power cable.

[3] In the UK, by law, the power cable must be disconnected after the telephone line cable.

Country Specific Rules

Notice for USA

Federal Communications Commission Radio Frequency Interference Statement

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

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

Properly shielded and grounded cables and connectors (IBM part number 1502067 or its equivalent) must be used for connection to Data Terminal Equipment in order to meet FCC emission limits. Proper cables are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables or by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

FCC and Telephone Company Requirements

The IBM 7855-10 is registered with the Federal Communications Commission (FCC). Before installing the modem on a switched telephone line, be aware that:

- The modem must not be connected to a party line or to a coin-operated telephone.
- No field repair or adjustments are permitted to the modem. Field repair is limited to exchange of the modem. All repairs to the modem must be done by the manufacturer. When a problem is determined to be in or caused by the modem, the modem must be immediately disconnected from the switched telephone line.
- Part 68 of FCC regulations states that, under certain circumstances, the telephone company may temporarily stop service and make changes in the facilities and service that may affect the operation of the user's equipment; however, the user shall be given adequate notice in writing to allow the user to maintain uninterrupted service.

- The telephone company must be notified that an FCC-registered device is being installed. The FCC registration number is AMQUSA-61269-MD-E and the ringer equivalence number is 0.8B.

Notice for Canada

Canadian Department of Communication Statement

For Canada, the *Canadian Department of Communication Statement*, GX27-3884, applies.

Notice for Japan

Voluntary Control Counsel for Interference (VCCI) Statement

This equipment is Class 2 Equipment (information equipment to be used in and around residential districts) which is in conformance with the standard set by Voluntary Control Counsel for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines with an aim to prevent radio interference in residential districts.

This equipment could cause interference to radio and television receivers.

Please handle the equipment properly according to this instruction manual.

Notice for UK

Telecommunications Safety Requirements

This IBM product is made to high safety standards. It complies inherently with telecommunications safety standard BS 6301. However, it is not designed to provide protection from excessive voltages appearing externally on its interfaces. The DTE socket is labelled as follows.

Warning: CONNECT ONLY APPARATUS COMPLYING WITH BS6301 TO THIS PORT.

Interconnection directly, of by way of other apparatus, of ports of this apparatus and ports not marked as above may produce hazardous conditions on the PTO network. Advice should be obtained from a competent engineer before making such a connection.

The safety earth of this modem is routed through the power cord. Therefore you MUST remove the plug(s) of the telecommunication cable(s) from the wall socket(s) before disconnecting the power cord. You must always use a plug connection to the wall socket(s); the telecommunication cable(s) must not be hard wired.

The approval of this modem for connection to P.T.O. Public Switched Telephone Networks and Private Speechband circuits is INVALIDATED if the apparatus is subject to any modification in any material way not authorised by BABT or it is used with, or connected to:

1. Internal software that has not been formally accepted by BABT
2. External control software or external control apparatus which causes the operation of the modem or associated call set-up equipment to contravene

the requirements of the standards set out in BABT/SITS/82/005S/D and BABT/SITS/82/01/C.

All apparatus connected to this modem and thereby connected directly or indirectly to P.T.O. Public Switched Telephone Networks and Private Speechband circuits must be approved apparatus as defined in section 22(10) of the British Telecommunications Act 1984.

Connections to the Line(s)

This modem may be used on point to point private speechband circuits and may also be connected to a direct exchange line, suitable for a 2 wire connection.

It is also approved for connection to a Relevant Branch System for a PSTN line which is connected to a direct exchange line. Please refer to BS6789 section 6.1 1986 clause 2.4 for a definition of a Relevant Branch System.

The connection to the PTO private circuit is via a BS6312 plug, with the transmit A and B wires on pins 1 and 6 respectively and the receive A and B wires on pins 2 and 5.

The connection to the PTO switched circuit is via an approved line jack unit (LJU) which plugs directly into an exchange line master socket. The A and B wires of the LJU are connected to pins 2 and 5 respectively. A standard telephone instrument can then be plugged into the back of the LJU.

The ringer equivalence number (REN) of this modem is 3. The REN is a guide to the maximum number of items of apparatus that should be connected simultaneously to an exclusive exchange line. To determine the maximum number of items of apparatus that can be connected simultaneously; the total REN, obtained by summing the REN values of each piece of apparatus simultaneously connected to an exclusive line, should not exceed the maximum REN value, which is 4. A telephone instrument usually has a REN value of 1, therefore only one instrument with a REN of 1 can be simultaneously connected with this modem to the exclusive exchange line. This telephone instrument, if connected, must be connected via the supplied line jack unit (LJU) and **not** via any other parallel-connected socket or adapter.

When a simple telephone is used in association with this modem, difficulties may occasionally be experienced when making calls. Such difficulties may include:

- Difficulties in making calls
- Problems in telephone conversation being experienced by both parties to the call.

Users are warned that while operation may be possible initially, changes to or modernisation of the network taking place in the normal course of events may result in the apparatus being connected to a network service with which it was not designed to be compatible. Failure of the apparatus to work under these circumstances may not be the responsibility of the network operator. Users are further advised to consult IBM, not the network operator, if such difficulties are experienced.

We advise the user that, after entering telephone number(s) via the attached DTE, for the autodial function, he should ensure that all entries have been made

correctly. Loss of power to the modem will not reset the stored telephone number(s).

In no circumstance should this modem be connected to exchange lines listed in telephone directories issued by British Telecom.

This modem, when used in Switched Network mode, must only be used on PSTN lines on which facilities for loop disconnect or multifrequency tone signalling are provided.

This modem is not suitable for connection as an extension to a payphone, to 1 + carrier systems, or to shared service facilities.

This modem is not intended for use on speechband circuits with signalling at a nominal frequency of 2280 Hz, nor does it require signalling or otherwise employ the frequency range d.c. to 200 Hz. No D.C. interaction between this modem and the speechband circuit is intended.

This modem has been approved for the use of the following facilities:

1. Auto calling facilities
2. Series connection facility (see note below)
3. Loudspeaking facilities.

Any other usage will invalidate the approval of the modem if as a result it then ceases to comply with the standards against which approval was granted.

Note: The volt drop introduced by this modem into the loop connection between the series connected telephone and the PSTN, at a current source of 40 mA is 1.9 V dc. The user is advised that the modem should not be used in conjunction with other series-connected apparatus such that the aggregate declared voltage drops of all this apparatus, together with the voltage drop introduced at 40 mA by any separate wiring that is used to link items of apparatus, exceeds 2.0 V.

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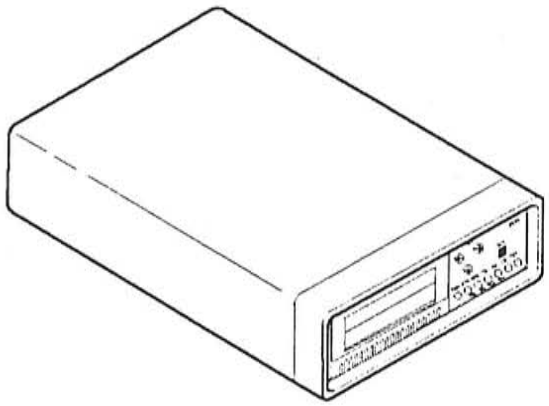
Part 1. Description and Planning

Chapter 1. Introduction



The IBM* 7855 Model 10 V.32 Modem (called the 7855-10) operates in duplex mode at line speeds of up to 12 000 bps over switched or nonswitched lines.

It allows your data terminal equipment (DTE) to communicate with other DTEs in synchronous protocol up to 12 000 bps or asynchronous protocol up to 19 200 bps.

Highlights

This IBM modem provides flexible operation in both synchronous and asynchronous modes.

Modem Control

Each 7855-10 can be controlled and configured from its front panel, from the attached DTE, or through a telecommunication line.

The following command sets are available:

- A synchronous command set that is compatible with CCITT V.25 *Bis*[1]
- A CCITT V.25 *Bis* asynchronous command set
- An Attention (AT) command set in asynchronous operation
- IBM's Link Problem Determination Aid (LPDA) Call Out and Disconnect Commands.

When used with the public switched network, the IBM 7855-10 modem can be attached to some automatic calling units for use in installations that cannot support any of the 7855's command sets.

1 *Bis* is used by the CCITT to denote the second in a series of recommendations.

Adaptation to Line Conditions

The modem can be set to automatically decrease or increase the connection speed if telecommunication line conditions degrade or improve.

IBM 7855-10 modems can be set to automatically restore a lost nonswitched connection by using the public switched network. Also, the modems can be set to automatically resume nonswitched line operation after the line is repaired.

Features in Asynchronous Operation

For asynchronous operation, the 7855-10 modem incorporàtes error checking that is functionally equivalent to the Microcom Networking Protocol** (MNP**) class 4 service as included in the CCITT V.42 recommendation. With error checking, the data integrity in asynchronous operation is as good as typical synchronous protocols. Data compression is available equivalent to MNP class 5.

Asynchronous speed buffering allows the DTE speed to remain constant (up to 19 200 bps) while the modem-to-modem line speed changes from call to call (maximum 12 000 bps). For instance, your DTE speed may be 19 200 bps while the modem-to-modem line speed may be only 9600 bps.

Other Features

Line Speeds

The line speeds supported are: 0-300, 600, 1200, 2400, 4800, 7200, 9600, and 12 000 bps.

Standards Compliance

The 7855-10 Modem is compatible with:

- CCITT Recommendations V.21, V.22, V.22 *Bis*, V.24, V.25 *Bis*, V.28, and V.32
- EIA Standard 232D
- Bell 212A and 103 Modems.

Error checking in asynchronous operation is compatible with CCITT Recommendation V.42.

In call-originate mode, the 7855-10 modem automatically selects 212A/103 or V.22 *Bis* operation to match the remote modem.

The 7855 Modem satisfies the U.S. requirements for both residential and commercial use.

Dialing

- Tone, pulse, or adaptive dialing
- Automatic or manual dialing and answering
- If the number dialed is busy, can automatically retry it or try an alternate second or third number.

Directory functions are provided; directory entries may have:

- Password security
- A user-friendly name.

Status Monitoring

- 16-character liquid crystal display (LCD) and seven lights show status and configuration information
- A DTE can obtain status information about both local and remote modems
- Built-in speaker for aural monitoring.

Further Asynchronous Features

In asynchronous operation, provides:

- Data compression of about 2 to 1 (MNP 5) (depends on exact data content)
- Automatic speed and character format detection. This is normal for the Attention command set and is an IBM 7855-10 enhancement to the V.25 *Bis* command set.

Connecting Lines

- Can operate on the public switched network, 4-wire nonswitched lines, or 2-wire nonswitched lines.
- **Do not use this modem for multipoint nonswitched lines.**
- Can be used with DTE cables of up to 100 meters.

Diagnostics

The IBM 7855-10 Modem provides the following diagnostic facilities:

- Local loop test
- Local loop test with built in pattern checking
- Remote loop test
- Remote loop self-test with built in pattern checking
- Internal diagnostics
- Lamp test
- DTE interface test
- V.54 loops 2 and 3.
- Speaker and Ring Test

Certifications

The modem is certified as needed for your country.

Physical Characteristics

- Desk-top unit
- Weighs less than 2.5 kilograms (5.5 pounds)
- Self-contained power supply
- Convection cooling
- Comparatively small for a V.32 modem.

Chapter 2. Basic Concepts and Terminology

This chapter describes the basic concepts and terminology of data transmission in a communication network and the internal structure of the 7855 modem.

Typical Data Communication Network

Figure 2-1 shows a typical communication network consisting of modems, data terminal equipment, and a telecommunication line.

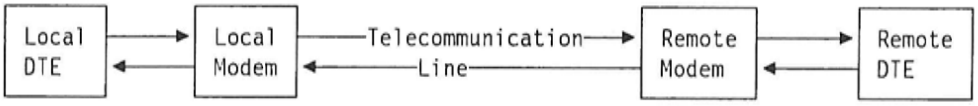


Figure 2-1. Typical Communication Link

Assume that you want to send a unit of information (for example, the letter A) from the local DTE to the remote DTE. With a telephone line connection established, the steps required to do this are:

- Press the A key at the local DTE.
- The local DTE sends a bit pattern representing the letter A to the local modem.
- The local modem converts the bits into signals that can be transmitted over telephone lines.
- The local modem transmits the signals to the remote modem.
- The remote modem converts the telephone signals back to bits.
- The remote modem sends the bit pattern (representing the letter A) to the remote DTE, which completes the transmission.

Local and Remote

The modem and DTE that you are working on are *local*. A modem and DTE that you are connected to *through a telephone line* are *remote*.

Data Terminal Equipment (DTE)

A data terminal equipment (DTE) is almost any type of equipment which attaches to a modem. Some examples of DTEs are terminals, personal computers, display controllers, and even vending machines.

DTE Characteristics

The DTE characteristics that matter to the modem relate to its V.24 interface to the modem. In some countries, this interface is also known as EIA-232-D or RS-232. The V.24 interface has two major characteristics:

- Data on its way to or from some remote site flows across the interface.
- The local modem and DTE signal each other across the interface.

Synchronous or Asynchronous Data Flow

One of the very basic modem settings is the choice between asynchronous and synchronous data. This is determined completely by the DTE.

Asynchronous data communication is usually used for:

- ASCII (start-stop) data
- Most bulletin board services
- Data transmission through the serial interface of a personal computer.

Synchronous data communication is used for:

- Synchronous data link control (SDLC)
- High-level data link control (HDLC)
- Binary synchronous communication (BSC).

The 7855-10 modem also can be configured to accept asynchronous commands from the local DTE and synchronous data during communication with a remote DTE.

Asynchronous Character Formats: For asynchronous communication, a character contains 1 start bit, at least 1 stop bit, and either 7, 8, or 9 data bits. The start and stop bits are added to the data bits to allow the receiving DTE to recognize the beginning of the data bits by detecting the transition from a stop bit to a start bit.

Within the data bits, there can be a parity bit that is used by the receiving DTE to detect errors in the received character.

If the modem is not set for automatic asynchronous character format recognition, it must be set to match the character format of the DTEs. Usually this means that you must make the following choices:

- Number of data bits: 7 or 8
- Number of parity bits: 0 or 1
- Type of parity: One of the five shown in Table 2-1.

Table 2-1. Asynchronous Parity Notation

Parity Bit	Type
Odd	O
Even	E
Space (0)	S
Mark (1)	M
None	N

Asynchronous Character Format Notation: A common short method of describing asynchronous character formats uses the form of the number of data bits, followed by the parity type used, followed by the number of stop bits. `8N1` means 8 data bits, no parity bit, and one stop bit in this notation.

Synchronous Character Formats: The 7855-10 modem does not need to be adjusted or set for any synchronous character formats or data coding.

Character Alphabets: After the DTEs have agreed on the character formats, they must also agree on the character alphabets; that is, the meanings of each bit pattern within the format.

Note: Normally, data flow *through a modem* can be done in any character alphabet. However, when commands and responses are exchanged *between a modem and DTE*, both must use the same alphabet. The alphabets used by the 7855-10 modem are described in "Commands and Command Sets" below.

Two commonly used character alphabets are the International Alphabet number 5 (IA5), which is called ASCII (American Standard Code for Information Interchange) in some countries, and EBCDIC (Extended Binary Coded Decimal Interchange Code). ASCII is a 7-bit code and EBCDIC is an 8-bit code. For example the number "7" is:

`B'0110111'` in IA5 and `B'11110111'` in EBCDIC.

The letter "a" is:

`B'1100001'` in IA5 and `B'10000001'` in EBCDIC.

Commands and Command Sets

A DTE can control an attached modem by sending it *commands* that instruct the modem to perform certain operations. For example, the dial command causes the modem to dial a telephone number.

The commands are arranged in *sets* according to the type data flow that is used for the commands and responses. The IBM 7855-10 supports the following command sets:

- The Attention (AT) command set, which uses asynchronous data flow between the DTE and modem. For more information on the Attention command set, see Chapter 12, "Attention Command Set."
- The V.25 Bis asynchronous command set, which is also asynchronous. For more information on the V.25 Bis command set, see Chapter 13, "V.25 Bis Command Set."
- The V.25 Bis synchronous command set, which is done using synchronous data flow between the DTE and modem. For more information on the V.25 Bis command set, see Chapter 13, "V.25 Bis Command Set."
- An LPDA synchronous command set, which is also a synchronous command set. For more information on the LPDA command set, see Chapter 14, "LPDA Command Set."

The 7855-10 modem uses the IA5 character alphabet for all commands and responses except those of LPDA, which is EBCDIC.

For more information on ASCII and IA5, see Chapter 16, "IA5 and ASCII Codes."

Signaling

There are several signals exchanged between a DTE and its local modem that are independent of data. For example, a DTE may activate a signal called "Request To Send" when the DTE wishes to send data to the modem. The modem responds with a "Ready for Sending" signal when the modem can accept the data.

Different DTEs manipulate signal leads differently and require different manipulation of signal leads by modems. The 7855-10 modem can be configured to operate with most DTEs.

For general information about the signals in the DTE interface, see Chapter 17, "DTE Interface." For detailed information about the configuration options that control the way the modem manipulates the signals it generates, see "Commands and Signaling" on page 5-1. The configuration options that control the way the modem responds to signals from the DTE are described in Chapter 6, "Configuration" and Chapter 12, "Attention Command Set."

Telephone Lines

Telephone lines, which are also called telecommunication lines, come in two basic types:

PSTN - PSN The common dial-up type of telephone line. PSTN stands for public switched telephone network. PSTN and PSN are synonymous in this book.

LL Nonswitched line. This type of telephone line permanently connects two fixed locations. LL stands for leased line.

Since your 7855-10 modem can be used with either type of telephone line, it is important to introduce you to the concepts that are relevant to each.

Public Switched Network (PSN) Lines

Auto-Dial The 7855-10 modem can automatically dial telephone numbers. This is also called *auto-call* or *automatic calling*.

Auto-Answer
The 7855-10 modem can automatically answer incoming telephone calls.

On-Hook and Off-Hook
A modem that is on-hook is electrically disconnected from the telephone line except that it can still detect ringing signals. A modem that is off-hook is electrically connected to the telephone line and can dial, transmit, and receive data signals.

Call Progress Detection
When you make a telephone call, you listen to determine if the other end answers, is busy, does not answer, or is a wrong number.

The 7855-10 modem can listen and, if you wish, notify you of the result of an attempt to establish a connection. For example, if a call attempt fails because the other end is off-hook, the modem can detect the

busy condition, end the attempt, and give you a message indicating the call attempt failed and a busy signal was detected.

Nonswitched Lines (LL)

2-Wire and 4-Wire

A 7855-10 modem can be set to operate on either.

All Lines

Handshaking

When two modems start communicating, they first exchange information between themselves (the DTEs are not involved) to get ready to transfer data. Among other things, this handshaking process determines the data rate the modems will use. Handshaking takes approximately 4 to 18 seconds to complete.

A modem configured for nonswitched operation starts handshaking shortly after you turn it **on** because the modem assumes the end-to-end telecommunication connection is present. A modem configured for PSTN operation does not start handshaking until it receives a signal that a call is occurring.

Inside the Modem

Figure 2-2 shows the part of the internal structure of the modem that is used for data transfer.

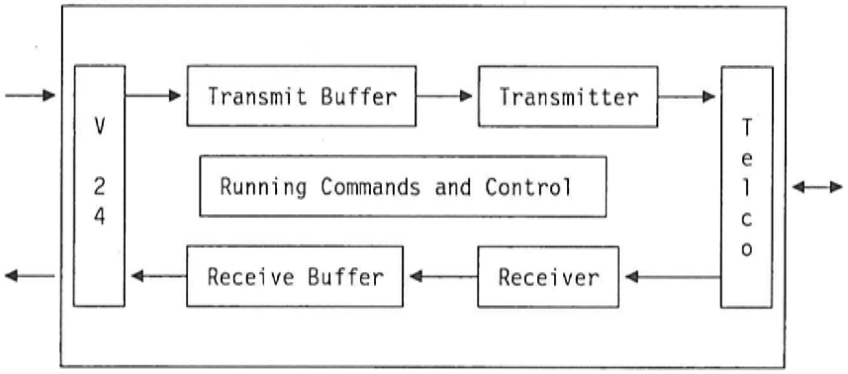


Figure 2-2. Data Flow Through the Modem. The "Running Commands and Control" block controls the other blocks.

Buffers The transmit and receive buffers are used for temporary storage of data before the data is delivered to its final destination. They are not used when the modem is configured for synchronous operation and can be used or not used as desired during asynchronous operation. Each buffer can hold up to approximately 4000 8-bit characters. The contents of the buffers are lost when the modem is powered **off** or reset.

Receiver The receiver changes analog signals from a telecommunication line to digital signals. You can change several receiver parameters to optimize the behavior of the receiver in your telecommunication environment.

Transmitter The transmitter changes digital signals from the DTE to analog signals. You can change several transmitter parameters to optimize the behavior of the transmitter in your environment. Some transmitter parameters can be changed only by service personnel.

Working and Nonvolatile Memory

You can use the front panel or one of the command sets to change the modem's configuration options from the factory default to those that better meet your requirements. Three types of memory are used for storing configuration options:

Factory Memory that cannot be changed outside the factory. Its contents are unaffected by a power loss or reset.

Nonvolatile Memory whose contents are not affected by loss of power.

Working Memory that is used during normal operation of the modem, but its contents are lost if the modem loses power.

Worth Remembering

With very few exceptions, configuration changes you make are placed only in working memory. If you want such changes to survive a power loss or reset, you must store the changes in one of the three profiles in nonvolatile memory and instruct the modem to use that profile to reload working memory as needed.

When you switch the modem power **on**, working memory is loaded from the factory default information and then from the nonvolatile memory. The following figure shows the various paths that the modem uses to store configuration options in the nonvolatile and working memory.

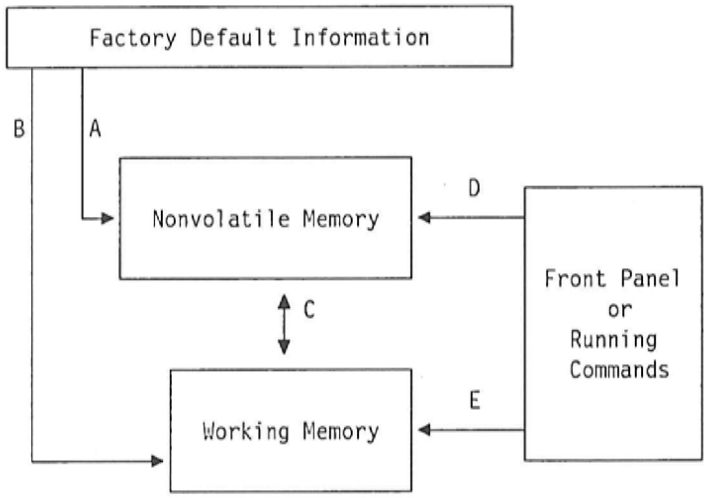


Figure 2-3. Modem Memory Management

Path Description

A This path is used only if you choose to reset the modem to the factory defaults. Instructions for that process are given in "Factory Reset" on page 9-1.

B This path is used:

- To load working memory each time power is switched **on** or the modem is reset.
- When the modem is reset to the factory defaults as explained in Path A.
- When the "&Fn -Restore Factory Configuration" on page 12-14 command is run (either from the front panel or from a DTE).

C This path is used to load working memory after path B is used because of a power-on-reset or a regular reset and during modem pooling operation (see "Modem Pooling" on page 9-2).

This path is used to save working memory in the nonvolatile memory when the "&Wn -Store (Write) Configuration" on page 12-20 command is run and when modem pooling is turned **on**.

D This path is used by a few commands and front panel operations to change some of the basic characteristics of the modem such as which factory profile is to be loaded when a reset occurs, whether the modem is considered synchronous or asynchronous, and which command set is available.

E This path is used during running of most commands.

Chapter 3. Planning for Your Modem

This chapter describes how to plan for your modem.

Note: The document *Power Supply and Telecommunication Connections for IBM Modems*, GA33-0054, contains information that can help planning for the modem.

Planning for Your Modem (All Users)

Modem-to-DTE Attachment

The data terminal equipment (DTE) to which the modem will be attached must have a standard CCITT V.24 or EIA-232-D interface. The modem is attached to the DTE with a cable that is provided by the DTE. For information about the DTE interface, see Chapter 17, "DTE Interface."

Note: A typical DTE cable length should not exceed 15 meters (50 feet). However, low capacitance cables up to 100 meters long can be used.

The modem's DTE connector is a standard 25 pin female connector equipped with M2.6, M3, or UNC 4-40 retaining nuts as required by national regulations. In Japan, and Korea the DTE cable should have M2.6 threaded retaining screws to match the modem. In FR. Germany, the DTE cable should have M3 screws. In countries other than Japan, Korea, and FR. Germany, the DTE cable should have UNC 4-40 threaded retaining screws.

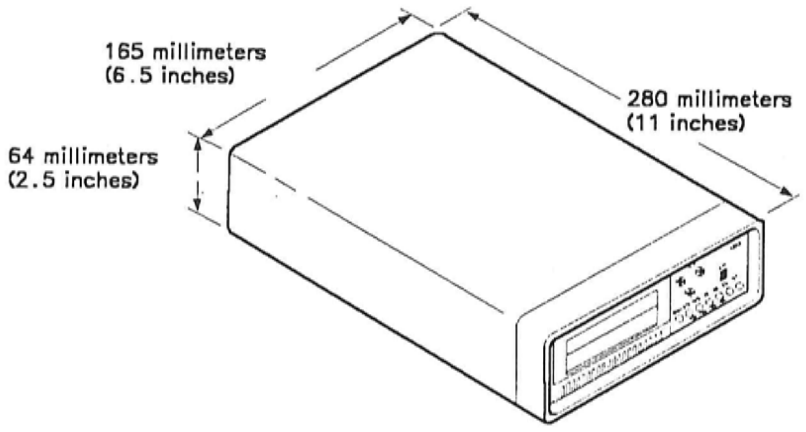
Cable Lengths

The lengths of the cables supplied with the modem are:

- Power cord: 1.8 m (6 ft)
- Communication cables: 4.6 m (15 ft).

Modem Dimensions

The following figure shows the dimensions of the modem.



Ventilation in this modem is front to back so plan to keep the front and rear of the modem free of obstructions that would block air flow.

Temperature and Humidity Requirements

Warning: Exceeding these temperatures may affect the modem's reliability and violate national certifications.

The modem case temperature must never exceed 54° C (129° F). For continuous operation of the modem, the temperature and humidity should be within their ranges and not at the limits.

Table 3-1. 7855 Temperature Limits

Temperature	Single Modem	Stacked (2 or more)
Operating	10° to 40.6° C (50° to 105° F)	15.6° to 29.4° C (60° to 85°) F
Storage	-40° to 60° C (-40° to 140° F)	-40° to 60° C (-40° to 140° F)

Table 3-2. 7855 Humidity Limits

Relative Humidity	Single Modem	Stacked (2 or more)
Operating	8% to 80% (no condensation)	8% to 80% (no condensation)
Storage	5% to 100%	5% to 100%

Note: In extreme cases, the air may require filtering to remove impurities such as oil, grit, corrosive gases, or other contaminants.

Power Requirements

The power requirements for the modem are:

Input voltage:	90 to 259 V ac
Frequency:	49.5 Hz to 60.5 Hz
Phase:	Single
Input current:	0.16 A or less on the average (There is an initial surge of current when the unit is turned on.)
Power usage:	Less than 20 VA and less than 11 W.

Note: The internal insulation in the modem is suitable for use with impedance-grounded neutral power systems.

Power Line Transients

The modem's power plug must have an acceptable earth ground connection. For most installations, the 7855-10's internal protection will be sufficient provided it is correctly grounded.

Plan to have some form of transient suppressor on the ac power line if:

- The modem will be located in an area which has frequent lightning storms.
- Your power company recommends the use of surge limiting devices.

Acoustical Data

Table 3-3. Declaration of IBM Product Noise Emission Values for the 7855-10 Modem

LWAd		LpAm		<LpA>m		I	T
Operating (bels)	Idling (bels)	Operating (dB)	Idling (dB)	Operating (dB)	Idling (dB)		
<3.6	N/A	N/A	N/A	<29	N/A	No	No

Communication Line Interfaces

If you plan to attach the modem to a switched telephone line, read "Planning for Users of the Switched Network" and if you plan to use a nonswitched line, read "Planning for Nonswitched Line Users" on page 3-4. *Power Supply and Telecommunication Connections for IBM Modems* shows both telecommunication line cables.

Plan to have a switched network telephone line and handset available near the modem's location for use by service personnel.

Telecommunication Line Transients

The 7855-10's lightning protection circuitry can work only if the modem has a good earth ground connection (through the ac power cord or in some countries via a rear panel ground terminal). Additional lightning protection outside the modem as approved by the telecommunication services provider could help protect the modem.

Planning for Users of the Switched Network

For the best possible operation of the 7855-10 modem, the local loop should be "unloaded". Inform your telecommunication services supplier that you plan to use a V.32 modem and discuss whether your local loop is unloaded. The 7855-10 modem attaches to a public switched network telephone line in a way that is typical for your country. To confirm that the attachment wiring you plan to use will work with the modem see Chapter 18, "Telecommunication Line Interfaces."

In some countries, you can order either a "permissive" or "programmable" public switched network (PSN) interface. The 7855-10 modem can operate with either. If the local loop connecting your location to the telephone services provider's office is less than 3 km (10 000 ft), the "permissive" type of interface should work satisfactorily. However, use of the "programmable" interface will result in the fewest data errors - especially if you have a long local loop.

Important

If you are attaching this modem to a private branch exchange (PBX), make certain you get an "analog" as opposed to a "digital" line. Attaching this modem to the type of digital line provided by some PBXs can damage the modem.

Automatic Calling Unit (ACU)

The modem is capable of dialing on a switched network. However, it can also be attached to some automatic calling units (ACU). In some countries, a special modular cable is supplied with the modem for attaching the modem to an ACU.

For correct operation, configure the ACU as follows:

- The ACU must pass a minimum of 600 milliseconds of answer tone to the modem.
- If the ACU uses the mode indicate (MI) and mode indicate common (MIC) technique for transferring a connection from the ACU to the modem, the ACU must hold the MI and MIC contact closed for a minimum of 700 milliseconds.

For more information on connecting the modem to an ACU, see Chapter 18, "Telecommunication Line Interfaces."

Planning for Nonswitched Line Users

The 7855-10 modem can be used with either 2-wire or 4-wire **point-to-point** non-switched telecommunication lines.

- Usually, fewer data errors occur with a 4-wire line.
- For most installations, no special type of 4-wire line is needed if you plan to use speeds of 9600 bps (bits per second) or slower. If you plan to use the modem's 12 000 bps capability some installations will require improved lines.
- 2-wire telecommunication lines should be "unloaded". Contact your telecommunication services supplier.

Part 2. Installation and Configuration

Chapter 4. Installing Your Modem

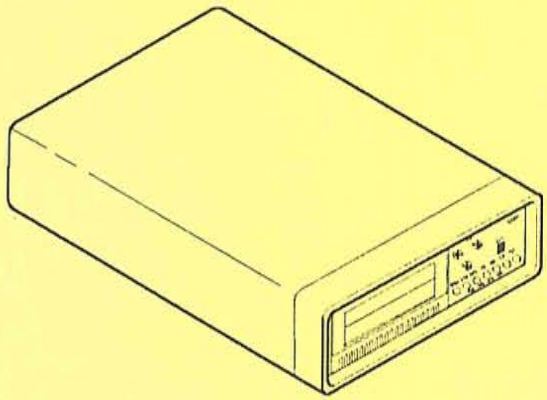
This chapter describes how to install your modem.

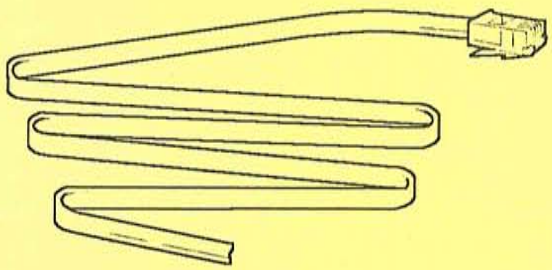
Note: The document *Power Supply and Telecommunication Connections for IBM Modems*, GA33-0054, contains useful information about the different telecommunication connectors and power supply plugs.

Read the *IBM Telecommunication Products Safety Handbook*, GA33-0126.

How to Set Up Your Modem

Unpacking the Modem





Besides the modem and this manual, the carton should contain:

- Telecommunication cables as needed for your country.
- A DTE interface wrap plug.
- A 4-wire nonswitched line wrap socket or plug.
- If this book is not written in English, then you should have received a copy of the *Telecommunication Products Safety Handbook*. The handbook's safety material is included in the English language version of this book.

If any of these items is missing or damaged, contact the place of purchase for instructions on how to exchange your modem or obtain the missing items.

Note: The telecommunication cables are color coded. There are three ways (depending on your country) to identify the color of your cables by:

- The color of the cable insulation
- The colored sticker on the cable's label
- The colored identification band around the cable.

The nonswitched line cables fit into either the LL or PSTN socket behind the modem. The switched line cables fit easily into only the PSTN (or PSN in some countries) socket behind the modem.

Line Type	Cable Type and Identification Color
PSTN	Use the silver or green cable for typical installations. In some countries, a light brown cable is included for special PSTN connections such as the 8 pin programmable type of connections available in the U.S.A.
4-wire Nonswitched	Use the black cable. This cable is used for problem determination so do not discard it even if you do not need it for normal operation of the modem.
2-wire Nonswitched	Use the gray cable if one is included. Otherwise use the black cable.

The next figure shows the rear panel of the modem. Note the keyway near pin 8 of the PSN or PSTN connector. 7855-10 cables for PSN/PSTN use have a ridge that fits into the keyway. Cables for nonswitched lines do not have that ridge.

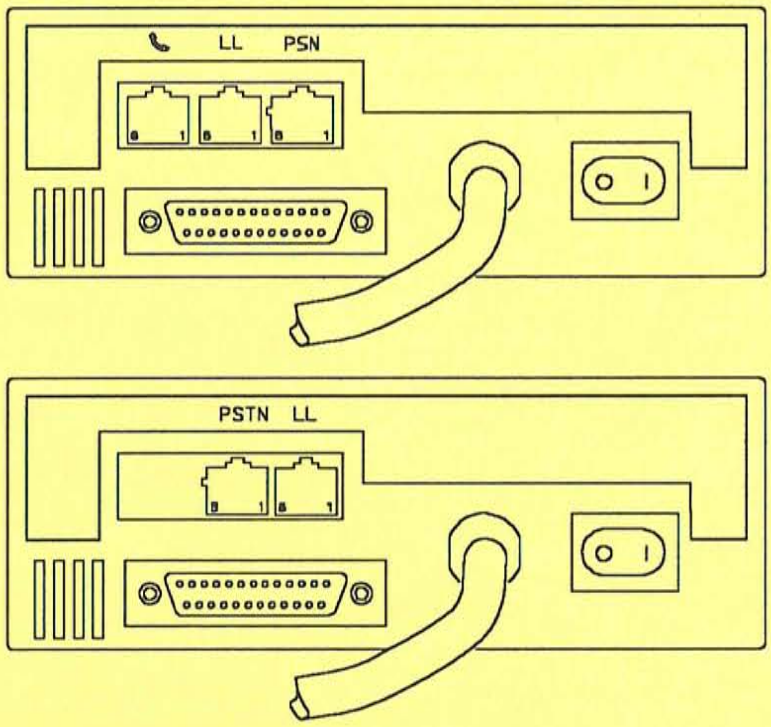


Figure 4-1. 7855-10 Rear Panel. Your modem may not have the 6-pin socket or the ground post and ground symbol.

Points to Remember

The silver or green cable has a key on its modular connector. The gray cable does not. The key fits into the 7855's PSTN socket.

Chapter 18, "Telecommunication Line Interfaces" shows more detail about the modem's telecommunication line interface if your service provider uses a socket that is different from the plug we shipped you.

Checking Out the Modem

Step 1 Be sure that the power switch located on the modem's rear panel is **off** as shown in Figure 4-3 on page 4-4.

Step 2 If you are going to use a switched network telecommunication cable, plug it into the 8-pin *PSTN* or *PSN* jack located on the modem's rear panel. If this modem is ***not*** being installed in the United Kingdom, connect the other end of the cable to the telecommunication line. See Figure 4-2.

Note: If you are planning to use an automatic calling unit (ACU), it is normally connected between the modem and the telecommunication line. There are several different interfaces in use between ACUs and modems. See your ACU instructions and Chapter 18, "Telecommunication Line Interfaces" to determine how to attach your ACU to the 7855-10 modem.

Step 3 If you plan to use a nonswitched line telecommunication cable, plug it into the 8 pin *LL* jack located on the modem's rear panel. If this modem is ***not*** being installed in the United Kingdom, connect the other end of the cable to the telecommunication line. See Figure 4-2.

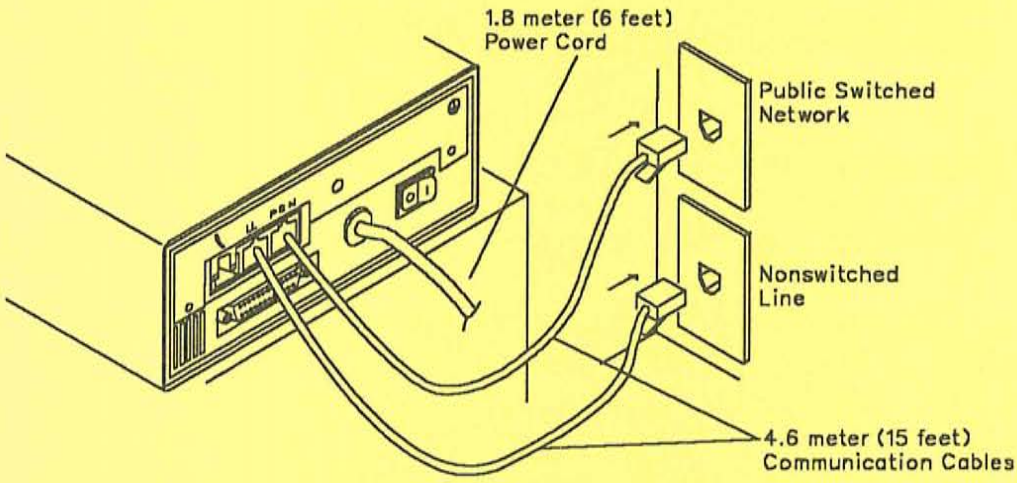


Figure 4-2. Installing Telecommunication Line Cables. Your modem's rear panel may have the PSTN and LL connectors located differently from those shown.

Step 4 Connect the modem's power plug to a standard 3 pin *grounded* ac outlet. If this modem is being installed in the United Kingdom, connect the telecommunication cables you have attached to the modem to the telecommunication lines now.

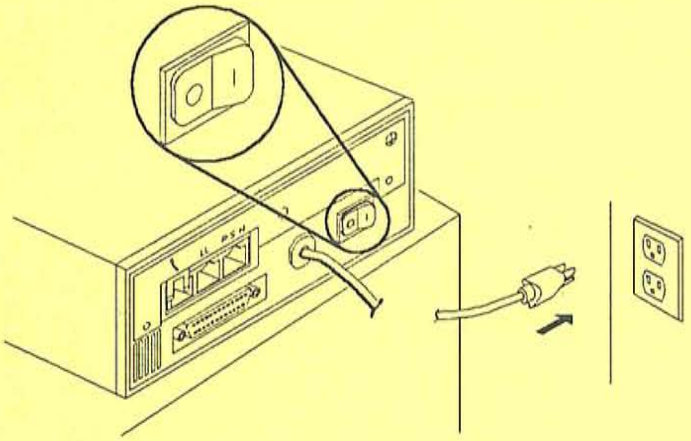


Figure 4-3. Connecting ac Power

Step 5 Plug the DTE wrap connector into the back of the modem.

Step 6 Set the modem's power switch to **on**. If after 10 seconds *all* the front panel lights are still **on** or the TST light is blinking, the modem is defective and should be replaced. The RFS light on the modem may blink while the DTE wrap connector is installed. This is normal.

If the modem is set to its factory defaults, the front panel shows `SYNC Int 9600 a`. This operational message shows that the modem is set for synchronous 9600 bps operation with internal clocking and the modem will auto-answer an incoming call.

Point to Remember

Operational LCD messages are defined in "Liquid Crystal Display" on page 7-2.

The next steps reset the modem's options to the factory default values. Jump ahead to step 12 if your modem has never been used.

In the next steps, you are instructed to manipulate the front panel buttons of the modem. Unless the step suggests otherwise, do not press them in for longer than one second unless you have already read Chapter 6, "Configuration."

Step 7 Press both the ← and → buttons on the front panel of the modem. The modem displays the message `<Exit Enter>`.

Step 8 Press the → button. If the modem displays `View Only`, go to step 9. If the modem displays `Password....■■■■`, use the → button and the ↑ button to change the display to `Password....B293` by changing one character at a time, press the → button one more time, and then check the display again to make sure it shows `View Only`.

Step 9 Press and release the ↑ or ↓ button as needed to change the display to show `First Setup`.

Step 10 Press the → button (just once) and then press and release the ↑ or ↓ button as needed to change the display to `Reset to Factory`.

Step 11 Press the ← button. All the lights on the front panel come **on** briefly.

Step 12 The next steps can only be done if you have attached the modem to the public switched network. Go to step 21 if you do not want to test the modem's public switched network interface.

Step 13 If the front panel display does not show `View Only` or `First Setup`, use steps 7 to 9. If the front panel display shows either message, go to the next step.

Step 14 Press and release the ↑ or ↓ button until the display shows `Diagnostics`.

Step 15 Press the → button twice. The display should show `Do Tests` and then `Test Timer`.

Step 16 Press and release the ↑ or ↓ button until the display shows `Select Test` and then press the → button once.

Step 17 Press and release the ↑ or ↓ button to change the display to `Pass/Fail` and then press the → button once.

Step 18 Use (meaning press and release) the ↑ or ↓ button to change the display to `Speaker Test` and then press the ← button. The display should change to show `Pass/Fail`, the TST light should turn **on**, and the modem's speaker immediately turns **on** and emit tones at a high volume for about 2 seconds. You will normally hear both a modem generated tone and dial tone during this portion of the test but it is OK if you hear only a single tone. The speaker then turns **off** for about 2 seconds and then turn back **on** and emit tones at a low volume for about 2 seconds.
The modem is operating correctly if you hear the pattern of *loud, off, quiet, off* of the speaker's volume. If not, replace it.

Step 19 Dial the modem's phone number from another telephone. You should hear a volume pattern of *loud, quiet, loud, off* in the handset of the dialing telephone. If you hear the correct tone pattern, go to step 21. Otherwise, continue with step 20.

Step 20 If you do not hear the tone, verify that the telephone line is operating properly. In most countries, you can do this by replacing the modem with a handset and then attempting a second time to dial the modem's phone number from another telephone to verify that the handset rings properly. If you are using an ACU, verify that it is operating properly and is configured as described in "Automatic Calling Unit (ACU)" on page 3-4.

Try dialing the modem's phone number again. Observe the front panel ONH light. This light turns **off** when the modem answers. If this attempt to call the modem fails, the modem is defective. Replace it.

Step 21 Set the modem's power switch to **off**.

Note: The following steps assume that your DTE is already installed and operational.

Step 22 Detach the DTE wrap plug from the modem and then connect the 25-pin EIA cable from the DTE to the 25-pin connector on the modem's rear panel as shown in Figure 4-4. Fasten the connector's retaining screws.

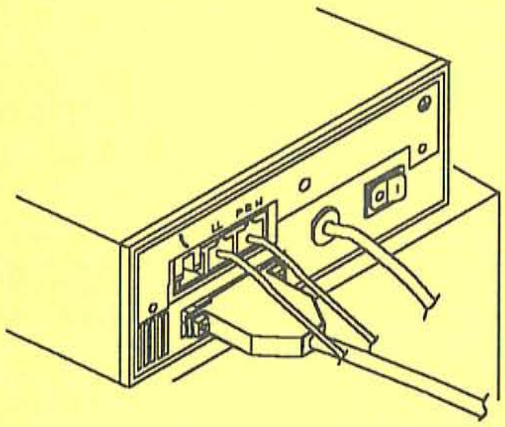


Figure 4-4. Attaching a DTE Cable

Step 23 If you are using the modem for public switched network operation and your modem has three rear panel modular jacks, you can connect a telephone to the 6-pin jack located on the modem's rear panel as shown in Figure 4-5. If not, go to step 25.

If you *are* using an auto call unit and you want to connect a telephone, see "Using an ACU" on page 18-5. A telephone may not work if it is plugged into the back of the modem and an automatic calling unit is being used with the modem.

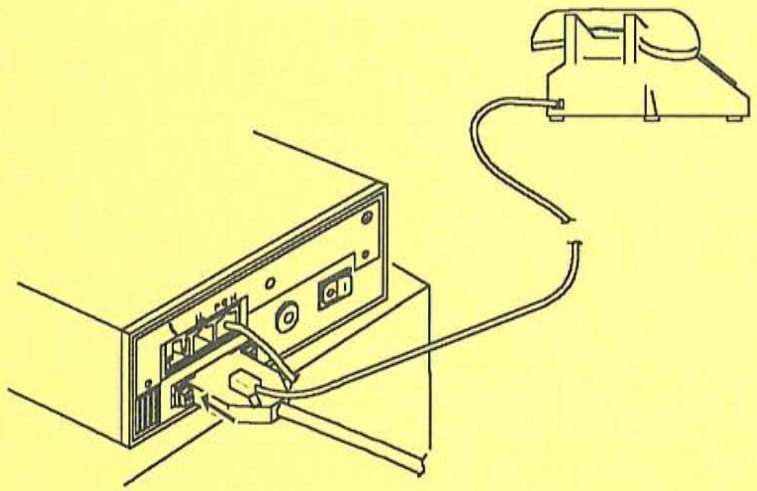


Figure 4-5. Plugging a Handset into the Rear of a Modem with Three Sockets

Step 24 If you have plugged a telephone into the back of the modem, pick up the telephone handset and listen for a dial tone. If you hear a dial tone, continue with step 25. If you do not hear a dial tone, disconnect the telephone cable from the wall jack and the telephone set cable from the modem. Connect the telephone set cable directly to the wall jack. Pick up the telephone handset again and listen for a dial tone. If you get a dial tone, replace the modem.

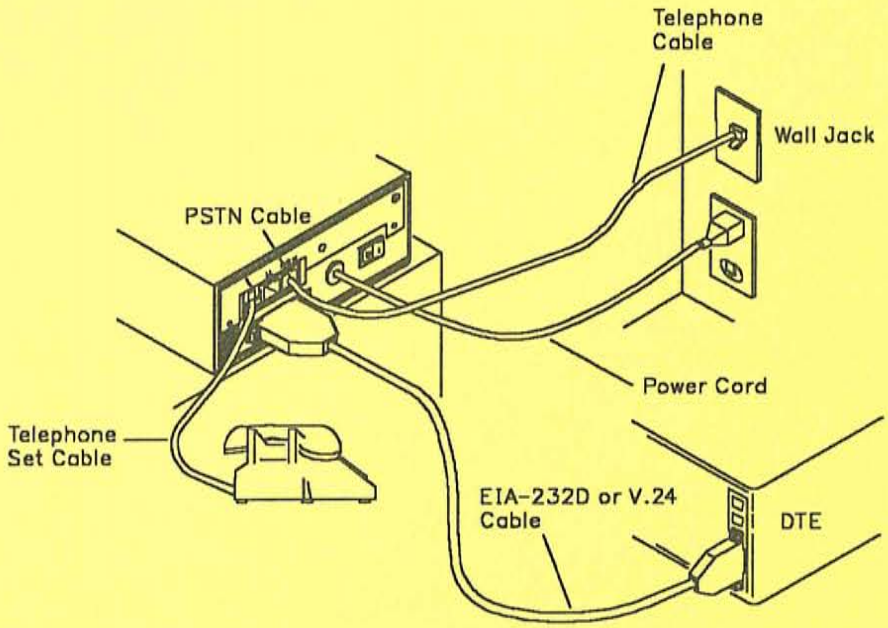


Figure 4-6. A Fully Cabled Modem. Your installation may not require all cables shown.

Step 25 You can use the following steps to do basic configuration of the modem if you plan to use it for switched network operation.
If you plan to use the modem for nonswitched operation, go to Chapter 6, "Configuration" to start configuring the modem to match your system's requirements.

If you are new to telecommunications, you might wish to read Chapter 2, "Basic Concepts and Terminology."

Step 26 Set the modem's power switch to **on**. Wait until the modem front panel stabilizes (about 10 seconds).

Step 27 Press both the ← and → buttons on the front panel of the modem. The modem displays the message <Exit Enter>.

Step 28 Press the → button. If the modem displays View Only, go to step 29. If the modem displays Password....■■■■, use the → button and the ↑ button to change the display to Password....B293. By changing one character at a time, press the → button one more time, and then check the display again to make sure it shows View Only.

Step 29 Press and release the ↑ or ↓ button as needed to change the display to show First Setup.

Step 30 If you want to use the modem for synchronous commands or for synchronous operation without any commands, go to step 33. If you want to use asynchronous commands or asynchronous data with the modem, go to the next step.

Step 31 Press the → button (just once) and then press and release the ↑ or ↓ button as needed to change the display to:

`Asynchronous AT`	if you want to use the AT command set or asynchronous data without commands.
`Async V.25 bis`	if you want to use asynchronous V.25 Bis commands.

Step 32 If you have chosen `Asynchronous AT`, press the ← button once and then go to step 33.
If you have chosen `Async V.25 bis`, press the → button and then use the ↑ or ↓ button to make the display show:

`No Speed Sense`	if you must use only regular V.25 Bis commands.
`Speed Sense`	if you want to use <CR> and <LF> to have the modem sense the speed and character format of the DTE.

Press the ← button once and then go to the next step.

Step 33 The front panel display should show `First Setup`.
You have now configured the modem to be either asynchronous or synchronous and have also done what is needed to instruct the modem to accept commands you might wish to send from your DTE to the modem. In the next steps you choose one of the modem's predefined profiles which will further adapt the modem to operate with your DTE.

If your DTE will be sending V.25 Bis commands to the modem, go to step 36, otherwise go on to the next step.

Step 34 Press the → button once and then press and release the ↑ or ↓ button until the front panel display shows `Get Profile`.

Step 35 Press the → button once and then use the ↑ or ↓ button to make the display show:

`Profile.....AT`	if you will be manually sending commands to the modem from a "dumb" terminal such as an IBM 3151. This profile may be a good choice if your DTE will be sending AT commands to the modem. Note that this profile allows any DTE to send any type of command to the modem because it makes the modem DTE interface behave as though a connection is established all of the time. If your DTE does not work well with this profile, you can try `Profile..V.25Bis` or use the next two chapters to learn how to change individual configuration parameters in the modem.
`Profile...NO CMD`	if you do not plan to send commands from the DTE to its local modem.

Step 36 Press and release the ← button repeatedly until the front panel display stops changing.

Step 37 You have just set up the modem and verified most aspects of the modem's operation. You can try it with your system. If you observe a basic system problem, such as the DTE not being able to send commands to the modem successfully, read Chapter 5, "Knowing Your Communication System" and then go to Chapter 6, "Configuration" to see how to adjust individual configuration parameters in the modem to match your system's requirements. If you have a problem while using the modem, see Chapter 10, "Problem Determination."

Chapter 5. Knowing Your Communication System

The modem must be set according to the requirements of your communication system.

The DTE Interface

Find out about the kind of data that will flow between the modem and DTE and the signal conventions used between the two. Also, if you plan to use modem commands, you may need to find out some additional information about your system. The next three sections provide you with specific questions to answer.

Data

Do the DTEs transfer data synchronously or asynchronously?

- If synchronous, which one of the three types of clock sources is used to transfer data from the DTE to the local modem?
  - 7855 clocking is the most desirable and most DTEs can be set to accept a transmit clock from the modem.
  - DTE clocking means the DTE provides the transmit data clock. This type of clocking does not allow the modem to automatically change speeds to adjust itself to telecommunication line conditions.
  - "Receive" clocking is required by a few DTEs that are set up to transmit *exactly* one bit for each received bit. The modem's transmit clock is derived from its receive clock. DTEs that use "loop" operation may require this type of clocking.
- If asynchronous, how many bits are in each data character?
  - The length of an asynchronous character can be 9, 10, 11, or 12 bits. This is the sum of one start bit, the number of data bits (which can be seven or eight), the number of parity bits (zero or one) and the number of stop bits (one or two). Stop bits of length ½ are not supported.
  - 10-bit characters are the most common. Data formats 7 even, 7 odd, and 8 none are all 10-bit formats. In this book, these are abbreviated to 7-E, 7-O, and 8-N as shown in Table 2-1 on page 2-2.

Commands and Signaling

Do you want to exchange commands and responses between your DTE and the modem?

- If no, go to "The Telecommunication Interface" on page 5-3.
- If yes,
  - If the commands are to be done using asynchronous characters, will they be "AT" or V.25 Bis commands?
  - What signals should the modem give the DTE to allow the DTE to send commands to the modem?

    DSR, RFS, and RLSD are signals that govern whether a DTE sends commands to the modem. For each signal, there are several different options about how the modem manipulates the signal.

DSR (107)

The 7855 modem has three options for how the modem controls the DSR signal during PSTN operation. If the modem is configured for nonswitched operation, it keeps DSR active unless it is doing diagnostics. The table shows the three options as the modem displays them.

Table 5-1. DSR Options

Message	Description
DSR On...CONNECT	Select this option if you want the modem to manipulate DSR in the way specified by the CCITT V.25 Bis recommendation or if your DTE will not be sending any commands to the modem. The modem makes DSR active when a connection is established and inactive when no connection is established. Try this option if you are using this modem to replace older modems that do not recognize commands. If your DTE will be using both V.25 Bis and AT commands, try this option first.
DSR On....ALWAYS	Some DTEs require DSR to be active before they send any data to the modem. Examples include the IBM 3151 type of asynchronous terminal and many IBM synchronous adapter cards for IBM PCs and IBM Personal System/2* (PS/2) systems. This option causes DSR to be active if DTR is active, and to be inactive if DTR is inactive. Selecting this option makes the modem behave like a typical "AT" type of modem.
DSR On...USUALLY	This option causes the modem to keep DSR active until a connection attempt progresses to the point at which your local modem can recognize the presence of a remote modem. Your local modem then makes DSR inactive for a few seconds. Use this option if you plan to send the modem synchronous V.25 Bis commands from a IBM PC or PS/2 equipped with an IBM SDLC or multi-protocol adapter card.

RFS (106)

The 7855 modem has four options for how the modem controls the RFS signal. The active option affects both PSTN and nonswitched operation.

Table 5-2. RFS Options

Message	Description
RFS On....V.25 B	If your DTE will be sending V.25 Bis commands to the modem, select this option. The modem holds RFS active when it is waiting for a command and inactive during handshaking and RFS follows RTS when a connection is established. Select this option if your DTE will be sending AT and V.25 Bis commands to the modem and you would prefer not to change configuration options when using different command sets.
RFS On...CONNECT	The modem keeps RFS inactive until a connection is established. This behavior matches the V.24 standard for older modems and DTEs. Try this option if the modem will not be receiving commands from the attached DTE.
RFS On....ALWAYS	This option makes the RFS signal match the normal behavior of an AT type modem.
RFS On.....DELAY	If you choose this option, the modem makes RFS behave like the V.25 Bis option except that the modem will hold RFS inactive for a few seconds longer than would normally be necessary. You may need to use this option if you place the modem in a PBX controlled modem pool.

RLSD (109)

Most DTEs are tolerant of unexpected behavior of the RLSD signal because RLSD is normally derived from the telecommunication line so line impairments can cause an unexpected loss of the carrier signal. However the 7855 modem has some options available if your DTE needs some particular behavior from the modem.

Table 5-3. RLSD Options

Message	Description
RLSD On...V.25 B	Selecting this configuration option makes the modem manipulate RLSD as described in the V.25 Bis recommendation. The modem will hold RLSD active when it is waiting for a command and inactive during handshaking and then active again as allowed by the telecommunication line and the modem's receive buffer when a connection is established. Select this option if your DTE will be sending both V.25 Bis and AT commands to the modem.
RLSD On..CONNECT	The modem keeps RLSD inactive until a connection is established. This behavior matches the V.24 standard for older modems and DTEs. Try this option if you are using this modem to replace older modems that do not recognize commands or if no commands will be sent from a DTE to the modem.
RLSD On...ALWAYS	This option makes the RLSD signal match the normal behavior of an AT type modem.

The Telecommunication Interface

Is the modem to be used with the PSTN or for nonswitched operation?

- If PSTN, and your modem has three rear panel telecommunication sockets, you must choose between "permissive" and "programmable" operation if your country supports both. If your modem has two rear panel telecommunication sockets, then you do not need to make any other choices for PSTN operation.
- If nonswitched, then the only thing you need to know to get started is whether the line is a 2-wire or 4-wire line.

Chapter 6. Configuration

This chapter shows how to configure your 7855 modem from its own front panel. There are other ways to configure the modem, but **to set the basic characteristics of the modem such as whether it is synchronous or asynchronous, you must use the LCD** `FIRST SETUP` **menu** even if you want to do most of the modem's configuration via the alternative techniques of:.

- Using commands from the local DTE
- Sending configuration information from a remote DTE or modem.

They are described in Chapter 12, "Attention Command Set," Chapter 13, "V.25 Bis Command Set," and Chapter 9, "Advanced Modem Operation."

Using This Chapter

Configuration of a 7855 modem is a three step process:

Points to Remember

1. Choose the basic modem configuration from the `First Setup` menu.
2. If necessary, modify that basic configuration by making choices in the `Quick Customize` or `Total Customize` menus.
3. Instruct the modem to save the changes.

This chapter contains two types of material to help you accomplish these three steps - tutorial material and configuration menu details.
The tutorial material explains the tree and menu structure, how to use the front panel buttons, some of the special symbols that can appear on the front panel display, and other background information. This educational material starts with the next section and continues to page 6-8.
The remainder of this chapter, starting with "Configuring the Modem" on page 6-8, describes configuration options.

Notes:

1. Chapter 4, "Installing Your Modem" contains a step by step procedure for doing basic configuration of the modem starting with step 25 on page 4-7. This simple procedure may be sufficient for your needs.
2. At the end of this book, there are some fold-out pages that show the configuration tree structure.

   Note: When you have the modem working correctly in your environment, it is a good idea to circle menu selections you made that differ from the factory defaults.
   Doing so will create a record of the modem's configuration that you can use if you ever need to configure another modem the same way.
3. Most users should be able to use one of the factory profiles with few or no modifications, so try one before attempting to set each individual parameter. The four predefined profiles are described briefly in "Simplified Configuration" on page 6-13 and in detail in "Four Permanent Profiles" on page 6-30.

4. If your main goal or difficulty is to get data flowing between your modem and your local DTE, read "Commands and Signaling" on page 5-1 before you spend much time in this chapter.

5. If you know the task you want to accomplish, you can look in "Where to Find the Basic Configuration Parameters" on page 6-28 or "AT Commands Grouped by Operation" on page 12-60 to see if either list contains the task you want to accomplish.
   Chapter 8, "Basic Modem Operation" and Chapter 9, "Advanced Modem Operation" are task oriented so they are also good places to look if you want to accomplish a specific task (such as: storing a phone number in the modem and configuring the modem to dial that number automatically).

Points to Remember

The underlying operation of front panel configuration is that the ← button causes the modem to run AT cmdwords.

To learn the AT cmdword that corresponds to a front panel message, see Chapter 15, "LCD Messages."

To learn the front panel message that corresponds to an AT cmdword, see Chapter 12, "Attention Command Set."

The Tree Structure

Imagine a tree laying on its side with the trunk and roots to your left and the branches and leaves to your right. Why? Well, one way of organizing a large amount of information is to arrange it in what is called a decision tree and we have organized the front panel configuration options into such a structure. Part of the 7855-10's tree structure is shown in Figure 6-1 on page 6-3.
When you begin configuring the modem, the front panel display is positioned at the trunk of the tree structure. You use the right arrow button to move toward the leaves of the tree which are configuration choices and the left arrow button to move toward the root of the tree which is the exit from the tree structure.

In this manual, we call a group of branches and their associated leaves a "menu."

The <Exit Enter> message corresponds to the trunk of the tree, messages such as First Setup are branches, and messages such as Synchronous correspond to leaves.

The ↑, ↓, ←, and → buttons on the front panel move the display in the tree.

Note

In the tree structure figures, the order of the messages in any single column is not necessarily the same as the order of the messages shown on the front panel of the modem as you scroll vertically.

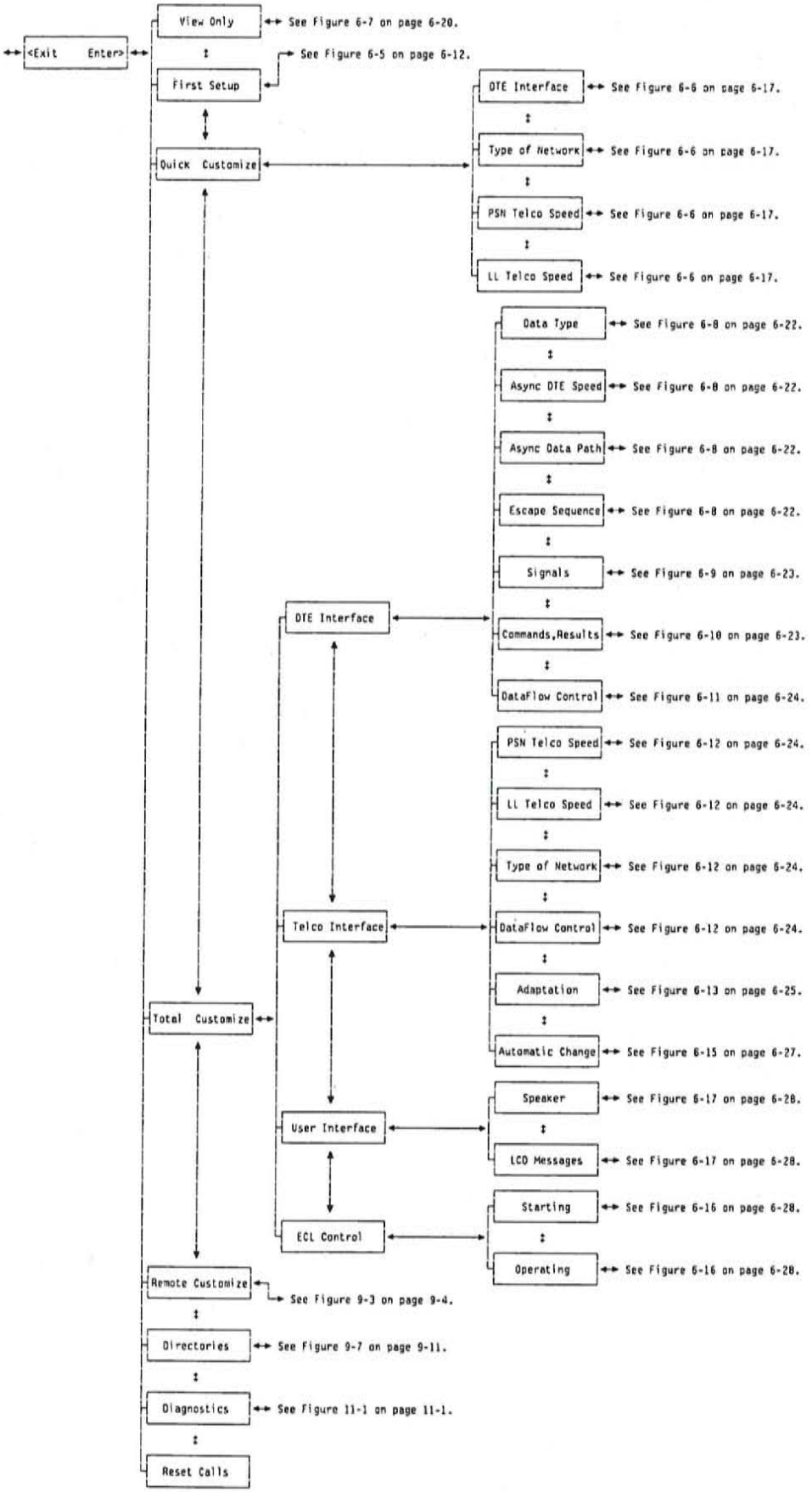


Figure 6-1. Part of the LCD Configuration Tree

Using the ←, ↑, →, and ↓ Buttons

Look at the front panel.

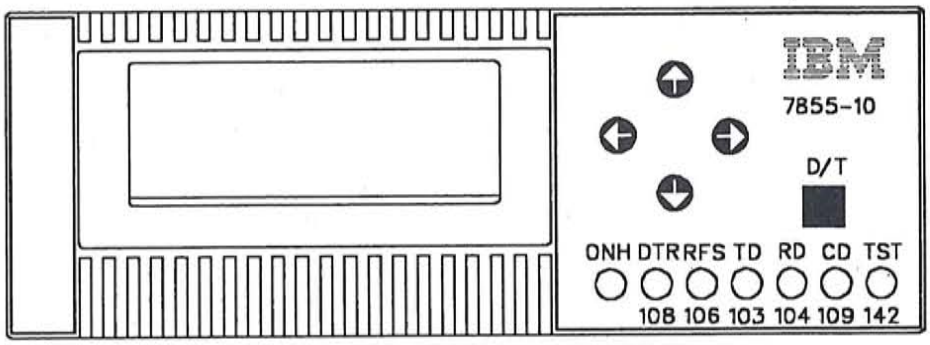


Figure 6-2. The Front Panel

There are four round buttons with arrows on their tips. They are used to move around in the configuration menus and to make configuration selections as you move around. You use one by pressing and then releasing it and if you use one at a time, they do the following:

← ***This button is analogous to an "enter" or "run" button. Use it to put your configuration choices into working memory unless you are in the view only menu.*** You can also use it to make the modem start a test or start dialing a number. It also moves the cursor one position to the left when the LCD is showing a numerical display. Also, its use changes the display to a position in the tree closer to the trunk or roots.

Points to Remember

The ← button combines two functions, an run command function when the display message is able to be run, and a movement of the display to a position one step closer to the root.

↑ This button is used to select a single choice from several. When the choices are numerical, this button increments the numbers.

↓ This button is used to select a single choice from several. When the choices are numerical, this button decrements the numbers.

→ This button makes the modem show additional detail. When the LCD is showing a multiple digit field, this button moves the cursor one position to the right. Use this button to find out if there are additional configuration choices in a category.

If you press and release any of these buttons quickly, the display moves one position in the tree structure. If you hold one of the buttons pressed for more than approximately one second, the display will start to change quickly.

Warning: Each time the ← button is used, you may be changing a configuration parameter.

Example

If you have a modem, turn it on (the switch is on the back panel). You will see an operational message which will show such things as the modem's preferred telecommunication line speed and whether the modem is set for synchronous or asynchronous operation. Operational messages have nothing to do with the configuration process (although they normally show some results of configuration activity) so you can ignore the message for now. If you want to study the message, turn to "Operational Messages" on page 7-2 for details.

This example will help you become more comfortable with the tree structure and the buttons. If you do not have a modem or if you prefer to become familiar with the figures in this book, start by using Figure 6-3 on page 6-9 as a reference. Press and release front panel buttons in the sequence shown below to move through the tree structure.

Press	Observe the Display
← and →	(Simultaneously) You should see <Exit Enter>.
	This is the entry point for the tree structure.
→	You will see either Password ▪▪▪▪ or View Only
	If you see the Password message, use the ↑ or ↓ button and then the → button to change the display to read Password B293 and then press the → button until the display shows View Only.
→	The display shows DTE Interface.
→	Now the display message is Data Type.
→	The display shows a message of the form Idle/Data..▪SYNC.
↑ or ↓	Press ↑ or ↓ repeatedly and watch the display. The left part Idle/Data does not change, but the right side of the display changes as you use a vertical arrow button. This display format is used to show the name of a configuration parameter, Idle/Data here, and the possible settings it can have which for this parameter are SYNC, DS/ASY, DS/SYN, AS/SYN, and ASYNC. The ▪ symbol shows the configuration parameter's current setting in working memory.
	Use a vertical arrow button to show a message that does not have a ▪ symbol.
←	The display changes back to Data Type.
	The fact that the display changed to the message one step closer to the trunk of the tree would normally tell you that you had successfully set the configuration parameter to your desired value.
	However, this menu is the View Only menu so the modem will not change its behavior.
→	The display shows the same message with the same ▪ symbol that you had the first time you saw a Idle/Data message. You cannot change the modem's configuration settings from within the View Only menu because the purpose of this menu is to allow you to see safely the current configuration of the modem and the possible variants.
↑ and ↓	The display changes to <Exit Enter>.

Lost in the Tree?

Read the list below. You can find out where you are in the tree, move quickly to a known location in the tree, or leave the tree entirely.

Check Table 15-1 on page 15-1
This table describes the configuration messages and shows where in the tree they are.

Press ↑ and ↓ together Moves the display to the <Exit Enter> message without making *additional* changes to working memory.

Press ← and → together The display moves to the <Exit Enter> message and working memory is changed as though you had pushed the ← button multiple times.

Press and hold in ← The modem behaves as though you had pressed the ← and → buttons together.

Wait for 10 minutes The modem leaves the configuration menu without doing more changes to any memory.

Turn off the modem The modem resets working memory.

The Factory Setting

When we ship the modem from the factory, it is set to be a synchronous switched network modem with a preferred speed of 9600 bps. It uses the signaling conventions of the CCITT V.25 Bis recommendation when it is on-hook and of the V.24 recommendation only when it is connected. It will accept one configuration command from the telephone line if the connection is in the V.32 mode. Also, it expects to provide the transmit clock to the DTE.

If this configuration matches your requirements and you are certain the modem is set to its factory defaults, then try it in your system.

If this configuration matches your requirements and you are not sure the modem is set to its factory defaults, then see either "Factory Reset" on page 9-1 or the next section.

Predefined Profiles

The modem has four predefined profiles that are simple to select. If the needs of your communication system match one of the predefined profiles, then configuration can be very simple - you will use only the First Setup menu.

"Simplified Configuration" on page 6-13 contains a general description of the 4 profiles and "Four Permanent Profiles" on page 6-30 describes them in detail.

Checking the Configuration

The View Only section of the configuration tree is useful for checking the configuration of the modem because it is not possible to change the configuration from that section of the tree. Figure 6-3 on page 6-9 shows how to get into the View Only section of the tree and "The Total Customize and View Only Menu" on page 6-19 describes the structure you see.

Using Commands to Configure the Modem

So you do not want to push buttons on the front of the modem? Fine. Continue to read this chapter and remember that Table 15-1 on page 15-1 shows the commands that are equivalent to the front panel LCD messages.

You *can* configure the modem with commands *if* you can get the modem and DTE to communicate across the modem's DTE interface. That first necessary configuration process is discussed in "Commands and Signaling" on page 5-1.

Display Rules

If you want to find out where you are in the tree structure or want to get to a known position in the tree, see "Lost in the Tree?" on page 6-6.

Pressing ← Does Nothing

The modem is refusing to do something it cannot accomplish such as requesting a preferred speed of 0-300 bps when the modem is set for synchronous operation or requesting the modem auto-answer after one incoming ring when your country requires a modem wait for at least two rings. The modem also refuses requests that would cause a reset if the request is made in the quick or total customize portion of the tree structure.

▪ Appears in a Message

If a ▪ is in the middle of a message, such as `Idle/Data.▪ASYNC`, the message is showing the current setup of the modem.

▪▪▪▪ Appears in a Message

The modem is requesting a password. There are three. The password that unlocks the front panel is discussed in "The Front Panel Password" on page 6-9.

Hints for New Installations

Problems with new installations are usually caused by:

- Incorrect modem and DTE configurations
- Incompatibilities between the modem and its attached DTE
- Incompatibilities between the modem and the telephone line.

Following are some suggestions that may help prevent installation problems:

- Familiarize yourself with the modem's configuration. This is best accomplished by stepping through the `View Only` menu, see page 6-19.
- If the attached DTE is synchronous, the modem should be set for synchronous operation. Also, if the attached DTE is asynchronous, the modem should be set for asynchronous operation. If you wish to use asynchronous commands and synchronous data with the modem, set it for asynchronous operation. The current setting is shown as part of the normal idle message on the 7855 display. If this message is not easily available, then you can use the `First Setup` menu to determine if the modem is set for synchronous or asynchronous operation. For more information, see "The First Setup Menu" on page 6-12.

- If the connection speed is lower than expected, verify the preferred telco speed on both modems.
- For asynchronous operation, verify that the DTE speed matches the modem's DTE interface speed. If they are different, change the setting of the modem or DTE to match the other, or start speed buffering or ECL and make certain direct mode is turned off.
- For synchronous operation, verify that the DTE and modem are in agreement on the transmit timing source. If the DTE is providing the transmit timing signal, verify that the DTE speed is the same as the modem speed at both ends of the link.
- For asynchronous operation, if the modem is not running or responding to commands, you may need to change the operation of the DSR, RFS, or RLSD signals. For information on manipulating those signals, see "Commands and Signaling" on page 5-1.
- Verify that the V.24 cable contains all the wires needed for operation (see "DTE-to-Modem Interface Cable" on page 17-1).
- Verify that the DTE supports all the wires in the V.24 cable. For example, if pin 18 is wired from end to end in the cable, the DTE should support that pin.
- Verify that the cables are properly installed as instructed in "Checking Out the Modem" on page 4-3.
- If your installation includes an auto call unit (ACU), verify that the connection between the modem and the ACU is correct. See your ACU instructions and Chapter 18, "Telecommunication Line Interfaces" on page 18-1 to determine how to attach an ACU to the 7855.

Configuring the Modem

The next sections will take you through a three step process that is summarized below.

1. Choose the basic modem configuration from the `First Setup` menu.
2. If necessary, modify that basic configuration by making choices in the `Quick Customize` or `Total Customize` menus.
3. Instruct the modem to save the changes.

If you need to configure the modem and already know how to get into and out of the configuration tree, skip ahead to "The First Setup Menu" on page 6-12.

Entering the LCD Tree Structure

Press the ← and → buttons together. The display shows `<Exit  Enter>`. Pressing the ← button when this message is showing moves you toward the exit from the tree structure, while pressing the → button moves you into the configuration choices. Figure 6-3 on page 6-9 shows the tree structure near the "exit/enter" message in more detail than is shown in Figure 6-1 on page 6-3.

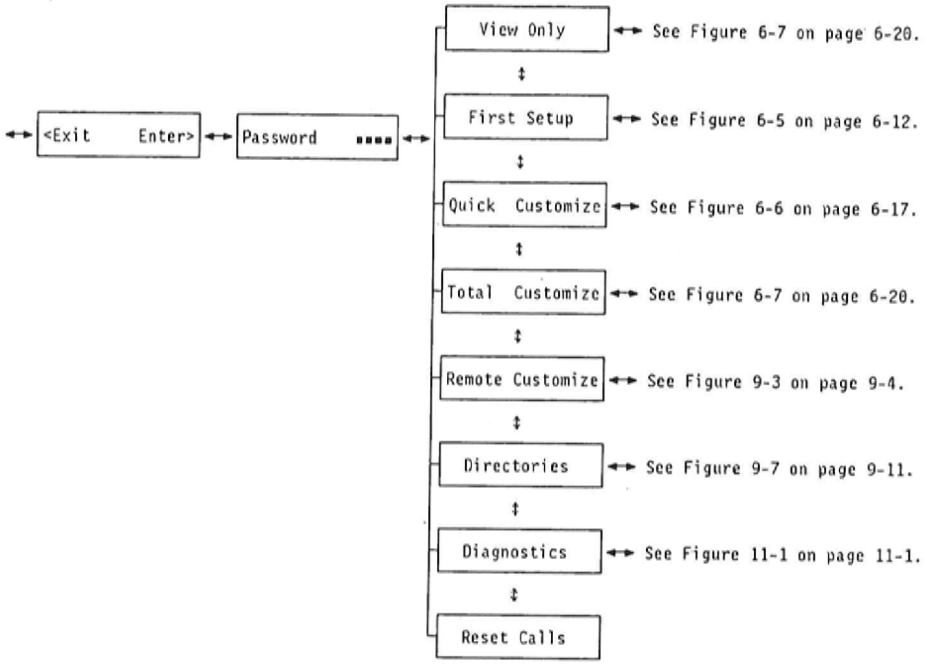


Figure 6-3. The Configuration Tree Near the Entry Point. The Password ■■■■ *message is skipped if the front panel is unlocked.*

If you leave this menu with the ← button, you go to Figure 6-4 on page 6-11.

The Front Panel Password

If you see the "Password ■■■■" message, you must replace ■■■■ with B293 to unlock the front panel.

The Major Branches of the Tree

The First Setup and Quick Customize menus are discussed later in this chapter. Brief descriptions of the other menus shown in Figure 6-3 follow:

Non-configuration Menus

Diagnostics Pressing the → button when this message is showing moves the display to a menu that allows you to start and stop tests and obtain information from the modem that is useful for problem determination. For more information, see Chapter 11, "Diagnostic Tests."

Directories Pressing the → button when this message is showing gives you access to the telephone numbers and command lists that can be stored in the modem. Operation of these directories is described in "Directories and Passwords" on page 9-10.

Reset Calls In some countries, the modem is required to refuse to dial some telephone numbers some of the time. If this happens, you can make the modem allow the number to be called by scrolling the display to this message and pressing the ← button.

`Remote Customize` Pressing the → button when this message is showing moves the display to a section of the tree structure that allows you to configure a remote modem or to get a copy of a remote modem's configuration to use at your local modem. You can also change your local modem's security level and password. These modem capabilities are described in Chapter 9, "Advanced Modem Operation."

`Total Customize` Pressing the → button when this message is showing moves the display to a large section of the tree that includes most aspects of the 7855-10's configuration. You will need to use this section of the tree if you have unusual configuration requirements. For details, see "The Total Customize and View Only Menu" on page 6-19 and Chapter 9, "Advanced Modem Operation."

`View Only` Pressing the → button when this message is showing moves the display to the `Total Customize` section of the tree and freezes the contents of working memory so that use of the ← button moves the display but does not change the modem's behavior. You can use `View Only` to determine the modem's configuration settings and to investigate other settings that are available without being concerned about accidentally changing the modem's behavior.

Leaving the Configuration Tree (Returning to Operate Messages)

From the <Exit Enter> message, press the ← button to move toward the exit from the menus. The structure of the roots is shown in Figure 6-4. If you press the ← button when one of the four left-most messages is showing on the display, the display leaves the configuration tree and show an operate message.

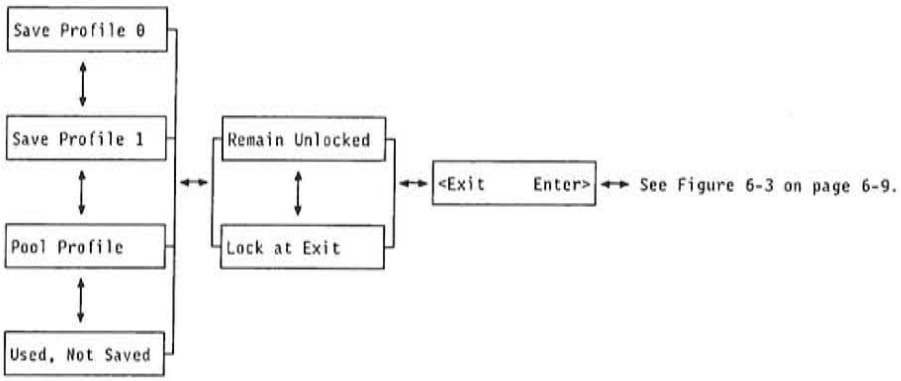


Figure 6-4. Exiting the Configuration Menu. Here are the trunk and roots of the tree.

As you exit the configuration tree, you must make some choices.

When the display shows the <Exit Enter> message and you press the ← button, the display shows Remain Unlocked.

1. Do you want the front panel buttons to be operational after you finish configuring the modem?

   You might say "no" if the modem is to be located in a place where people might accidentally press the front panel buttons.

   - If yes, then press the ← button again.
   - If no, then use a vertical arrow button to change the display to Lock at Exit and then press the ← button.

2. After you have chosen whether to have the front panel be locked or unlocked, you must decide whether the configuration choices you have made are to be stored in nonvolatile memory.
   Use the vertical arrow buttons to select one of the four options below and then press the ← button to finish exiting the configuration menu.

Save Profile 0 — Select this message if you want to store the modem's configuration in profile 0 which is the profile the modem uses when it is turned on or reset unless you have set the modem to use one of the other profiles or no profile at all. The modem copies the contents of working memory into the area of nonvolatile memory called "profile 0."

Save Profile 1 — Select this message if you want to store the modem's configuration in profile 1. You might store a configuration in profile 1 if you want to create a special profile to send to remote modems or if you connect to two very different remote DTEs at different times and therefore want to quickly change the modem configuration back and forth.

Pool Profile	You would not normally store a configuration in the pool profile unless you plan to use modem pooling. See "Modem Pooling" on page 9-2 for more information about modem pooling.
Used, Not Saved	If you press ← while the display shows this message, the modem does not store its configuration in nonvolatile memory and the configuration in working memory is lost at the next power loss or reset.

The First Setup Menu

Use the First Setup portion of the configuration tree to select some basic modem characteristics including whether the modem is to be synchronous or asynchronous, whether the AT or V.25 Bis command set is to be used, and which profile (of the two available stored in nonvolatile memory and the four factory profiles) will be loaded into working memory after power is turned on or the modem is reset.

Also, this menu is used to reset the modem to its factory defaults.

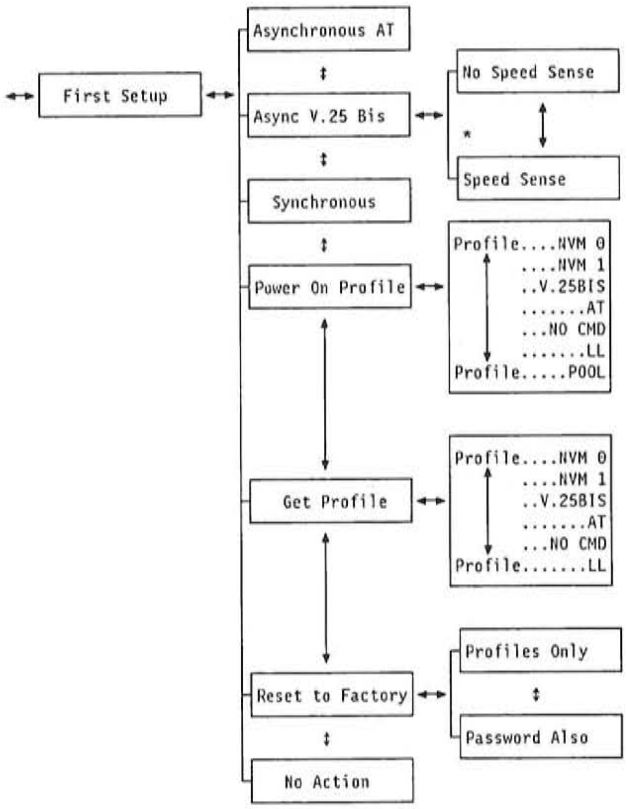


*Figure 6-5. The First Setup Selections. * If this option is selected, see "Asynchronous Speed Sensing" on page 8-3.*

Warning: When the ← button is pushed from within this portion of the tree structure, the contents of working memory are replaced if the display shows something different from what was shown when you used the → button to get to that section of the tree. Normally, you would make a selection here before making any other changes to the modem's configuration. Store working memory in a profile before making a selection here if you want to be able to recover the contents of working memory later.

Point to Remember

If working memory contains configuration settings that are not in one of the profiles, store working memory before making a selection in the First Setup menu.

Simplified Configuration

This section is similar to the configuration procedure that starts at step 25 on page 4-7 except there is more explanatory material here. If you have tried the earlier procedure and it did not work, jump ahead to "General Configuration" on page 6-14.

You can use the simple configuration steps shown in this section if your needs match one of the configurations described below and the modem is set to its factory defaults (meaning it is either new or you have followed the procedure described in "The First Setup Menu" on page 6-12). If not, jump ahead to "General Configuration" on page 6-14.

- Switched operation with AT commands
- Switched operation with asynchronous V.25 Bis commands with the modem sensing the speed of incoming commands
- Switched operation with synchronous commands
- Switched operation at the 7855-10's default telco line speed with no commands flowing between the DTE and 7855
- Nonswitched operation.

Note that when your modem is set to its factory defaults, it will accept one remote configuration session from the switched network if it is connected at 4800 bps or higher.

Configuration for AT Command Set Users: In the First Setup menu, use the ↑ or ↓ to make the display show Asynchronous AT and press the ← button.

Push the → button to go back into the First Setup menu and scroll vertically to make the display show Get Profile, press the → button and then the ↑ or ↓ button to show Profile.....AT, and then press ←.

Leave the tree structure as described in "Leaving the Configuration Tree (Returning to Operate Messages)" on page 6-11 saving working memory in profile 0 as you exit.

Configuration for Asynchronous V.25 Bis Command Users: In the First Setup menu, use the ↑ or ↓ button to make the display show Async V.25 bis, press the → button and then use the ↑ or ↓ button to make the display show Speed Sense or No Speed Sense as desired (Speed Sense is an enhanced form of V.25 Bis in which the modem can sense the speed of the attached DTE) and then press ←.

Note: In the 7855, V.25 Bis speed sensing requires the DTE to send <CR><LF> characters. If Speed Sense is selected, the <CR><LF> characters must be received by the 7855 before any V.25 Bis commands can be recognized. See "Asynchronous Speed Sensing" on page 8-3 for details.

Leave the tree structure as described in "Leaving the Configuration Tree (Returning to Operate Messages)" on page 6-11. You do not need to save working memory into a profile.

Configuration for Synchronous Command Users: If the modem is set to its factory defaults, you do not need to do anything. Otherwise...

In the First Setup menu, use the ↑ or ↓ to make the display show Synchronous and press the ← button.

Push the → button to go back into the First Setup menu and scroll vertically to make the display show Get Profile , press the → button and then the ↑ or ↓ button to show Profile..V.25BIS, and then press ←.

Leave the tree structure as described in "Leaving the Configuration Tree (Returning to Operate Messages)" on page 6-11 saving working memory in profile 0 as you exit.

Configuration for Users Who Do Not Use Commands: In the First Setup menu, use the ↑ or ↓ button to make the display show Get Profile , press the → button and then the ↑ or ↓ button to show Profile...NO CMD, and then press ←.

Leave the tree structure as described in "Leaving the Configuration Tree (Returning to Operate Messages)" on page 6-11 saving working memory in profile 0 as you exit.

Configuration for Nonswitched Operation: In the First Setup menu, use the ↑ or ↓ button to make the display show Get Profile and then press → and then use the ↑ or ↓ button to display Profile.....LL and then press ←. The modem is now set for synchronous operation as the originate modem for a 2-wire non-switched telecommunication network. Remember that for nonswitched operation, one modem must be set to originate and the other to answer mode handshaking and that a V.32 modem such as this one should be used with point-to-point (not multi-point) telecommunication lines. You can make this change in the Quick Customize menu which is shown in Figure 6-6 on page 6-17. When you leave the tree structure as described in "Leaving the Configuration Tree (Returning to Operate Messages)" on page 6-11, remember to save working memory in profile 0.

General Configuration

The best way to configure the modem when none of the four predefined profiles matches your need is to:

1. Choose from the First Setup menu. Asynchronous AT, Async V.25 bis, or Synchronous.
2. Using Get Profile in the First Setup menu get the predefined profile that best matches your needs into working memory.
3. Modify working memory as needed using the Quick Customize or Total Customize menu from Figure 6-3 on page 6-9.
4. Save working memory into profile 0 on the way out of the tree.

"Lost in the Tree?" on page 6-6 describes how to exit from this part of the tree or you can use a vertical arrow button to make the display show No Action and then press the ← button.

Some examples follow:

- If the modem is to be installed in an environment where no commands are to be given to the modem:

  1. Select Asynchronous AT or Synchronous from the First Setup menu to set the modem for asynchronous or synchronous operation.
  2. Go back into the First Setup menu and choose Profile...NO CMD from Get Profile.
  3. Go to "The Quick Customize Menu" on page 6-17 or "The Total Customize and View Only Menu" on page 6-19.

- If you want to use synchronous commands with the modem:

  1. Select Synchronous from the First Setup menu to set the modem for synchronous operation.
  2. Press the ← button.
  3. Go to "The Quick Customize Menu" on page 6-17 or "The Total Customize and View Only Menu" on page 6-19.

  Alternatively, if you know profile 0 contains its factory settings, make the display show Profile....NVM 0 and press the ← button.
  The first approach does not modify the existing signal lead settings of the modem, the second approach forces the signal lead settings to those appropriate for V.25 Bis commands which could save you time later in the configuration process.

- If you want to send asynchronous commands to the modem, choose one of the following:

  — To use the AT command set:

    1. Select Asynchronous AT from the First Setup menu to set the modem for asynchronous operation This sets the modem to accept AT commands and may be all you need to do.
    2. To further make the modem behave like some other AT modems:
       a. Use the ↑ and ↓ buttons to display GET PROFILE
       b. Press the → button
       c. Use the ↑ and ↓ buttons to display PROFILE.....AT
       d. Press the ← button.

    The choice of Asynchronous AT tells the modem you want to use AT type commands but does not cause the modem to change any other aspect of its behavior. Choosing Profile.....AT forces the modem to be an AT type switched network modem by transferring the complete modem profile into working memory.

  — To use V.25 Bis asynchronous commands, you must choose whether the modem can automatically sense the speed of the DTE interface.

    1. Select Async V.25 Bis from the First Setup menu to set the modem for asynchronous operation
    2. Press the → button

       - If you want the modem to behave exactly as defined in the V.25 Bis standard, than press the ← button when the display shows No Speed Sense. You have to manually set the modem and DTE to the same speed because the modem is not able to sense the speed of your V.25 Bis commands.

       - If you want to use the 7855's enhancement to V.25 Bis that allows the modem to automatically set itself to match the DTE's data

rate, make the modem display show Speed Sense and then press the ← button. The speed sensing process is discussed in "Asynchronous Speed Sensing" on page 8-3.

Points to Remember

- Within the First Setup menu, any choice you make is permanent until the modem is re-configured except Get Profile which modifies only working memory. For example, if you choose Profile....NVM 1 from Power On Profile, then each time the modem is turned on, profile 1 is loaded into working memory.
- The modem's command setting and basic synchronous or asynchronous operation as selected by the messages ,Asynchronous AT, Async V.25 bis, or Synchronous, are independent of the profiles that can be chosen from the Power On Profile and Get Profile selections.

The Reset to Factory message and its branches are described in "Factory Reset" on page 9-1.

If you plan to use the modem for public switched network operation, you may be done configuring it. You should either try it now or go to either the Quick Customize menu described next or the Total Customize menu described in "The Total Customize and View Only Menu" on page 6-19. The most common configuration items are available in the First Setup and Quick Customize portions of the tree.

The Quick Customize Menu

Use this portion of the tree to configure your modem to match your telecommunications lines (PSTN or nonswitched) and to select the modem's preferred data speed. The basic ECL settings are also available here. Figure 6-3 on page 6-9 shows how to get the display to the Quick Customize portion of the tree.

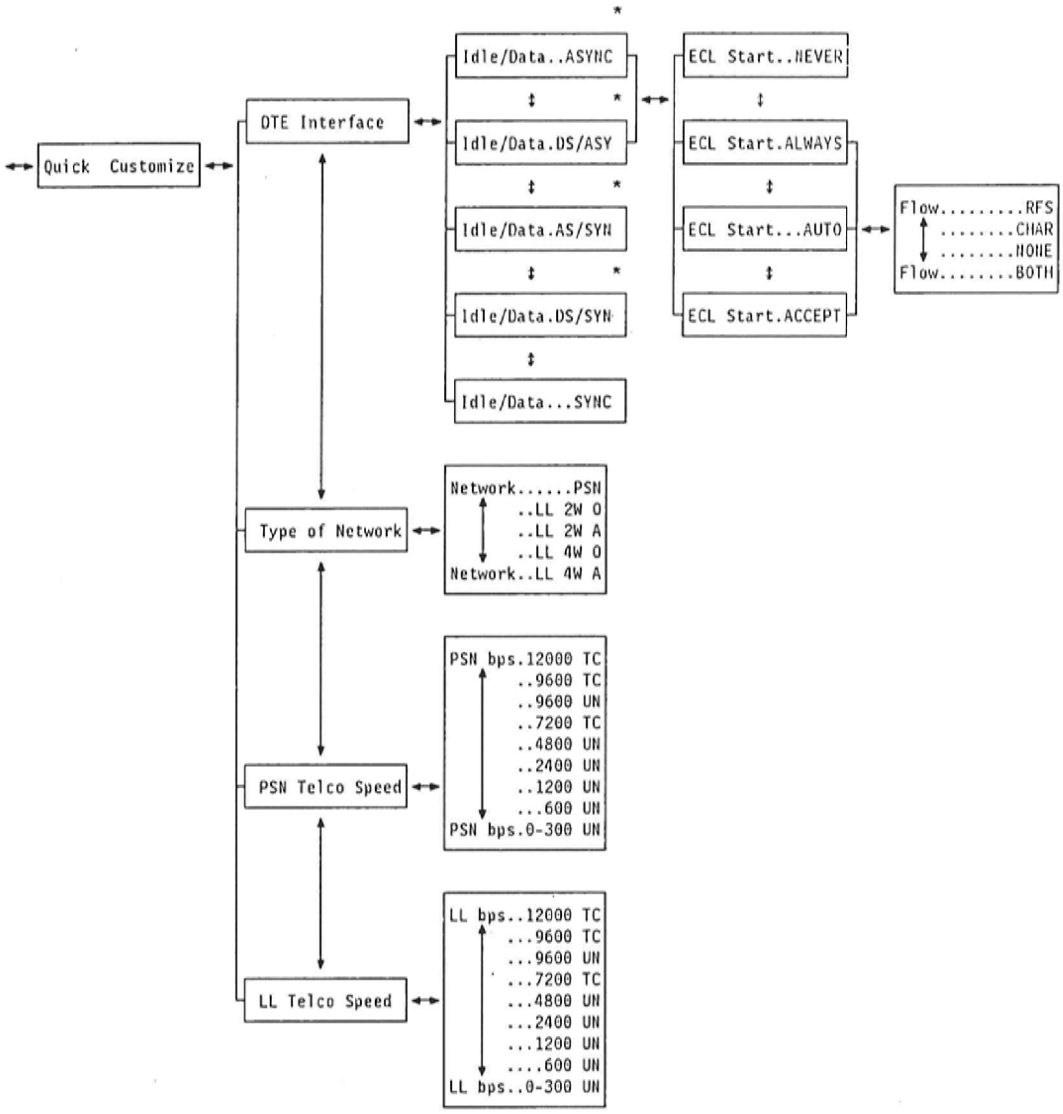


Figure 6-6. The Quick Customize Selections

* *These options can be selected only if the* First Setup *menu shows that the modem is asynchronous.*

Note: Selections in this part of the tree affect only working memory - not nonvolatile memory. Remember to store your changes in a profile if you want the changes to be permanent.

The Quick Customize portion of the tree has four main branches which are described in the next sections.

DTE Interface: If the modem is to be used for PSTN operation, the Idle/Data messages define the behavior of its DTE interface when the modem is on-hook, that is, "Idle," and when the modem is off-hook exchanging data with a remote modem.

For nonswitched operation, there is no equivalent to the on-hook idle state so the Idle/Data messages only show whether data is asynchronous or synchronous.

Changing between Synchronous and Asynchronous Operation

You must use the choices shown in "The First Setup Menu" on page 6-12 to set the basic synchronous or asynchronous operation of the modem. The modem does not allow you to change its behavior to or from the Idle/Data...Sync choice in this menu.

- If you want the modem to accept asynchronous commands when it is on-hook and have asynchronous data flow to and from the telecommunication line, press ← when the display shows Idle/Data..ASYNC.
- If you want the modem to automatically dial a telephone number when the DTE activates the DTR signal and then have *asynchronous* data flow when a connection is established, press ← when the display shows the Idle/Data.DS/ASY message. DS stands for "Dial a Stored number." The rules for which directory entry is used are shown in "Directories and Passwords" on page 9-10.
- If you want the modem to automatically dial a telephone number when the DTE activates the DTR signal and then have *synchronous* data flow when a connection is established, press ← when the display shows the Idle/Data.DS/SYN message. DS stands for "Dial a Stored number." The rules for which directory entry is used are shown in "Directories and Passwords" on page 9-10.
- If you want the modem to accept asynchronous commands when it is on-hook and then use synchronous data when a connection is established, press ← when the display shows Idle/Data.AS/SYN.
- If the modem expects both synchronous commands and synchronous data, the display shows the Idle/Data...SYNC message.

If your DTEs use asynchronous data, you can choose whether to use the ECL protocol with the ECL Start messages. If you choose to use ECL, you should also use flow control. Flow control and ECL are discussed in more detail in "Asynchronous Data Flow Control (Async)" on page 9-12 and "Error-Checking Link (ECL) Protocol (Async)" on page 9-14.

Type of Network: The 7855 modem can attach to the PSTN or to nonswitched lines that have either 2- or 4-wires. Scroll the modem display to one of the following messages and then press the ← button to instruct the modem to set itself as shown.

Network.....PSN if you plan to use *only* switched network operation.

Note that for nonswitched lines, one modem must be set to originate and the other must be set to answer.

`Network..LL 2W O`	if you want to use a 2-wire nonswitched line with your 7855-10 set to originate.
`Network..LL 2W A`	if you want to use a 2-wire nonswitched line with your 7855-10 set to answer.
`Network..LL 4W O`	if you want to use a 4-wire nonswitched line with your 7855-10 set to originate.
`Network..LL 4W A`	if you want to use a 4-wire nonswitched line with your 7855-10 set to answer.

PSTN Telco Speed: You can set the modem's preferred telecommunication line speed for PSTN operation by choosing one of the `PSN bps` messages. The abbreviations `TC` and `UN` stand for "trellis coding" and "uncoded" respectively and show whether coding is used for each of the speeds. At 9600 bps, the 7855-10 modem normally uses trellis coding which reduces data errors compared to uncoded data. However, if you *must* connect to a 9600 bps modem which does not use trellis coding, you can turn off trellis coding by making a selection in the `Telco Interface` section of the total customize menu. "Trellis coding" is defined in the glossary.

LL Telco Speed: You can set the modem's preferred telecommunication line speed for nonswitched operation by choosing one of the `LL bps` messages. The abbreviations `TC` and `UN` stand for "trellis coding" and "uncoded" respectively and show whether coding is used for each of the speeds.

The Total Customize and View Only Menu

This section shows the structure of the total customize and view only part of the tree. This portion of the tree is accessible from either the `View Only` or the `Total Customize` message as shown in Figure 6-3 on page 6-9.

The overall structure is shown in Figure 6-7 on page 6-20. The following figures give the details. To learn more about any individual message, turn to Table 15-1 on page 15-1.

Know how to move around in the tree structure before using this menu. Read "The Tree Structure" on page 6-2 or Chapter 6, "Configuration" on page 6-1 if you have not already done so.

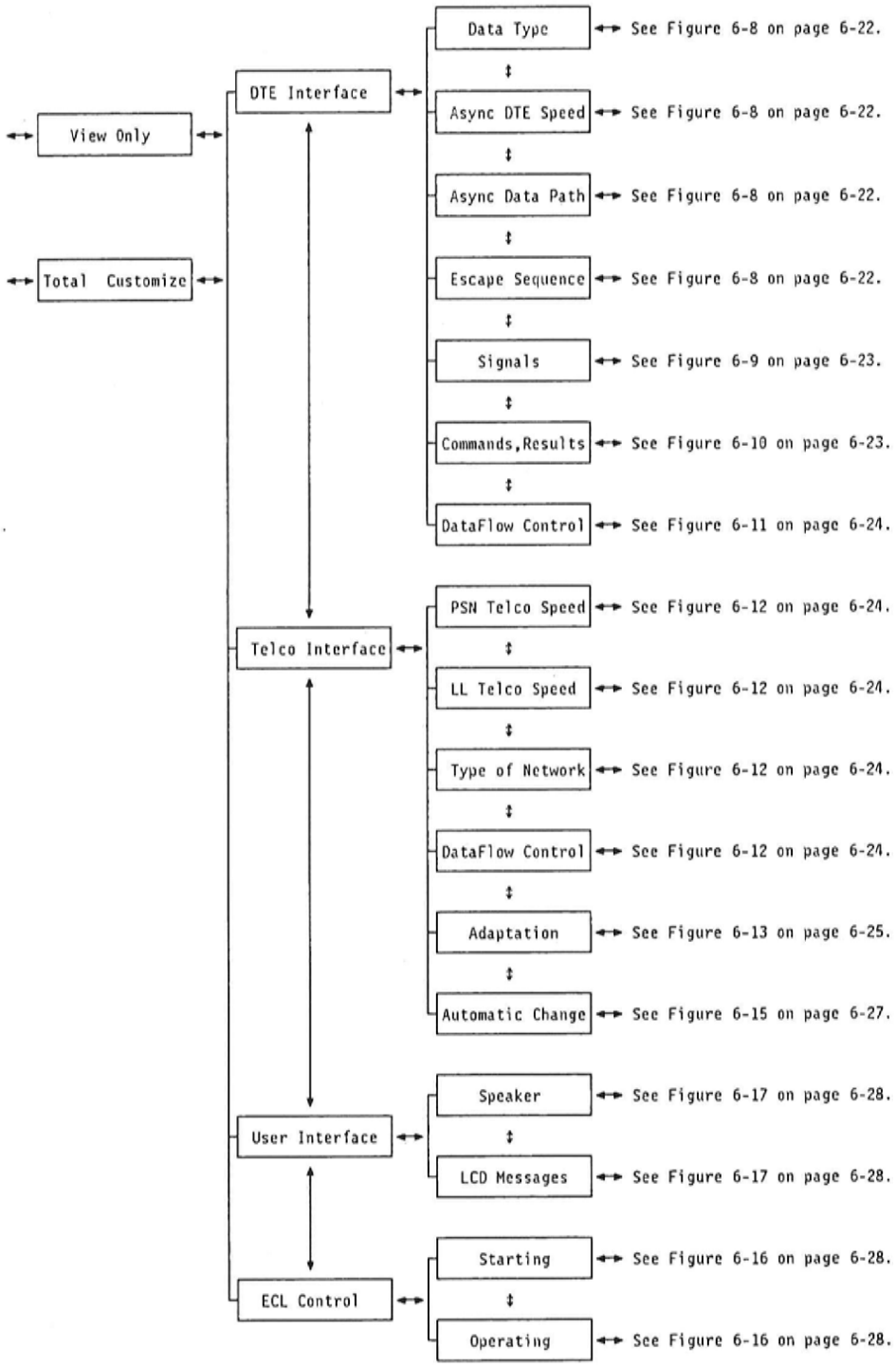


Figure 6-7. The Total Customize and View Only Tree Structure

Note: Selections in this part of the tree affect only working memory - not nonvolatile memory. Remember to store your changes in a profile if you want the changes to be permanent.

The Total Customize portion of the tree as shown in Figure 6-7 has four main branches which are:

DTE Interface: This area of the tree can be used to set up the behavior of the 7855-10's DTE interface including the type of data and commands the modem accepts across the interface, the modem's response to changes in the DTE's signaling leads and the way the modem manipulates the leads it uses for signaling information back to the DTE. You would also use this area of the tree to force the DTE interface to be constant, to define the flow control methods used by the modem and DTE, and to define how the modem can be changed from data transfer to command mode when a connection is established (the escape sequence).

Telco Interface: The 7855 modem can attach to the PSTN or to nonswitched lines that have either 2 or 4 wires with telecommunication line speeds of 300 to 12 000 bps. The abbreviations TC and UN stand for "trellis coding" and "uncoded" respectively. 9600 bps is the only speed at which either can be chosen; use 9600 TC unless you are certain you must use UN. This section of the tree also allows you to change various operational parameters of the modem to optimize the modem for your telecommunication environment. You also use this part of the tree to set up the modem's retrain and automatic speed change characteristics.

User Interface: This part of the tree controls the behavior of the modem's speaker and whether the LCD displays compact but cryptic messages or normal messages that are easier to understand.

ECL Control: Finally, you can use the Total Customize menu to control whether the modem uses the ECL protocol during asynchronous data transfer and whether the modem attempts to compress asynchronous data.

Changing between Synchronous and Asynchronous Operation

You must use the choices shown in "The First Setup Menu" on page 6-12 to set the basic synchronous or asynchronous operation of the modem. The modem does not allow you to change its behavior to or from the IDLE/DATA...SYNC choice from the DATA TYPE in Figure 6-8 on page 6-22.

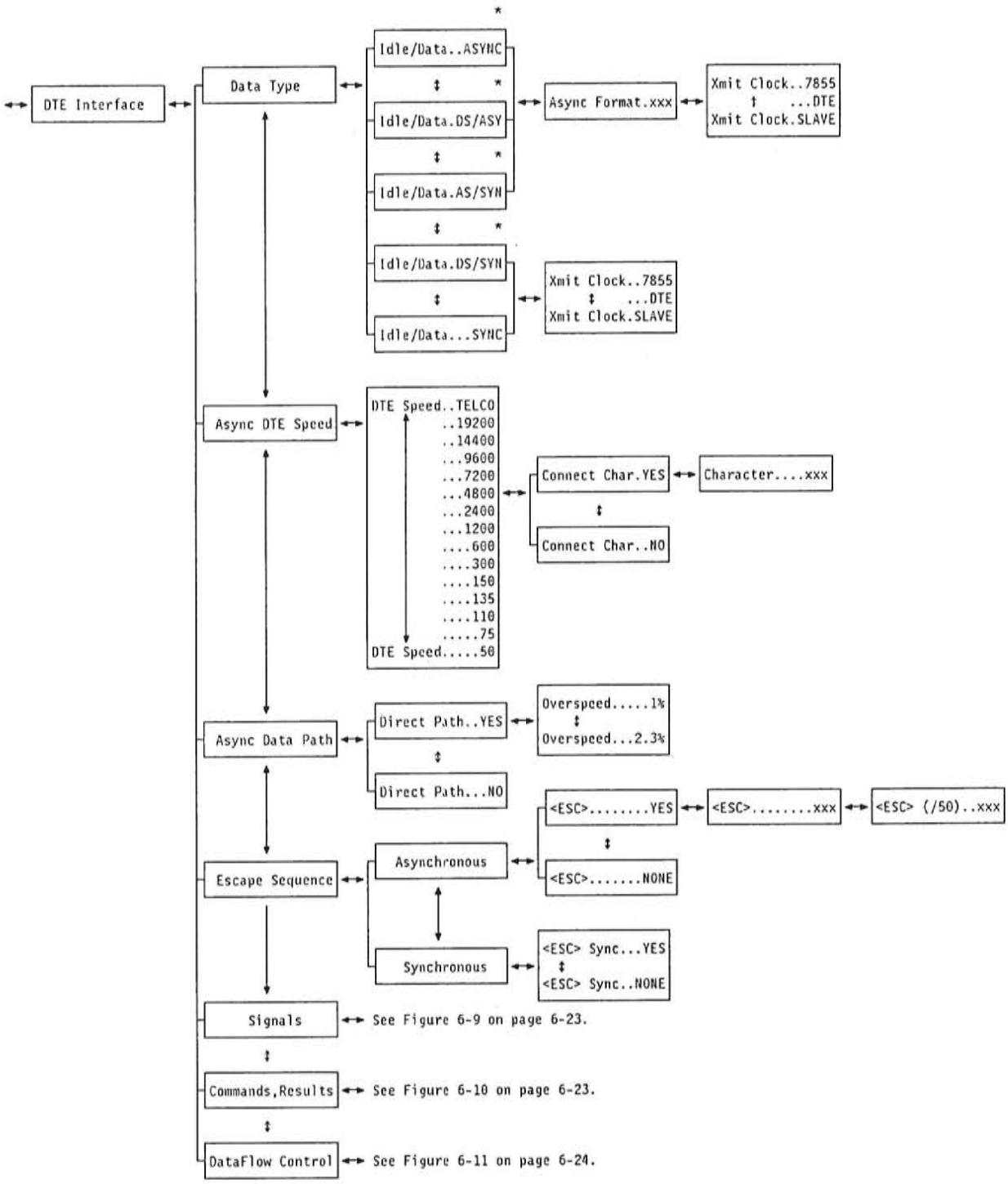


Figure 6-8. Data Type, Asynchronous DTE Speed and Data Path, and Escapes. The portion of the tree to the "left" of this menu is shown in Figure 6-7.
** These options can be selected only if the* First Setup *menu shows that the modem is asynchronous.*

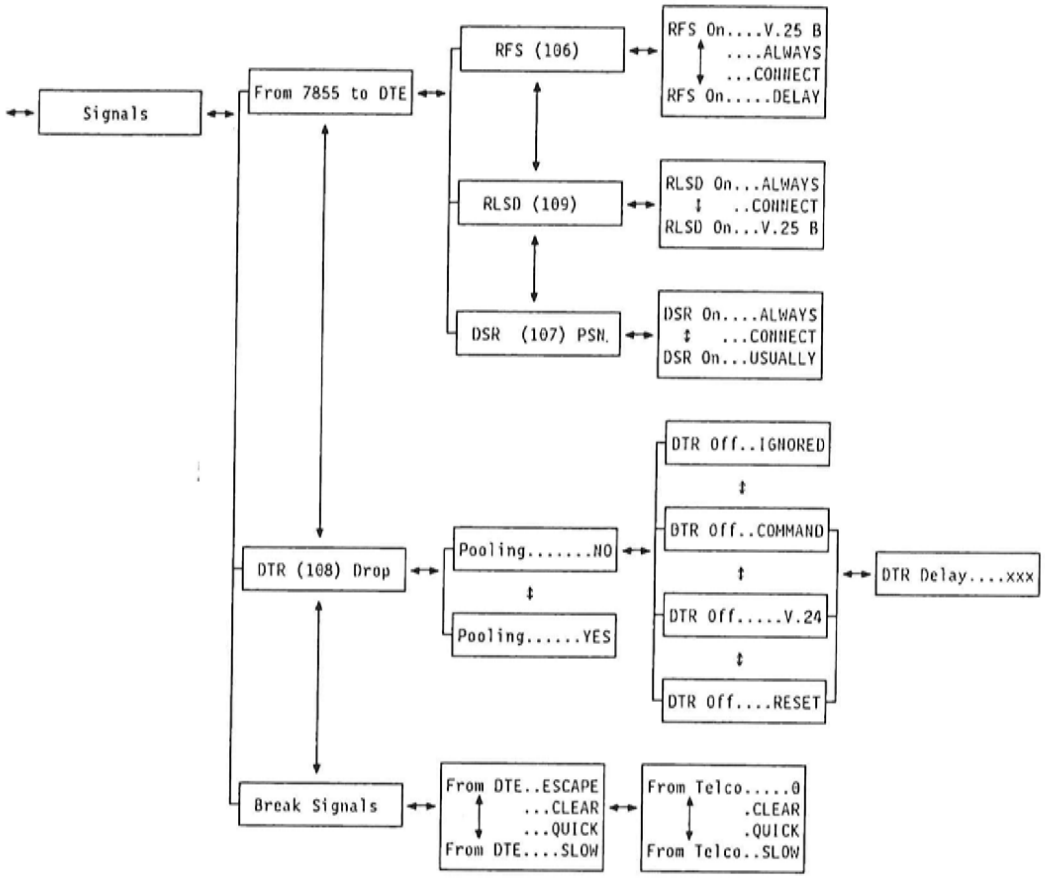


Figure 6-9. Control of the Modem's Signaling Leads. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

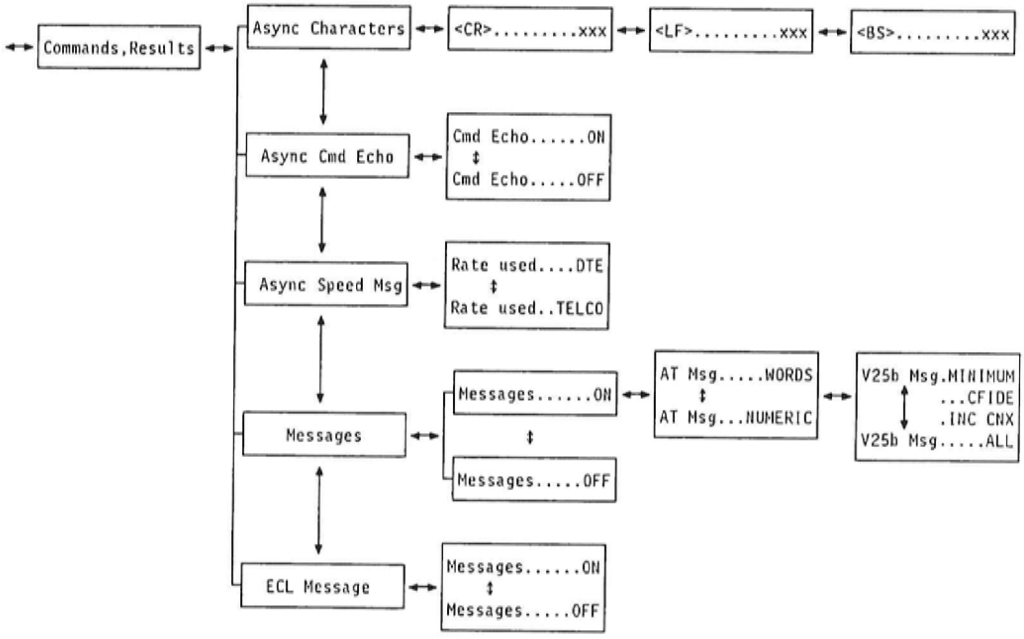


Figure 6-10. Choosing Commands and Results. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

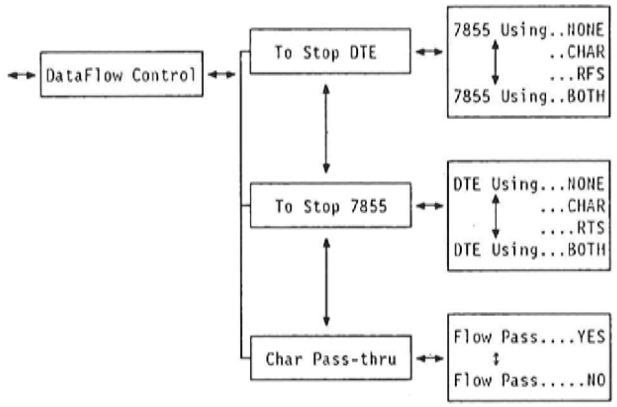


Figure 6-11. DataFlow Control for the DTE Interface. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

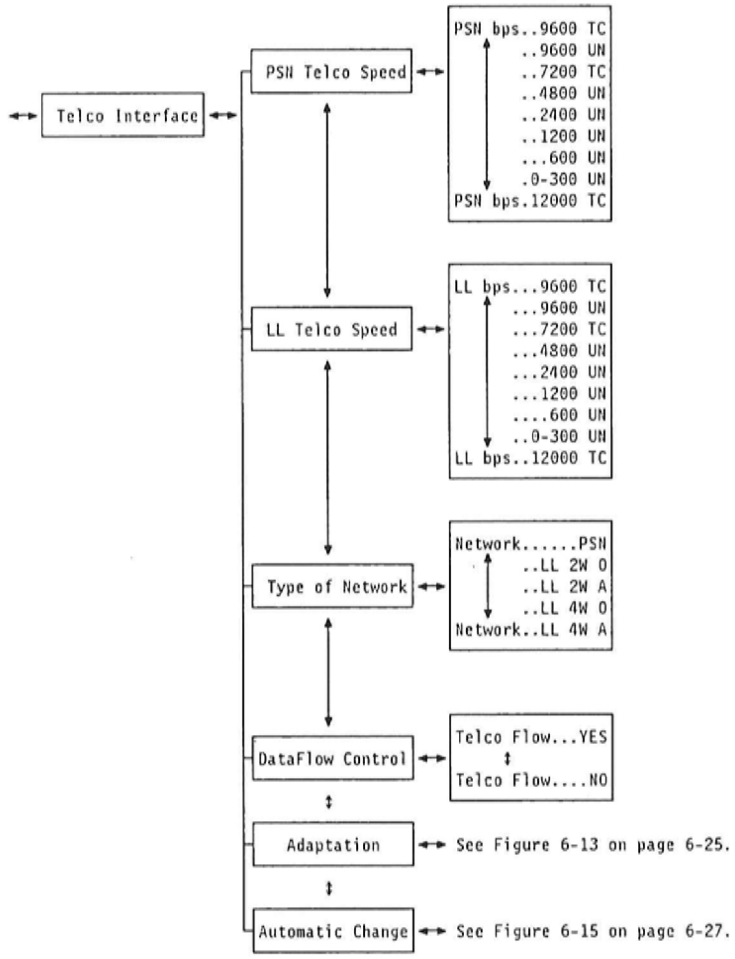


Figure 6-12. Basic Telecommunication Interface Settings. Note that the 9600 bps uncoded speed should be selected only if you are certain it is needed. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

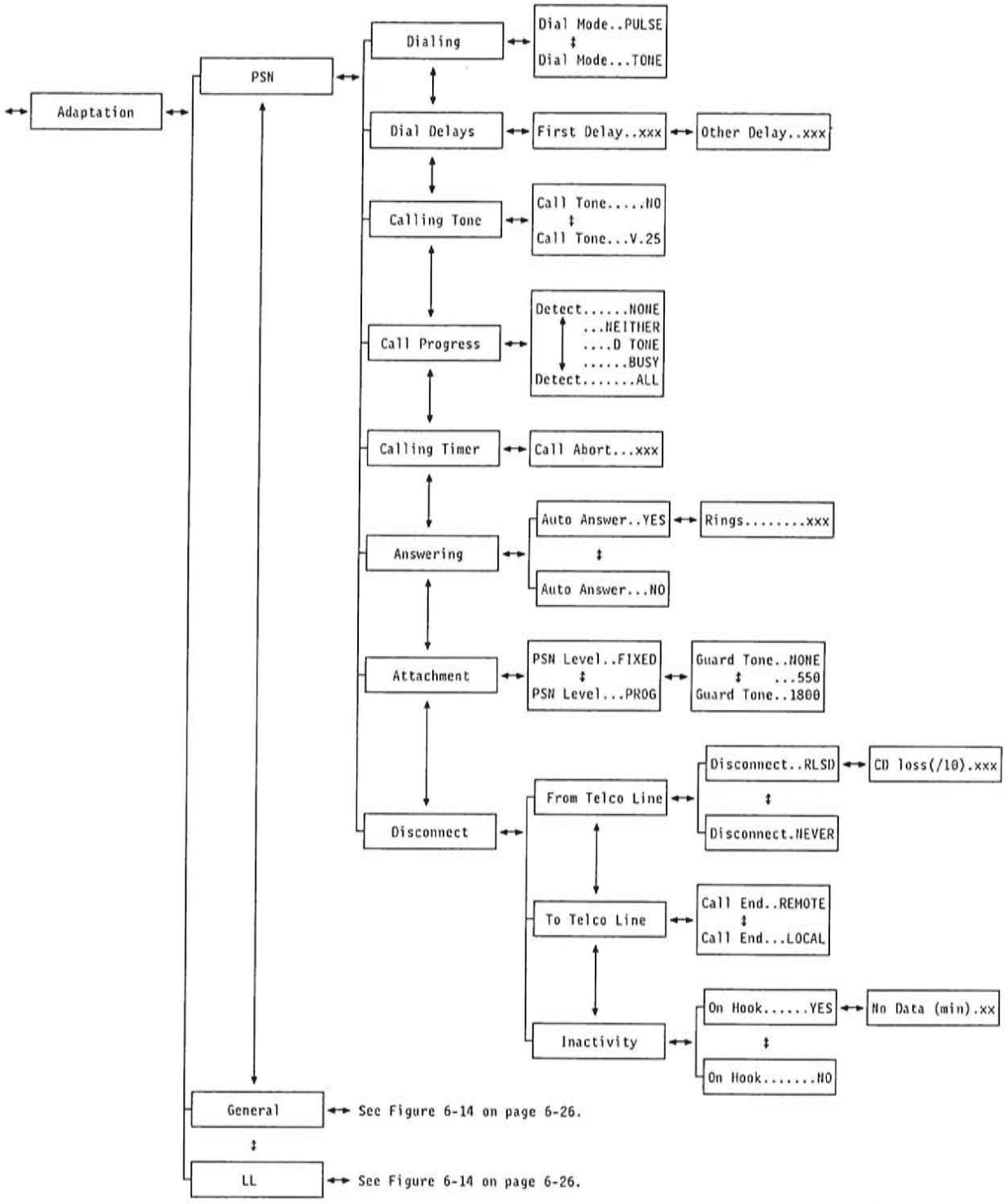


Figure 6-13. Adapting the Modem to the Telecommunication Line. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

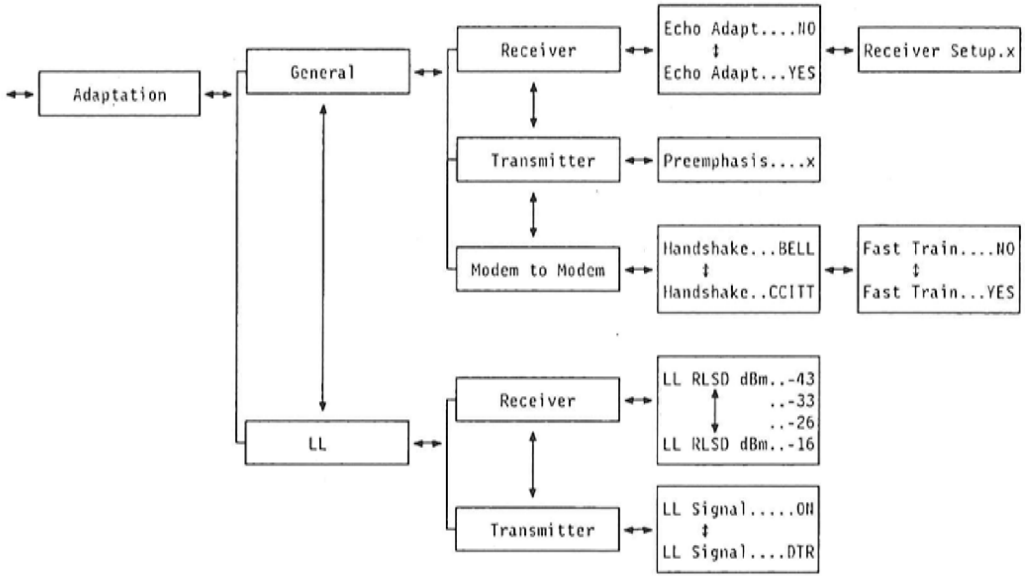


Figure 6-14. Adapting to the Telecommunication Line. This figure finishes Figure 6-13.

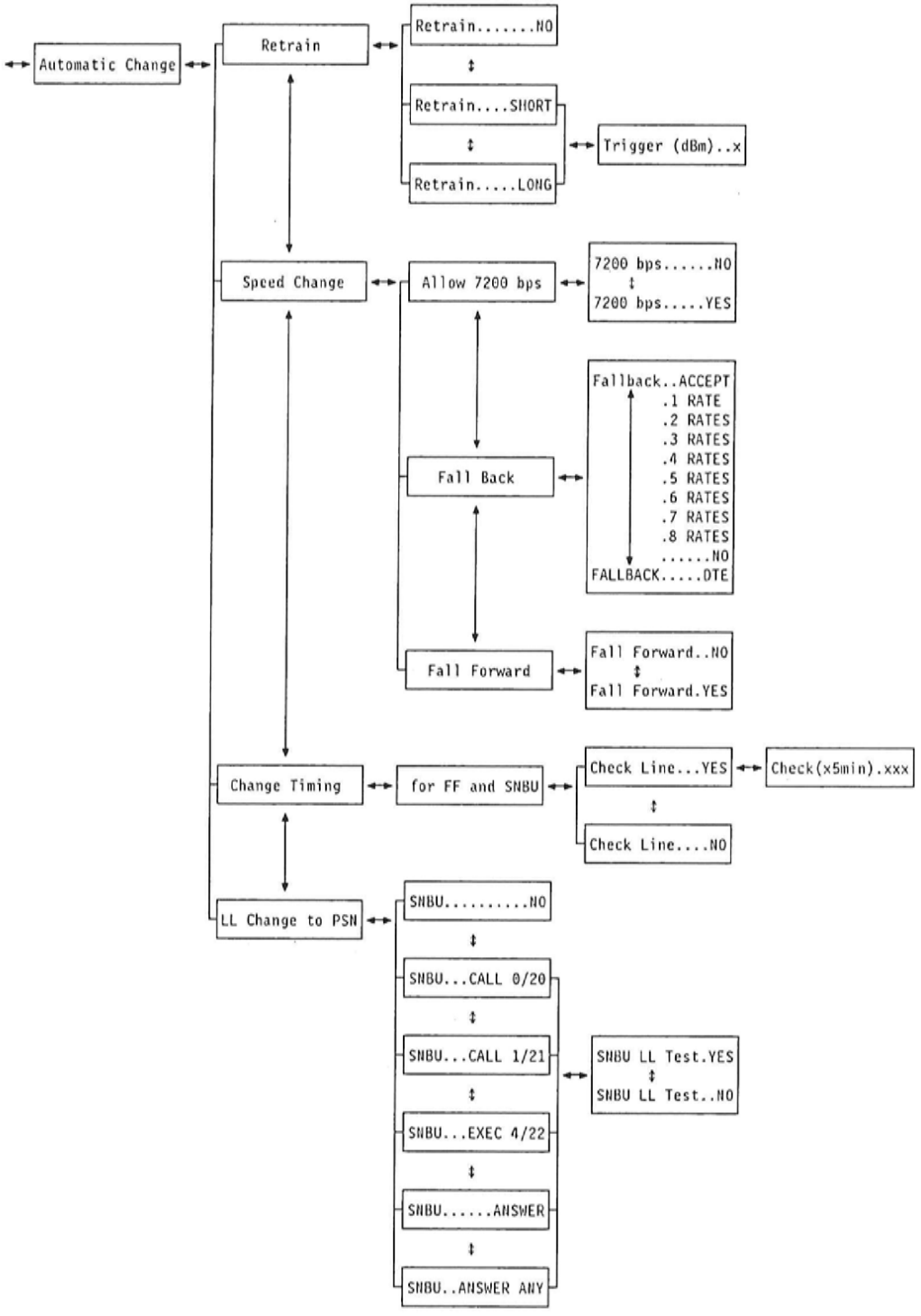


Figure 6-15. Automatic Speed Changes, Retrains, and SNBU. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

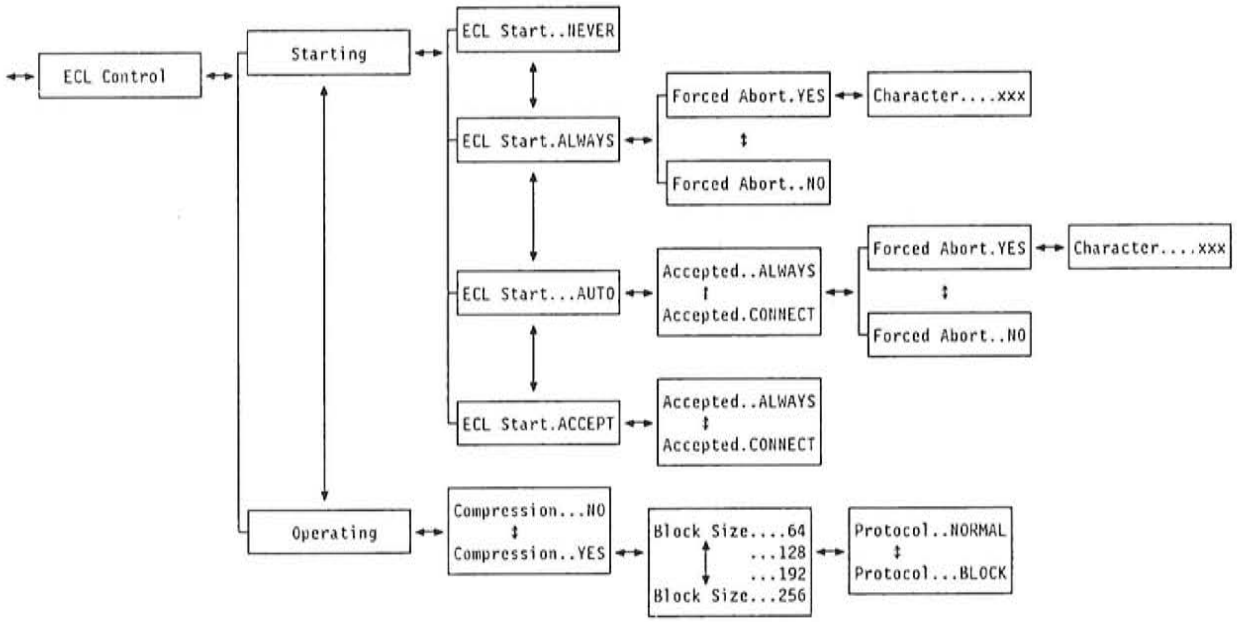


Figure 6-16. ECL Control. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

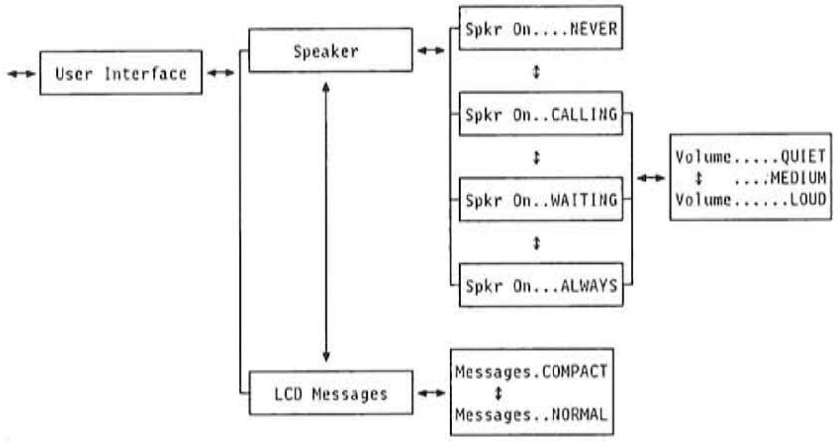


Figure 6-17. User Interface. The portion of the tree to the "left" of this menu is shown in Figure 6-7.

Where to Find the Basic Configuration Parameters

Use this section if there is some particular modem characteristic you want to observe or change and you want to know where to look in the tree. Only basic configuration characteristics are described here. If you are doing a complex operation, such as configuring the modem to do automatic switched network backup of a nonswitched connection, start from one of the following:

- Chapter 8, "Basic Modem Operation"
- Chapter 9, "Advanced Modem Operation"
- Chapter 15, "LCD Messages."

Asynchronous Character Formats
See Figure 6-8 on page 6-22.

Telecommunication Line Speed
See Figure 6-6 on page 6-17 or Figure 6-12 on page 6-24.

Modem Identification
See Figure 11-1 on page 11-1.

ECL Control
See Figure 6-6 on page 6-17 or Figure 6-16 on page 6-28.

Switched Network or Nonswitched
See Figure 6-6 on page 6-17 or Figure 6-12 on page 6-24.

Synchronous or Asynchronous Operation
See Figure 6-5 on page 6-12.

Data Type
See Figure 6-6 on page 6-17 or Figure 6-8 on page 6-22.

Saving Changes in a Profile
See Figure 6-4 on page 6-11.

Command Sets
See Figure 6-5 on page 6-12.

Clock Source for Synchronous Operation
See Figure 6-8 on page 6-22.

DTE Interface Signal Control
See Figure 6-9 on page 6-23.

Flow Control
See Figure 6-6 on page 6-17 or Figure 6-11 on page 6-24.

Diagnostics
See Figure 11-1 on page 11-1.

Storing Telephone Numbers
See Figure 9-7 on page 9-11.

Resetting the Modem
See Figure 6-5 on page 6-12.

Escape Sequence Control
See Figure 6-8 on page 6-22.

Speaker Control
See Figure 6-17 on page 6-28.

Command Echo and Modem Responses
See Figure 6-10 on page 6-23.

LCD Message Selection
See Figure 6-17 on page 6-28.

Four Permanent Profiles

There are four predefined profiles set in the factory.

Factory Profile Settings

Table 6-1 shows the settings that define the four factory profiles:

1. For V.25 Bis operation
2. For a modem in which all signaling between the modem and local DTE is done with commands and responses (typically an AT modem)
3. For modems that will not receive commands from the DTE
4. For nonswitched operation.

Notes:

1. Initial setting of local echo optimization setting probably different for different coupler/countries.
2. Direct versus buffered default depends on speed tolerance capability and whether MNP can work for remote buffered unit.
3. "*" means the setting differs from country to country as required by country regulations. If a value is shown, it is the one used in countries that have no applicable restrictions.

Table 6-1 (Page 1 of 3). Factory Profile Settings

Cmd	V.25 Bis	AT	No Cmd	Non-PSN	Description
B	0*	1*	0*	0*	0-CCITT 1-Bell.
C	1	1	1	1	Nonswitched carrier does not follow DTR.
E	1	1	1	1	Asynchronous commands are echoed.
F	1	1	1	1	Data is not echoed. (Never changes)
L	2	2	2	2	Medium volume.
M	1	1	1	0	0-Speaker disabled 1-Speaker on for call progress.
P	*	*	*	*	Default is adaptive dial where allowed.
Q	0	0	1	0	0-Messages used 1-Messages off.
T	*	*	*	*	Default is adaptive dial where allowed.
V	1	1	1	1	Verbose responses to commands.
X	4*	4*	4*	4*	Maximum call progress detection.
Y	1	1	1	1	Sends out disconnect signal when going on-hook.
&Ap	7*	7*	7*	7*	9600 bps with trellis coding.
&AI	8*	7*	8*	8*	7-9600 bps with trellis coding 8-12 000 bps.
&B	7e1	8n1	8n1	8n1	10-bit asynchronous characters.
&C	2	0	1	1	Carrier 0-Always 1-Connect 2- V.25 Bis.
&D	2	2	2	2	DTR drop ends switched connections.
&G	0*	0*	0*	0*	No guard tone unless required.
&I	0*	0*	0*	0*	Asynchronous connect messages show telco speed.
&J	0*	0*	0*	0*	Send level set by modem.
&L	0	0	0	1	0-PSN 1-LL 2W Originate.

Table 6-1 (Page 2 of 3). Factory Profile Settings

Cmd	V.25 Bis	AT	No Cmd	Non-PSN	Description
&M	0	0	0	0	Forced to 4 if modem is synchronous.
&P	0	0	0	0	Regular pulse dial.
&R	0	1	2	0	RFS 0-V.25 Bis 1-Always 2-Connect.
&S	1	0	1	2	DSR 0-Always 1-Connect 2-Usually.
&T	4	4	4	4	Modem accepts remote loop.
&X	0	0	0	0	Modem provides the synchronous transmit clock.
&Y					Not changed by these profiles.
"R					Unlocked.
"S	1	1	1	1	Local password required.
"X	2	3*	3*	3*	2-INC & CNX 3-Extended responses.
\A	0	0	0	3	0-64 byte blocks 3-256 byte blocks.
\C	2	2	2	2	ECL is accepted per the \N cmdword setting.
\D	0	0	0	0	Modem set to buffered mode.
\G	0	0	0	0	Modem to modem flow control disabled.
\I	1	1	1	1	Synchronous escape sequence turned on.
\K	2	2	2	2	Break delivery immediate - buffers not cleared.
\L	0	0	0	0	ECL transmission during pauses.
\M	0	0	0	0	Asynchronous DTE speed matches telco speed.
\N	0	0	0	0	ECL is accepted initially.
\P					Not changed by these profiles.
\Q	2	2	2	2	Modem drops RFS to stop DTE transmission.
\R	0	0	0	0	Modem recognizes no flow control from its DTE.
\T	0*	0*	0*	0*	No inactivity timer.
\V	0	0	0	0	No Asynchronous ECL messages after CONNECT.
\X	1	1	1	1	XON/XOFF characters removed from data stream.
%A	13	13	13	13	Decimal value ECL cancel character.
%B	0*	0*	0*	0*	Local loop test does not affect switched network.
%C	1	1	1	1	Modem negotiates to do data compression.
%D	0	0	0	0	No auto-speed character at connection.
%E	1	1	1	2	Retraining 1-30 Seconds 2-2 Minutes.
%F	1	0	1	1	Fallback 0-Accept 1-Initiate one speed.
%G	0	0	0	1	Fall forward 0-Off 1-Enabled.
%H	1*	1*	1*	1*	7200 bps is usable during speed changes.
%I	0	0	0	0	Maximum length V.32 training sequence.
%J	6	6	6	3	Receive level trigger 6-6dBm 3-3dBm.
%L					Not changed by these profiles.
%O	0	0	0	0	Basic asynchronous speed range.
%P	13	13	13	13	Decimal value auto-speed character. <CR>
%Q	0	0	0	0	Do not check nonswitched line during SNBU.
%R	24	24	24	24	2 hours between recovery attempts.

Table 6-1 (Page 3 of 3). Factory Profile Settings					
Cmd	**V.25 Bis**	**AT**	**No Cmd**	**Non-PSN**	**Description**
%S	0	0	0	0	No SNBU.
%TD					Not changed by these profiles.
%TP					Not changed by these profiles.
%TXI					Not changed by these profiles.
%TXp					Not changed by these profiles.
%U	0*	0*	0*	0*	Nonswitched carrier threshold -43.
%V	1	1	1	1	Normal (not compact) LCD messages.
%X	0*	0*	0*	0*	The V.25 calling tone is not used.
Note: The S Registers follow.					
S0	1*	1*	1*	1*	Auto-answer after 1 ring.
S2	43	43	43	43	Decimal value of asynchronous escape character(+).
S3	13	13	13	13	Decimal value of asynchronous carriage return < Cr > .
S4	10	10	10	10	Decimal value of asynchronous line feed < Lf > .
S5	08	08	08	08	Decimal value of asynchronous back space < Bs > .
S6	2*	2*	2*	2*	Pause before blind dial (seconds).
S7	60*	60*	60*	60*	Handshake cancel time (seconds).
S8	1*	1*	1*	1*	Pause character value (seconds).
S9	0	0	0	0	Carrier recover time (1 = 0.1 seconds).
S10	15*	15*	15*	15*	Disconnect after carrier loss (1 = 0.1 seconds).
S12	50	50	50	50	Asynchronous escape guard time (1 = 0.02 seconds).
S18	0	0	0	0	Test timer (seconds).
S25	0	0	0	0	Respond immediately to DTR drop.

Non-Profile Settings

Table 6-2 shows the factory settings of configuration parameters that can be stored in NVM but which are not changed by commands such as &F, &Y, Z, or &W. Typically these are parameters that are protected by the maintenance password.

Note: "*" means the setting differs from country to country as required by country regulations. If a value is shown, it is the one used in countries that have no applicable restrictions.

Table 6-2. Non-Profile Settings

Parameter	Setting	Meaning of Factory Setting
%L		Synchronous operation (because &Mn is set to 4).
&Y	0	NVM profile 0 is used at resets and POR.
"P		Password factory setting of B293.
\P	0	Modem is not connected to a PBX.
%TD	0	Basic modem receiver set up.
%TP	2	Medium pre-emphasis.
%TXI	*	Maximum allowed in country.
%TXp	*	Maximum allowed in country.
Pool	Off	Modem pooling turned **off**.

Manipulating Profiles

The 7855 modem has four permanent factory profiles and two profiles that a user can create and store in nonvolatile memory. There is also a pool profile that a user creates for a modem pooling environment.

Selecting

A user has a choice of which profile is loaded into working memory when the modem is reset. This option is specified by the &Y cmdword, see page 12-21 for details. To make this choice from the modem's front panel, see the Power On Profile messages in Figure 6-5 on page 6-12. Figure 6-18 on page 6-34 shows how the &Y setting determines which profile is loaded into working memory at power on.

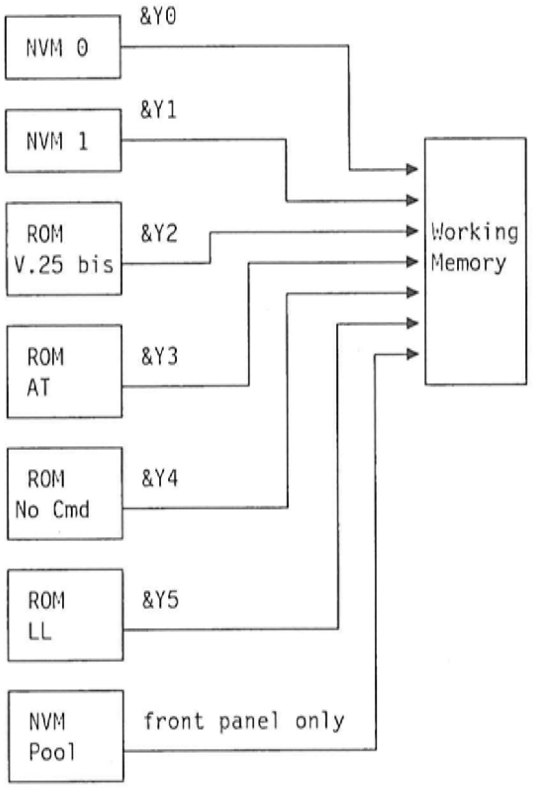


Figure 6-18. Profile Selection for Power On

Editing and Storing

Users can store any configuration parameters in the two nonvolatile memory profiles. There are two ways to do so:

- After entering all the cmdwords desired, issue the &W0 or &W1 cmdword to store the complete working memory configuration information in nonvolatile profile 0 or 1 respectively. See page 12-20 for details.
- Use the `Save Profile 0` or `Save Profile 1` as explained in "Leaving the Configuration Tree (Returning to Operate Messages)" on page 6-11.

Working memory is copied into one of the NVM profiles as shown in Figure 6-19. These changes are not lost when the modem is powered **off** and back **on** again.

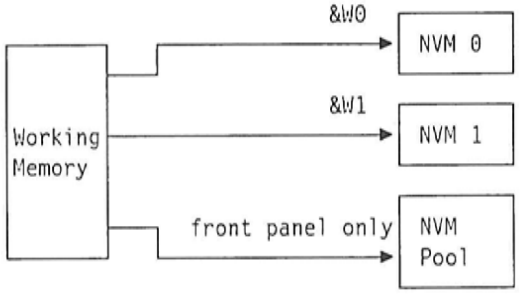


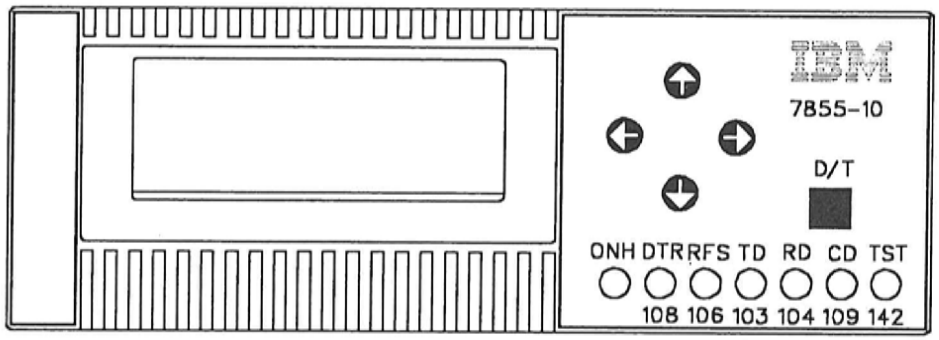
Figure 6-19. Saving Working Memory

Part 3. Operation

Chapter 7. Lights, Buttons, and Messages

This chapter describes the lights, liquid crystal display (LCD), and the buttons on the modem. The ←, ↑, →, and ↓ buttons are described on page 6-4.

Front Panel Lights



All the lights are green except for the TST light, which is yellow.

ONH (On-Hook) is **on** when the modem is powered **on** and is on-hook. This light turns **off** when the modem goes off-hook to connect to the public-switched network (PSN).

DTR 108 (Data Terminal Ready) is **on** when the circuit 108 signal is active from the attached DTE.

RFS 106 (Ready for Sending) is **on** when the modem makes circuit 106 active to the attached DTE. This signal is sometimes called Clear To Send (CTS).

TD 103 (Transmit Data) flickers as data is sent from the DTE to the modem.

RD 104 (Receive Data) flickers as data is sent by the modem to the DTE. the telephone line.

CD 109 (Carrier Detect) is **on** when the modem is receiving a data signal from the telephone line. The state of this light may be different from the state of pin 8 (Receive Line Signal Detect) on the DTE interface.

or

DSR 107 (Data Set Ready) is **on** when the modem is ready to send data to and receive data from a telecommunication line. In PSN operation, this normally happens when the modem is off-hook and has detected the presence of a modem at the other end of the line. The modem has several options to allow different DSR behavior as required in different system environments (see "The Telecommunication Interface" on page 5-3).

If the modem is set for nonswitched (LL) operation, DSR is normally **on** when the modem is turned on.

TST 142 (Test) is **on** while modem tests are running and it blinks to show abnormal conditions as follows:

- **Off** briefly each time the modem detects an error during a test.

- Continuously to show an error condition discovered during a test.
- Continuously, if a test that requires a physical connection is attempted when no connection exists.
- **On** briefly, each time an Error Checking Link (ECL) re-transmission occurs.

Note: The numbers beside the light definitions are the CCITT nomenclature.

Liquid Crystal Display

The LCD displays two types of messages. Operational messages show you what the modem is doing. Configuration messages show you the modem's actual and possible configurations. Configuration messages are described in "Configuring the Modem" on page 6-8.

Operational Messages

The connect and idle operational messages compress a lot of information into the message; the other messages are short phrases. The connect messages are defined next; if you want to learn about the idle messages turn to Table 7-2 on page 7-5 or for the other messages see Table 7-3 on page 7-7.

Table 7-1 (Page 1 of 3). The Connect Message

Message	Description
`DQ=1 9600P SYNC`	This is a connect message in the *normal* format. It shows the modem is synchronous with a 9600 bps switched network connection with good data quality. The fields in this message are defined in detail below.
`1 9600 24 10T30`	In this example of the *compact* format, the connect message shows good data quality, a telecommunication line speed of 9600 bps, a -24 dBm receive signal level, a 10 dB local echo loss a short terrestrial propagation delay time, and a -30 dBm remote echo level. The fields in this message are defined in detail below.

Table 7-1 (Page 2 of 3). The Connect Message

Message	Description
`DQ=a bbbbbc dddd`	This is the *normal* format of the connect message. **a** Is a value of 0 through 9 or A, B, C, D, E, or F. 0 is the best possible receive data quality and E is the worst. If F is shown, the modem cannot calculate the data quality - usually because there is no connection. Data quality is a measure of the quality of the signal received by the modem from the telecommunication line. Note that the DQ number does not show the effects of telecommunication line impairments of short duration such as impulse hits. Because of this, it is possible to have a DQ of 0 as data errors occur. If the telecommunication line speed is 0-300 bps, `DQ=a` does not appear in the message. **bbbbb** Is the telecommunication line speed which is one of 12 000, 9600, 7200, 4800, 2400o, 2400a, 1200o, 1200a, 600o, 600a, or 0-300. "o" and "a" show whether the carrier frequency is originate (low) or answer (high). **c** Is L for nonswitched operation, P for switched operation, B for switched network backup operation, and T is shown when the modem is participating in a test initiated from the telecommunication line. **dddd** Shows the basic way the modem is handling data which is one of: **SYNC** Data is synchronous. **ECL** An error checking link has been established. Basic data flow is asynchronous and the modem is making certain only correct data is delivered to the attached DTE. **ECLC** An error checking link has been established, and the modem is doing data compression. **ASnp** Data flow between the DTE and modem is asynchronous. "n" is either 7 or 8 to show the number of data bits in each character. "p" shows the type of parity the modem thinks is correct: **E** Even parity. **O** Odd parity. **N** There is no parity bit. **M** All characters have a mark in the parity position. **S** All characters have a space in the parity position.

Table 7-1 (Page 3 of 3). The Connect Message

Message	Description
`a bbbbb ff ggihh`	This is the *compact* format of the connect message. **a** Is a value of 0 through 9 or A, B, C, D, E, or F. 0 is the best possible receive data quality and E is the worst. If F is shown, the modem cannot calculate the data quality - usually because there is no connection. Data quality is a measure of the quality of the signal received by the modem from the telecommunication line. Note that the DQ number does not show the effects of telecommunication line impairments of short duration such as impulse hits. Because of this, it is possible to have a DQ of 0 as occasional data errors occur. If the telecommunication line speed is 0-300 bps, `DQ=a` does not appear in the message. **bbbbb** Is the telecommunication line speed which is one of 12 000, 9600, 7200, 4800, 2400o, 2400a, 1200o, 1200a, 600o, 600a, or 0-300. "o" and "a" show whether the carrier frequency is originate (low) or answer (high). **ff** Shows the received signal strength. "10" corresponds to a receive signal level of -10 dBm. **gg** Is the local echo loss through the modem. "8" would mean the local echo loss is 8 db. The gg field is blank unless local echo optimization has been done. See "Other Adaptation for Maximum Data Throughput" on page 9-6 for details. **Note** The **i** and **hh** fields appear only if the telecommunication line speed is 4800 bps or faster. **i** Shows the round trip propagation time. **(blank)** The round trip time is less than 0.023 seconds. **T** The round trip time is less than 0.2 seconds. This occurs when the connection between the two modems uses terrestrial circuits. **H** Means the connection is partly via a satellite and partly via terrestrial circuits. A V.32 modem may not perform well when such a connection occurs. **S** Is used when the round trip time is greater than 0.4 seconds which means the connection is via satellite. **hh** Shows the strength of the remote echo. "50" would be an echo level of -50 dBm.

Table 7-2 (Page 1 of 2). The Idle Message. This message is used only when the modem is configured for PSN operation because there is no modem idle state during nonswitched operation.

Message	Description
`SYNC Int 9600 a`	Is a *normal* idle message that shows the modem is set up for synchronous operation at 9600 bps with the normal type of internal clocking and it can answer automatically an incoming call. The fields in this message are defined in detail below.
`A7E19200r/x 9600`	Shows a *compact* idle message when the modem is set up for asynchronous operation with a character format of 7 even, a DTE interface speed of 19 200 bps, the modem uses the RFS signal to control data flow from the DTE, the DTE uses XON/XOFF characters to control data flow from the modem, and the preferred telecommunication line speed is 9600 bps. The fields in this message are defined in detail below.
`aaaanpfc bbbbb j`	Is the format of the *normal* idle message. **aaaa** Is either `ASYN` or `SYNC` to show that communication with the modem while it is idle must be done either asynchronously or synchronously. **npfc** For `SYNC` operation is `int`, `ext`, or `slv` for internal, external (From DTE), or slave (from modem receiver) to show the source of the modem's transmit clock. Most installations use internal clocking. **npfc** For `ASYN` operation is: **n** Is 7 or 8 and shows the number of data bits in each asynchronous character **p** Shows the type of parity used in each character **E** Even parity. **O** Odd parity. **N** There is no parity bit. **M** All characters have a mark in the parity position. **S** All characters have a space in the parity position. **f** Is `c` if all connections must use ECL and the modem does data compression if allowed by the modem at the other end, `e` if ECL is required and compression is turned off, blank if ECL is not required, or `d` if the modem is doing direct, as opposed to buffered, data transfer through the modem. **c** Is `A` if the AT command set is available or `V` if the V.25 Bis command set is available. **bbbbb** Shows the modem's preferred telecommunication line speed. **j** Is `a` if the modem can answer automatically and is blank if not.

Table 7-2 (Page 2 of 2). The Idle Message. This message is used only when the modem is configured for PSN operation because there is no modem idle state during nonswitched operation.

Message	Description
`Anpdddddf/gbbbbb`	Is the format of the *compact* form of the idle message when the modem is set to be asynchronous while it is idle. **n** Is 7 or 8 and shows the number of data bits in each asynchronous character **p** Shows the type of parity used in each character **E** Even parity. **O** Odd parity. **N** There is no parity bit. **M** All characters have a mark in the parity position. **S** All characters have a space in the parity position. **ddddd** Shows the expected DTE interface speed which is identical to the expected telecommunication line speed if speed buffering is turned off. **f/g** Is `Syn` if the connection is synchronous and is `Dir` if the modem is set to direct mode and shows the type of flow control allowed between the DTE and modem otherwise. "f" shows the type of flow control the modem uses to control data transmission by the DTE and "g" shows the type of flow control the DTE can use to control the modem. These can be: **n** No flow control **x** XON and XOFF characters are used for flow control **r** The RTS or RFS signal is used for flow control **b** Both XON/XOFF and RTS or RFS flow control is used **bbbbb** Shows the modem's preferred telecommunication line speed.
`DTRdial Synbbbbb`	Is the format of the *compact* form of the idle message when the modem is set to do directory dialing when DTR is raised and the connection has synchronous data flow. **bbbbb** Shows the modem's preferred telecommunication line speed.
`SYNC nnn bbbbb`	Is the format of the compact form of the idle message when the modem cannot accept asynchronous commands during idle and is going to have synchronous data flow when a connection is established. **nnn** Shows the type of transmit data clock used when the modem can accept commands while the modem is idle. **Int** For internal clocking (the normal case) **Ext** When the DTE is providing transmit clock **Slv** When the modem's receive clock is used for clocking transmitted data. **bbbbb** Shows the modem's preferred telecommunication line speed.

Table 7-3 (Page 1 of 2). Other Operational Messages	
Message	**Description**
ANSWERING.....	Is used when the modem starts the handshaking process without knowing there is a modem at the other end.
BAD PASSWORD	Is shown when remote configuration is attempted from the front panel and a bad remote password is issued.
BUSY.....	Is shown briefly when the modem recognizes that a call attempt on the switched network failed because it detected a busy signal.
CONNECTING.....	Means the modem believes there is another modem at the other end and they are negotiating the connection speed.
DELAYED.....	Is displayed if the requested number has been delayed.
DIALING.....	Is shown when the modem starts dialing on the switched network.
ERROR	Is shown when remote configuration is attempted from the front panel and no end-to-end connection exists, or the modems are connected synchronously at a speed of 2400 bps or slower.
FORBIDDEN.....	Is displayed if the requested number can not be dialed until manual intervention occurs.
GOING TO 12000..	Is shown when the modem is switching from 9600 to 12 000 bps when the DTE interface is asynchronous.
INCOMING RING...	Means the modem has detected a ring signal from the telecommunication line.
LOCAL LOOP 3	Is shown when the modem is instructed to do a local loop (V.54 loop 3) without pattern detection.
LOOP 3 SELF-TEST	Is shown when the modem is instructed to do a local loop (V.54 loop 3), provide the data for the loop, and count the errors. This also appears if the modem is performing one of the 4-wire nonswitched network tests.
NO ACTIVITY.....	Is shown when the connection is ended because the inactivity timer has expired.
NO ANSWER.....	Is used when ringing did not stop at the other end.
NO CARRIER.....	Is shown if the connection failed and no additional information is available. Also shown if the connection is ended from the telco side of the modem.
NO DIALTONE.....	Is shown if dial tone detection was required but no dial tone was detected.
ORIGINATING.....	Is used when a modem in originate mode is trying to establish a connection and has not yet determined whether a modem is present at the other end of the telecommunication line.
NO RESPONSE	Is shown when remote configuration is attempted from the front panel and no modem-to-modem session could be established.
NOT ACCEPTED	Is shown when remote configuration is attempted from the front panel but denied by the remote modem.
REMOTE CUSTOMIZE	Is used when the local modem is attempting to set up a remote configuration session with the remote modem.
REMOTE RETRAIN..	Means the other end is requesting a retrain, speed change, or a remote configuration session.
RETRAINING.....	Means the local modem is sending out a request for a retrain or speed change.
RINGING.....	Is shown when the modem detects a ringback signal during a switched network call out attempt.
[TALK Selected]	Signifies the modem keeps itself disconnected from the public switched network to allow the PSN line to be used for voice. This message is used only if normal LCD messages have been selected.

Table 7-3 (Page 2 of 2). Other Operational Messages	
Message	**Description**
[TALK Mode c]	Where c is P for switched network, B for switched network back up, L for nonswitched line, and T for a telco-originated test. This message is used only if compact LCD messages have been selected.
WAIT.....	Is shown while the modem is resetting itself or is doing some other brief activity.

Configuration Messages

See Table 15-1 on page 15-1 for definitions of these messages.

Front Panel Buttons

There are five buttons on the front panel of the modem.

D/T (Data/Talk). When the LCD shows a TALK message, pressing and releasing this button instructs the modem to go off-hook and attempt to establish a switched network connection. When the modem is already off-hook, or is on-hook and not displaying a TALK message, pressing and releasing this button forces the modem to be on-hook and makes the modem display a TALK message.
The general meaning of a TALK message is that the switched network line is available for use by a telephone handset.

The operation of the other four buttons is summarized here. See "Configuring the Modem" on page 6-8 for more details.

← This button places your configuration choices into working memory, and starts resets, tests, and dialing. It also moves the cursor one position to the left when the LCD is showing a numerical display.

↑ This button is used to select a single choice from several. When the choices are numerical, this button increments the numbers.

↓ This button is used to select a single choice from several. When the choices are numerical, this button decrements the numbers.

→ This button makes the modem show additional detail. When the LCD is showing a multiple digit field, this button moves the cursor one position to the right.

Rear Panel Switch

The only control on the rear panel is the power switch. Pressing the "0" on the switch turns the modem **off**.

Chapter 8. Basic Modem Operation

This chapter describes how to use your modem for basic asynchronous and synchronous operations, such as establishing a connection.

Command Sets

This section describes general characteristics of the command sets available in the 7855 modem. If you do not plan to use commands between your DTE and modem, you can jump ahead to "Connections" on page 8-6.

Considerations in Choosing an Asynchronous Command Set

You do not need to use a command set with the 7855-10 modem because the modem can be controlled from its own front panel. However, using a command set can be much more efficient. This is especially true for repetitive operations such as making the modem dial different telephone numbers to establish switched network connections.

> You *can* program the desired telephone numbers into the modem and trigger dialing from either the front panel or by activating the DTR signal from the DTE to the modem. However, such programming is tedious.

Since the 7855-10 supports two asynchronous command sets, if you want to use one of them, you need to know their relative merits.

The strengths of the Attention (AT) command set, as available in the 7855-10, are:

- Support by many communication programs used in PCs and PS/2s.
- The dial command is more flexible than the corresponding command in the V.25 Bis command set.
- Configuration of a modem requires fewer keystrokes with AT commands than with any other command set.
- The AT command set has become a defacto standard in some countries. Low speed modems with AT command sets have become common, which has led to widespread understanding of the AT command set in these countries.

The weaknesses of the Attention (AT) command set are:

- There is no official standard describing how the AT commands should work so each modem manufacturer's implementation is slightly unique.
- Certain AT commands are forbidden in some countries.
- Command names are basically one character long which makes it hard to remember their meanings.

The strengths of the V.25 Bis asynchronous command set, as implemented in the 7855-10, are:

- There is an official standard that describes how the basic commands must work.
- V.25 Bis is international. As of the date of this publication, there are no countries that forbid the use of V.25 Bis commands.

- The commands are three characters long and are good acronyms of their complete English names (for example, CRN stands for "Call Requested Number").
- Synchronous modems that support V.25 Bis are becoming more common.

The weaknesses of the V.25 Bis asynchronous command set are:

- There are no commands in the standard that allow configuration of the modem. We have added some commands to correct that in the IBM 7855-10 modem, but those commands are unique to this modem.
- The dial command does not have as many options as the corresponding command in the AT command set.
- In standard asynchronous V.25 Bis, the modem must be set manually to match the speed and character format of the attached DTE. In the 7855, we have added a capability to automatically recognize the speed and character format. However, to use that capability, you must learn something of outside the official standard.

Considerations in Choosing a Synchronous Command Set

There are two synchronous command sets available in the 7855 modem. The V.25 Bis synchronous command set is supported for two types of synchronous protocols and allows the DTE to configure and test the modem. The LPDA-2 command set in this modem contains only the call out and disconnect commands.

The main consideration in choosing a synchronous command set is whether the local DTE supports it.

Configuring the Modem to Use a Command Set

You must configure the modem to use either AT, asynchronous V.25 Bis, or synchronous commands. There are two ways to do this:

- Using the **LCD**. Use the `First Setup` menu on page 6-12 to tell the modem which command set to use. This is probably the easiest method.
- Using **cmdwords**. The following cmdwords can be preceded by an 'AT' or a V.25bis 'CNL', see page 13-6.

  &M4 Sets the modem to synchronous mode.
  %L0 Sets the modem for asynchronous V.25 Bis operation without speed sensing.
  %L1 Sets the modem for asynchronous V.25 Bis operation with speed sensing.
  %L2 Sets the modem for asynchronous AT commands.

  See "&Mn -Communication Mode" on page 12-16 and "%Ln -Limit Asynchronous Command Sets" on page 12-48 for details.

  Note: Use of these four cmdwords causes the modem to perform a reset. All changes that are made to working memory but not stored in NVM are lost.

Configuring the Modem so the DTE Can Send Commands

Signal Leads

The modem uses the leads DSR, RFS, and CD when giving its status to the DTE. Since different DTEs require different settings of these leads before they send a command to the modem, you must configure the modem to provide the necessary signal lead behavior before you can start using commands.

The simplest way to adjust the modem's signal lead behavior is to select one of the factory default profiles as shown in Figure 6-5 on page 6-12. Note that selecting a profile does not change which command set is used. For example, you could set the modem to use AT commands and also choose the V.25 Bis profile. Such a choice would mean the modem would manipulate its signal leads in ways defined by V.25 Bis and would run AT (and not V.25 Bis) commands.

If none of the four factory default profiles provides the necessary signal lead behavior, each lead can be configured independently of the other two as described in "Commands and Signaling" on page 5-1 and as shown in Figure 6-9 on page 6-23. Commands can be used to change the behavior of the DTE interface signal leads, but they are not normally used when the goal is to set the modem so that the DTE can send commands.

Matching an Asynchronous DTE's Speed and Character Format

If you use the AT command set, or the V.25 Bis command set with the speed sensing enhancement, and you ***will not*** be using one of the very unusual formats that has seven or eight data bits and a parity bit that is forced to a mark or a space (see "Asynchronous Character Format Notation" on page 2-2 for a definition of "mark" and "space"), skip this section. The modem adjusts itself to the DTE's speed and character format during normal operation.

However, you must configure the modem to match the DTE if you use:

- The "pure" form of asynchronous V.25 Bis
- One of the data formats with a fixed mark or space parity bit.

If speed buffering is disabled (which means that the DTE speed and the telephone line speed are the same), then you actually set your DTE interface speed by setting your preferred telephone speed. To set the speed, use the front panel display menu (see page 6-17) as needed for either switched network (PSN) or nonswitched (LL) operation. If speed buffering is enabled (which means that the DTE interface speed is fixed while the telephone line speed can vary) set the speed as shown on page 6-22. If the notation "7E1" is unfamiliar, review "Asynchronous Character Format Notation" on page 2-2 to set the character format of the modem. Then use the portion of the `Total Customize` menu shown on page 6-22 to configure the modem to match the attached DTE.

Asynchronous Speed Sensing

The modem can sense the speed of its local DTE if the speed is one of 75, 110, 135, 150, 300, 600, 1200, 2400, 4800, 7200, 9600, or 19 200 bps. When it senses the speed the DTE is using, it matches that speed.

The modem also can automatically match most character formats. If the character format used in your system has one stop bit and is 7 none, 7 even, 7 odd, 8 none, 8 odd, or 8 even, the modem can sense it. These are the formats commonly used in asynchronous systems.

To configure the modem to use other formats see Figure 6-8 on page 6-22 and, if necessary, the explanation in "Asynchronous Character Format Notation" on page 2-2.

The modem does speed and format sensing when all of the following is true:

- It is configured for switched network operation
- It is on-hook
- The DTE sends it the correct characters.

For DTEs Using AT Commands: Every AT command starts with AT or at or A/ or a/. The modem senses the speed of the A or the a. The modem uses a T or t character to set its character format. When the second character is / the modem assumes the character format is unchanged.

For DTEs Using Asynchronous V.25 Bis Commands: The CCITT V.25 Bis recommendation does not define a method for a modem to automatically detect the speed and character format of an attached DTE. However, if a 7855 modem is configured for V.25 Bis operation with Speed Sense, the modem senses the DTE speed and character format when it receives a <CR> <LF> from the DTE after DTR goes active and after each reset of the modem.

Notes:

1. <CR> <LF> speed sensing is not quite the same as the AT speed sensing described above because the <CR> <LF> cannot precede each command. The command <CR><LF>CRN... is rejected as invalid if the modem already knows the DTE interface speed.
2. The modem "forgets" the DTE interface speed and format when DTR drops or the modem is reset.
3. As speed sensing is made on <CR> <LF> these characters have to be received by the modem before entering any valid command, such as CRN xxx <CR>.

Matching the DTE's Choice for Transmit Clock (Sync)

Normally, no special action is needed because most DTE's use the modem's clock that is provided on pin 15 of the DTE interface. However, the 7855 modem can adapt to two other clocking arrangements as discussed in "The DTE Interface" on page 5-1 and shown in Figure 6-8 on page 6-22.

Activating the V.25 Bis Command Set

When the modem is configured for the V.25 Bis command set, it does not consider the command set active until it has received a V.25 Bis command. No V.25 Bis messages are delivered from the modem to its DTE until a command is received from the DTE.

Early versions of the 7855-10 behave the same way when the AT command set is chosen. But starting approximately November of 1990, a 7855-10 configured for AT commands delivers AT responses and messages to the local DTE even if no AT command is ever sent from the DTE to the modem.

Entering Asynchronous Commands

The format for AT commands is shown in "Entering Attention Commands" on page 12-2.

The format for asynchronous V.25 Bis commands without speed sensing is shown in "Asynchronous Frames" on page 13-3. The use of the speed sensing option does not affect the format of V.25 Bis commands but does require the DTE to send <CR><LF> characters at the right time as explained above.

Entering Synchronous Commands

The formats for synchronous V.25 Bis commands are shown in "HDLC Frames" on page 13-1 and "BSC Frames" on page 13-2.

The format for synchronous LPDA commands is shown in "Synchronous Data Link Control (SDLC) Frames" on page 14-1.

The modem automatically detects which command format is being used, so there are no configuration steps needed other than setting the DTE interface to synchronous operation.

Entering Commands during a Connection

When a connection is established a modem's DTE interface is normally being used for DTE-to-DTE data transfer. A DTE must send an "escape" sequence to its local modem to make the modem get ready to accept a command.

Asynchronous Escape Sequence: When DTE-to-DTE data transfer is asynchronous, the escape sequence is a pause followed by three identical characters followed by another pause. The pause time is set by register S12 (see page 12-59). The character is set by register S2 (see page 12-56).

Synchronous Escape Sequence: When DTE-to-DTE data transfer is synchronous, the escape sequence is a synchronous frame of the type shown in Figure 14-1 on page 14-1.

Changing Command Sets

No special action is required to change among the synchronous command formats. The modem changes automatically.

To change from one asynchronous command set to another, see "Configuring the Modem to Use a Command Set" on page 8-2.

Making the Modem Ignore Commands

The modem always accepts commands when it is on-hook and configured for switched network operation. However, it is possible to turn **off** the escape sequences so the modem does not recognize commands when a connection is established. See "S2 -Asynchronous Escape Character" on page 12-56 if you wish to turn the asynchronous escape sequence **on** and **off**, or see "\In -Imbedded Commands (Synchronous)" on page 12-34 to turn the synchronous escape sequence **on** and **off**.

Modem Responses

Responses to Asynchronous Commands

Responses are always delivered at the last known DTE interface speed and character format. AT command responses are defined in "Result Codes" on page 12-63. Using AT commands you can also:

- Disable all modem responses.
- Enable extended responses.
- Select terse (numeric) rather than verbose (word) responses.

For more information, see "Qn -Quiet Modem Messages" on page 12-9, "Xn -Extended Call Progress" on page 12-10, and "Vn -Verbose Result Codes" on page 12-10.

V.25 Bis command responses are defined in the individual commands in Chapter 13, "V.25 Bis Command Set." See also ""Xn -Extended V.25 Bis Indications" on page 12-30 .

Responses to Synchronous Commands

V.25 Bis command responses are defined in the individual commands in Chapter 13, "V.25 Bis Command Set." See also ""Xn -Extended V.25 Bis Indications" on page 12-30. LPDA responses are defined in "Information Field Format / Response" on page 14-2.

Connections

The Telecommunication Line Speed

Setting the Modem's Preferred Speed

When no connection is established, the modem has a preferred telecommunication line speed which can be set from the menu on page 6-17 or by using the AT cmdword"&Amn -Preferred Telco Speed" on page 12-12 .

Asynchronous: When the modem senses the speed of an asynchronous interface and speed buffering is turned **off** or direct mode is turned **on**, the preferred speed is set to match the sensed DTE speed (see "Asynchronous Speed Sensing" on page 8-3 for details.).

Synchronous: The modem's preferred line speed is set either by the front panel or by a DTE command.

Note: In some versions of the modem, the local DTE can change the preferred line speed via an interface lead (see "Pin 23-Data Signal Rate Selector" on page 17-5).

Connected Data Rate

When a telecommunication line connection is established, the modems at both ends exchange signals to agree on a line speed.

Table 8-1 on page 8-7 shows the telephone line data rate that occurs when modems with different preferred speeds connect if both are 7855-10 modems or equivalent.

Table 8-1. Speed Resulting from Handshaking (bps)

	Preferred Telco Speed										
Originate Mode Modem	**Answer Mode Modem**										
	TCM 12000	*TCM 9600*	*plain 9600*	*TCM 7200*	*V.32 4800*	*V.22b 2400*	*V.22 1200*	*Bell 1200*	*V.22 600*	*Bell 0-300*	*V.21 0-300*
12000 TCM	12000	9600T	9600p	72/48	4800	2400	1200	1200		0-300	
9600 TCM	9600T	9600T	9600p	72/48	4800	2400	1200	1200		0-300	
9600 plain	9600p	9600p	9600p	4800	4800	2400	1200	1200		0-300	
7200 TCM	72/48	72/48	4800	7200T	4800	2400	1200	1200		0-300	
4800 V.32	4800	4800	4800	4800	4800	2400	1200	1200		0-300	
2400 V.22b	2400	2400	2400	2400	2400	2400	1200	1200		0-300	
1200 V.22	1200	1200	1200	1200	1200	1200	1200	1200		0-300	
1200 Bell	1200	1200	1200	1200	1200	1200	1200	1200		0-300	
0600 V.22									600		
0-300 Bell	0-300	0-300	0-300	0-300	0-300	0-300	0-300	0-300		0-300	
0-300 V.21											0-300

For PSN operation, the originating modem is usually at the calling end.

When the DTE interface speed changes because a connected data rate differs from a preferred data rate, most synchronous DTEs are not affected. However, asynchronous DTEs may require a manual speed change to match such a change in a modem's speed. You may be able to configure the modem to keep its DTE interface speed constant even if the telecommunication line speed changes (see "Speed Buffering (Async)" on page 9-16). If you want to set the telco line speed to 12 000 bps and use asynchronous operation, set the DTE interface speed to the preferred speed that you want to use. Do not set the DTE interface speed equal to the telco line speed.

The 7855's preferred telecommunication line speed is displayed on its front panel when no connection is established and the actual line speed is shown when a connection exists (see "Operational Messages" on page 7-2).

Connection Times: From the start of answer tone, it takes from 2 to 15 seconds for a pair of modems to become ready to transfer data. For connection speeds of 4800 bps and faster, the modem can be set to use a short or long training sequence (see "%In -Short Training for Inter-working" on page 12-47). Short training does not work on all telecommunication lines; if it works it reduces the connection time by about 6 seconds.

Matching an Asynchronous DTE's Speed and Character Format

For information on setting the modem's speed, see "Setting the Modem's Preferred Speed" on page 8-6. For information on setting the modem's asynchronous character format see "Matching an Asynchronous DTE's Speed and Character Format" on page 8-3.

Switched Connections

A PSTN connection is established by dialing at one end and answering at the other end. An IBM 7855-10 can do both tasks or one or both of the tasks can be done manually. After a manual dial or manual answer, the telecommunication line must be transferred to the modem.

Calling Out Automatically

You can select one from among several modem dialing techniques:

- The attached DTE can send a dial command.
- The attached DTE can send a command instructing the modem to dial a number stored in one of the modem's directory positions.
- The modem can be set so that when the DTR signal from the attached DTE changes from inactive to active, the modem dials a stored number.
- The modem can be set so that pressing and releasing the D/T switch from the front panel causes the modem to dial a stored number.
- Directory entries can be stored, modified, and run using the LCD menu structure.

These five techniques are described in more detail in the next paragraphs.

Dial Commands: The AT dial command is described in "D -Dial" on page 12-5. You can make the modem re-try a telephone number automatically or try a different number if the dial attempt fails. These options make this dial command the most versatile in the 7855-10 modem. It can be 59 characters long.
For example, `ATD 555-1234` causes the modem to dial the number shown.
Only DTEs that can send asynchronous data can use AT commands.

The V.25 Bis command set has two dial commands which are described in "CRN -Call Request with Number" on page 13-14 and "CRI -Call Request with ID" on page 13-8. The `CRN` command should be used in most countries, but the `CRI` command may be required in a few countries. The V.25 Bis dial commands have parameters that allow several modem setup characteristics to be controlled by a dial command. Some are: the speaker behavior, the modem's preferred telecommunication line speed, and the call cancel time.
For example, `CRN EN 9:555-1234` causes the modem to enable extended responses and to dial the number shown. The colon (:) parameter makes the modem wait for a secondary dial tone before continuing to dial.
Parameter changes done within a V.25 Bis call command revert to their original settings when the call ends. These commands can be 57 characters long.
V.25 Bis commands can be sent by both synchronous and asynchronous DTEs. If a successful connection is established, the modem's CD light is turned **on**, and the modem may or may not send a connect message to the DTE depending on its configuration. The modem no longer monitors the data stream for commands until the connection is ended. The CRI command is used in a similar way to originate a data connection.
If the CRI command is sent to the modem and a busy response from the network is detected, the modem responds with `CFIET`.

The LPDA dial command is described in "LPDA Dial Command" on page 14-4. Some synchronous IBM DTEs support this command. Because dial digits are packed two per character in this command, a DTE could send over 100 dialable

digits in a single dial command which makes this the longest of the 7855's dial commands.

Directory Dial Commands: There are 40 directory locations numbered 0-39. Directory locations 0 to 3 can hold up to 56 characters each which can be any of the characters that can be used in an ATD command except for the S=n parameter.
Directory locations 4-19 are not restricted to telephone numbers and can be used to store any AT commands. Each of these locations can accept up to 40 characters.
Directory locations 20-39 store V.25 Bis dial parameters and can accept 54 characters in each location.

For more information, refer to "Directories and Passwords" on page 9-10.

DTR Direct Call Dialing: The modem can be set to dial a stored number whenever DTR goes active. The modem uses directory 0 if the AT command set is allowed and directory 20 if the **asynchronous** V.25 Bis command set is allowed. See "&Mn -Communication Mode" on page 12-16 or the front panel Idle/Data.DS messages of Figure 6-6 on page 6-17. Note that DS stands for dialing a stored number. Even if the modem operation is synchronous in the data mode, the First Setup menu option should be Asynchronous AT or Async V.25 bis.

D/T Dialing: When the D/T switch is pressed and released, the modem changes from talk operation to data operation. The modem first determines whether the AT or V.25 Bis command set has been selected and then checks either directory 0 or 20 respectively. If the directory is not empty and if the DTR signal is active or being ignored by the modem, the modem dials the number.
The front panel must be unlocked.

LCD Menu Dialing: From the LCD directory menu, you can manually select and dial any of the 40 directory locations (see Figure 9-7 on page 9-11).

Adaptive Dialing

All of the dial commands include T and P parameters to allow you or your DTE to control whether the modem uses DTMF or pulse dialing. However, usually, you do not need to use either parameter because the modem determines which type of dialing works in your environment.

Synchronous Connections after Asynchronous Dialing

The modem can be set up so that it establishes a connection with synchronous data transfer and behaves like an asynchronous modem when no connection is established. This can be useful if you wish to take advantage of the versatility of the asynchronous dial capabilities of the modem and need synchronous DTE-to-DTE data transfer.

See the Idle/Data.AS/SYN and Idle/Data.DS/SYN messages in "&Mn -Communication Mode" on page 12-16 for more information.

Answering Automatically

To automatically answer a call from another modem, the following conditions must be met:

- The modem must be switched **on**.
- The local DTE must turn **on** pin 20 (Data Terminal Ready) or the modem must be set to consider pin 20 active all of the time (see "&Dn -Data Terminal Ready Control" on page 12-14). Pin 20 can be turned **on** before or after a ringing signal is detected.
- The modem's LCD must not show a TALK message which would mean the modem was in talk mode rather than data mode.
- The answer on ring count value must be greater than zero. This is controlled by register S0 (see "S0 -Rings Until Answer" on page 12-55) and can also be controlled from the front panel via the Rings message in Figure 6-13 on page 6-25.

Establishing a Connection Manually

A call may be dialed or answered manually and then transferred to the modem. The procedure is:

1. Enter talk mode.
   This can be done by pressing and releasing the D/T switch on the front of the modem to make the LCD display TALK. In some environments, the telephone set associated with the modem can put the modem into talk mode although this does not change the LCD message.
2. Manually dial or manually answer as desired.
3. Be certain directory 0 (if AT commands are possible) or directory 20 (if V.25 Bis commands are possible) is empty, otherwise the modem tries to dial if you use the modem's D/T switch to transfer the call to the modem. You can erase directories one at a time or all at once (see ""Cn -Clear Command List Entry" on page 12-229.
4. Make certain DTR is active to the modem or the modem has been set to assume DTR is always active (see"&Dn -Data Terminal Ready Control" on page 12-14 or the front panel message DTR Off..IGNORED in Figure 6-9 on page 6-23).
5. Transfer the call to the modem.
   In some environments, this is done by pressing and releasing the D/T switch on the front of the modem to change the modem's front panel message from TALK to ORIGINATING. In some environments, this can be done from the telephone set without using the D/T switch on the front of the modem.
   When the D/T switch is used to change the modem from talk operation to data operation. This must be done at the beginning of the answer tone otherwise, the modems do not handshake.

Point to Remember

You must do the transfer so that one of the two modems sends answer tone and the other one "hears" at least ½ second of answer tone.
This is easy to do by first transferring one end and then listening at the telephone set at the other end for answer tone (and transferring the call when answer tone is heard).

Using Call Progress

Call progress signals are generated by the telephone network and sent to the modem to indicate the progress of an outbound call. They include such signals as dial tone, busy, and ringback. You can hear these signals on the modem's speaker.

In general, call progress signals are very useful. For example, if the modem correctly recognizes a busy signal, it automatically cancels the call-out attempt, which means it is free to attempt another number. However, different call progress signals are used in different countries. Suppose, for example, that the ringback signal in country A sounds much like the busy signal in country B. A modem doing call progress detection in country B could never call country A because it would always think the desired number was busy.
The 7855 modem gives you ways to turn **off** call progress. The applicable AT cmdwords follow. There are corresponding front panel options.

- "Mn -Speaker Mode" on page 12-8
- "Xn -Extended Call Progress" on page 12-10
- Table 13-2 on page 13-9 (the SS and DB parameters).

Change from Data Call to Voice Call and Back

You can use the front panel D/T button (see "Establishing a Connection Manually" on page 8-10). These changes must be coordinated with similar actions at the remote modem.

When using the AT command set, a voice connection can be obtained by lifting the telephone handset at both the local and remote modems and then sending an on-hook (H) command to either one or both modems (see page 12-7). The data connection can be re-established by using the dial (D) and answer (A) commands (see page 12-5 or 12-4 respectively).

Preventing the Modem from Auto-Answering

Use any of the following to prevent the modem from auto-answering:

- Switch the modem power **off**.
- De-activate the signal DTR from the DTE to the modem and make certain the modem is not set to ignore DTR (see "&Dn -Data Terminal Ready Control" on page 12-14). The DTR light on the front panel is **off** when this signal is de-activated.
- Change register S0 to zero using either ATS0=0 (see page 12-55) or the Rings set up parameter from the front panel as shown in Figure 6-13 on page 6-25.
- Press and release the D/T button so that the modem's LCD shows a TALK message. However, be aware that if the D/T button is pressed again while the modem is turned **on** and the DTR light is **on**, the modem goes off-hook and attempts to handshake.

Early Ending of a Connection

If the modem receives an asynchronous dial command, either AT or V.25 Bis, when the modem is off-hook attempting to run the command it goes on-hook and ends the command if a character arrives from the DTE before the connection to the remote modem is established. This is useful if the modem starts to dial a wrong number. This character cancel function also applies any other time the modem goes off-hook to establish a connection, for example, during auto-answer.

When the modem's DTE interface is synchronous, it ignores any data that arrives from the DTE while running a command.

Normal Ending of a PSTN Connection

Switched network connections are ended by the user as follows:

- By turning **off** pin 20 (Data Terminal Ready)
- By pressing the front panel D/T button to put the modem into the talk mode. This method is not recommended. Because pressing the button again to switch back to the DATA mode causes the modem to either go off-hook and attempt to handshake or to dial the directory 0 or directory 20 telephone number.
- By sending an ATH command to the modem after the asynchronous escape sequence.
- By initiating the analog loop or analog loop self test (see "Local Loop Test" on page 11-3 or "Local Loop Self-Test" on page 11-4).
- By detecting loss of carrier according to the setting of register S10 (see "S10 -Carrier Loss to On-hook Time" on page 12-58).
- By using the `Disconnect` message in the directory menu (see Figure 9-7 on page 9-11).

Connecting to Other Types of Modems

If you want the 7855 modem to connect with a modem at 600 bps or slower, make certain the modem is set for CCITT or Bell operation as appropriate (see page 12-4). For 0-300 or 600 bps CCITT operation, you must also set the modem to one of those two speeds since they are not part of the modem's automatic speed determining capability that allows the modem to match its speed to most remote modems.

Also, some V.32 modems use a different inter-working scheme than that agreed on by the CCITT. It may be difficult to connect a 7855 modem to one of these older modems.

The IBM 7855-10 can originate a connection to an originate only modem if the AT command set is used. For more information, see the R parameter of the AT dial command on page 12-5.

Nonswitched Connections

Establishing a nonswitched connection is just a matter of setting one modem to originate mode and the other, linked by a telecommunication line, to answer mode (see Figure 6-6 on page 6-17).

Finding Out What Is Happening

The Front Panel Lights

The front panel lights are a very good indicator of the moment to moment activity of the modem. They are described in "Front Panel Lights" on page 7-1.

The Front Panel Operate Messages

When the front panel is not being used for configuration, it shows some basic set up information. Such as whether the modem is configured for synchronous or asynchronous operation and the modem's preferred or actual speed. The front panel operate messages are defined starting on page 7-2. Note that the operate messages can be shown in either a compact or normal format. The compact format contains more information but is harder to decipher (see Figure 6-15 on page 6-27).

Controlling the Modem's Speaker

See Figure 6-15 on page 6-27, "Mn -Speaker Mode" on page 12-8, or "Ln -Level (Volume)" on page 12-8.

Configuration Information

Use the front panel LCD `View Only` menu (see page 6-9), the \S (see page 12-40), or &V (see page 12-20) cmdwords to get configuration information about the modem.

Handling Telecommunication Line Problems

Sometimes, the carrier signal used to transmit the data over the telephone line can be temporarily interrupted or impaired by a *call waiting* signal (generated by the telephone network) or by electrical noise on the telephone line. If this occurs, it will probably cause data errors.

Errors caused by call waiting signals can be eliminated by establishing an ECL (see "Error-Checking Link (ECL) Protocol (Async)" on page 9-14).

DTE Problems

See "Commands and Signaling" on page 5-1 for information about the signals RFS, DSR, and RLSD that are sent from the modem to the DTE. Also, see "%TDn -Receiver Set Up" on page 12-51 if your DTE cannot tolerate the unexpected loss of RFS caused by re-trains.

The CCITT V.32 recommendation defines how two 4800 bps or faster modems interact to adjust to the telecommunication line. This process takes longer than

the equivalent process in the older and slower modulation techniques. Older DTEs may need to have some timer values adjusted to operate with V.32 modems.

Chapter 9. Advanced Modem Operation

This chapter describes the advanced functions that are available in the IBM 7855-10 modem. Some of these functions may not be applicable to your network and most require a detailed understanding of your network to use them.

Many of the sections in this chapter apply to either asynchronous or synchronous operation but not both. Those sections have either "(Async)" or "(Sync)" in the title.

Getting the Modem to a Known State

Factory Reset

The modem can be reset to its factory defaults two ways:

- Resetting the modem from the front panel (see "The First Setup Menu" on page 6-12). This resets the nonvolatile memory profiles and working memory to factory settings. The modem is configured exactly the same way as when it was first removed from its shipping box. This Reset to Factory is outlined in Figure 9-1.
- The &F cmdword (see page 12-14) resets working memory only to one of the four permanent factory profiles. It does not effect nonvolatile memory. It also does not change which command set is active or whether the modem is synchronous or asynchronous. Those parameters remain the same.

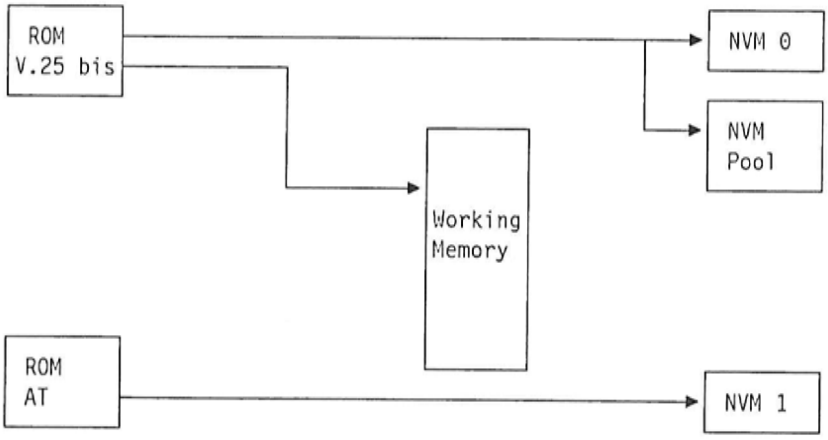


Figure 9-1. Factory Resets from the Front Panel

Normal Resets

A user can reset the working memory of the modem to one of the nonvolatile memory profiles by issuing the Z cmdword (see page 12-12 or Figure 9-2). Also, the &F cmdword or one of the front panel Get Profile messages can be used to copy a factory profile into working memory.

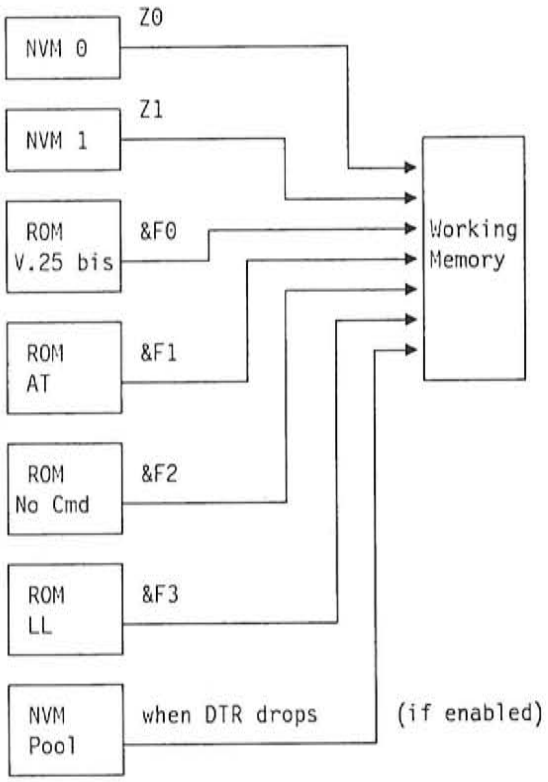


Figure 9-2. Routine Resets

Modem Pooling

Users can set up a pool profile that is loaded into working memory each time the DTE drops Data Terminal Ready (DTR). Pooling is controlled from the front panel only; there are no DTE commands that turn it **on** or **off**. See Figure 6-4 on page 6-11 to see how to store changes in the pool profile and see Figure 6-9 on page 6-23 to see how to configure the modem for the modem pooling environment.

Remote Configuration

After a physical connection has been established, the modem at a local installation may:

- Configure the modem at the remote location, one command at a time
- Obtain a profile or directory from the remote modem
- Send a profile or directory to a remote modem
- For security purposes, be configured so that it does not accept a profile from the remote modem.

If the modems are connected at 4800 bps or above, remote configuration can be performed regardless of whether the modems are synchronous or asynchronous and whether the remote modem can accept an ECL connection.

For speeds of 2400 and below, the modems must be asynchronous to perform remote configuration. At these speeds, the local modem automatically tries to initiate an ECL connection if one is not already established before doing the remote configuration. Therefore, for remote configuration to work at speeds below 4800 bps, the remote modem must be configured to always accept an ECL connection attempt (see page 12-32). If modems are configured for synchronous operation and are connected at 2400 bps or below, ERROR appears on the LCD if remote configuration is attempted from the front panel.

Remote Configuration Using the Local DTE

Asynchronous

After a connection has been established, issue the asynchronous escape sequence to put the modem in the command state. Then issue the "I cmdword (see page 12-26) if the AT command set is active, or the CNR command (see page 13-7) if the V.25 Bis command set is active. The AT "I cmdword or the CNR command allows the user to issue one or more commands to the remote modem.

Synchronous

After a connection has been established, issue the synchronous escape sequence (see "V.25 Bis Commands during a Connection" on page 13-2) along with a CNR command in the message field to send a command string to the remote modem (see page 13-7).

Factory Default Password

As shipped from the factory, the modem accepts exactly one remote configuration attempt from the telecommunication line. The write once flag is reset each time the "C cmdword is issued (see page 12-22). If you change the remote modem's password to something other than the factory default value of B293, the modem accepts any number of remote configuration attempts.

Getting a Profile or Directory

Asynchronous

After a connection has been established, issue the asynchronous escape sequence to put the modem in the command state. Then issue the "G cmdword (see page 12-24) to get a profile or the "F cmdword (see page 12-23) to get a directory from a remote modem.

Synchronous

After a connection has been established, issue the synchronous escape sequence (see "V.25 Bis Commands during a Connection" on page 13-2) along with a CNL command in the message field (see page 13-6). Include the "G cmdword to get a profile or the "F cmdword to get a directory or list entry from the remote modem.

Configuration Menus

A directory or a command list can also be obtained from a remote modem by using the front panel of the local modem.

After entering the remote password in the Remote Operation section of Remote Customize, the user can get a profile or command list from a remote modem or send a profile or command list to a remote modem. The tree structure for this section is shown in Figure 9-3.

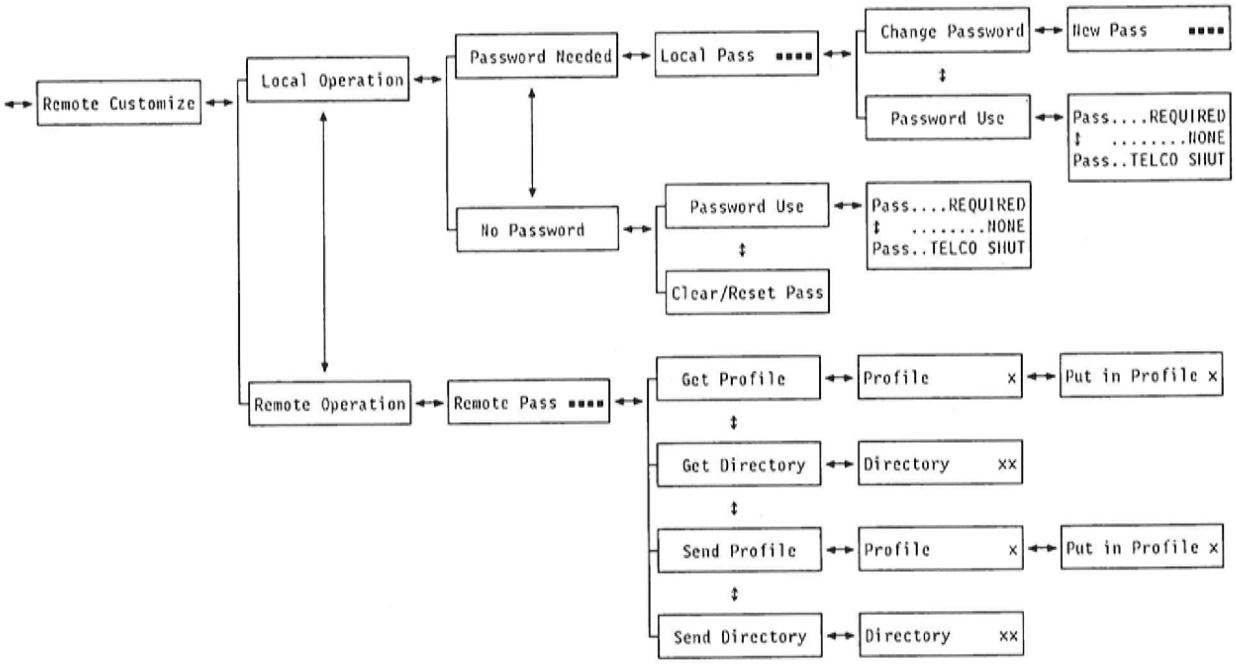


Figure 9-3. Front Panel Remote Configuration and Local 7855-10 Security

Sending a Profile or Directory

Asynchronous

After a connection has been established, issue the asynchronous escape sequence to put the modem in the command state. Then issue the "L cmdword (see page 12-27) to send a profile or the "H cmdword (see page 12-25) to send a directory to a remote modem. If the remote modem is configured for the security option that disallows any remote configuration, it does not accept the profile sent by the local modem. See ""Sn -Security Defeat" on page 12-29.

Synchronous

After a connection has been established, issue the synchronous escape sequence (see "V.25 Bis Commands during a Connection" on page 13-2) along with a CNL command in the message field (see page 13-6). Include the "L cmdword to send a profile or the "H cmdword to send a directory or list entry to the remote modem.

Configuration Menus

Refer to "Configuration Menus" on page 9-4 for information on sending profiles or directories to a remote modem.

Preventing Your Modem from Being Changed

Issue the "S2 cmdword (see page 12-29) to prevent your modem from accepting configuration changes from a remote modem. See also Figure 9-3 on page 9-4 for setting the modem to a secured state via the front panel configuration menus. The secured state is called TELCO SHUT since no configuration information is allowed from the telecommunication line.

Automatic Telecommunication Line Speed Change

Modems can be configured to automatically try to decrease the telecommunication line speed on a poor quality line or try to increase the speed on an exceptionally good line. We call such speed changes "fallback" and "fall forward". The modems must be configured for asynchronous operation with speed buffering or ECL operational, or synchronous modems with internal clocking,

Allowing the Line Speed to Decrease

The %F cmdword (see page 12-45) determines if the modem is allowed to initiate an attempt to decrease the line speed. This cmdword sets the number of rates the modem is allowed to initiate back to. For example, if the modem is configured with the %F2 cmdword, it is allowed to initiate a fallback of only two rates below its initial connection speed. The modem does not initiate a fallback attempt to a rate below this, but it accepts an attempt by the remote modem. Unless the modem is configured with the %F9 option, it always responds to a fallback attempt by the remote modem.

Fallback and SNBU Used Together

While the line degrades but the carrier signal is still present, the modem will try to fallback. When the carrier is completely lost, the modem attempts an SNBU connection.

Allowing the Line Speed to Increase

The modem can be configured to initiate an increase in the telecommunication line speed above its initial connection rate if the line quality is exceptionally good. The is determined by the %G cmdword (see page 12-46). The modem always responds to a request by the remote modem to increase the speed. There are four rules that govern the modem's ability to fall forward:

1. A modem tries to increase its speed only by one rate per fall forward attempt.
2. For nonswitched networks, the modem initiates a fall forward attempt no more often than the time specified by the recovery timer (see "%Rnnn -Recovery Timer" on page 12-49).
3. For switched network operation only one fall forward attempt is done per connection. This increase does not take place until the line quality has been good for the time specified by the recovery timer.
4. The telecommunication line speed is not allowed to increase across a modulation boundary. For the 7855 modem, this restricts the modem from falling

forward from a line speed of 2400 bps and from a Bell 212A speed of 1200 bps.

Other Adaptation for Maximum Data Throughput

Users can exercise certain other options to adapt their IBM 7855-10 modem to their particular telephone system.

2-Wire Telecommunication Lines

For telecommunication line speeds of 4800 bps and above, the modem uses an echo cancellation technique to cancel any echo of its own transmitted signal so that it primarily hears the signal transmitted by the remote modem. The 7855 modem has four different optimizing networks to choose from to minimize this local echo. When the optimization is enabled, the modem checks each of the four optimizing networks independently, measures the local echo, and then permanently starts using the network which most closely matched the telecommunication line and resulted in the lowest echo. This value is stored in nonvolatile memory. To enable the optimization function issue the \E1 cmdword (see page 12-33) or enable it from the front panel (see Figure 6-10 on page 6-23). For a modem configured for switched network operation, the echo optimization occurs during the next connection attempt. If the modem is configured for a 2-wire non-switched network, it does the operation when the cmdword is issued.

Since the local loop from the modem to the central office does not change once a modem is installed, this optimization needs only be performed one time.

Optimizing Your Transmitter

For problems with telecommunication line performance, the %TP cmdword (see page 12-52) can be used to change the characteristics of the transmitted signal from the local modem that could improve your performance. The maintenance password may be required to run this cmdword. It should only be changed by service personnel.

Optimizing Your Receiver

For problems with telecommunication line performance, the %TD cmdword (see page 12-51) can be used to try to optimize the receiver of the local modem to improve performance on your telecommunication network. The maintenance password may be required to run this cmdword. It should only be changed by service personnel.

Switched Network Backup (SNBU)

The 7855 modem uses SNBU to automatically change to a public switched network connection if the modem considers that the nonswitched line has become too poor for further communication.

The modem can be set to periodically check the status of the nonswitched line to see if conditions have improved. If so, the modem can automatically re-establish the nonswitched line connection.

These two types of operations, *initiation* or changing to a switched line and *recovery* back to a nonswitched line, can be configured in three ways:

- Automatically by the modem
- By the DTE
- Manually.

Notes:

1. When the 7855 changes to the public switched network the DTE interface pin 10 goes active.
2. When fallback and SNBU are used together:
   - While the line degrades, but the carrier signal is still present, the modem will try to fallback.
   - When the carrier is completely lost, the modem attempts an SNBU connection.

Topologies

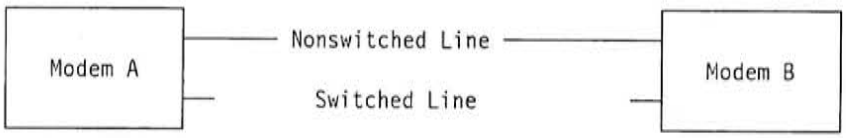


Figure 9-4. Two-Modem SNBU Configuration.
Both modem A and modem B must be connected to both a nonswitched and a switched line.

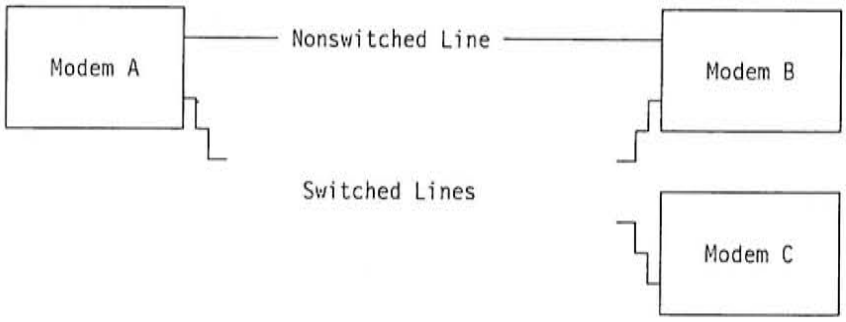


Figure 9-5. Three-Modem SNBU Configuration.
Both modem A and modem B must be connected to both a nonswitched and a switched line. Modem C can only be connected to a switched network.

Automatic Modem Control of SNBU

The cmdwords to be configured are:

- "%Sn -SNBU Control" on page 12-50
- "%Qn -SNBU Query Control" on page 12-49
- "%Rnnn -Recovery Timer" on page 12-49.

Initiation: A modem configured for a nonswitched network can also be configured so that it automatically dials a stored number and establish a public switched network connection if it decides the nonswitched connection is too poor to continue. This is enabled using the %S cmdword. Typically, in a 2-modem configuration, one modem is configured to dial over the public switched network (using %S1, %S2 or %S3) and the other is configured to answer the incoming call automatically (using %S4 or %S5).

Fast SNBU: Additional cmdwords to be configured are:

- "%En -Retrain Control" on page 12-44.
- "%Fn -Fallback Control" on page 12-45.

Automatic initiation an SNBU can be greatly speeded up by, in addition to the above, setting both the local and remote modems to `Retrain.....NO` (using %E0) and `Fallback.....NO` (using %F9).

Recovery: A modem can be configured so that it periodically checks the status of the nonswitched line in an SNBU connection. This is controlled by the %Q cmdword. Usually one modem is configured to be the master (using %Q1) and the other is configured to be the follower (using %Q0). The interval used to check the nonswitched line is a multiple of five minutes and is set using the %R cmdword.

Note: %R is active only in a modem with %Q1 set.

If the condition of the nonswitched line has improved, the modems end the SNBU connection and attempt to re-establish a nonswitched connection.

DTE Control of SNBU

The cmdwords to be configured are:

- "Cn -Carrier Control" on page 12-4
- "Hn -Switch Hook" on page 12-7
- "%Sn -SNBU Control" on page 12-50.

Initiation: The DTE can force a switched network backup connection if the modems are configured properly. This can be done in two ways:

1. The first method is:
   a. The remote modem is configured to answer incoming calls automatically (using %S4 or %S5).
   b. The DTE sends a dial command to the local modem:
      - If the connection is asynchronous, from the escaped state
      - If the connection is synchronous, using the synchronous escape sequence.

Note: When connected to an IBM Communications Controller which supports LPDA, the modem responds to the LPDA connect and disconnect commands issued by Netview* through NCP* on nonswitched lines defined as LPDATS = LPDA-2.

The calling modem must be set to SNBU.....NO and the called modem must be set to either SNBU.....ANSWER or SNBU..ANSWER ANY.

Dialing is explained in "Switched Connections" on page 8-8. The modem ends the nonswitched line connection and dial the number sent over the public switched network.

2. The second method is:

   a. Configure the local modem so that it turns **off** its carrier signal when the DTE drops DTR (using C0).

   b. Configure the remote modem to dial a stored number (using %S1, %S2, or %S3). The number dialed could be an alternate local modem connected to the same DTE (see Figure 9-6). When it, modem B, does not sense a carrier signal, it initiates an SNBU to reconnect to the DTE.

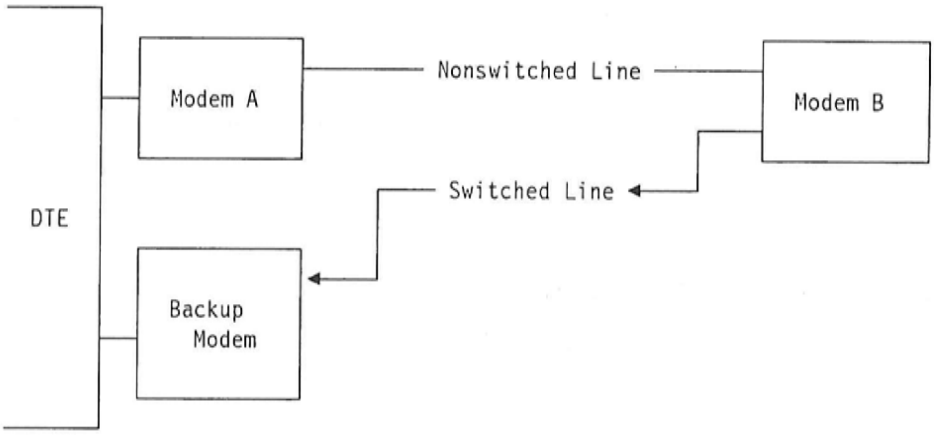


Figure 9-6. Use of an SNBU with a Backup Modem

Recovery: A DTE can also force the modems to try to re-establish a nonswitched connection in two ways:

- The DTE sends the modem a disconnect command (using H0). The modems end the SNBU connection and attempt to re-establish the nonswitched connection.
- The DTE drops DTR to end the SNBU connection. The modems try to re-establish the nonswitched connection.

Manual Control of SNBU

The cmdword to be configured is:

- "%Sn -SNBU Control" on page 12-50.

Initiation: There are two methods to manually initiate an SNBU:

1. The first method is used to establish an SNBU if you know that the nonswitched network will be disrupted shortly:

a. Configure the local modem to dial the number stored in directory 0 or directory 20 when it tries to change to an SNBU (using %S1)

b. Configure the remote modem to answer an incoming call (using the %S5)

c. To attempt an SNBU connection, press twice the data/talk button on the front of the modem.

The modem dials the stored number to attempt an SNBU connection (directory 0 is used for the AT commands, directory 20 is used for the V.25 Bis commands).

2. The second is used if you want the modem to *never automatically* initiate an SNBU.

   a. Configure both modems with the %S5 cmdword so that they answer an incoming call. This way neither one initiates the call.

   b. Store the remote modem's phone number in one of the local modem's dial directories.

   c. From the DIAL OR EXECUTE section of DIRECTORIES menu, you can force the local modem to dial the remote modem to establish an SNBU connection.

   Directory operations are explained on page 9-11.

Recovery: Go into the configuration menus to the DIRECTORIES section (see page 9-11). Press the ← key when the display shows DISCONNECT. The SNBU connection ends and the modems tries to re-establish the nonswitched connection.

Directories and Passwords

See "Directory Dial Commands" on page 8-9 for basic information about directories.

Storing and Running Command Lists

Command lists can be created using the "W cmdword (see page 12-30). A user specifies a number, a name, a list of commands, and a security level for each command. To run the commands, use the "E cmdword to run the command list by specifying the number (see page 12-23) or use the "N cmdword to do the list by specifying the name of the list (see page 12-28). For secured command lists, the user must also enter the local password to run the commands.

A user may also store and do command lists via the front panel configuration menus. This is shown in Figure 9-7 on page 9-11. In the menu, there is no place for a user to specify a name or a security level so the modem obeys the following conventions:

- If a new command list is created, it does not have a name associated with it and the security level is the same as the modem's "S setting,
- If an existing command list is modified from the front panel, the name and security level remains the same.

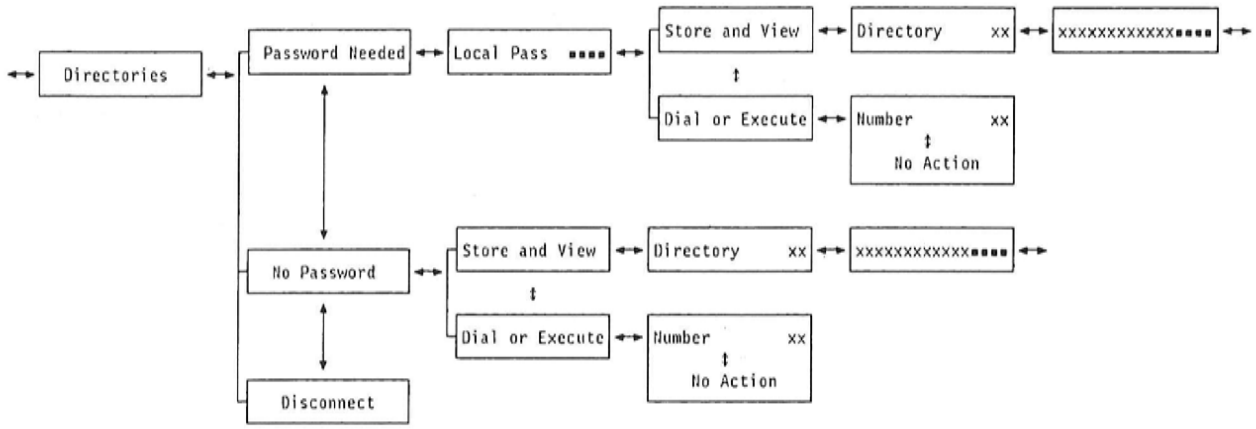


Figure 9-7. Front Panel Directory Menu

Storing and Dialing Telephone Numbers

Telephone numbers are stored using the &Z cmdword with the AT command set (see page 12-21), and are stored using the PRN command with the V.25 Bis command set (see page 13-15). They can also be stored from the front panel.

The stored numbers can be dialed by using the CRS command in V.25 Bis (see page 13-14) or the S=n parameter of the AT dial command (see page 12-5). They can also be dialed from the front panel (see Figure 9-7).

A final way to dial stored numbers is to press and release the data/talk switch to place the modem in TALK mode and then press and release it again. If the AT command set is active, the modem dials the number stored in directory 0. If the V.25 Bis command set is active, the modem dials the number stored in directory 20. This provides the user with an easy method of dialing a frequently called number.

Changing Passwords

The 7855 modem has three passwords associated with it. Two of them are fixed and cannot be changed. These are the maintenance password, which is only used by service personnel, and the second is the password required to enter the front panel configuration menus when the front panel is locked. The other password, called the local password, can be changed by the user by using the "P cmdword (see page 12-28). It can also be changed from the front panel. This password can be reset to the factory default value of B293 by using the "C cmdword (see page 12-22) or with the Password Also from the front panel first setup menu shown in Figure 6-5 on page 6-12.

This local password cannot be changed from a remote modem.

Clearing Directories

Dial directories 0 through 3 are cleared one at a time with the &Z cmdword (see page 12-21).

Directories 4 through 19, the command list directories, are cleared by issuing the "C cmdword (see page 12-22). One or all command lists can be cleared by issuing this cmdword.

Dial directories 20 through 39 can be cleared one at a time with the V.25 Bis PRN command (see page 13-15).

Any directory can also be cleared easily from the front panel. Simply enter the Store and View section of Directories and move to the directory to be cleared. In the first block of the directory, scroll through the alphabet until the solid block character is displayed and then press the left arrow button. Everything to the right of this character, which is the entire entry, will be erased.

All 40 directories are cleared by the Password Also option that is part of the First Setup menu (see Figure 6-5 on page 6-12).

Asynchronous Data Flow Control (Async)

Flow control is a method of temporarily stopping the flow of data between a 7855 modem and its attached DTE, or between a 7855 modem and a remote modem. Modem-DTE flow control and modem-to-modem flow control are independent of each other and each method is described separately below.

Flow Control between a Modem and Its DTE

How the DTE Can Control Data Flow

The DTE can control data flow from the modem in two different ways. The first way involves the DTE manipulating its Request to Send (RTS) signal. When the DTE drops RTS, the modem can be configured to stop transferring data to the DTE. When RTS is raised, the modem resumes sending data. The second method involves the use of XON/XOFF characters sent by the DTE. When a DTE sends an XOFF character to the modem, the modem can be configured to stop the flow of data to the DTE. When the modem receives an XON character from the DTE, it resumes transferring data to the DTE. The 7855 modem can be configured to accept one or both of these methods of DTE flow control. See "\Rn -V.24 Flow Control (DTE Stops Modem)" on page 12-40 for details.

How the Modem Can Control Data Flow

The 7855 modem can control data flow from the attached DTE in two different ways. The first involves the modem manipulating its Ready for Sending (RFS) signal. If the DTE recognizes this type of flow control, it stops sending data when RFS drops. When it raises again, the DTE resumes sending data. The modem can also be configured so that it also uses XON/XOFF characters for flow control. The modem sends an XOFF character to the DTE when it wants the DTE to stop sending data and sends an XON character when it is again ready to receive data. The 7855 modem can be configured to use one or both of these methods of data flow control. See "\Qn -V.24 Flow Control (Modem Stops DTE)" on page 12-39 for details.

Modem-to-Modem Flow Control

The 7855-10 modem has two methods of modem-modem flow control. They are:

- Flow control provided by the error-checking link (ECL) protocol when an ECL connection is established.
- Flow control using the XON/XOFF characters is almost the same as in "Starting Modem-to-DTE Flow Control" on page 9-13. The difference is that the XON/XOFF characters are exchanged between modems instead of

between a modem and a DTE. Use the \G cmdword, see "\Gn -Modem to Modem Flow Control" on page 12-34 to enable this type of flow control.

Flow Control Lockup

Sometimes data transmission in either direction stops because of a flow control error. This is most likely to occur when XON/XOFF flow control is used for modem-modem flow control.

To clear a modem-to-modem lockup, send a break signal by issuing the \B cmdword (see page 12-32).

Flow Control Summary

- The modem must be able control data flow if you use speed buffering or ECL.
- It is not recommended that the DTE control data flow but this method is supported by the modem if your system requires its use.
- If you use speed buffering, you should also use ECL to get the desirable form of modem-to-modem flow control.
- If you use speed buffering and cannot use ECL, set the DTE speed to 9600 bps or faster and turn **off** modem-to-modem flow control to prevent flow control lockup because of noisy telephone lines.

Testing for Flow Control

General Guidelines

- When transmitting *binary* data files, XON/XOFF flow control should *not* be used because XON and XOFF characters may appear in the data.
- If your DTE is a keyboard and display only without additional capability or is programmed to function as such, any type of flow control probably will work.
- If your DTE can display the XON and XOFF characters, use *Ready for Sending* flow control. For programmable DTEs such as the IBM Personal Computer (PC), the program determines if XON and XOFF characters are interpreted as data. The IBM PC displays XON (X'11') as '◄' and XOFF (X'13') as '‼'.
- If necessary, experiment with the different types of flow control. You cannot damage anything by choosing a type of flow control that does not work (but you may lose data).

Starting Modem-to-DTE Flow Control

After you know the type of flow control that your DTE uses, set up the 7855-10 modem as follows:

- If your DTE sends XON and XOFF characters as flow control characters, use the cmdword \R1 or \R3.
- If your DTE turns **off** pin 4 (Request to Send) when it wants to stop data from the modem, use the cmdword \R2 or \R3.
- If your DTE accepts XON and XOFF characters as flow control characters, use the cmdword \Q1 or \Q3.

- If your DTE stops transmitting data when the modem turns **off** pin 5 (Ready for Sending), use the cmdword \Q2 or \Q3.

Error-Checking Link (ECL) Protocol (Async)

The *error-checking link* (ECL) protocol is a method of data transmission which the receiver can detect transmission errors and request that the transmitter send the data again. Also, ECL data throughput is higher because start-stop bits are not transmitted.

To use ECL, both modems must use the ECL protocol or a functionally equivalent protocol (for example, the Microcom Network Protocol**).

ECL can be used only if the modem is in asynchronous operation at 600 bps or faster. After the modems establish an error-checking link, the message ECL appears on the LCD if the modem is configured for normal LCD messages (see "%Vn -Verbose LCD Messages" on page 12-53).

ECL Cmdwords

Following is a brief description of the AT cmdwords that can control the ECL protocol.

The cmdword "\Nn -Logical Handshaking Control" on page 12-37 is used with \C to determine whether an ECL connection can be established and when it can be established.

- \N0. The modem does not initiate an ECL handshake. If it receives an ECL request within the first three seconds of a physical connection, it responds and attempt to establish a connection. This parameter is overridden if the modem is configured with \C0 or \C2.
- \N1. The modem does not respond an ECL request but passes it along as data. This parameter is overridden if the modem is configured with \C0 or \C2.
- \N2. The connection must be an ECL connection. If the remote modem is not configured to allow an ECL connection, the modem ends a switched network connection attempt and re-starts a nonswitched connection attempt.
- \N3. An originate mode modem automatically attempts an ECL connection after a physical connection has been established. The modem finishes with an ECL connection or a non-ECL connection depending on the success of the ECL handshake. An answer mode modem behaves according to the \N0 setting.

The cmdword "\Cn -ECL Startup" on page 12-32 is used with \N to determine whether an ECL connection can be established and when it can be established. Also, it determines if an ECL attempt should be canceled if an ECL cancel character arrives when the modem is initiating an ECL attempt.

- \C0. Only accept a request for ECL when directed by the \N cmdword. Also, if the modem is initiating the ECL attempt, it does not cancel the attempt if the ECL cancel character arrives.
- \C1. Accept an ECL request at any time during a non-ECL connection. Also, do not cancel the ECL handshake attempt if the ECL cancel character arrives.

- \C2. Only accept a request for ECL when directed by the \N cmdword. Cancel the ECL handshake attempt if the ECL cancel character arrives.
- \C3. Accept an ECL request at any time during a non-ECL connection. Cancel the ECL handshake attempt if the ECL cancel character arrives.

The \O, \Y, and \Z. cmdwords (see pages 12-38, 12-42,and 12-42) determine immediate actions taken by the modem to try to establish an ECL connection or end an existing one.

- \O. When this cmdword is issued, if an ECL connection does not already exist, the modem initiates an ECL connection attempt.
- \Y. When this cmdword is issued, if an ECL connection does not already exist, the modem in originate mode immediately initiates an attempt for an ECL connection. If the modem is in answer mode, it accepts a request that arrives during the next three seconds.
- \Z. When this cmdword is issued, if an ECL connection does exist, the modem ends the ECL connection and return to a non-ECL one. Since ECL is required for a 12 000 bps connection, this command is not run if the underlying telephone line speed is 12 000 bps.

The %C cmdword controls whether the modem negotiates to do data compression when an ECL connection is established (see page 12-43).

- %C0. The modem does not attempt to do data compression during an ECL handshake attempt.
- %C1. The modem attempts to do data compression during an ECL handshake attempt.

Ending an Error-Checking Link

You can end an error-checking link by putting the modem in the escaped state and issue the \Z cmdword (see page 12-42). If the underlying telephone line speed is not 12 000 bps, the modem ends the ECL connection but does not end the physical connection.

Using ECL with Non-ECL Modems

When a *non*-ECL modem receives an ECL request, it treats the request as data and passes it on to the DTE. The DTE also treats the request as data and displays it as such. To keep this from occurring when you do not know if the remote modem does ECL, issue the \N0 cmdword to accept an ECL connection before establishing a connection with a remote modem. After the connection is established, if the remote modem does ECL, it can send the ECL request.

A disadvantage of this procedure is that the remote modem may also be in accept error-checking link mode, in which case neither modem sends the ECL request.

Speed Buffering (Async)

Speed buffering allows the modem-to-modem and modem-to-DTE speeds to be different. It also allows the modem-to-DTE speed at one end of the link to be different from that at the other end. By using speed buffering, you can avoid having to adjust the DTE speed each time that you communicate with a remote modem that has a different speed. Use the \M cmdword to enable or disable speed buffering (see page 12-36).

Speed buffering:

- Is useful for receiving calls from other modems if you do not know in advance what the modem-to-modem speed will be.
- Can be used at any telephone line speed, but only if the modem-to-DTE interface is asynchronous.
- Used with a DTE and the modem-to-DTE speed is less than the modem-to-modem speed, requires the use of modem-to-modem flow control.
- Is not of any benefit if you always send and receive at the same speed, since the DTE speed remains unchanged from call to call even without speed buffering. If you send and receive at different speeds, speed buffering is recommended. If you use speed buffering, you should either:
  - Use ECL (because of its modem-to-modem flow control)
  - Set the DTE interface to 9600 bps or faster so that XON/XOFF modem-to-modem flow control is not needed.

Setting the Modem's Preferred Speed

The *preferred* line speed is the modem's first choice for the telephone line data rate. When a physical connection is established, the telephone line data rate is determined from the preferred line speed of both modems (see "Connected Data Rate" on page 8-6).

Setting the Modem's Preferred Telephone Line Speed

Follow the procedure outlined in "Setting the Modem's Preferred Speed" on page 8-6 for setting the preferred telephone line speed of the modem.

Setting the Modem's DTE Speed

The preliminary speed of the modem's DTE port is controlled by the \M cmdword (see page "\Mn -Speed Buffered DTE Interface Speed" on page 12-36).

This preliminary setting is the speed used when the modem auto-answers from the *idle without commands* state. See "Asynchronous Speed Sensing" on page 8-3 for details on automatic speed sensing. If the sensed speed is one that cannot be a modem-to-modem speed, the modem automatically turns **on** speed buffering.

When Not to Use Speed Buffering

Do not use speed buffering if your DTE does not support one of the modem's methods of flow control.

Direct Mode (Async)

Normally, a customer would only use asynchronous direct mode if they are using 11-bit character formats without ECL or running overspeed beyond the 1% limit. The \D1 cmdword sets the modem for direct mode and the \D0 cmdword sets the modem for buffered mode (see page 12-33).

A disadvantage of using direct mode is that a modem cannot initiate or accept an ECL attempt. Therefore, a user cannot obtain an ECL connection if they are set for direct mode.

Generating Tones

For security, some computer systems require a user identification number before the system allows the user access to a modem at the system end. Typically the user is required to send an ID number using dial tones (dual tone multi-frequency [DTMF] tones). If the system recognizes the ID number, it immediately connects the user to a modem or disconnects the line, calls back, and connects the user to a modem.

DTMF Tones Using the Attention Command Set

To generate DTMF using the AT command set:

- Use the ; parameter at the end of a dial command. After the modem dials, it returns to command mode without hanging up.
- Listen to the speaker to determine when to issue a second *dial* command with your identification code. You must make sure, however, that your modem is not configured so that it must detect a dialtone before it dials (see "Xn -Extended Call Progress" on page 12-10).

Part 4. Problem Determination and Testing

Chapter 10. Problem Determination

Use this chapter to determine whether a problem is located in the local DTE, local modem, telecommunication line, remote modem, or remote DTE.

Starting Out

Problem determination involves using test procedures and comparing the observed results with the expected results. Telecommunications problems can occur in any area of the connection and are sometimes difficult to diagnose because of the relationship of the modem to the attached telephone line and DTE.

These test procedures attempt to isolate problems to the modem, telephone line, or the DTE and are designed to guide you through a series of steps that lead to a probable cause and recommended solution. Figure 10-1 shows an overview of the network components checked by these procedures.

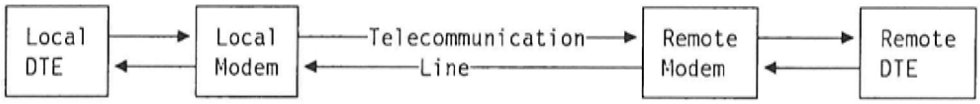


Figure 10-1. Typical Communication Link

"Testing Your Modem" on page 10-2 describes a procedure to test if your modem (Local Modem in the above figure) is operating properly. These tests allow you to isolate problems in your modem without an attached DTE.

"Network Tests" on page 10-9 describes other test procedures that assist you in isolating problems in your communication network.

Notes:

1. No special training is required to perform problem determination on your modem.
2. You should have an additional telephone set available at the other end of the switched network to use for problem determination.
3. After any corrective action, try the communication link again. If the link still fails to work properly, restart the problem determination procedures if there are multiple failures in the network.
4. If you determine that the modem has failed, national regulations may require that the modem be immediately disconnected from the telephone line.

Testing Your Modem

Step 1 Set the modem's power switch to **off**.

Step 2 Disconnect the V.24 cable from the modem (this is the cable that attaches the modem to the DTE).

Step 3 If the modem is *not* attached to the public switched telephone network (you are not using the silver nor light brown telecommunication cables), go to step 9.

Step 4 If the modem is *not* connected to an auto call unit, go to step 8.

Step 5 Disconnect the modem from the auto call unit.

Step 6 Disconnect the auto call unit from the telecommunication line.

Step 7 Connect the modem directly to the telecommunication line using a switched network telecommunication cable.

Step 8 If you do *not* have a telephone attached to the 6-pin jack located on the rear panel of your modem, continue with step 9.

Disconnect the telephone set's cable from the modem and inspect the cable for damage, such as a frayed or split cable, or a damaged jack.

Connect the telephone set's cable back into the modem's 6-pin jack.

Lift the telephone handset and listen for dial tone.

Do you hear a dial tone?

Yes Return the telephone handset to its cradle and continue with step 9.

No Refer to the figure below and:

Note: For UK ONLY, please follow these instructions in reverse order: d, c, b, and then a.

a. Disconnect the modem's power plug from the ac outlet.

b. Disconnect the telephone set cable from the modem's 6 pin jack.

c. Disconnect the modem's telephone cable from the wall outlet. Do *not* disconnect the cable from the modem.

d. Connect the telephone set cable to the wall outlet.

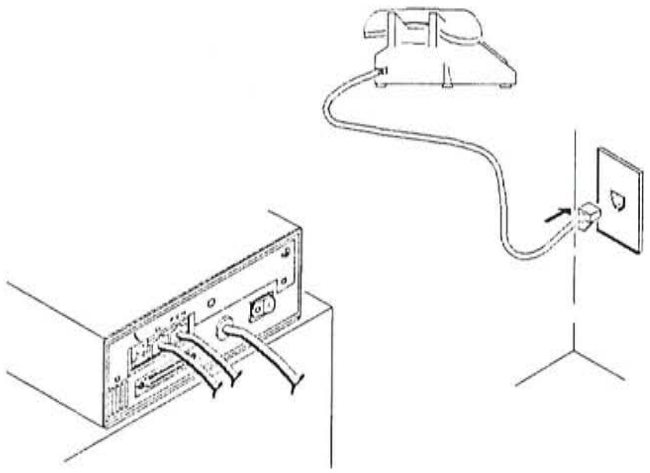


Figure 10-2. Replacing a Modem with a Handset

e. Lift the telephone handset and listen for a dial tone.

Do you hear a dial tone?

Yes The modem is defective. Follow the procedure for the type of warranty or post-warranty service to which you are entitled.

No The probable cause of the problem is either the telephone set or the telephone line.

Step 9 Set the modem's power switch to **on**.

Is the front panel ONH light on? Disregard all the other lights.

Yes Continue with step 10.

No Set the modem's power switch to **off** and disconnect the modem's power cord from the ac outlet.

Connect a known working device, such as a lamp, into the outlet.

Does the device work OK?

Yes The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

No The ac power is not at the outlet. Have the problem corrected.

Step 10 Set the modem's power switch to **off**.

Step 11 Plug the DTE wrap connector into the 25-pin V.24 connector on the back of the modem.

Points to Remember

1. Determine a cable's color from the sticker on the cable label or from the cable insulation.
2. You should have either a telecommunication wrap *plug* or a wrap *socket*. We included one or the other with the modem depending on your country. A wrap *plug* plugs into the *LL* socket at the rear of the modem while a wrap *socket* mates with one end of the nonswitched telecommunication cable shipped with your modem.

Step 12 If you have a telecommunication wrap *plug* remove any cable that is in the *LL* jack from the wall outlet first and then from the modem and then plug the wrap plug into the *LL* jack and then continue with step 18.

If you have a telecommunication wrap socket continue with the next step.

Step 13 If you are using the *black* telecommunication cable for nonswitched operation, continue with step 15.

Step 14 If you are using the *gray* telecommunication cable for nonswitched operation, continue with step 16.

If you are *not* operating with nonswitched lines, continue with step 18.

Step 15 Disconnect the black cable from the wall outlet. Continue with step 17.

Step 16 Disconnect the gray cable from the wall outlet, then disconnect it from the back of the modem.

Connect the *black* telecommunication cable to the 8-pin *LL* jack located on the modem's rear panel.

Step 17 Plug the other end of the *black* cable into the telecommunication wrap socket. The wrap socket was fastened to the black cable or to the power cord at the factory.

Continue with step 18.

Step 18 Set the modem's power switch to **on**. Observe the front panel lights.

Do all the lights turn on for at least 3 seconds?

Yes Continue with step 19.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 19 The modem executes a series of tests after each power on (see "Initiating the Tests" on page 11-2).

The tests last approximately 10 seconds.

Observe the front panel TST light. After 20 seconds maximum, the TST light should be off and not blinking.

After 20 seconds maximum, is the TST light off and not blinking?

Yes Continue with step 20.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 20 Press the ← and → buttons together.

Does the display show `<Exit  Enter>` **?**

Yes Continue with step 21.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 21 Press the ← button twice. The display shows `Save Profile 0` .

Step 22 Press the ↓ button to change the display to show `Save Profile 1` .

Step 23 Press the ← button. The display shows an idle message.

The current modem settings have been saved in Profile 1. This was necessary because you will be changing the modem's configuration during the testing.

Step 24 Press the ← and → buttons together. The display shows `<Exit  Enter>` .

Step 25 Press the → button. If the modem displays `View Only` , go to step 26. If the modem displays `Password....` ■■■■, use the → key and the ↑ button to change the display to `Password....B293` , press the

→ button one more time, and then check the display again to make sure it shows `View Only`

Step 26 Use the ↑ or ↓ button to change the display to show `First Setup` . You can press and release the button multiple times, or you can press the key and hold it in.

Step 27 Press the → once and then use the ↑ or ↓ button to change the display to show `Get Profile` .

Step 28 If the modem is *not* attached to the public switched network (i.e. you are not using the silver nor tan telecommunication cables), go to step 40.

Step 29 Press the → once and then use the ↑ or ↓ button to change the display to show `Profile...NO CMD` .

Step 30 Press the ← button once and then use the ↑ or ↓ button to change the display to show `Diagnostics` .

Step 31 Press the → button twice and use the ↑ or ↓ button to change the display to show `Select Test` .

Step 32 Press the → button once and use the ↑ or ↓ button to change the display to show `Pass/Fail` .

Step 33 Press the → button once and use the ↑ or ↓ button to change the display to show `Speaker Test` .

Step 34 Press the ← button once. The TST light turns **on** and display shows `Pass/Fail` and the modem's speaker will immediately turn **on** and emit tones at a high volume for about 2 seconds. The speaker will then turn **off** for about 2 seconds and then turn back **on** and emit tones at a low volume for about 2 seconds.
The modem is operating correctly if you hear the pattern of *loud*, ***off***, *quiet*, ***off*** of the speaker's volume.

Did you hear the desired pattern of volume changes?

Yes Continue with 35.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 35 Go to another telephone and call the modem, or ask someone to dial the modem's telephone number.

Is the modem's telephone number busy?

Yes Disconnect the modem's telecommunication cable from the wall outlet and call again.

Is the modem's telephone number still busy?

Yes The probable cause of the problem is the telephone line.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

No Continue with step 36.

Step 36 After ringing, the modem answers and sends a pattern of tones to the calling telephone. The pattern should be *loud, quiet, loud, **off***.

Was the desired pattern of volume changes heard at the calling telephone?

Yes Continue with step 37.

No Verify the modem's telephone number and return to step 35. If you are sure that you dialed the correct number, the modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 37 Press the front panel D/T switch.

Did the ONH light turn on?

Yes Hang up the calling telephone and press the front panel D/T switch.

Press the ← button three times. The display shows `Diagnostics`

Continue with step 38.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 38 If you do *not* have either the *black* telecommunication cable connected to the modem or a wrap plug in the *LL* jack at the rear of the modem, go to step 57; otherwise, continue with step 39.

Step 39 Press the ↑ or ↓ button to change the display to show `First Setup` .

Press the → button and use the ↑ or ↓ button to change the display to show `Get Profile` .

Step 40 Press the → once and then use the ↑ or ↓ button to change the display to show `Profile.....LL` .

Step 41 Press the ← button once and then use the ↑ or ↓ button to change the display to show `Quick Customize` .

Step 42 Press the → button once and then use the ↑ or ↓ button to change the display to show `Type of Network` .

Step 43 Press the → button once and then use the ↑ or ↓ button to change the display to show either `Network.LL 2W A` or `Network.LL 4W A` .

Step 44 Press the ← button twice to return to the `Quick Customize` message and then use the ↑ or ↓ button to change the display to show `Diagnostics` .

Step 45 Press the → button twice and use the ↑ or ↓ button to change the display to show `Select Test` .

Step 46 Press the → button once and use the ↑ or ↓ button to change the display to show `Pass/Fail` .

Step 47 Press the → button once and use the ↑ or ↓ button to change the display to show `Cable Wrapped` .

Step 48 Verify that the telecommunication wrap socket is connected to the black cable as instructed in step 17 or that the telecommunication wrap plug is plugged into the *LL* jack of the modem.

Before proceeding, disconnect the DTE wrap connector from the V.24 connector on the rear of the modem.

Step 49 Press the ← button once. The display shows `Pass/Fail` . Wait for approximately thirty seconds and observe the front panel lights.

Is the CD light ON and the TST light ON and not blinking? Disregard all the other lights.

Yes Press the ← button once and use the ↑ or ↓ button to change the display to show `End Test` .

Press the ← twice. The display shows `Diagnostics` .

Continue with step 50.

No The modem is defective. Disconnect it from the wall outlet and follow the procedure for the type of warranty or post-warranty service to which you are entitled.

Step 50 Disconnect the cable from the telecommunication wrap socket or unplug the telecommunication wrap socket as appropriate.

If you disconnected the *gray* cable from the modem in step 16, continue with step 51.

If you were *not* using the *gray* cable, continue with step 56.

Step 51 Disconnect the *black* cable from the modem and store it for later use. Re-connect the *gray* cable to the 8 pin LL jack on the modem's rear panel.

Step 52 If you want to re-install an auto call unit, turn **off** the modem.

Otherwise, go to step 57.

Step 53 Disconnect the switched network telecommunication cable from the back of the modem housing.

Step 54 Connect the switched network telecommunication cable to the auto call unit.

Step 55 Connect the auto call unit to the switched line connector on the back of the modem housing.

Step 56 Re-connect the nonswitched cable to the wall outlet and then to the modem.

Step 57 Re-connect the V.24 DTE cable to the modem.

Step 58 Turn **on** the modem.

Step 59 Your modem is operating properly.

If you still suspect a problem in your communication network, continue with "Network Tests."

Network Tests

So far, you have tested the *local modem* as shown in Figure 10-3 and have determined whether it is operating properly. You can now use the local modem as a tool for expanding your test coverage to include the local DTE, telephone line, and the remote modem.

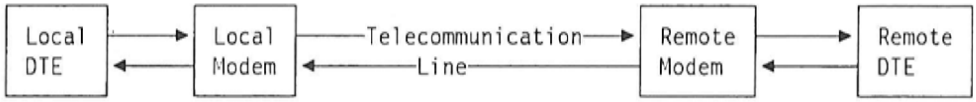


Figure 10-3. Typical Communication Link

Notes about Network Testing

Read through the network test procedures completely before initiating a test.

The remote modem or modems must be set to accept a Remote Digital Loop request. For more information, see "&Tn -Test" on page 12-19.

For nonswitched environments, a connection between the modems is established automatically. If a nonswitched connection attempt is not successful, check the configuration of each modem to make sure they are compatible. For example, if one modem is 2 wire nonswitched originate mode, the other modem must be 2 wire nonswitched answer mode.

It is helpful to have access to a telephone set at both ends of the network during network problem determination.

The modem offers nine diagnostic tests to assist you in isolating failures to various components of your network. Four of these tests were performed as part of "Testing Your Modem" on page 10-2. Before continuing with network testing, familiarize yourself with each of the nine tests described in Chapter 11, "Diagnostic Tests."

Network tests can be initiated in one of three ways:

- The front panel buttons and display
- V.24 interface pins 18 and 21
- Test command from the DTE.

Notes about Command-Initiated Tests

The modem remains in the selected test mode when started by the test command until you do one of the following:

- Type in an escape sequence followed by the end test command (&T0).
- Abort the test by pressing the data/talk switch.
- Start a new test using the front panel buttons.

If your DTE is an IBM Personal Computer, you need a communication program that supports the Attention or V.25 Bis command set that opens communications between the IBM Personal Computer and the modem so you can enter commands directly.

The network test procedures describe how to initiate a particular test using the front panel buttons and the V.24 interface pins. For information on how to use the test command and its associated parameters, see "&Tn -Test" on page 12-19 or Chapter 11, "Diagnostic Tests" on page 11-1.

Which Network Do You Want to Test?

Before starting the test, the modem has to be configured properly for your particular network environment. From the list below, determine which item best describes your network and continue as instructed.

2-wire nonswitched, remote modem is set to *answer* mode

Continue with "Begin Network Tests" on page 10-11.

2-wire nonswitched, remote modem is set to *originate* mode

Configure your modem to be 2-wire nonswitched, answer mode.

1. Use the ↑ or ↓ button to change the display to show `Quick Customize .`
2. Press the → button once and then the ↓ button once. The display to shows `Type of Network .`
3. Press the → button once and use the ↑ or ↓ button to change the display to show `Network LL 2W A .`
4. Press the ← button twice and use the ↑ or ↓ button to change the display to show `Diagnostics .`
5. Continue with "Begin Network Tests" on page 10-11.

4-wire nonswitched, remote modem is set to *answer* mode

Configure your modem to be 4-wire nonswitched, originate mode.

1. Use the ↑ or ↓ button to change the display to show `Quick Customize .`
2. Press the → button once and then the ↓ button once. The display to shows `Type of Network .`
3. Press the → button once and use the ↑ or ↓ button to change the display to show `Network LL 4W O .`
4. Press the ← button twice and use the ↑ or ↓ button to change the display to show `Diagnostics .`
5. Continue with "Begin Network Tests" on page 10-11.

4-wire nonswitched, remote modem is set to *originate* mode

Configure your modem to be 4-wire nonswitched, answer mode.

1. Use the ↑ or ↓ button to change the display to show `Quick Customize .`
2. Press the → button once and then the ↓ button once. The display to shows `Type of Network .`
3. Press the → button once and use the ↑ or ↓ button to change the display to show `Network LL 4W A .`
4. Press the ← button twice and use the ↑ or ↓ button to change the display to show `Diagnostics .`
5. Continue with "Begin Network Tests."

Switched Network Operation

Configure your modem to participate in a switched network connection even though there is no DTE connected.

1. Use the ↑ or ↓ button to change the display to show `Total Customize .`
2. Press the → button twice. The display shows `Data Type .`
3. Use the ↑ or ↓ button to change the display to show `Signals .`
4. Press the → button once. The display shows `From 7855 to DTE .`
5. Use the ↑ or ↓ button to change the display to show `DTR (108) Drop .`
6. Press the → button twice.
7. Use the ↑ or ↓ button to change the display to show `DTR Off..IGNORED .`
8. Press the ← button five times. The display shows `Total Customize .`
9. Use the ↑ or ↓ button to change the display to show `Diagnostics .`
10. Continue with "Begin Network Tests."

Begin Network Tests

1 Establish a connection between the modems.

For nonswitched lines, a connection is automatically established by the modems.

For switched network operation, you should establish a manual dial connection using an attached telephone or directory dial using a stored telephone number. A third way is to auto answer a call originated from the remote modem.

Are connection attempts successful?

Yes Continue with step 2.

No Go to step 1 on page 10-12.

2 Follow the steps below to perform the remote digital loop self test. For more information on this test, see "Remote Loop Self-Test" on page 11-6.

a. Press the → button twice and use the ↓ button to change the display to show `Select Test` .

b. Press the → button once and use the ↓ button to change the display to show `Error Count Here` .

c. Press the → button once and use the ↓ button to change the display to show `Remote Loop` .

d. Press the ← button twice. The display shows `Select Test` .

Observe the front panel lights. The test is executing correctly if the CD, and TST lights are **on**. Disregard the other lights.

Is the test executing correctly?

Yes Continue with step 3.

No Terminate the test and restart the remote digital loop self-test procedure as described in 1 on page 10-11. For switched network, it is important to also terminate the connection before restarting the test. If, after many attempts, the test never executes correctly, go to step 1 of "Repair Actions for Network Tests."

3 Observe the TST light. This light blinks when data errors are detected on the line. Allow the test to run for several minutes.

Press the ↓ button to change the display to show `Test Errors ___` . Note the number of errors shown.

End the test by pressing the ↑ button to change the display to show `End Test` . Press the ← button once.

Repeat the remote digital loop self-test several times, each time noting the number of errors shown on the modem's display.

Note: For switched network operation, terminate and establish another connection for each test cycle.

Evaluate the results of the tests. Under normal conditions, the TST light should blink no more than two or three times per minute under normal line conditions.

Did the TST light blink more than two or three times per minute?

Yes (Always) Continue with step 2 on page 10-13 of "Repair Actions for Network Tests."

Yes (Sometimes) Continue with step 3 on page 10-13 of "Repair Actions for Network Tests."

No Continue with step 4 on page 10-13 of "Repair Actions for Network Tests."

Repair Actions for Network Tests

1 Never successful establishing a connection.

It is likely that one or both of the modems is not configured properly or there is a significant problem with the telephone line. If you are confident that the configuration of each modem is correct, then contact the telephone company or your technical support staff for assistance.

To restore your modem to the original configuration, continue with "Restoring Your Modem Configuration" on page 10-14.

2 Excessive errors were detected during every test cycle.

It is likely that the connection from one of the modems to the telephone company central office (local loop) is impaired more than normally expected. You should contact the telephone company to have the problem investigated. If this fails, consider the following recommendations. See "Other Adaptation for Maximum Data Throughput" on page 9-6.

- Reducing the modem-to-modem telephone line speed (see "Setting the Modem's Preferred Speed" on page 8-6).
- Optimizing the local loop. See "\En -Local Echo Optimization" on page 12-33.
- Use of transmit pre-emphasis. See "%TPn -Transmitter Pre-emphasis" on page 12-52.
- Increasing the transmit level.

  Note: This can only be done by telephone company personnel or IBM service personnel. The ability to increase the transmit level is prohibited in some countries.

To restore your modem to the original configuration, continue with "Restoring Your Modem Configuration" on page 10-14.

3 Excessive errors were detected during some, but not all, of the test cycles.

This condition suggests switched telephone line problems created by the various physical connections provided by the telephone line switching equipment. A different physical path is usually obtained on each connection.

If the network experiences excessive errors, terminate the connection and establish a new connection. Continue this process until a suitable physical path is obtained.

To restore your modem to the original configuration, continue with "Restoring Your Modem Configuration" on page 10-14.

4 Few errors were detected.

The modems and telephone line are operating correctly and are experiencing only normal line errors.

Continue with "Testing Has Uncovered No Problems."

Testing Has Uncovered No Problems

Available tests suggest that the modem and network are operating properly. The problem may be with the DTE or the V.24 cable. Follow the problem isolation procedures in your DTE documentation to determine if the problem is caused by the DTE or the V.24 cable.

For further assistance, contact your technical support staff.

To restore your modem to the original configuration, continue with "Restoring Your Modem Configuration" on page 10-14.

Restoring Your Modem Configuration

Recall that your modem configuration was stored in Profile 1 before modem testing. Follow the instructions below to restore your modem to its original configuration.

1. Press the ← and → together. The display shows `<Exit  Enter>`
2. Press the → button. If the modem displays `View Only` , continue to the next step. If the modem displays `Password....` ■■■■, use the → key and the ↑ button to change the display to `Password....B293` , press the → button one more time, and then check the display again to make sure it shows `View Only`
3. Use the ↑ or ↓ button to change the display to show `First Setup`
4. Press the → button once and then use the ↑ or ↓ button to change the display to show `Get Profile`
5. Press the → button once and then use the ↑ or ↓ button to change the display to show `Profile....NVM 1`
6. Press the ← button once. The display shows `Wait....` then `First Setup` .
7. Press the ← once. The display shows `<Exit  Enter>` .
8. Exit configuration using the ← button.

Chapter 11. Diagnostic Tests

This chapter describes the diagnostic tests provided by 7855. They are the investigative tools of the process described in Chapter 10, "Problem Determination." Figure 11-1 shows the structure of the front panel diagnostic menu. Other methods for starting and stopping tests are described in the next section.

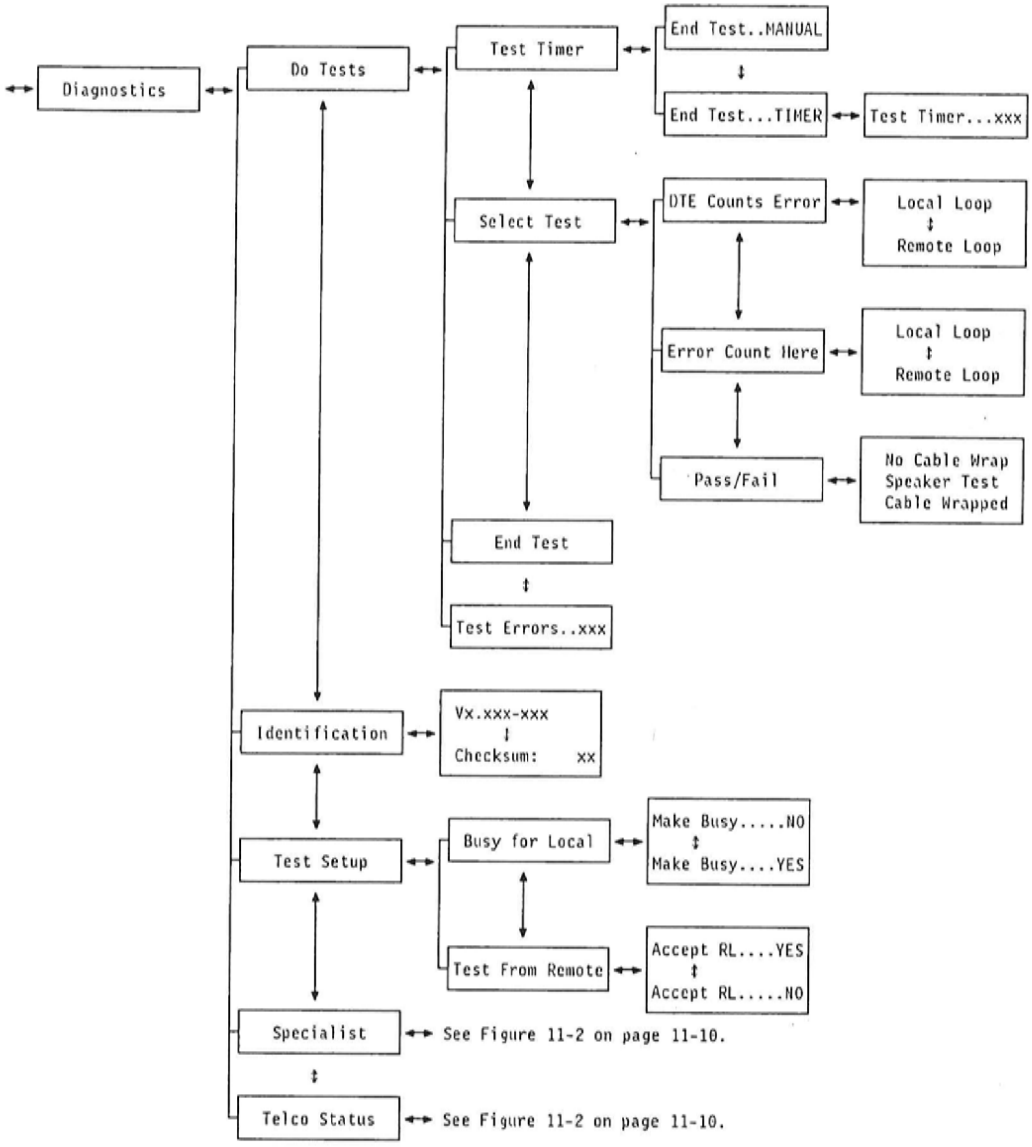


Figure 11-1. Tests and 7855-10 Identification

Initiating the Tests

Power-On Reset (POR)

- "Lamp Test" on page 11-7
- "Internal Diagnostics" on page 11-6
- "DTE Wrap Plug Test" on page 11-8.

Front Panel

- "Local Loop Test" on page 11-3
- "Local Loop Self-Test" on page 11-4
- "Remote Loop Self-Test" on page 11-6
- "Remote Loop Test" on page 11-5
- "Speaker and Ring Test" on page 11-7
- "Self-Test without Cable Wrapped" on page 11-8
- "Self-Test with Cable Wrapped" on page 11-8.

DTE Interface (Pins 18 and 21)

- "Local Loop Test" on page 11-3
- "Remote Loop Test" on page 11-5.

AT Cmdwords

- (1) "Local Loop Test" on page 11-3
- (2) "Self-Test without Cable Wrapped" on page 11-8
- (6) "Remote Loop Test" on page 11-5
- (7) "Remote Loop Self-Test" on page 11-6
- (8) "Local Loop Self-Test" on page 11-4
- (9) "Self-Test with Cable Wrapped" on page 11-8
- (10) "Speaker and Ring Test" on page 11-7
- (11) "Lamp Test" on page 11-7.

Note: The number enclosed by the parentheses is the appropriate argument used in the &Tn cmdword (see page 12-19).

Signals Received from the Telephone Line

- "Remote Loop Self-Test" on page 11-6
- "Remote Loop Test" on page 11-5.

Ending the Tests

AT Cmdwords

Any existing test is ended when the &T0 cmdword (see 12-19) is run. For tests such as Local Loop and Remote Loop where data is looped back to the DTE and not checked for errors in the modem, the DTE must first issue the escape sequence to put the modem in the escaped state before sending the &T0 cmdword to end a test. Note, however, that self-tests initiated while the modem is in synchronous mode cannot be ended by a cmdword.

DTE Interface (Pins 18 and 21)

The tests started by raising pins 18 or 21 are ended when the respective pins are lowered.

Test Timer

All tests, except the lamp test and the speaker test, are automatically ended when the timer set by register S18 (see page 12-59) times out.

Front Panel

An existing test can be ended through the front panel in the DIAGNOSTICS section under ENDTEST.

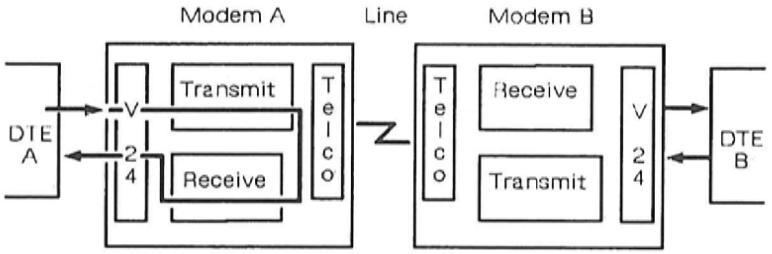
Power-On Reset (POR)

Any existing test is ended when the modem is powered off.

Automatically

Some self tests end automatically when an error is detected. If this happens, the TST light on the modem blinks continuously.

Local Loop Test



Purpose: This test checks the internal operation of the modem and the cable between the modem and the DTE.

Initiation: The test is started when DTE interface pin 18 is raised and stopped when it is lowered. The test can also be started by pressing the left arrow key when when the LCD is displaying Local Loop in the DTE Counts Error section of Select Test, see Figure 11-1 on page 11-1. The modem also enters the test when it receives the &T1 cmdword, see page 12-19.

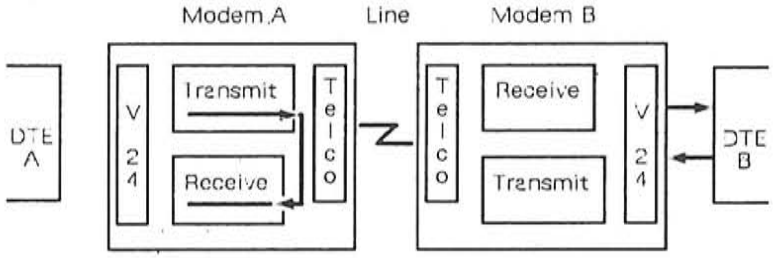
Description: Data from DTE A is looped back to DTE A.

Test Results: It is the DTE's responsibility to perform data comparison and test analysis. The modem does not monitor the data stream for data patterns.

Warning: This test ends a connection with a remote modem if the test is started when a connection exists.

Table 11-1. DTE Interface Behavior during the Analog Loop Test		
DTE	**Test Started with Pin 18**	**Test Started with &T1 Cmdword**
RD	Follows TD	Follows TD
RFS	Follows RTS	Normal
DSR	Follows DTR	Follows DTR
RLSD	Follows RTS (like RFS)	Follows RTS (like RFS)
TCLK	Normal	Normal
RCLK	Normal	Normal
RI	Functional	Functional
TI	On	On

Local Loop Self-Test



Purpose: This test checks the internal operation of the modem.

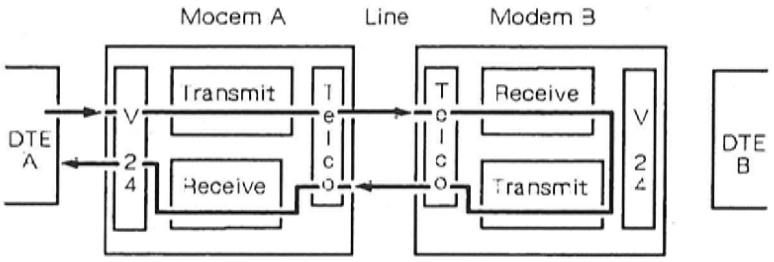
Initiation: This test can be started from the front panel by pressing the left arrow key when the LCD is displaying `Local Loop` in the `Error Count Here` section of `Select Test`, see Figure 11-1 on page 11-1. The modem also enters the test when it receives the &T8 cmdword, see page 12-19.

Description: The modem internally transmits a test pattern to its receiver. The receiver checks the pattern for errors.

Test Results: If the test was initiated by receiving the cmdword, the modem sends an error count to the DTE when the test ends. The test ends when the modem detects an error, the test timer expires, the test is ended with a cmdword, or the test is ended from the front panel. If the test ends automatically because the modem detected an error, the TST light blinks continuously.

Warning: This test ends a connection with a remote modem if the test is started when a connection exists.

Remote Loop Test



Purpose: This test allows DTE A to check both modem A and B and the telephone line that connects them.

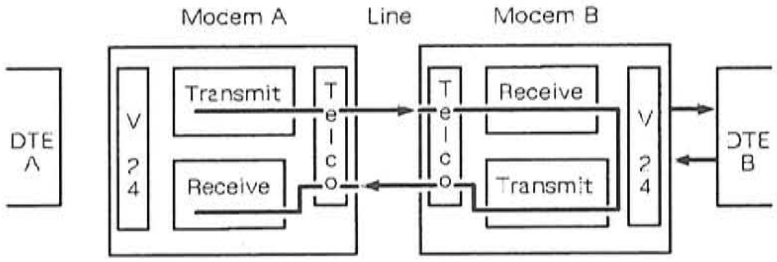
Initiation: This test can be started only if an end-to-end connection exists and only if modem B is configured to allow the test. The front panel can be used to allow the test by pressing the left arrow key on modem B when the LCD is displaying `Accept RL....YES` in the `Test From Remote` section of `Test Setup`. The modem also permits a remote loop test if it receives the &T4 cmdword, see page 12-19. The test starts when the DTE interface pin 21 (RL) is raised and it stops when it is lowered. The test can also be started from the front panel of modem A by pressing the left arrow key when the LCD is displaying `Remote Loop` in the `DTE Counts Error` section of `Select Test`, see Figure 11-1 on page 11-1. The modem also enters the test when it receives the &T6 cmdword, see page 12-19.

Description: Data generated by DTE A is sent through modem A to modem B. Modem B loops the data back to modem A and DTE A, where it is checked for errors. Both modems are in test mode with their TST lights **on** (not blinking).

Test Results: It is the responsibility of the DTE to perform data comparison and test analysis. The modem does not monitor the data stream for data patterns, except for escape sequence.

Note: ECL connections are ended by the modems when loop tests start. When the test stops, ECL connections are not re-started automatically by the modem but can be re-started by the user (if allowed by the configurations of the modems).

Remote Loop Self-Test



Purpose: This test checks the operation of both modem A and B and the telephone line that connects them.

Initiation: This test can be started only if an end-to-end connection exists and only if modem B is configured to allow the test. The front panel can be used to allow the test by pressing the left arrow key on modem B when the LCD is displaying `Accept RL....YES` in the `Test From Remote` section of `Test Setup`. The modem also permits a remote loop test if it receives the &T4 cmdword, see page 12-19. The test can be started from the front panel by pressing the left arrow key on modem A when the LCD is displaying `Remote Loop` in the `Error Count Here` section of `Select Test`, see Figure 11-1 on page 11-1. Modem A also initiates the test when it receives the &T7 cmdword, see page 12-19.

Description: Modem A transmits a test pattern to modem B, where it is looped back to modem A and checked for errors.

Test Results: If no errors are detected, the TST light (on both modems) is **on** (not blinking). Errors detected during the test cause the TST light on modem A to blink. If the test was started by the AT cmdword &T7, modem A sends an error count to DTE A when the test ends.

Note: ECL connections are ended by the modems when loop tests start. When the test stops, ECL connections are not re-started automatically by the modem but can be re-started by the user (if allowed by the configurations of the modems).

Internal Diagnostics

Purpose: This test checks the internal modem hardware.

Initiation: This test is part of the test sequences that occur when a power-on reset (POR) occurs.

Test Results: If the test results are favorable no indication is given. If the test fails, the modem locks up with the TST light blinking with a certain cadence. The number of blinks shows the failure area.

1 Working memory failure
2 Program memory failure
3 Nonvolatile memory failure
4 Numerical processor failure
5 DTE wrap plug test failure.

Lamp Test

Purpose: This test verifies the LEDs and the LCD on the front of the modem are operating correctly. Also, if the test is initiated with the &T11 cmdword (see page 12-19), operation of the front panel switches can be tested.

Initiation: Perform a power-on reset (POR) or perform a factory reset from the the front panel. The test may also be initiated using the &T11 cmdword, see page 12-19.

Test Results: All of the lights on the front panel turn **on** for two seconds. If the test is initiated using the &T11 cmdword, all of the lights on the front panel turns **on** and stay **on** and the LCD cycles through its complete alphabet. Also, pressing any of the arrow keys on the front panel causes a character string to be sent to the attached DTE that identifies the key.

Speaker and Ring Test

Purpose: This test checks the speaker volume levels and also checks the modems ability to detect a ring signal at the next available opportunity.

Note: This test is not available if the 7855-10 is attached to a **nonswitched** telecommunication line.

Initiation: Start the test with the &T10 cmdword, see page 12-19, or with the front panel by pressing the left arrow key when the LCD is displaying `Speaker Test` in the `Pass/Fail` section of `Select Test`, see Figure 11-1 on page 11-1.

Test Results: The modem's speaker immediately turns **on** and emit tone s at a high volume for about 2 seconds. The speaker then turns **off** for about 2 seconds and then turn back **on** and emit tones at a low volume for about 2 seconds.
The modem is operating correctly if you hear the pattern of *loud*, ***off***, *quiet*, ***off*** of the speaker's volume during this first part of the test.
The modem generates a tone during this test. If the modem is plugged into a switched network line, you will hear the modem-generated tone and you may hear a dial tone as well. Hearing either one or both tones is normal - it is the pattern of volume changes that is important.

Next, the modem waits for an incoming call. When the call arrives, the modem goes off-hook and sends a tone over the phone line. The modem varies the volume of the tone. You should hear a volume pattern of *loud, quiet, loud*, ***off*** in the handset of the dialing telephone. This test is run only once after the command is sent.

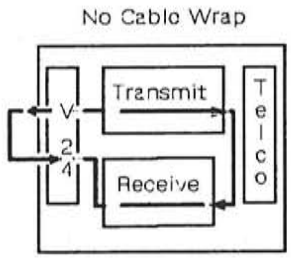
DTE Wrap Plug Test

Purpose: This test checks the modem portion of the DTE interface.

Initiation: This test is performed automatically at power **on** time when the modem checks for the presence of the wrap plug.

Test Results: If the test results are favorable, no indication is given. If the test fails, the modem 'freezes' at the failure point with the TST light blinking continuously.
The RFS light may blink while the DTE wrap plug is installed. This is normal behavior for some modem configurations.

Self-Test without Cable Wrapped

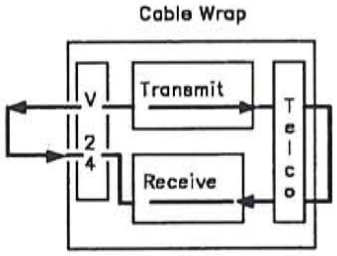


Purpose: This test checks the 4-wire nonswitched line operation.

Initiation: This test can be initiated from the front panel by pressing the left arrow key when the LCD is displaying `No Cable Wrap` in the `Pass/Fail` section of `Select Test`, see Figure 11-1 on page 11-1. The modem also enters the test when it receives the &T2 cmdword, see page 12-19. Note - The DTE wrap plug is not required for this test.

Test Results: If the test was initiated by the cmdword, an error count is sent to the DTE when the test ends. If an error does occur, the modem ends the test immediately and the test light blinks continuously.

Self-Test with Cable Wrapped



Purpose: This test checks the 4-wire nonswitched line operation.

Initiation: Start this test only after the nonswitched telecommunication line interface is wrapped with the wrap plug or socket you received with the modem. This test can be initiated from the front panel by pressing the left arrow key when the LCD is displaying `Cable Wrapped` in the `Pass/Fail` section of `Select Test`,

see Figure 11-1 on page 11-1. The modem also enters the test when it receives the &T9 cmdword, see page 12-19.

Note: DTE wrap plug is not required for this test. The modem takes approximately 25 seconds to establish the loop after this test is enabled. During this time, the front panel is inoperative if the test was initiated from the front panel.

Test Results: If the test was initiated by the cmdword, an error count is sent to the DTE when the test ends. If an error does occur, the modem ends the test immediately and the test light blinks continuously.

Note: Early 7855-10 modems with microcode version 4.100 will fail this test if the modem is configured for `Network LL 2W 0` or `Network LL 4W 0` , see page 12-16.

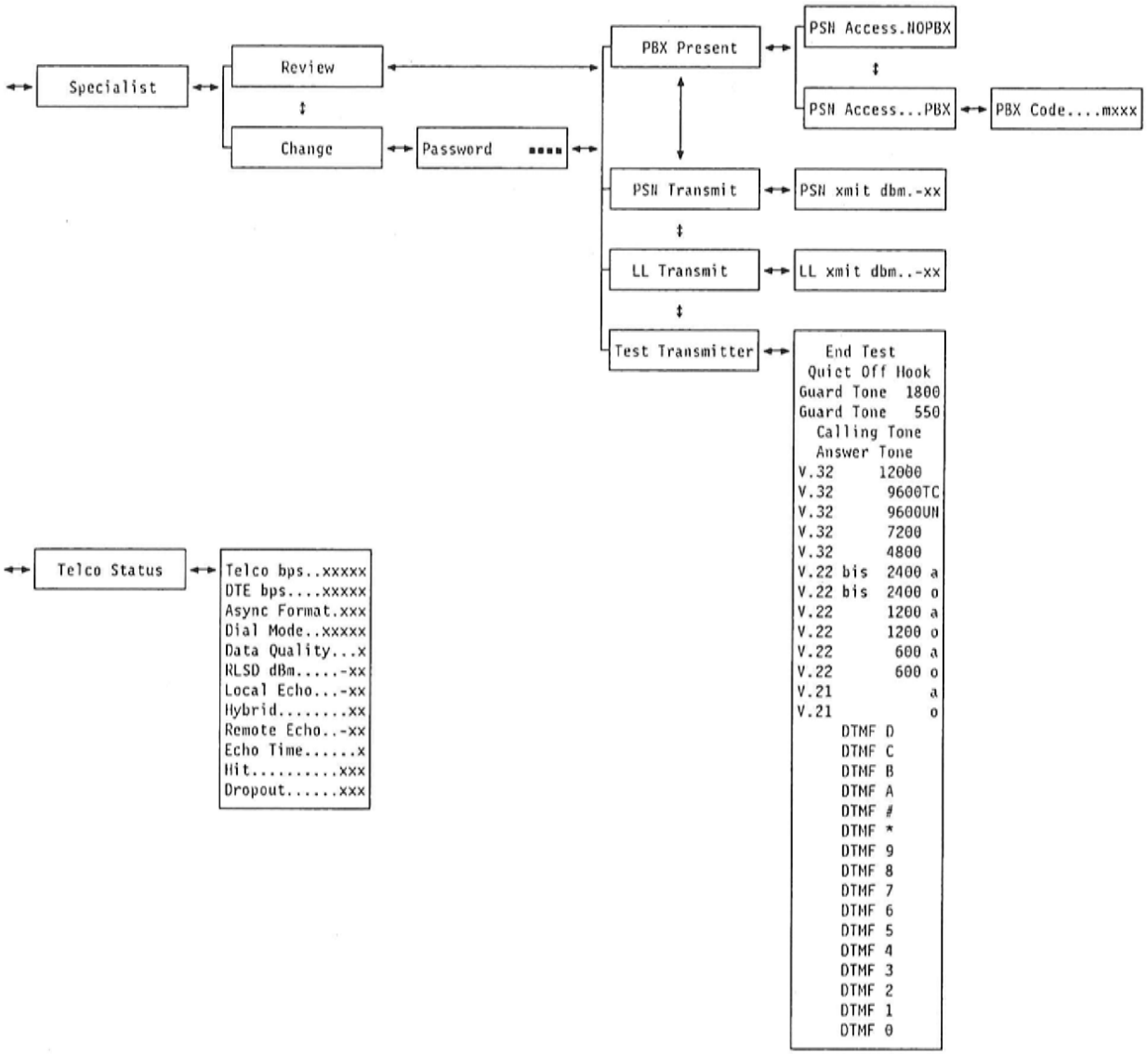


Figure 11-2. Telecommunication Line Status and Specialist Configurations. This figure completes Figure 11-1 on page 11-1.

Part 5. Reference Information

Chapter 12. Attention Command Set

The Attention (AT) command set in the IBM 7855-10 can be used from the DTE interface, front panel, or telecommunication line to control the modem's behavior. Furthermore, most of the AT cmdwords can be imbedded in V.25 Bis commands to give that command set virtually the same capabilities as the AT command set.

You can use the Attention command set while in the idle state or escaped state and the modem is configured to accept AT cmdwords. The modem accepts an Attention command by recognizing the AT sequence followed by one or more cmdwords, parameters (if any), and a carriage return. Each time the modem accepts an AT sequence, it automatically detects the speed and data format of the DTE and adjusts itself to that speed and format.

Note: For more information on transmission speeds and formats, see Chapter 8, "Basic Modem Operation."

The modem continues to accept Attention cmdwords until a connection with a remote modem is established. After that, it passes all characters received from the local DTE to the telephone line without searching for a command sequence. If you want the modem to accept a cmdword after the connection is established, you must enter the asynchronous escape sequence (see "S2 -Asynchronous Escape Character" on page 12-56) at the DTE which tells the modem to reenter the Attention command state.

Note: The three escape characters can occur with any timing relationship but they must be consecutive. The escape sequence must be preceded and followed by a guard time during which no other data is sent to the modem. This guard time is set by the contents of register S12 (see "S12 -Escape Code Guard Time" on page 12-59).

After the modem enters the Attention command state, it stops sending data to the remote modem but still maintains the connection. To return to the data transmission state, use the On-line cmdword.

"AT Commands Grouped by Operation" on page 12-60 groups all the AT commands according to the modem operation that is affected by the command.

Entering Attention Commands

The format of the Attention commands is as follows:

```
AT cmdword parameter <CR>
```

Where:

AT Both characters may be typed in either upper case or lower case, but not mixed.

cmdword An alphanumeric character string.

parameter A numeric character sequence.

<CR> Press the carriage return key on your terminal.

Note: The backspace key must not be used to correct mistakes while entering the AT sequence. If you make a mistake, press the carriage return key and begin again.

Command Equivalence

A '\n' cmdword is equivalent to a ')n' cmdword.
A '#n' cmdword is equivalent to a '"n' cmdword.

General Rules

- Commands are sent by the DTE to the modem. Responses are sent by the modem to the DTE.
- Commands and parameters can be entered in mixed, upper, or lower case (but no mixed case in a speed/format recognition pair. That is, when an AT or an at is sent to the modem for speed and format sensing).
- A CTRL-X (Hex 18) from the DTE causes the modem to clear its command buffer.
- Missing numeric parameters are considered to be "0". (ATX has the same effect as if an ATX0 cmdword was sent, for example).
- If a cmdword is entered with a parameter value too high, the modem responds as if the cmdword was entered with its highest allowable value. For example, ATI5 yields the same response as ATI3 since the highest allowable parameter for the In cmdword is 3.
- **If an attempt is made to set an S register to a value outside its allowed range, the modem performs modular arithmetic to change the number to a value in the proper range**. For example, the command line ATS10=258 sets the value of register S10 to a value of 2.
- Read the value of a register 'n' by the command ATSn?.
- Leading zeros in a cmdword parameter are allowed but not required.

- Multiple cmdwords can be entered on the same command line (60 characters is the maximum per command line) and must be formatted as follows:

  ```
  AT cmdword1 parameter1 cmdword2 parameter2 ... <CR>
  ```

  For example:

  ```
  ATE1F1M0 <CR>
  ```

  or

  ```
  AT E1 F1 M0 <CR>
  ```

  Note: The different cmdwords can be separated by a space for clarity but it is not required to do so.

- The modem cannot be set to make it operate contrary to applicable national regulations. For example, in countries which do not allow a modem to auto-answer quickly, the modem does not allow the auto-answer ring count to be 1 (but does allow 0 since 0 means "do not answer").
- Most cmdwords cannot be used in a command line containing a dial string. It is recommended that the user first enters a command line changing any configuration options that the user wants changed, and then entering a second command line that contains a dial string.

Response Format

The modem can be configured to return terse (numeric) or verbose (words) results codes (see "Vn -Verbose Result Codes" on page 12-10) or can be configured so that result codes are not returned (see "Qn -Quiet Modem Messages" on page 12-9). Following is a list of common verbose result codes. In the description of the individual cmdwords in this chapter, only special result codes or text messages associated with that particular cmdword are listed.

OK	For all valid parameters
ERROR	For all invalid parameters and for an attempt to set the modem to a level that is not allowed in that country. This response is also returned for an invalid password when a password is required.

Cmdwords and Parameters

A/ -Repeat Command Line

Format: A/

Function: The cmdword causes the modem to re-run the last command line.

Note: This cmdword must not be preceded by AT and a carriage return must not be used after the A/.

A -Answer

Format: A

Function: For switched network operation, this cmdword forces the modem off-hook and into answer mode. The modem disconnects the telephone handset from the telephone line and places answer tone on the line. It is used to manually answer an incoming call.

For nonswitched line operation, this cmdword forces the modem to attempt to do answer mode SNBU.

Notes:

To run the command, the following conditions must be met:

1. The Data Terminal Ready (DTR) interface signal from the DTE must be active unless the modem is set to ignore DTR, see "&Dn -Data Terminal Ready Control" on page 12-14.
2. The D/T switch must be set to DATA mode.
3. The modem must not be in TEST mode.

Commands that follow this cmdword on the same command line are not run.

Bn -Communications Standards

Format: Bn

Function: This cmdword tells the modem whether to use CCITT or Bell standards for communicating at 1200 and 0-300 bps. It does not affect the modem at any other telephone line speed. This command word is inoperative in some countries (Austria, for example).

Configuration Tree Location: Shown on page 6-26.

Parameters

n	LCD Message	
0	Handshake..CCITT	Use CCITT standards.
1	Handshake...Bell	Use Bell standards.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 0. Nonvolatile memory profile 1 is reset to 1.

Cn -Carrier Control

Format: Cn

Function: This cmdword specifies whether the DTE can force the modem to turn off its transmitted carrier in nonswitched line mode. This effectively forces the link into SNBU if SNBU is allowed, see "%Sn -SNBU Control" on page 12-50.

Configuration Tree Location: Shown on page 6-26.

Parameters

n	LCD Message	
0	LL Signal....DTR	Use to shut **off** the nonswitched line carrier when DTR is inactive and the modem is paying normal attention to DTR (&D2).
1	LL Signal.....ON	Nonswitched line carrier behavior is normal (on almost continuously).

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

D -Dial

Format: D

Function: For switched network operation, this cmdword causes the modem to go off hook and dial the parameters entered. If D is entered with no parameters, the modem goes off-hook without dialing and looks for answer tone. Punctuation (parenthesis (), hyphens(-), and spaces) can be used for clarity but are ignored by the modem.

For nonswitched line operation, this cmdword forces the modem to attempt a SNBU connection as the dialing modem.

Configuration Tree Location: Shown on page 9-11.

LCD Message
Dial or Execute

Parameters

0-9	Dialable digits
A,B,C,D,#,*	Dialable digits when tone dialing is used. Ignored when pulse dialing is used.
P	Pulse dialing. Later digits are pulse dialed until the modem is told to adaptive dial or tone dial.
R	Reverse to answer mode. At the end of dialing, the modem waits for at least one dial inter-digit delay of the dial technique used and at most 1 second and then sends answer tone and starts hand-shaking as an answering modem.
S=n	Append stored dial string. There are four locations corresponding to n = 0 - 3. Echo of the appended dial string occurs as a text message depending on the setting of "Qn -Quiet Modem Messages" on page 12-9. If the "=", or "n" values are absent, the modem uses location 0.
T	Tone dialing. Later digits are tone dialed if allowed in that country until the modem is told to adaptive dial or pulse dial.
W	Wait for dial tone. When this parameter is met in the dial string, the modem listens for dial tone for up to the remaining time left in the maximum off-hook timer. If dial tone is detected, the modem proceeds to the next dial string parameter. If no dial tone is detected before the call cancel timer expires, the modem sends a response back to the DTE and ends the call attempt. Pause. The modem waits for a length of time specified by the S8 register before running the next dial string parameter. If the next parameter is dialable, the modem dials it whether dial tone is

present or absent. If this parameter occurs in the dial string before any dialable digits, it is not run until either dial tone is detected or the initial blind dial timer expires - whichever occurs first.

! Flash. The modem goes on-hook for a country and user dependent amount of time and then returns off-hook for a country dependent amount of time.

@ Wait for Silence. The modem will "listen" for five seconds of silence before continuing to the next dial string parameter. If the modem does not hear five seconds of silence before the expiration of the maximum off-hook timer, the modem ends the call out attempt and send a response back to the DTE. If answer tone arrives while running this parameter, the modem handshakes.

; Escaped state. This parameter changes the modem to the escaped state. If the ; is not the last entry in the command line, the remaining entries are expected to be commands and are processed accordingly. After the modem processes all the cmdwords in the command line, if it is still in the escaped state, it accepts commands from the DTE.

/ Dial string link. This parameter defines the end of a dial string and the start of another. If the 7855 fails to make a connection using the first dial string, it goes on-hook and then goes off-hook again to run the second dial string.

: Comment. Running a cmdword line stops when a ":" is found in a dial string.

U Dial until answer. If the first attempt fails, the modem makes up to 5 connection attempts using the dial string preceding the "U" parameter.

L Dial last number dialed. When used as the only parameter in a dial string, the modem echoes the last number it dialed back to the DTE (if allowed by setting of "Qn -Quiet Modem Messages" on page 12-9) and re-dials the number. If a number has not been dialed since the modem was reset, the modem behaves as if a "D" cmdword was issued without any parameters. This parameter is ignored if any dial parameters precede the "L" parameter in the dial string. Finally, it also ends a dial string.

Notes:

To run the command, the following conditions must be met:

1. The Data Terminal Ready (DTR) interface signal from the DTE must be active unless the modem is set to ignore DTR, see "&Dn -Data Terminal Ready Control" on page 12-14.
2. The D/T must be set to DATA mode.
3. The modem must not be in TEST mode.

Commands that follow this cmdword on the same command line are not run unless a ; appears between the dial parameter and the next cmdword.

En -Character Echo during Idle

Format: En

Function: This cmdword controls whether characters sent by the DTE to the modem (while the modem is in idle or in the escaped state) are echoed back to the DTE. Only asynchronous DTE interface operation is affected.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n	LCD Message	
0	Cmd Echo.....OFF	Character echo is disabled.
1	Cmd Echo......ON	Character echo is enabled.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

Hn -Switch Hook

Format: Hn

Function This cmdword controls the telephone switch hook. It is usually used to end a switched network connection.

Configuration Tree Location: Shown on page 9-11.

Parameters

n	LCD Message	
0	Disconnect	Go on-hook using the normal disconnect process.
1		Go off-hook. The modem goes off-hook on the PSN for as long as is allowed in its country. During this time, the modem is in the command state and can accept cmdwords.

In -Identification

Format: In

Function: This cmdword causes the modem to send some form of identification to the DTE. The identification is determined by the parameter entered.

Configuration Tree Location: Shown on page 11-1.

Parameters

n	LCD Message		
0			The modem responds with 249.
1	Checksum	xxH	The modem responds with a computed memory checksum.
2			The modem computes and verifies the program memory checksum and then responds with either an OK if every program memory checksum is correct or an ERROR if any checksum is incorrect.
3	Vx.xxx-xxx		The modem responds with the microcode version level followed by a 3 digit country code.

Ln -Level (Volume)

Format: Ln

Function: This cmdword sets the speaker volume that is used when the speaker is turned **on**. The change occurs immediately.

Configuration Tree Location: Shown in Figure 6-17 on page 6-28.

Parameters

n	LCD Message	
0	Volume.....QUIET	Low volume.
1	Volume.....QUIET	Low volume.
2	Volume....MEDIUM	Medium volume.
3	Volume......LOUD	High volume.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2.

Mn -Speaker Mode

Format: Mn

Function: This cmdword tells the modem when the speaker should be **on** during both nonswitched line and switched network operation. The change occurs immediately. Note that incoming rings are never audible.

Configuration Tree Location: Shown in Figure 6-17 on page 6-28.

Parameters

n	LCD Message	
0	Spkr On....NEVER	Disables the speaker.
1	Spkr On..CALLING	Enables the speaker when the modem is dialing and disables it when carrier is detected.
2	Spkr On...ALWAYS	Enables the speaker always.
3	Spkr On..WAITING	Enables the speaker for dial tone detection, disables it while dialing, enables it for call progress, and then disables it again when carrier is detected.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

On -Online

Format: On

Function: This cmdword causes the modem to go from the escaped state to the connect state which is also called returning from online idle to online. Also, for speeds greater than 1200 bps, the modem can be instructed to retrain on its way to the connect state. If issued without an existing connection, the modem goes off hook and do "universal" handshaking.

Parameters

n	
0	Return to the connect state directly.
1	Return to the connect state via a retrain.

P -Pulse

Format: P

Function: This cmdword places the modem in pulse dial mode. All later digits are pulse dialed until tone dial is specified (see "T -Tone" on page 12-10). The P cmdword can be used either inside a dial string or outside.

Configuration Tree Location: Shown on page 6-25.

LCD Message
Dial Mode..PULSE

Qn -Quiet Modem Messages

Format: Qn

Function: This cmdword determines whether the modem sends result codes to the local DTE. Text responses are not affected as they are always sent.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n LCD Message
0 Messages.....ON Enable result codes.
1 Messages.....OFF Disable result codes.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

Sn? -Query (Read) a Register

Format: Sn?

Function: This cmdword causes the modem to send the contents of the register specified by n to the local DTE.

Parameters

n
0-27 Register number in decimal.

Responses: The modem sends the value of register specified by n to the DTE as a three digit decimal number.

Sn=v -Write to a Register

Format: Sn=v

Function: This cmdword sets the contents of the register specified by n to the numeric value specified by v If the value is outside the allowable range for the register, the modem performs modular arithmetic to change the number to a value in the proper range. For example, the command line ATS10=258 sets the value of register 10 to a value of 2. Note, however, that the register value will never be set to a value that would cause the modem to operate contrary to country regulations.

Parameters: "v" can be one, two, or three digits long. If "v" is missing, zero is assumed.

v
0-255
Decimal number.

T -Tone

Format: T

Function: This cmdword places the modem in tone (DTMF) dial mode. All later digits are tone dialed until pulse dial is specified (see "P -Pulse" on page 12-9). The T cmdword can be used either inside a dial string or outside.

Configuration Tree Location: Shown on page 6-25.

LCD Message
Dial Mode...TONE

Vn -Verbose Result Codes

Format: Vn

Function: This cmdword determines the type of result codes returned by the modem to the DTE if result codes are enabled, see "Qn -Quiet Modem Messages" on page 12-9.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n	LCD Message	
0	AT Msg...NUMERIC	Result codes are returned as a digit code (terse).
1	AT Msg.....WORDS	Result codes are returned as words (verbose).

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

Xn -Extended Call Progress

Format: Xn

Function: This cmdword controls the modem's use of the dial tone and busy signal capabilities of call progress to the extent allowed in the country of installation. For example, in a country that requires dial tone detection before the start of dialing, the modem listens for dial tone even if this cmdword is set to X0, X1, or X3.

Also, this cmdword influences the connection command result codes used by the modem.

Finally, this cmdword controls whether a RINGback message is sent to the originating DTE. (Note, this is different from the incoming RING message.) This message is enabled only with the X4 cmdword and is sent when the calling modem detects ring-back from the remote modem.

Configuration Tree Location: Shown on page 6-25.

Parameters

Table 12-1. Result Code and Call Progress Behavior

n	Detect		Result Codes		LCD Message
	Busy	Dial Tone	Enabled	Disabled	
0	no	no	OK, CONNECT, RING, NO CARRIER, ERROR, REMOTE LOOP, NO REMOTE LOOP, NO ECL.	Others	NONE
1	no	no	Others	NO DIALTONE, BUSY	NEITHER
2	no	yes	Others	BUSY	D TONE
3	yes	no	Others	NO DIALTONE	BUSY
4	yes	yes	All	None	ALL

If n=0 is chosen:

- Result codes that show the modem never went off-hook, such as DELAYED and FORBIDDEN CALL, are mapped into ERROR.
- Result codes that show the modem went off-hook but something went wrong, such as NO ANSWER and ABORT, are mapped into NO CARRIER.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 4.

Yn -Signal Remote to Disconnect

Format: Yn

Function: This cmdword determines whether the modem ends a regular switched network connection by simply going on-hook or by first sending out a special signal and then going on-hook. The modem ignores the setting of this cmdword during nonswitched line operation.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	LCD Message	
0	Call End...LOCAL	No special signal is sent.
1	Call End..REMOTE	The special signal is sent when a regular switched network connection is ended by the local modem.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

Zn -Reset to NVM

Format: Zn

Function: This cmdword causes the modem to do a soft reset and then load working memory from the specified user profile stored in NVM or from the factory defaults stored in factory memory. If the soft reset fails, the modem does not recover.

Configuration Tree Location: Shown on page 6-12.

Parameters

n	LCD Message	
0	Profile....NVM 0	Load working memory from NVM profile zero. If the checksum of the user profile is bad, load from the factory V.25 Bis profile.
1	Profile....NVM 1	Load working memory from NVM profile one. If the checksum of the user profile is bad, load from the factory V.25 Bis profile.

Note: Running this cmdword ends a switched network connection and temporarily disrupts a nonswitched line connection.

&Amn -Preferred Telco Speed

Format: &Amn

Function: This cmdword sets the modems preferred telecommunication line speed. The modem attempts to establish every connection at this speed but it is not be able to if the remote modem has a preferred line speed lower than this one.

The nonswitched line and switched network preferred speeds are set independently.

Configuration Tree Location: Shown on page 6-17 and in Figure 6-12 on page 6-24.

Parameters

m

P	Next character specifies the switched network preferred speed
L	Next character specifies the nonswitched line preferred speed
Other	There is no next character. This character sets the switched network preferred telco speed as described for "n" below.

n

0	0-300 bps
1	600 bps
2	1200 bps
3	2400 bps
4	4800 bps
5	7200 bps (normal Trellis coded)
6	9600 bps (uncoded)
7	9600 bps (normal Trellis coded)
8	12 000 bps (normal Trellis coded)

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to &AP7 and &AL8. Nonvolatile memory profile 1 is reset to &AP7 and &AL7.

Examples

```
&AP7 sets switched network preferred telco speed to 9600 bps coded.
&AL8 sets nonswitched preferred telco speed to 12 000 bps.
&A4 sets the switched network preferred telco speed to 2400 bps.
```

Notes:

1. Because the parameters associated with this cmdword are alphanumeric, use of this cmdword with no parameters can produce undesirable results.
2. For asynchronous operation, you cannot have a 12 000 bps connection without also having an ECL connection.
3. IBM recommends always using 9600 bps Trellis coded instead of uncoded for improved performance.

&Babc -Default Asynchronous Character Format

Format: &Babc

Function: This cmdword sets the modem's view the asynchronous data stream's characteristics when the modem has not sensed them directly since a reset. When the modem senses the format from the DTE, this value is no longer used.

Configuration Tree Location: Shown on page 6-22.

Parameters

abc	LCD Message	
a	Async Format.Xxx	7,8 The number of data bits in a character.
b	Async Format.xXx	S, M, N, E, or O (or lower case) which represent space, mark, none, even, or odd and describe any parity bit in the character.
c	Async Format.xxX	1-2. The number of stop bits in a character.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 7E1. Nonvolatile memory profile 1 is reset to 8N1.

&Cn -RLSD (Carrier Detect) Control

Format: &Cn

Function: This cmdword controls the behavior of the RLSD signal (pin 8) from the modem.

Configuration Tree Location: Shown in Figure 6-9 on page 6-23.

Parameters

n	LCD Message	
0	RLSD On...ALWAYS	RLSD is **on** when power is **on**.
1	RLSD On..CONNECT	RLSD is active only when a connection is established (dumb mode).
2	RLSD On...V.25 B	RLSD follows V.25 Bis rules.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 2. Nonvolatile memory profile 1 is reset to 0.

&Dn -Data Terminal Ready Control

Format: &Dn

Function: This cmdword sets the behavior of the modem when DTR from the DTE drops unless modem pooling is enabled. In that case this cmdword is accepted but ignored.

Configuration Tree Location: Shown in Figure 6-9 on page 6-23.

Parameters

n	LCD Message	
0	DTR Off..IGNORED	DTR drop is ignored. The modem's behavior does not change.
1	DTR Off..COMMAND	The modem enters the escaped state when DTR drops if the DTE interface is asynchronous. It goes back on-line when the On Line cmdword is issued. If the DTE interface is synchronous, the modem behaves per "2" below.
2	DTR Off.....V.24	The modem ends a switched network connection cleanly and nonswitched line connections continue.
3	DTR Off....RESET	The modem does a soft reset and then loads working memory from the location specified by the "&Yn -Power-up Profile Selection" on page 12-21 setting or from the modem pooling profile if modem pooling is active. If a NVM profile is chosen and its checksum is bad, working memory is loaded from factory profile 1.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2.

&Fn -Restore Factory Configuration

Format: &Fn

Function: Running this cmdword loads a factory profile into working memory. Nonvolatile memory is not affected.

Configuration Tree Location: Shown on page 6-12.

Parameters

n	LCD Message	
0	Profile..V.25Bis	The V.25 Bis factory profile into working memory.
1	Profile.....AT	The AT factory profile into working memory.
2	Profile...NO CMD	The No Commands factory profile into working memory.

3	Profile.....LL	The Nonswitched Line factory profile into working memory.

Running this cmdword does not affect which profile is loaded into working memory at the next power-on, nor whether the modem is synchronous or asynchronous, nor which command set is active, nor whether modem pooling is **on** or **off**, nor the modem parameters that can only be changed with the maintenance password.

&Gn -Guard Tone

Format: &Gn

Function: This cmdword controls the transmission of guard tones during operation of the modem in a V.22 type high band (answer mode). Guard tones are not sent if the modem is set to Bell 212 operation.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	**LCD Message**	
0	Guard Tone..NONE	No guard tone is used.
1	Guard Tone...550	550 Hz guard tone is used.
2	Guard Tone..1800	1800 Hz guard tone is used.

A Reset to Factory (see page 9-1) resets nonvolatile memory profiles 0 and 1, and working memory to 0 or 2 depending on country restrictions.

&In -Connect Message during Speed Buffering

Format: &In

Function: This cmdword determines whether the speed used in an asynchronous connect message is the DTE interface speed or the speed of the telephone line.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n	**LCD Message**	
0	Rate Used..TELCO	The telephone line speed is used in a CONNECT message.
1	Rate Used....DTE	The DTE interface speed is used in a CONNECT message.

A Reset to Factory (see page 9-1) resets nonvolatile memory profiles 0 and 1, and working memory to 0 or 1 depending on country restrictions.

&Jn -Telephone Jack Control (US/Canada Only)

Format: &Jn

Function: This cmdword determines whether the switched network transmit level is a fixed value set by the modem or whether an external resistor supplied by the telecommunication services supplier influences the transmit level.

This applies only to modems with three (not two) telephone sockets on the rear.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	LCD Message	
0	PSN Level..FIXED	The switched network transmit level is determined solely by the modem.
1	PSN Level...PROG	The modem uses the value of an external resistor to set the modem's switched network transmit level.

A Reset to Factory (see page 9-1) resets nonvolatile memory profiles 0 and 1, and working memory to 0 or 1 depending on country restrictions.

&Ln -Nonswitched (Leased) Line

Format: &Ln

Function: This cmdword determines which telecommunication interface is used by the modem for normal operation and whether the modem does originate or answer mode handshaking in nonswitched operation.

Configuration Tree Location: Shown on page 6-17 and in Figure 6-12 on page 6-24.

Parameters

n	LCD Message	
0	Network.....PSN	Select the switched line interface.
1	Network..LL 2W O	Select the 2 wire nonswitched line interface and do originate mode handshaking.
2	Network..LL 2W A	Select the 2 wire nonswitched line interface and do answer mode handshaking.
3	Network..LL 4W O	Select the 4 wire nonswitched line interface in originate mode.
4	Network..LL 4W A	Select the 4 wire nonswitched line interface in answer mode.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

Note: If the interface is changed, the modem cleanly ends any existing connection except if the modem changes to switched network operation while participating in an SNBU connection.

&Mn -Communication Mode

Format: &Mn

Function: This cmdword is used to choose among asynchronous, synchronous, and "direct dial" modes while the modem is in the idle state, and between synchronous and asynchronous data flow when a connection is established.

Configuration Tree Location: Shown on pages 6-17 and 6-22.

Parameters

> **Note**
>
> Parameters 0,1,2, or 3 cannot be selected unless Asynchronous AT or Async V.25 bis has been selected in the First Setup menu.

n	LCD Message	
0	Idle/Data..ASYNC	Idle is asynchronous and connect is asynchronous. This is normal asynchronous operation and applies to both nonswitched and switched network operation.
1	Idle/Data.AS/SYN	Idle is asynchronous and connect is synchronous. This applies to both switched and nonswitched line operation.
2	Idle/Data.DS/SYN	When DTR goes active, and if no ring condition is underway, the modem goes off-hook and runs one of the following: 1. The dial number in directory 0 if present and if AT dialing is allowed 2. The dial number in directory 20 if present or 3. "Universal" handshaking. The connection is synchronous. In nonswitched line operation, no dialing is done. When DTR goes active, the modem behaves normally (which means either that nothing happens or that the modem starts handshaking).
3	Idle/Data.DS/ASY	When DTR goes active, and if no ring condition is underway, the modem goes off-hook and runs one of the following: 1. The dial number in directory 0 if present and if AT dialing is allowed 2. The dial number in directory 20 if present or 3. "Universal" handshaking. The connection is asynchronous. In nonswitched line operation, no dialing is done. When DTR goes active, the modem behaves normally (which means either that nothing happens or that the modem starts handshaking).
4	Idle/Data...SYNC	Idle is synchronous and connect is synchronous. This is normal synchronous operation and applies to both switched and nonswitched line operation.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 4.

&Pn -Dial Pulse Ratio

Format: &Pn

Function: This cmdword will not be implemented unless a country is found where a single dial pulse ratio is insufficient.

Parameters: Reserved.

&Qn -Communication Mode

Format: &Qn

Function: See "&Mn -Communication Mode" on page 12-16. Both commands produce the same results.

&Rn -RFS Control

Format: &Rn

Function: This cmdword controls the behavior of the Ready For Sending, RFS, signal (pin 5) from the modem.

Configuration Tree Location: Shown in Figure 6-9 on page 6-23.

Parameters

n	LCD Message	
0	RFS On....V.25 B	Normal. RFS follows the V.25 Bis rules during idle and RTS during a connection.
1	RFS On....ALWAYS	Always active. RFS follows DTR.
2	RFS On...CONNECT	Dumb. RFS is inactive during idle and follows RTS during a connection.
3	RFS On.....DELAY	Delayed after each answer mode handshake (includes retrains). The delay value is up to three seconds. RFS follows DTR during idle and is forced inactive when the modem goes off-hook to auto-answer. RFS is released to follow RTS when the first of the following events occurs: • An ECL connection is established. • An ECL handshake cancel character is received from the telco line (see "%Annn -Set ECL Handshake Cancel Character" on page 12-43). • Three seconds elapse.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 0. Nonvolatile memory profile 1 is reset to 1.

Note: If RFS flow control is selected and the modem needs to stop the DTE from transmitting, RFS is lowered regardless of the value of this option.

&Sn -Data Set Ready Control for Switched Operation

Format: &Sn

Function: This cmdword controls the behavior of signal DSR (pin 6) during switched network operation. For a nonswitched line modem, including one doing SNBU, DSR stays active all of the time and this cmdword is ignored.

Configuration Tree Location: Shown in Figure 6-9 on page 6-23.

Parameters

n	LCD Message	
0	DSR On....ALWAYS	DSR is active if DTR is active and inactive if DTR is inactive.
1	DSR On...CONNECT	DSR active shows a connection is or is about to be established. This is normal operation for switched network modems.
2	DSR On...USUALLY	DSR is usually active. This means that during idle and a connection, DSR follows DTR but is inactive for the start of handshaking.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 1. Nonvolatile memory profile 1 is reset to 0.

&Tn -Test

Format: &Tn

Function: This cmdword is used to start or stop a test. Also, tests that are started with this cmdword can be stopped by a test timer (except the front panel and speaker tests) or by a H0 or Zn cmdword.

Configuration Tree Location: Shown on page 11-1.

Parameters

n	LCD Message	
0	End Test	End any existing test.
1	Local Loop	Initiate local loop test.
2	No Cable Wrap	Initiate a self-test without 4-wire nonswitched cable loop.
3		Reserved.
4	Accept RL....YES	Give a positive response to a remote loop request that comes in from the telecommunication line.
5	Accept RL.....NO	Give a negative response to a remote loop request that comes in from the telecommunication line.
6	Remote Loop	Initiate a remote loop request as the local modem.
7	Remote Loop	Initiate a remote loop self-test.
8	Local Loop	Initiate a local loop self-test.
9	Cable Wrapped	Initiate self-test with 4-wire nonswitched cable loop.
10	Speaker Test	Initiate speaker and ring detect test at the next opportunity.
11	(blank)	Initiate front panel test.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 4.

Responses

xxx	Three digit text message showing the error count at the end of a self-test.
OK	For all valid parameters.
ERROR	For all invalid parameters and for an attempt to set the modem to a mode not allowed in that country and for an attempt to start a test that cannot be done (remote loop without a connection for example).

Note: Any existing ECL connection is ended at the beginning of a loop test and is not automatically re-started after the loop test ends.

&V -View Configuration

Format: &V

Function: This cmdword causes the modem to send configuration information to the DTE. The information consists of configuration parameters in working memory and in profile 0 and profile 1. It also displays the contents of the four AT directories but does not display any command list entries. For more complete working memory configuration information, use the \Sn cmdword.

Responses: The modem displays elements of working memory, profile 0, and profile 1, and directory entries.

&Wn -Store (Write) Configuration

Format: &Wn

Function: This cmdword copies configuration information from working memory to nonvolatile memory if it is run when modem pooling is not active.

Configuration Tree Location: Shown on page 6-11.

Parameters

n	LCD Message	
0	Save Profile 0	Store in profile 0.
1	Save Profile 1	Store in profile 1.

&Xn -Transmit (Xmit) Clock Source Control

Format: &Xn

Function: This cmdword determines where the clock that the modem uses to clock data from the DTE onto the telecommunication line comes from. This affects synchronous operation only.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message	
0	Xmit Clock..7855	The modem generates the transmit clock.
1	Xmit Clock...DTE	The modem uses an external clock supplied by the DTE. If this option is selected and no legitimate clock is present on pin 24, data errors may occur.
2	Xmit Clock.SLAVE	The transmit clock comes from the receive clock. This is sometimes called slave clocking.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

&Yn -Power-up Profile Selection

Format: &Yn

Function: This cmdword selects what profile is loaded into working memory at power **on** time and after a hard reset. The setting of this cmdword is always stored in nonvolatile memory (NVM) and is not part of any profile.

Configuration Tree Location: Shown on page 6-12.

Parameters

n	LCD Message	Profile to be loaded:
0	Profile....NVM 0	NVM user profile 0.
1	Profile....NVM 1	NVM user profile 1.
2	Profile..V.25Bis	V.25 Bis factory profile.
3	Profile.......AT	AT factory profile.
4	Profile...NO CMD	No Command factory profile.
5	Profile.......LL	Nonswitched line factory profile.

After a Reset to Factory (see page 9-1), the modem loads NVM profile 0 into working memory when the modem is turned **on**.

&Zn -Store Number

Format: &Zn

Function: This cmdword stores a dial string in nonvolatile memory. Characters that cannot be part of a dial string may be included but are not stored.

Configuration Tree Location: Shown on page 9-11.

LCD Message
Store and View

Parameters

n	
0	location 0
1	location 1
2	location 2
3	location 3

Example

```
&Z<dial string of length up to the remaining command buffer space><CR>
&Z=<dial string of length up to the remaining command buffer space><CR>
&Zn=<dial string of length up to the remaining command buffer space><CR>
```

If 'n' or '=' is missing, 'n' is assumed to be 0. For locations 1-3, up to 56 characters can be stored.

Note: If a number is stored in location 0 and the AT command set is active (see "%Ln -Limit Asynchronous Command Sets" on page 12-48), the modem dials this number automatically when it is changed from talk mode to data mode through the D/T switch.

"Cn -Clear Command List Entry

Format: "Cn or #Cn

Function: This cmdword clears one or all command list entries. If all command list entries are cleared, the list password is reset to the factory default value. The modem asks for the list password before clearing any single secured command list entry unless the modem is set for the no security option (see ""Sn -Security Defeat" on page 12-29).

The modem does not ask for the password before clearing all list entries.

Configuration Tree Location: Shown on page 9-4.

Parameters

n	LCD Message	
0	Clear/Reset Pass	Clears all entries and resets the command list password to the factory default of B293.
4-19		Clears only the command list specified.

Example: To clear directory 18 (its security level is set to 0):

```
at"c18<CR>
```

"Dn -Display Command List Entry

Format: "Dn or #Dn

Function: This cmdword causes the modem to send command list entries to the DTE to be displayed as a text response. The modem first asks for the list password before displaying any entry if any entry to be displayed is secured unless the modem is set for the no security option (see ""Sn -Security Defeat" on page 12-29).

Parameters

n	
0	Display all of the directory entries. The modem displays either all entries or only the unsecured entries depending on the result of its password query.
4-19	Display only the selected command list depending on the result of its password query.

Example: To see the command list in directory 18 (its security level is set to 0):

```
at"d18<CR>
```

The DTE display shows directory number (18), name, command list, and security level information that is in directory 18.

"En -Run a Command List by Number

Format: "En or #En

Function: The cmdword causes the modem to run a command list. The modem requests the list password if the directory entry is secured unless the modem is set for the no security option (see ""Sn -Security Defeat" on page 12-29).

Configuration Tree Location: Shown on page 9-11.

LCD Message
Dial or Execute

Parameters

n
4-19 Selects the cmdword list to be run.

Responses: Normal for the commands being run. The command list is "echoed" back to the attached DTE as a text response if messages are enabled (per "Qn -Quiet Modem Messages" on page 12-9).

An ERROR result code is used for invalid parameters.

Example: To run the command list in directory 18 (its security level is set to 0):

at"e18<CR>

The DTE display shows the command list in directory 18 that was run or is running.

"Fn -Get Remote Directory or List Entry

Format: "Fn or #Fn

Function: This cmdword allows a local modem to get a directory entry or command list entry from a remote modem. The directory or list entry "writes over" the same number entry in the local modem. The remote modem password is not needed unless the desired command list is secured in the remote modem. The local modem password is needed only if the command list to be "written over" is secured and the modem requires use of a password (see ""Sn -Security Defeat" on page 12-29).

See "Getting a Profile or Directory" on page 9-3 for further details.

Configuration Tree Location: Shown on page 9-4.

LCD Message
Get Directory

Parameters

n
0 - 3 The regular AT directories
4 - 19 The AT command lists
20 - 39 The V.25 Bis directories

Responses

Prompt Messages

`LOCAL PASSWORD:`

If the user fails to enter the correct password, the cmdword ends immediately with an ERROR result code.

`REMOTE PASSWORD:`

This message is always used. The user response (which may be a null line (<CR> <LF>)) is sent to the remote modem where it is either checked for validity or ignored.

`NO RESPONSE`

This message is used when no modem-to-modem session could be established with the remote modem.

`BAD REMOTE PASSWORD`

This message is used if the "get" request is for a secured list entry and the remote password provided is invalid.

Example: To get the remote modem directory 18 and put in the local modem directory 18 (the remote password is the factory default):

1. Connect to the remote modem
2. Enter the escape sequence +++ (which can be reset using "S2 -Asynchronous Escape Character" on page 12-56).
3. Enter the command:

```
at"f18<CR>
REMOTE PASSWORD: b293
```

"Gmn -Get Remote Profile

Format: `"Gmn` or `#Gmn`

Function: This cmdword replaces a local modem profile with one from a remote modem. The cmdword is only run if the two modems have the same country type. (The country type cannot be changed.)

See "Getting a Profile or Directory" on page 9-3 for further details.

Configuration Tree Location: Shown on page 9-4.

LCD Message

`Get Profile`

Parameters

m

0, 1 Specifies the profile number that is obtained from the remote modem.

n

0, 1 Specifies the profile number that is "written over" in the local modem. If this parameter is not present, the remote profile number is used.

Responses

Prompt Messages

NO RESPONSE

This message is used when no modem-to-modem session could be established with the remote modem.

"Hn -Send Remote Directory or List Entry

Format: "Hn or #Hn

Function: This cmdword allows a local modem to duplicate a local directory or command list entry in a remote modem. The directory or list entry "writes over" the same number entry in the remote modem. The local modem password is needed only if the command list to be sent is secured and the modem requires use of a password (see ""Sn -Security Defeat" on page 12-29).

See "Sending a Profile or Directory" on page 9-4 for further details.

Configuration Tree Location: Shown on page 9-4.

LCD Message

Send Directory

Parameters

n

0 - 3 The regular AT directories
4 - 19 The AT command lists
20 - 39 The V.25 Bis directories

Responses

Prompt Messages

LOCAL PASSWORD:

If the user fails to enter the correct password, the cmdword ends immediately with an ERROR result code.

REMOTE PASSWORD:

This message is always used. The user response (which may be a null line (<CR> <LF>)) is sent to the remote modem where it is either checked for validity or ignored.

NO RESPONSE

This message is used if no modem-to-modem session could be established with the remote modem.

NOT ACCEPTED

This message is used if the modem-to-modem session was established but the remote modem is not accepting configuration changes.

BAD REMOTE PASSWORD

This message is used if the remote modem would normally accept the configuration change but the password issued is found to be incorrect. This is only used if the remote modem requires a correct password.

Example: To send the local modem directory 18 to the remote modem directory 18 (its security level is set to 0 and the remote password is the factory default):

1. Connect to the remote modem
2. Enter the escape sequence +++ (which can be reset using "S2 -Asynchronous Escape Character" on page 12-56).
3. Enter the command:

```
at"h18<CR>
REMOTE PASSWORD: b293
```

"In -Remote DTE Interface

Format: "In, "I, #In, or #I (The parameter is not necessary for this cmdword.)

Function: This cmdword causes the local modem's DTE interface to become the DTE interface for the remote modem. Once the "session" is established, the local modem is transparent and any commands given to the local modem are run and responded to by the remote modem. The only AT commands not allowed are: A, D, O, "Fnn, "Gmn, "Hnn, "Lmn, \B, \P, \O, \U, \Y, \Z and %TXlnn.

See "Remote Configuration Using the Local DTE" on page 9-3 for further details.

Parameters

n

0 Start a modem-to-modem session with the remote modem interface exchange (if one does not already exist).

0 Stop the remote modem interface exchange (if one exists) and return to normal operation.

Responses

Prompt Messages

REMOTE PASSWORD:
: This message is always used. The user response (which may be a null line (<CR><LF>)) is sent to the remote modem where it is either checked for validity or ignored.

NO RESPONSE
: This message is used if no modem-to-modem session could be established with the remote modem.

NOT ACCEPTED
: This message is used if the modem-to-modem session was established but the remote modem is not accepting configuration changes.

BAD REMOTE PASSWORD
: This message is used if the remote modem would normally accept the configuration change but the password issued is found to be incorrect. This is only used if the remote modem requires a correct password.

!AT
: This message is shown at the beginning of each command line for the remote modem after the session has been established. The desired command string is typed without the letters 'AT'.

!
: This message precedes each response from the remote modem.

Example: To display the contents of the remote directory 18 (its security level is set to 0 and the remote password is the factory default):

1. Connect to the remote modem
2. Enter the escape sequence +++ (which can be reset using "S2 -Asynchronous Escape Character" on page 12-56).
3. Enter the command:

```
at"i<CR>
REMOTE PASSWORD: b293
!AT"d18<CR>
```

The contents of the remote directory 18 are displayed on the DTE display.

4. Enter the "In cmdword again to end the "session":

```
!AT"i<CR>
```

"Lmn -Send Remote Profile

Format: "Lmn

Function: This cmdword replaces one of the profiles in a remote modem with a copy of one of the local modem's profiles. The command is only run if the modems have the same country type. (The country type cannot be changed.)

See "Sending a Profile or Directory" on page 9-4 for further details.

Configuration Tree Location: Shown on page 9-4.

LCD Message

Send Profile

Parameters

m

0, 1 Specifies the profile number that is sent to the remote modem.

n

0, 1 Specifies the profile number that is "written over" in the remote modem. If this parameter is not present, the local profile number is used.

Responses

Prompt Messages

REMOTE PASSWORD:
: This message is always used. The user response (which may be a null line (<CR> <LF>)) is sent to the remote modem where it is either checked for validity or ignored.

NO RESPONSE
: This message is used if no modem-to-modem session could be established with the remote modem.

NOT ACCEPTED
: This message is used if the modem-to-modem session was established but the remote modem is not accepting configuration changes.

BAD REMOTE PASSWORD
: This message is used if the remote modem would normally accept the configuration change but the password issued is found to be

incorrect. This is only used if the remote modem requires a correct password.

Note: This cmdword causes a modem reset at the remote modem. It does not cause the power-up profile selection at the remote modem to be changed. If this profile is to become active at the remote modem, it must be sent to the appropriate NVM location (usually `Profile....NVM 0`).

"Nxxxxx -Run a Command List by Name

Format: `"Nxxxxx or #Nxxxxx`

Function: This cmdword allows users to run a command list entry by specifying part of a 'name' associated with the list entry. The modem requests the list password if the list entry is secured unless the modem is set for the no security option (see ""Sn -Security Defeat" on page 12-29).

Parameters

xxxxx Alphanumeric characters (up to 5) that correspond to a cmdword list 'name'. Use of fewer than five characters is allowed only if the cmdword is the last in a cmdword line (ended by a <CR>). Blanks, spaces, and asterisks can be used to pad the end of an entry.

```
For a list name of 'smith';
 'smit '
 'smi**'
 'Sm* *'
all find the entry - if no earlier entry has the same initial
characters.
```

Responses: Normal for the commands being run. The command list is "echoed" back to the DTE as a text response if messages are enabled, see "Qn -Quiet Modem Messages" on page 12-9.

An ERROR result code is used if no match is found for the 'name'.

Example: To run a list of commands in the directory named 'smith' (its security level is set to 0):

```
at"nsmith<CR>
```

Note: See the "Wn on page 12-30 to create a directory named 'Smith'.

The DTE display shows the number, name (smith), the command list run, and the security level of the 'smith' directory.

"P -Change Password

Format: `"P or #P`

Function: This cmdword allows the user to change the password that is used for access security. This password applies to both command lists and for allowing a remote modem to configure a local modem.

The password must be 4 characters long and is considered to be hexadecimal which means it must be made up of the characters 0-9, a-f, or A-F.

Configuration Tree Location: Shown on page 9-4.

LCD Message
Change Password

Responses

Prompt Messages
OLD PASSWORD:
First text message when the directory password is to be changed. Not used if the modem is set for the no security option.
NEW PASSWORD:
Second text message.
REPEAT: Third text message.

"R -Restrict Front Switches

Format: "R or #R

Function: This cmdword locks the front panel switches and the data/talk switch so that the correct password is required to enter the configuration menus or use the switch.

Configuration Tree Location: Shown on page 6-11.

LCD Message
Lock at Exit

"Sn -Security Defeat

Format: "Sn or #Sn

Function: This cmdword allows the user to turn **on** and **off** the use of password security for the command list and for acceptance of configuration information from a remote modem.

Configuration Tree Location: Shown on page 9-4.

Parameters

n	LCD Message	
0	Pass.....NONE	Command lists and the local configuration can be manipulated without a password.
1	Pass....REQUIRED	The correct password is needed to see and use command list entries and a remote modem must have the correct password to change the configuration of the local modem.
2	Pass..TELCO SHUT	The correct password is needed to see and use command list entries and configuration information is not be accepted from the telco line. This prevents a remote modem from running the "Hn, "In, and "Lmn cmdwords.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

Responses

Prompt Messages

PASSWORD The local password is requested when the security level is decreased, that is changed from 2 to 1, for example.

"Wn -Create (Write) a Command List Entry

Format: "Wn or #Wn

Function: This cmdword can be used to store a command list in the modem. The modem requests the list password if the list entry already exists and is secured unless the modem is set for the no security option (see ""Sn -Security Defeat" on page 12-29).

Configuration Tree Location: Shown on page 9-11.

LCD Message
Store and View

Parameters

n
4-19 Selects the entry to be written.

Responses

Prompt Messages
NAME: The name allows the user to specify an alphanumeric "name" string up to 24 characters long to be associated with the directory entry. An entry that is too long is accepted by the modem but truncated. A null entry (carriage return) is also accepted.
COMMANDS:
The cmdword list can be 40 characters long not counting the carriage return that ends the list. A null entry causes ending of the cmdword with an ERROR result code.
SECURITY LEVEL:
The security level must be set to be "0", "1", "2", or <CR>. 0 and <CR> are equivalent and are the "no security" choices. An illegal entry in this field causes early ending of the cmdword with an ERROR result code.

Example: To store a command list in the empty directory 18 named "Smith":

```
at"w18<CR>
NAME:                smith<CR>
COMMANDS:            m0d6169<CR>
SECURITY LEVEL:      0<CR>
```

The DTE display shows directory number (18), name (smith), command list (m0d6169), and security level (0) that were entered.

"Xn -Extended V.25 Bis Indications

Format: "Xn or #Xn

Function: This cmdword determines whether the modem is allowed to give more detailed indications than what are supported by the V.25 Bis standard and also allows the user to choose between 1984 type indications and the more recent 1988 indications.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n LCD Message

0 V25b Msg.MINIMUM — Basic 1984 indications (per 5853)

1 V25b Msg...CFIDE — Extended 1984 indications (per 5853) Allows DE response.

2 V25b Msg.INC CNX — Basic 1988 indications Allows INC and CNX responses, disallows DE.

3 V25b Msg.....ALL — Extended 1988 indications Allows all the above. This option also causes a VAL response to be sent immediately after a valid CNR or CRI command.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 2. Nonvolatile memory profile 1 is reset to 3.

Table 12-2. Extended V.25 Bis Indications

Event	Indication			
	1984	1984 Extended	1988	1988 Extended
Dial tone error detected and call fails	CFINT	CFIDE	CFINT	VAL and CFIDE
Collision between incoming and out-going calls	INV	CFIDE	INC	VAL and INC
Successful handshake	none	none	CNX	VAL and CNX speed

For definition of the indications see Table 13-3 on page 13-12.

\An -ECL Block Size

Format: \An or)An

Function: This cmdword sets the maximum data block size to be used by the modem during a stream mode ECL session but does not influence the minimum size. During an ECL session this cmdword may be used to reduce the maximum data block size but will not be able to increase the size since that is negotiated at the beginning of an ECL attempt.

This cmdword is intended to be a means for a customer to maximize data throughput of ECL connections.

Configuration Tree Location: Shown in Figure 6-16 on page 6-28.

Parameters

n LCD Message

0 Block Size....64 — Maximum block size is 64 characters.

1 Block Size...128 — Maximum block size is 128 characters.

2 Block Size...192 — Maximum block size is 192 characters.

3 Block Size...256 Maximum block size is 256 characters.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

\Bn -Send Break

Format: \Bn or)Bn

Function: This cmdword causes the modem put a break (continuous scrambled zero/start bits) of duration roughly n00 ms onto the phone line during asynchronous operation.

Parameters

n

0 Send 300 ms of break onto the phone line when no ECL connection is established. When an ECL connection is established, this cmdword results in a fixed length break being delivered to the remote DTE (roughly 450 ms).

1-9 Send 100 to 900 ms of break signal onto the phone line when no ECL connection is established. When an ECL connection is established, this cmdword results in a fixed length break being delivered to the remote DTE (roughly 450 ms).

\Cn -ECL Startup

Format: \Cn or)Cn

Function: This cmdword determines two things independently:

1. Whether the modem will "listen" for an incoming LRPDU throughout a non-ECL connection.
2. Whether a modem that is attempting to do an ECL handshake will abandon that attempt (and either go to non-ECL or end the connection) if the auto-fallback character arrives from the phone line during the handshake attempt, see "%Annn -Set ECL Handshake Cancel Character" on page 12-43.

Configuration Tree Location: Shown in Figure 6-16 on page 6-28.

Parameters

n

0

1. Does not "listen" for an incoming LRPDU throughout a non-ECL connection. Listen only when directed by the "\N" command.
2. Does not "listen" for the auto-fallback character during an ECL handshake attempt.

1

1. Listens for an incoming LRPDU for the duration of a non-ECL connection and complete the ECL handshake if an LRPDU is detected.

   Note: This setting overrides \N0 and \N1 settings.
2. Does not "listen" for the auto-fallback character during an ECL handshake attempt.

2

1. Does not "listen" for an incoming LRPDU throughout a non-ECL connection. Listen only when directed by the "\N" command.
2. Listens for the auto-fallback character during an ECL handshake attempt and abandon the attempt if the auto-fallback character arrives.

3

1. Listens for an incoming LRPDU for the duration of a non-ECL connection and attempt the ECL handshake if an LRPDU is detected.

   Note: This setting overrides \N0 and \N1 settings.

2. Listens for the auto-fallback character during an ECL handshake attempt and abandon the attempt if the auto-fallback character arrives.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2.

\Dn -Direct Mode

Format: \Dn or)Dn

Function: This cmdword forces data flow for a non-ECL asynchronous connection to be direct mode rather than the normal buffer mode. Normally a customer would only use asynchronous direct mode if he uses an 11 bit character format without ECL or runs overspeed beyond the 1% limit.

In the 7855 modem, this cmdword affects asynchronous operation only.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message	
0	Direct Path...NO	The modem is set up in buffer mode.
1	Direct Path..YES	The modem is set up in direct mode.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

Note: A modem set for direct mode cannot initiate nor respond to an LRPDU so an ECL connection is not possible.

\En -Local Echo Optimization

Format: \En or)En

Function: This cmdword causes the modem to do a 2-wire local echo optimization at the next opportunity. The optimization is done immediately if a 2-wire nonswitched connection exists. It is done during the next call if the modem is configured for 2-wire PSTN operation.

If the optimization process succeeds (meaning the two modems achieve synchronization), the results are stored in NVM immediately.

Configuration Tree Location: Shown on page 6-26.

Parameters

n	LCD Message	
0	Echo Adapt....NO	Cancel any pending local echo request.
1	Echo Adapt...YES	Perform a local echo optimization at the next opportunity.

\Gn -Modem to Modem Flow Control

Format: \Gn or)Gn

Function: This cmdword determines whether the modem uses single character flow control across its telco port during asynchronous non-ECL operation. This cmdword does not affect the way the modem and attached DTE perform flow control nor how the modem does flow control across the telco interface when an ECL connection exists.

Configuration Tree Location: Shown in Figure 6-12 on page 6-24.

Parameters

n	LCD Message	
0	Telco Flow....NO	No flow control. XON and XOFF characters that come in from the phone line are just data and the modem does not insert XON or XOFF characters into the data stream going to the phone line.
1	Telco Flow...YES	The modem uses and responds to single character flow control at the telco interface.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

\In -Imbedded Commands (Synchronous)

Format: \In or)In

Function: This cmdword controls the synchronous form of escape sequence recognition.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message	
0	<ESC> Sync..NONE	No frames imbedded in data are considered to be commands.
1	<ESC> Sync...YES	The address and control bytes of a frame imbedded in data must be those of a LPDA frame before the frame is eligible for consideration as a command.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

\Kn -Break Control

Format: \Kn or)Kn

Function: This cmdword determines what a 7855 modem in an asynchronous non-ECL connection does if a break signal comes in from the DTE or telco interface or if a \B cmdword comes in from the attached DTE. During an asynchronous ECL connection, the \K setting of the modem that receives a break signal or \B cmdword from an attached DTE controls the behavior of the modem that delivers the break to its attached DTE.

A modem that receives a break signal or cmdword at its DTE or telco port changes an XOFF (single character flow control) condition to XON as needed to get the break signal through the modem and out the other port. This change to XON frees that path for later data transfer.

Configuration Tree Location: Shown in Figure 6-9 on page 6-23.

Parameters

n

For a break signal or \B cmdword that comes in from the attached DTE (or from the phone line if ECL is active):

0 The modem goes to the escaped state if the escaped state is allowed. It will place a break on the phone line if it is in direct mode or if the DTE used a \B command. Buffers are not cleared. A break that comes in from the phone line is delivered in sequence with any received data.

1 The modem clears its buffers and delivers a break at its other port. This is the "expedited destructive" break operation of ECL. Shown as CLEAR in the tree structure.

2 The modem does not clear the buffer that is in-line with the port receiving the break and it delivers a break at its other port ahead of any buffered data. For ECL operation, this is the "expedited nondestructive" break. Shown as QUICK in the tree structure.

3 The modem does not clear any buffer and it delivers a break at its other port in time sequence with any buffered data. This is the "nonexpedited nondestructive" break operation. Shown as SLOW in the tree structure.

For a break signal that arrives from the telecommunication port when the modem is in buffered mode and ECL is not active:

0 The break is ignored.

1 The modem clears its receive buffer and delivers a break to the attached DTE.

2 The modem does not clear its receive buffer but delivers a break to the DTE ahead of any buffered data.

3 The modem does not clear its receive buffer and delivers a break to the attached DTE in sequence with any buffered data.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2.

\Ln -ECL Data Transfer Control

Format: \Ln or)Ln

Function: This cmdword determines whether ECL operation is done using the ECL stream mode or the ECL block mode.

Note: Only use block mode when your DTE requires use of block mode ECL. Use stream mode at all other times.

Configuration Tree Location: Shown in Figure 6-16 on page 6-28.

Parameters

n	LCD Message	
0	Protocol..NORMAL	Stream mode with normal stream timer.
1	Protocol...BLOCK	Block mode.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

\Mn -Speed Buffered DTE Interface Speed

Format: \Mn or)Mn

Function: This cmdword sets that DTE interface speed that the modem uses when speed buffering is turned **on**. The nonswitched line and switched network preferred speeds are set together (since speed buffering is either **on** or **off** for both). Running this cmdword does not override a previously sensed DTE speed. To do so, run the command, store working memory in a profile and then load that profile into working memory with a reset.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message		
0	DTE Speed..TELCO	Speed buffering is turned **off**. The DTE interface speed is the same as the preferred telecommunication line speed, which is set as follows: • The preferred line speed is the speed most recently sensed DTE interface speed or the &A setting if no command has been sent by the DTE since the last modem reset. • If the DTE speed is higher than an achievable line speed, such as for 19 200 bps, the preferred line speed is the nearest available speed (except for 12 000). In such cases, speed buffering is effectively turned **on** and the DTE interface speed is different from the telecommunication line speed. If you want to set the telco line speed to 12 000 bps and use asynchronous operation, set the DTE interface speed to the preferred speed that you want to use. Do not set the DTE interface speed equal to the telco line speed.	
1	DTE Speed.....50	50 bps	(The modem cannot sense this speed)
2	DTE Speed.....75	75 bps	

3 DTE Speed....110	110 bps	
4 DTE Speed....135	134.5 bps	
5 DTE Speed....150	150 bps	
6 DTE Speed....300	300 bps	
7 DTE Speed....600	600 bps	
8 DTE Speed...1200	1200 bps	
9 DTE Speed...2400	2400 bps	
10 DTE Speed...4800	4800 bps	
11 DTE Speed...7200	7200 bps	
12 DTE Speed...9600	9600 bps	
13 DTE Speed..14400	14 400 bps	(The modem cannot sense this speed)
14 DTE Speed..19200	19 200 bps	

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

Note: A new speed sensed during a connection produces a new DTE interface speed but not a telco speed change and should be avoided.

\Nn -Logical Handshaking Control

Format: \Nn or)Nn

Function: This cmdword determines the 7855 behavior regarding ECL LRPDUs just after a physical connection is established and, when no ECL connection exists, at the successful exit from the recovery state (for example after a retrain or speed change).

Note that several of the settings can be overridden by the \C cmdword described in "\Cn -ECL Startup" on page 12-32.

If this cmdword is issued after a physical connection exists, it takes affect at the next retrain or speed change or at the next physical connection.

Configuration Tree Location: Shown on page 6-17 and in Figure 6-16 on page 6-28.

Parameters

n	**LCD Message**	
0	ECL Start.ACCEPT	The modem does not initiate an ECL handshake. The modem recognizes and responds to a LRPDU that arrives during the first three seconds of the connection. Data that arrives from the phone line during this time is passed along to the attached DTE. Data from the attached DTE is sent onto the phone line until a LRPDU is recognized. **Note:** This behavior is needed if nonswitched modem-to-modem conversations are done with ECL. If not, then a "0" parameter makes the modem behave like a "1" parameter does. These timings apply if \C is set to 0 or 2.
1	ECL Start..NEVER	The modem does not send out an ECL LRPDU. An incoming LRPDU is passed along to the attached DTE as data if \C is set to 0 or 2.

2	ECL Start.ALWAYS	Only an ECL connection is acceptable. If the ECL three way handshake fails, the modem goes to the recovery state (normally ends a switched network connection and re-starts a nonswitched line connection). The modem does not normally signal a connection to the DTE unless the three way handshake succeeds.
3	ECL Start...AUTO	An originate mode modem sends out ECL LRPDUs. If the three way handshake fails, the modem reverts to a non-ECL connection. An answer mode modem recognizes and responds to a LRPDU that arrives during the first three seconds of the connection. Data that arrives from the phone line during this time is lost. Data from the attached DTE is sent onto the phone line until a LRPDU is recognized.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

\O -Originate an ECL Connection

Format: \0 or)0

Function: This cmdword causes the modem to send out an LRPDU in an attempt to establish an ECL connection. The modem either ends with an ECL connection or a non-ECL connection depending on the success or failure on the ECL three way handshake.

Notes:

1. Data that arrives from the phone line during this time is lost.
2. An error message is returned if this cmdword is attempted while an ECL connection already exists.

\Pmnnn -PBX Code for Access to PSN

Format: \Pmnnn or)Pmnnn

Function: This cmdword gives the modem the method used to access the public switched network from behind a PBX used at the site of installation of the modem. **This cmdword is relevant only in countries that require the modem to do syntactic checking of the dial command.**

The maintenance password is required for this cmdword.

Note

The modem must be in the V.25 Bis mode for the method selected below to be active.

Configuration Tree Location: Shown on page 11-10.

Parameters

m	LCD Message	
0	PSN Access.NOPBX	The modem is attached directly to the public switched network in which case the "nnn" parameter must not be present.
:	PBX code....Xxxx	The modem is connected to a PBX and the V.25 Bis : parameter (wait for dial tone) determines how the modem starts dialing with this PBX.
<	PBX code....Xxxx	The modem is connected to a PBX and the V.25 Bis < parameter (pause for one second) determines how the modem starts dialing with this PBX.
=	PBX code....Xxxx	The modem is connected to a PBX and the V.25 Bis = parameter (pause for three seconds) determines how the modem starts dialing with this PBX.

nnn PBX code....xXXX
dialable parameters
One, two, or three digits that are V.25 Bis dialable parameters which define the PBX's access code to reach the PSN.

\Qn -V.24 Flow Control (Modem Stops DTE)

Format: \Qn or)Qn

Function: This cmdword controls what kind of flow control the modem uses to inhibit or allow data to be delivered from the DTE when the DTE interface is asynchronous and either speed buffering is enabled or an ECL link is being attempted or is underway.

Configuration Tree Location: Shown on page 6-17 and in Figure 6-11 on page 6-24.

Parameters

n	LCD Message	
0	7855 Using..NONE	No flow control. The modem does not attempt to stop data flow from the attached DTE.
1	7855 Using..CHAR	The modem sends XON and XOFF characters to the attached DTE to control data transmission by the attached DTE.
2	7855 Using...RFS	The modem uses RFS to control data transmission by the attached DTE.
3	7855 Using..BOTH	The modem uses both RFS and XON/XOFF to control data transmission by the attached DTE.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2.

\Rn -V.24 Flow Control (DTE Stops Modem)

Format: \Rn or)Rn

Function: This cmdword controls what kind of flow control can be used by the DTE to allow or inhibit data sent by the modem to the attached DTE when the DTE interface is asynchronous and either speed buffering is enabled or an ECL link is be attempted or is underway.

Configuration Tree Location: Shown on page 6-17 and in Figure 6-11 on page 6-24.

Parameters

n	LCD Message	
0	DTE Using...NONE	No flow control. The modem does not recognize manipulation of RTS or the use of XON/XOFF characters by the DTE as flow control attempts.
1	DTE Using...CHAR	The modem stops delivering data to the attached DTE when it receives a XOFF character. Data transfer resumes when a XON character is received.
2	DTE Using....RTS	The modem stops delivering data to the attached DTE when the DTE drops RTS. Data transfer resumes when RTS goes active.
3	DTE Using...BOTH	The modem responds to RTS or XON/XOFF characters from the attached DTE.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

\Sn -Show Configuration

Format: \Sn or)Sn

Function: This cmdword causes the modem to send one screen of the configuration information stored in working memory to the DTE. Information stored in nonvolatile memory profiles 0 and 1 can be displayed by issuing the &V cmdword.

Parameters

n

0 Show commands up to approximately %Q.

1 Show the remaining commands and the S registers and status items.

Responses: See Table 15-1 on page 15-1 for the prompt messages.

\Tn -Inactivity Timer

Format: \Tn or)Tn

Function: This cmdword causes the modem to end a switched network and go on-hook if no data is received or transmitted for the specified period. This timer takes effect only when a modem-to-modem connection exists.

This timer has no function during nonswitched line operation and does function during SNBU (which is a switched network connection). If an SNBU connection is ended, the modem attempts to re-establish the nonswitched line connection.

In some countries, this command requires the maintenance password. In those countries, this timer can be changed only by issuing this cmdword, that is, it cannot be changed from the front panel.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	LCD Message	
0	On Hook.....NO	The inactivity timer is disabled.
1-90	No Data (min).xx	Inactivity for the specified number of minutes causes the modem to end the switched network connection.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0 if allowed by country regulations.

Note that the full range of parameter values is not available in every country.

\U -Accept an ECL Connection

Format: \U or)U

Function: This cmdword causes the modem to "listen" to the telecommunication line for up to three seconds for an ECL LRPDU. If an LRPDU arrives before the three seconds has expired, the modem attempts to establish an ECL connection.

Notes:

1. Data that arrives from the phone line during this time is lost.
2. An ERROR message is returned when this cmdword is used when no connection exists or an ECL connection already exists.

\Vn -ECL Result Messages

Format: \Vn or)Vn

Function: This cmdword enables or disables the ECL messages that can be confused with data. These are "ECL", "ECLC", and "NO ECL" when they would be delivered at a time when the DTE might not be expecting a result code from the modem. An example is the typical way which an auto-answer modem connects assuming result codes are enabled:

> First the modem delivers a CONNECT message and shows to the DTE with the RFS and RLSD signals that a connection is established.
> Sometime later, the modem receives a LRPDU and handshakes and starts an ECL connection.
>
> The local DTE would have no way of knowing whether the "ECL" message was a modem message or data from the remote end.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n	LCD Message	
0	Messages.....OFF	Do not send result codes that could be confusing.
1	Messages.....ON	Send ECL result codes.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

\Xn -XON/XOFF Passthrough

Format: \Xn or)Xn

Function: This cmdword determines what the modem does if it receives an XON/XOFF flow control character that it acts on from one of its ports when it is honoring XON/XOFF flow control. The modem either removes the character from the data stream or passes it along to its other port. XON/XOFF characters that the modem does not act on is passed along to its other port.

Configuration Tree Location: Shown in Figure 6-11 on page 6-24.

Parameters

n	LCD Message	
0	Flow Pass....YES	XON and XOFF characters that are acted on are passed through the modem.
1	Flow Pass.....NO	XON and XOFF characters that are acted on are removed from the data stream.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

\Y -Switch to an ECL Connection

Format: \Y or)Y

Function: This cmdword causes a modem to "listen" to the telecommunication line for an ECL LRPDU for up to three seconds if the modem is in answer mode. If an LRPDU arrives, the modem attempts to establish an ECL connection.

If the modem is in originate mode, it initiates an ECL three way handshake.

The modem ends either with an ECL connection or a non-ECL connection depending on whether a three way handshake is successful.

Notes:

1. Data that arrives from the phone line during this time is lost.
2. An ERROR message is returned when this cmdword is sent when no no connection exists or an ECL connection already exists.

\Z -Switch to Non-ECL

Format: \Z or)Z

Function: This cmdword causes the modem to end an existing ECL connection and change to a regular non-ECL connection. For switched network operation the modem does not go on-hook even if it had been set to allow only an ECL connection at connection time. However, some remote modems (such as the 5853) may go on-hook at the end of an ECL connection in which case the 7855 modem does its normal carrier detect loss activities.

Note: This cmdword cannot be used if the underlying telephone line speed is 12 000 bps because you cannot have a 12 000 bps connection unless you have an ECL connection. (This is for asynchronous operation only.)

%Annn -Set ECL Handshake Cancel Character

Format: %Annn

Function: This cmdword sets up a character that the modem can use to determine whether an ECL handshake attempt should be abandoned. The modem checks the incoming data stream to see if this character has been sent by the remote DTE. If so, the ECL attempt is canceled. This is also called an auto-fallback character.

Configuration Tree Location: Shown in Figure 6-16 on page 6-28.

Parameters

n	LCD Message	
0-127	Character....xxxx	Decimal representation of a character.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 013.

%Bn -Make Busy Control

Format: %Bn

Function: This cmdword determines whether the modem goes off-hook and "busy out" the switched network when it is doing a local loop test.

Configuration Tree Location: Shown on page 11-1.

Parameters

n	LCD Message	
0	Make Busy.....NO	The modem is on-hook when doing a local loop test.
1	Make Busy....YES	The modem goes off-hook when doing a local loop test. With this setting, the modem goes off-hook on the switched network whether it is configured for switched or nonswitched operation.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0 if allowed by country restrictions.

%Cn -Compression Control

Format: %Cn

Function: This cmdword determines whether the modem attempts to use MNP class 5 data compression when an ECL link is established. This effects asynchronous operation only.

Configuration Tree Location: Shown in Figure 6-16 on page 6-28.

Parameters

n	LCD Message	
0	Compression...NO	The modem does not do data compression.
1	Compression..YES	The modem negotiates to do MNP class 5 compression.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

%Dn -Deliver Parity/Speed Character

Format: %Dn

Function: This cmdword determines whether the modem delivers to an attached DTE a customer settable character at the beginning of certain physical connections. The eligible connections are those done in such a way that the modem would not deliver a connect message - manual answer, manual dial, and auto-answer when no cmdword set is active. This character allows the DTE to sense the speed of the telecommunication line connection and the parity of the data to be used.

This function only applies to asynchronous operation of the DTE interface when the modem is doing switched network connections. See "%Pnnn -Set Parity/Speed Character" on page 12-49 for the customer settable character.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message	
0	Connect Char..NO	The modem does not deliver such an auto-speed/auto-parity character to the attached DTE.
1	Connect Char.YES	The modem delivers a character to the attached DTE at the start of a connection if the modem has no other message to deliver.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

%En -Retrain Control

Format: %En

Function: This cmdword controls whether the modem is allowed to initiate retrains as part of its recovery process when the telephone line speed is 2400 bps or higher. The modem always responds to a retrain initiated by the remote end.

Configuration Tree Location: Shown on page 6-27.

Parameters

n	LCD Message	
0	Retrain.....NO	The modem cannot initiate a retrain.
1	Retrain....SHORT	The modem is allowed to initiate a retrain if needed for up to 30 seconds and then go to the next allowed step of the recovery process (if the retrain attempt does not resolve the problem).

2 Retrain.....LONG — The modem is allowed to initiate a retrain if needed for up to 2 minutes and then go to the next allowed step of the recovery process (if needed).

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

%Fn -Fallback Control

Format: %Fn

Function: This cmdword determines if the modem is allowed to initiate a fallback attempt after establishing a connection and also how many rates the modem is allowed to fallback. It can also be used to limit the initial connection speed to the preferred telco speed. Unless the modem is set for the %F9 option, the modem always responds to a fallback attempt by the remote modem.

This cmdword affects modem operation only when the DTE interface is synchronous with internal or slaved clocking, or is asynchronous with speed buffering or ECL operational.

Configuration Tree Location: Shown on page 6-27.

Parameters

n LCD Message

0 Fallback..ACCEPT — The initial connection handshake sets the telco line speed using both modem's preferred telco speeds in the normal way. After the initial handshake, the modem does not initiate an attempt to lower the connection speed but it follows the modem at the other end if it attempts to decrease the connection speed.

1-8 Fallback.n RATES — The initial connection handshake sets the telco line speed using both modem's preferred telco speeds in the normal way. The parameter chosen (1-8) sets the number of modem speeds down that are allowed below the initial connection speed if the connection speed degrades (down to a minimum speed of 1200 bps). For example, a setting of "2" and an initial connection speed of 2400 bps means the modem is allowed to fall-back to 1200 bps before proceeding to the next step in the recovery process.

A setting greater than the number of fall-back speeds available is accepted and means the modem should try all speeds before proceeding to the next step in the recovery process.

9 Fallback.....NO — The initial connection handshake must succeed at the preferred connection speed of the modem and no fall-back is allowed from that speed.

10 Fallback.....DTE — The modem's telecommunication line speed is controlled by the DTE using the DTE interface pin 23. The modem does not initiate any speed change. See "Pin 23-Data Signal Rate Selector" on page 17-5.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0 and working memory to 1. Nonvolatile memory profile 1 is reset to 0.

%Gn -Fall Forward Control

Format: %Gn

Function: This cmdword determines if the modem is allowed to initiate a fall forward attempt if the connection is found to be good enough. The modem always responds to a fall forward attempt from the other end (and may choose to respond that fall forward is not allowed). The rules regarding how often fall forward is allowed and how many speeds forward the modem can go are defined in "Allowing the Line Speed to Increase" on page 9-5. Note that the modem does not fall forward from a telco speed of 600 bps or slower.

This cmdword affects modem operation only when the DTE interface is synchronous with internal or slaved clocks or asynchronous with speed buffering or ECL operational. For the other two cases, asynchronous without speed buffering and synchronous with external clocks, the modem speed is not allowed to increase.

This command is ignored when the "%Fn -Fallback Control" on page 12-45 is set to %F10.

Configuration Tree Location: Shown on page 6-27.

Parameters

n	LCD Message	
0	Fall Forward..NO	Fall forward is not allowed.
1	Fall Forward.YES	Fall forward is allowed.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

%Hn -7200 bps Control

Format: %Hn

Function: This cmdword determines whether the modem that is attempting a fall forward or fall back considers 7200 bps to be an acceptable speed to try. The remote modem accepts 7200 bps if the initiating modem attempts it regardless of the setting of this cmdword. When 7200 bps is not acceptable, that speed is not counted when the modem computes its minimum allowed fall back speed. The setting of this cmdword does not affect the use of 7200 bps at the time a connection is established.

Configuration Tree Location: Shown on page 6-27.

Parameters

n	LCD Message	
0	7200 bps.....NO	7200 bps is not considered for fall back/forward.
1	7200 bps.....YES	7200 bps is allowed for fall back/forward.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1 if allowed by country restrictions.

%In -Short Training for Inter-working

Format: %In

Function: This cmdword can be used to decrease the duration of the modem's V.32 TRN sequence to make handshaking take less time. Use of the shorter handshaking does not allow the modem to adjust as completely to marginal telecommunication lines and thus should be tested in your environment before you use it permanently.

Configuration Tree Location: Shown on page 6-26.

Parameters

n	LCD Message	
0	Fast Train....NO	Use the normal TRN sequence.
1	Fast Train...YES	Use the shorter TRN sequence.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

%Jn -Retrain Trigger

Format: %Jn

Function: This cmdword allows the user to select the value of the change in the receive level which causes the modem to initiate a retrain in switched and 2-wire nonswitched operation. It has no effect in 4-wire nonswitched operation. In those networks where the modem transmits and receives on the same pair of wires, the local modem should see a sharp increase in its receive level if the connection is abruptly ended. Note that if this value is set too low, unnecessary retrains could occur if the line experiences ordinary signal increases and if this value is set too high, the local modem may take longer to recognize that the connection has ended.

Configuration Tree Location: Shown on page 6-27.

Parameters

n	LCD Message	
2	Trigger.(dBm)..2	A sudden 2 dBm change in receive level causes a retrain.
3	Trigger.(dBm)..3	3 dBm change
4	Trigger.(dBm)..4	4 dBm change
5	Trigger.(dBm)..5	5 dBm change
6	Trigger.(dBm)..6	6 dBm change
7	Trigger.(dBm)..7	7 dBm change
8	Trigger.(dBm)..8	8 dBm change
9	Trigger.(dBm)..9	9 dBm change

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 6.

Note: Testing at IBM has found that a 6 dBm change produced the best overall performance. However, each network may be a little different and a different value may be needed.

%Ln -Limit Asynchronous Command Sets

Format: %Ln

Function: This cmdword allows the user to choose among the AT, V.25 bis, and enhanced V.25 Bis (<CR> <LF> speed and format sensing) cmdword sets as allowed by national regulations.

Configuration Tree Location: Shown on page 6-12.

Parameters

n	LCD Message	
0	No Speed Sense	The modem expects V.25 Bis commands is used without any automatic speed sensing. The speed and format of the commands must be those pre-programmed into the modem.
1	Speed Sense	The modem expects V.25 Bis commands is used and there will be at least one <CR> <LF> given to the modem after each power **on** and raise of DTR to allow the modem to get ready for commands.
2	Asynchronous AT	The modem expects AT commands.

Note: This cmdword causes a modem reset. All changes made before issuing this cmdword that were not stored in nonvolatile memory is lost. This command can also be used as a parameter in the V.25 Bis CNL command to change the modem from synchronous to asynchronous mode.

%On -Overspeed (Asynchronous)

Format: %On

Function: This cmdword determines the allowable overspeed, either "+1%" or "+2.3%" rule from V.14, for the modem in direct mode operation.
When an asynchronous DTE sends data to an asynchronous modem, the data is usually sent at a rate that is not exactly the nominal rate, for example 9600.1 bps rather than 9 600.0 bps. When the modem sends the data onto the phone line, it must do a conversion as needed to send the data out at exactly the nominal rate. CCITT recommendation V.14 defines the conversion process. The modems at both ends of a connection must be set identically.

The 1% setting is preferred because it causes less distortion of the data.

When the modem is not using direct mode, and flow control is not allowed, the modem can accept data at up to 1% over the nominal rate.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message	
0	Overspeed.....1%	The modem does not make speed mismatch related errors if the DTE speed is within the basic range of V.14 (+1% to -2.5%).
1	Overspeed...2.3%	The DTE speed must be in the extended range of V.14 (+2.3% to -2.5%) (and the modem must be set to direct mode).

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

Data error may occur if this cmdword is run while a connection exists.

%Pnnn -Set Parity/Speed Character

Format: %Pnnn

Function: This cmdword sets up the character that the modem delivers to the attached DTE (if allowed by the "%Dn -Deliver Parity/Speed Character" on page 12-44 cmdword) at connection establishment time to allow the DTE to detect the speed of the connection and perhaps the character format in use. The modem delivers the character at the desired format. For example, if the format in use is 8 odd, then the modem delivers the character at that format even though only 7 bits are specified with this command.

Configuration Tree Location: Shown on page 6-22.

Parameters

n	LCD Message	
0-127	Character....xxxx	Decimal representation of a character.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 13.

%Qn -SNBU Query Control

Format: %Qn

Function: This cmdword is used to establish whether a modem is a "master" or "follower" during SNBU operation. Normally an SNBU connection consists of one of each.

Use of this cmdword during an SNBU connection changes the modem's behavior immediately.

Configuration Tree Location: Shown on page 6-27.

Parameters

n	LCD Messages	
0	SNBU LL Test..NO	The modem does not check the nonswitched line.
1	SNBU LL Test.YES	The modem checks the nonswitched line (the "master").

A RESET TO FACTORY (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

%Rnnn -Recovery Timer

Format: %Rnnn

Function: This timer has three functions:

- It governs how often the modem might attempt to fall forward one speed during nonswitched line operation.

- It sets when the modem would try its single fall forward allowed during a switched network non-SNBU connection.
- It sets the interval the modem uses for checking the nonswitched line if it is a "master" modem doing a SNBU.

  Note: For this last function the %Q cmdword must be set to 1 or 'YES' to activate this timer, see page 12-49.

Configuration Tree Location: Shown on page Figure 6-15 on page 6-27.

Parameters

n	LCD Messages	
0	Check Line....NO	The timer is disabled. The modem never falls forward and the modem never initiates a check of the non-switched line.
1-218	Check(x5min).xxx	The timer is enabled. The parameter gives the number of 5 minute intervals. 100 means 500 minutes; 218 is about 18 hours.
219-255		The timer is enabled about 18 hours.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 24.

%Sn -SNBU Control

Format: %Sn

Function: This cmdword controls what the modem does when it decides to use a SNBU to recover from a poor switched line connection.

This cmdword can also be used to force a nonswitched line modem to answer an incoming switched network call. It also controls how a nonswitched modem responds to a dial command.

Use of this cmdword during a SNBU connection changes the modem's behavior immediately.

Configuration Tree Location: Shown on page Figure 6-15 on page 6-27.

Parameters

n	LCD Messages	
0	SNBU.....NO	Automatic SNBU is not allowed.

For the nonzero parameters, dial commands are used activate a SNBU.

1	SNBU...CALL.0/20	SNBU is allowed. The modem dials using directory entry 0 or 20 (depending on which configuration (AT or V.25 Bis commands) is used) to establish a SNBU.
2	SNBU...CALL.1/21	SNBU is allowed. The modem dials using directory entry 1 or 21 (depending on which configuration (AT or V.25 Bis commands) is used) to establish a SNBU.
3	SNBU...EXEC.4/22	SNBU is allowed. The modem runs the command list stored in directory 4 or dial using directory 22 (depending on which configuration (AT or V.25 Bis commands) is used) to establish a SNBU.

4	SNBU.....ANSWER	SNBU is allowed. The modem auto-answers an incoming call (within the usual restrictions of DTR, D/T switch, and diagnostics) only if carrier is lost or the modem decides that a SNBU is appropriate.
5	SNBU..ANSWER ANY	SNBU is allowed. The modem auto-answers an incoming call (within the usual restrictions of DTR, D/T switch, and diagnostics) at any time - regardless of the modem's opinion of the nonswitched line.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

%TDn -Receiver Set Up

Format: %TDn

Function: This cmdword allows some receiver setup parameters to be changed at initialization time. This cmdword must be followed by a "write NVM" cmdword (that is, either by issuing a &W cmdword or by saving the change in a profile when exiting the front panel configuration menus) and then a reset to actually change the receiver operating parameters.

The maintenance password may or may not be required to use this cmdword.

Configuration Tree Location: Shown on page 6-26.

Parameters

n LCD Message

n Receiver.....x The parameter settings is bit mapped into a hex number.

bit

b3 0 is clamp data for poor EQM when no ECL connection is underway. 1 means do not clamp received data.
Clamping of data may prevent delivery of spurious data from the modem to its local DTE. However, it may also cause the modem to fail to deliver some valid data if the valid data arrives from the telecommunication line just as the modem decides the line is of low quality.

b2 Receiver equalizer timing. 0 means T spacing and 1 means T/2 spacing. Usually, the T setting gives better receiver performance. However, we have found that the T/2 setting gives better performance for some unusual conditions.

b1 Amplitude modulation tracker 0 means disabled and 1 means enabled.

b0 Train on data 0 means disabled and 1 means enabled.
Train on data and retrains are two alternative techniques that the modem can use to recover from telecommunication line degradation. The modem's receiver does better with train on data disabled but if your system cannot tolerate modem retrains, you can turn **off** retrains and enable train on data.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

%TPn -Transmitter Pre-emphasis

Format: %TPn

Function: This cmdword controls the modem's use of transmit pre-emphasis for V.32 operation.

The maintenance password may or may not be required to use this cmdword.

Configuration Tree Location: Shown on page 6-26.

Parameters

n LCD Message

0 Preemphasis....0 No transmit pre-emphasis

1-4 Preemphasis....n Various amounts/kinds of pre-emphasis

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2 if allowed by country restrictions.

%TXInn -Transmit Level

Format: %TXInn

Function: This cmdword allows the transmit level of the modem to be changed to the extent allowed in the country.

The maintenance password is required to change this parameter in some countries.

Configuration Tree Location: Shown on page 11-10.

Parameters

I LCD Messages

P PSN Xmit dBm.-xx The next one or two digits define the switched network transmit level.

L LL Xmit dBm.-xx The next one or two digits define the nonswitched transmit level.

0,1 This digit and possibly the next define the switched network transmit level.

nn

0-15 A transmit level in dBm with +0 -1 dBm tolerance from the nominal. The upper limit is per country requirements (-10 or -9 for U.S.A. PSN).

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to the greatest allowable transmit level per country restrictions.

Note: The switched network transmit level cannot be changed while the modem is configured for nonswitched operation and the nonswitched transmit level cannot be changed while the modem is configured for switched operation. The command is accepted but the command is not run.

Examples

```
%TXP9 sets the switched network transmit level to -9 dBm.
%TXL3 sets the nonswitched transmit level to -3 dBm.
%TX03 sets the switched network transmit level to -3 dBm.
```

%Un -Nonswitched Line Carrier Threshold

Format: %Un

Function: This cmdword allows the customer to select, within a country specific range, the carrier detect threshold the modem uses during nonswitched line operation. Customers can use this cmdword to help eliminate spurious data that can occur if the noise level of a line is very high.

For France only, this command requires the maintenance password. It can be changed by this cmdword only, that is, not from the front panel.

Configuration Tree Location: Shown on page 6-26.

Parameters

n	LCD Message	
0	LL RLSD dBm..-43	-43 dBm
1	LL RLSD dBm..-33	-33 dBm
2	LL RLSD dBm..-26	-26 dBm
3	LL RLSD dBm..-16	-16 dBm

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0 if allowed by country restrictions.

Note: This value cannot be changed unless the modem is configured for nonswitched operation. The command is accepted but not run if the modem is configured for a switched network.

%Vn -Verbose LCD Messages

Format: %Vn

Function: This cmdword selects whether the operational messages on the LCD are in compact or normal form. (Refer to tables Table 7-1 on page 7-2 and Table 7-2 on page 7-5.)

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n	LCD Message	
0	Messages.COMPACT	Compact messages.
1	Messages..NORMAL	Normal messages.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1.

%Xn -Transmit V.25 Calling Tone

Format: %Xn

Function: This cmdword determines, within national regulations, whether the modem uses the V.25 calling tone when it is originating a switched network connection. This cmdword does not affect nonswitched line operation.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	LCD Message	
0	Call Tone.....NO	Do not use the calling tone.
1	Call Tone...V.25	Use the calling tone per V.25.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0 if allowed by country restrictions.

S Registers

S registers control timer values and other aspects of the modem's behavior. They are storage locations inside the modem that can be read from and written to from outside the modem. (An exception is S16 which is read only.)

Ranges

If a user tries to set a register to a value outside its allowable range, the modem performs modular arithmetic to change the number to a value in the proper range. For example, the command line ATS10=258 sets the value of register S10 to a value of 2. Note, however, that the register value will never be set to a value that would cause the modem to operate contrary to country regulations. For example, if a country requires that the modem wait for at least 2 rings before answering in incoming switched network call, an attempt to set S0=2 succeeds and an attempt to set S0=1 results in the S0 register being set to 2.

It is a good idea to "read" an S register after writing it.

S0 -Rings Until Answer

Format: S0

Function: This register sets the number of rings that the modem must detect before it auto-answers. Of course, other conditions besides the ring count must be met before the modem auto-answers.

This parameter can also be used to prevent auto-answer.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	LCD Message	
0	Auto Answer...NO	The modem does not auto-answer.
1-255	Rings.....xxx	Rings counted before the modem auto-answers.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1 if allowed by country restrictions.

S1 -Ring Count

Format: S1

Function: This register shows the number of rings that have occurred during an incoming call up to 255. It cannot be altered from the DTE or front panel and is reset to 0 by the modem if no rings arrive for eight seconds.

Parameters

n	
0-255	The number of incoming rings that have been detected.

S2 -Asynchronous Escape Character

Format: S2

Function: This register specifies which character causes the modem to "escape" from data operation to commands.

This register can also be used to turn **off** the modem's ability to escape.

Configuration Tree Location: Shown on page 6-22.

Parameters

n LCD Message

0-127 <ESC>.....xxxx
The decimal representation of an IA5 character that is recognized by the modem as an escape character.

128-255 <ESC>.....NONE
The escape process is disabled. The modem treats all characters as either data characters or flow control characters.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 43 which is the '+' character.

S3 -Carriage Return Character

Format: S3

Function: This register specifies which character represents the <CR> character.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n LCD Message

0-127 <CR>.....xxx The decimal value of an IA5 character.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 13.

S4 -Line Feed Character

Format: S4

Function: This register specifies which character represents the <LF> character.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n LCD Message

0-127 <LF>.....xxx Shows the decimal value of an IA5 character.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 10.

S5 -Back Space Character

Format: S5

Function: This register specifies which character represents the <BS> character that can be used to edit cmdword entries and directory entries for asynchronous operation only.

Configuration Tree Location: Shown in Figure 6-10 on page 6-23.

Parameters

n	LCD Message	
0-32	<BS>.....xxx	The decimal value of an IA5 character that causes the modem to do a back space.
33-127		Means the modem does not do any backspace operation for editing.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 8.

S6 -Wait Before Blind Dialing

Format: S6

Function: This register sets the length of time the modem waits before going off-hook and starts a dial string when dial tone detection is disabled by user choice or national requirements.

If the maximum off-hook timer (country dependent) times are shorter than the setting of S6, then the modem will never dial.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	LCD Message	
2-255	First Delay..xxx	Seconds.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 2 if allowed by country restrictions.

S7 -Handshake Time Out

Format: S7

Function: This register specifies the time in which the modem must successfully handshake with a remote modem after a modem finishes dialing or when a modem starts to send answer tone. If the timer expires, the modem goes back on-hook.

Note that the country dependent maximum off-hook timer may force the modem back on hook before this S7 expires if S7 is set to a large value.

Configuration Tree Location: Shown on page 6-25.

Parameters

n LCD Message
1-255 Call Abort...xxx Seconds.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 60 if allowed by country restrictions.

S8 -Dial Pause Time

Format: S8

Function: This register specifies the length of time the modem pauses during dialing when a "pause" is found. It also controls all dialing "pauses" within the limits of country regulations. such as the ",", "<", and "W" parameters in the AT, V.25 bis, and LPDA command sets respectively.

Configuration Tree Location: Shown on page 6-25.

Parameters

n LCD Message
0-255 Other Delay..xxx Seconds.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 1 if allowed by country restrictions.

S9 -Carrier Recovery Time

Format: S9

Function: This register specifies the amount of time that carrier must be present before the modem considers it to be successfully recovered.

Parameters

n
0-255 Tenths of a second.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

S10 -Carrier Loss to On-hook Time

Format: S10

Function: This register specifies the amount of time that carrier can be lost before the modem goes on-hook when being used for switched network operation.

Configuration Tree Location: Shown on page 6-25.

Parameters

n	**LCD Message**	
0-254	CD loss(/10).xxx	Tenths of a second
255	Disconnect.NEVER	Loss of carrier does not force the modem to go on-hook.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 15.

S12 -Escape Code Guard Time

Format: S12

Function: This register specifies the guard time the modem uses to detect valid asynchronous escape sequences. See "Asynchronous Escape Sequence" on page 8-5 for details.

Parameters

n	LCD Message	
0-255	<ESC> (/50)..xxx	Fiftieths of a second.

Configuration Tree Location: Shown on page 6-22. A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 50.

S16 -Diagnostic Tests

Format: S16

Function: This register shows whether the modem is doing a diagnostic test. The information is bit mapped into this register's value so the value must be decoded to make sense of it. An easier way is to use the &T cmdword to start and stop tests.

S18 -Test Timer

Format: S18

Function: This register specifies the length of time the a test may run. When the timer expires, the modem ends an existing test, except the front panel test or the speaker test, and returns to its prior state.

Configuration Tree Location: Shown on page 11-1.

Parameters

n	LCD Message	
0	End Test..MANUAL	The modem does not automatically end a test.
1-255	Test Timer...xxx	Maximum number of seconds the test can run.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

S25 -Ignore DTR Drop

Format: S25

Function: This register specifies the amount of time that DTR may be lost before the modem responds if it is not set to ignore loss of DTR, see "&Dn -Data Terminal Ready Control" on page 12-14.

Configuration Tree Location: Shown in Figure 6-9 on page 6-23.

Parameters

n LCD Message
0-255 DTR Delay....xxxx Tenths of Seconds.

A Reset to Factory (see page 9-1) resets nonvolatile memory profile 0, NVM profile 1, and working memory to 0.

AT Commands Grouped by Operation

If you know the type of operations that you want to change, use this section to find all the AT cmdwords related to that operation.

Automatic Line Speed Change

%E	Retrain control
%F	Fall back control
%G	Fall forward control
%H	7200 bps control
%Q	SNBU query control
%R	Recovery timer
%S	SNBU control

Dialing and Answering

A	Answer
D	Dial
H	Disconnect
P	Pulse dial
T	Tone Dial
S0	Auto answer
S1	Ring count
S6	First delay
S7	Call cancel timer
S8	Other delay

Directories

"C	Clear command list entry
"D	Display command list entry
"E	Run a command list by number
"N	Run a command list by name
"P	Change password
"W	Create a command list entry
&Z	Store number

DTE Setup

E	Character echo
Q	Quiet modem messages
V	Verbose result codes
&B	Default asynchronous character format
&C	RLSD (carrier detect) control
&D	Data terminal ready control
&I	Connect messages during speed buffering
&M	Communication mode

&R	Ready for sending control
&S	Data set ready control for switched operation
&X	Transmit clock source control
"X	V.25 Bis messages
\D	Direct mode
\I	Imbedded commands (synchronous)
%D	Deliver parity/speed character
%L	Limit asynchronous command set
%O	Overspeed
%P	Set parity/speed control
S2	Imbedded commands (Asynchronous)
S3	Asynchronous character <CR>
S4	Asynchronous character <LF>
S5	Asynchronous character <BS>
S12	Asynchronous escape sequence guard time
S25	DTR drop timer

ECL, Flow Control, and Speed Buffering

\A	ECL block size
\C	ECL start up
\E	Local echo optimization
\G	Telco flow control
\K	Break signals
\L	ECL data transfer control
\M	Speed buffered DTE interface speed
\N	Logical handshaking control
\O	Originate an ECL connection
\Q	Modem stops DTE flow control
\R	DTE stops modem flow control
\T	Disconnect according to inactivity timer
\U	Accept an ECL connection
\V	ECL result messages
\X	XON/XOFF pass through
\Y	Switch to an ECL connection
\Z	Switch to a non-ECL connection
%A	ECL cancel character
%C	Compression control
%J	Retrain trigger
S9	RLSD recovery timer
S10	Disconnect from telco line

Remote Configuration

"F	Get remote directory or list entry
"G	Get remote profile
"H	Send remote directory or list entry
"I	Remote DTE interface
"L	Send remote profile
"S	Security defeat

Resetting and Viewing Configuration

Z	Reset to NVM
&F	Restore factory configuration
&V	View configuration
&W	Store (write) configuration
&Y	Power **on** profile selection
"R	Restrict front switches
\S	Show configuration

Telco Setup and Adaptation

B	Communications standard for 1200 bps
C	Carrier control
X	Extended call progress
Y	Signal remote to disconnect
&A	Preferred telco speed setting
&G	Guard tone
&J	Telephone jack control (US/Canada only)
&L	Nonswitched/leased line operation
%I	Short training for inter-working
%U	Nonswitched line carrier threshold
%X	Transmit V.25 calling tone

Tests and Specialists

I	Identification
&T	Test
%B	Make modem busy
\P	PSN access
%TD	Receiver set up
%TP	Transmitter pre-emphasis
%TX	Transmit level
S18	End test timer

User Interface

L	Speaker Level
M	Speaker mode
%V	LCD messages

Responses to AT Commands

The modem produces two types of responses when the AT command set is active: text and result codes. Result codes have fixed meaning and may be presented in either a terse or verbose form. "OK" and "NO CARRIER" are result codes.

Text is alphanumeric information such as at the microcode level or the contents of a register. Not all commands produce text responses. The contents of a text response do not change as result codes are changed between the terse and verbose settings. Any text responses for a command are delivered before any result codes for the command.

Modem response speed and character format rules are described in "Responses to Asynchronous Commands" on page 8-6.

Message Format

Two different message formats are used. They differ in the way <CR> and <LF> characters are used ahead of and after the response message.

Table 12-3. AT Response Message Formats

Message Type	Format
text verbose	<CR><LF>text<CR><LF>
result codes verbose	<CR><LF>code<CR><LF>
text terse	<CR><LF>text<CR><LF>
result codes terse	code<CR>

Command Lines with Multiple Commands

For command lines that contain multiple commands, the modem delivers at most one "OK" or "ERROR" result code and it is issued after running the commands stops (either because all commands in the line were run or because one of the commands in the line failed). Suspect that when the command line ends with a command that produces a connection, there is no overall result code issued by the modem. 7855 is compatible with Hayes in this regard.

Result Codes

The table that follows shows only result codes - not text responses.

Table 12-4 (Page 1 of 3). AT Result Codes

Terse	Verbose	Meaning
0	OK	
1	CONNECT	A physical connection has been established at a telephone line speed between 0 to 300 bps or modem is set with cmdword X0.
2	RING	The signal that signifies an incoming call has been present and has stopped (end of ring burst). Also identifies presence of ring-back signal if the modem is set with X4 cmdword.
3	NO CARRIER	Failure to connect (and no more specific information is known or allowed). An existing connection was ended from the telco side of the modem.
4	ERROR	The command could not be run. A requested checksum is wrong.
5	CONNECT 1200	A connection has been established at a telephone line speed of 1200 bps.
6	NO DIALTONE	Dial tone detection was required but no dial tone was heard.
7	BUSY	The line is busy.
8	NO ANSWER	Ringing at the other end did not stop. A "five second silent" period was required but was not heard.
9	CONNECT 600	A connection has been established at a telephone line speed of 600 bps.

Table 12-4 (Page 2 of 3). AT Result Codes		
Terse	**Verbose**	**Meaning**
10	CONNECT 2400	A connection has been established at a telephone line speed of 2400 bps.
12	REMOTE LOOP	A local remote loop command succeeded. The local modem has been "looped" from the phone line.
13	NO REMOTE LOOP	A local remote loop command could not be established.
15	Reserved	
16	NO ACTIVITY	The inactivity timer expired.
17	CIRCUIT BUSY	The call attempt failed because the calling modem was busy. It is in the TALK mode, the test mode or the MI/MIC contact is closed.
19	CONNECT ECL	An error checking link has been established without data compression.
20	CONNECT ECLC	An error checking link has been established with data compression.
22	CONNECT 600/ECL	Self explanatory
23	CONNECT 600/ECLC	Self explanatory
25	CONNECT 1200/ECL	Self explanatory
26	CONNECT 1200/ECLC	Self explanatory
30	CONNECT 2400/ECL	Self explanatory
31	CONNECT 2400/ECLC	Self explanatory
33	CONNECT 4800	Self explanatory
34	CONNECT 4800/ECL	Self explanatory
35	CONNECT 4800/ECLC	Self explanatory
37	CONNECT 7200	Self explanatory
38	CONNECT 7200/ECL	Self explanatory
39	CONNECT 7200/ECLC	Self explanatory
41	CONNECT 9600	Self explanatory
42	CONNECT 9600/ECL	Self explanatory
43	CONNECT 9600/ECLC	Self explanatory
45	CONNECT 12000	Self explanatory
46	CONNECT 12000/ECL	Self explanatory
47	CONNECT 12000/ECLC	Self explanatory
49	CONNECT 14400	Self explanatory
50	CONNECT 14400/ECL	Self explanatory

Table 12-4 (Page 3 of 3). AT Result Codes

Terse	Verbose	Meaning
51	CONNECT 14400/ECLC	Self explanatory
57	CONNECT 19200	Self explanatory
58	CONNECT 19200/ECL	Self explanatory
59	CONNECT 19200/ECLC	Self explanatory
61	CONNECT 38400	We recommend you do not use a DTE interface speed of 38 400 bps because data errors may occur.
62	CONNECT 38400/ECL	Self explanatory
63	CONNECT 38400/ECLC	Self explanatory
65	ECL	An ECL connection has been established. This and the other ECL messages are never used if the ECL connection is a nonswitched modem-to-modem connection.
66	NO ECL	An attempt to establish an ECL connection has failed.
67	ECLC	An ECL connection with data compression has been established.
68	Reserved	
72	DELAYED nnn	The requested call attempt has been delayed for "nnn" minutes. This response is not used if the delay is less than 30 seconds as is typical for call clearing requirements.
73	FORBIDDEN	The number requested cannot be dialed by a modem in this country or the number has been delayed until manual intervention occurs. It is not yet determined whether this response or "ERROR" should be used if the desired telephone number cannot be dialed because of a syntax error in the dial string.
74	Reserved	
	.	The physical connection has been established and the modem is working on establishing an ECL connection. Periods are delivered at roughly 1 second intervals during the ECL handshaking period. There is no terse mode equivalent.

Chapter 13. V.25 Bis Command Set

This chapter describes the V.25 Bis command set as it is available in the IBM 7855-10.

This command set provides a means for an attached DTE to command the IBM 7855-10 to automatically dial a telephone number and report back if the call was not successful. It also provides the means to support the other functions and features available in the modem, such as local and remote configuration.

The IBM 7855-10 supports commands and responses listed in the CCITT V.25 Bis recommendation for high-level data link control (HDLC), binary synchronous (BSC), and asynchronous (ASYNC) devices with addressed call capabilities. It also includes several extensions that may enhance your call throughput.

Note: To enable the V.25 Bis direct call capabilities in the modem, use the &Mn command or the V.25 Bis CNLx...x command. For information about the &Mn command, see page 12-16 For information about the CNLx...x command, see page 13-6.

Message Formats

There are three V.25 Bis message formats: HDLC, BSC, and Asynchronous.

HDLC Frames

V.25 Bis commands and responses are carried in the message field of the HDLC frame. The format of this frame is as shown in Figure 13-1.

Flag	Address	Control	Message	Frame Check Sequence	Flag

Figure 13-1. Frame Structure of Commands and Responses (HDLC)

Flag X'7E'. Binary '01111110'.

Address and Control
X'FF13'. Binary '1111111100010011' (neglecting zero bit insertion). Use of these two bytes signifies the command is a V.25 Bis command which should be checked for validity and run accordingly.

Message Data. Must be an integer number of 60 or fewer 8 bit characters. Acceptable characters are shown in Table 13-1 on page 13-5 (for V.25 Bis commands), Table 13-2 on page 13-9 (for V.25 Bis command parameters), and Table 13-3 on page 13-12 (for V.25 Bis responses).

FCS Sixteen bit cyclic redundancy check based on the polynomial $X^{16} + X^{12} + X^5 + X^1$.

Framing Rules

- A frame with an address, control, or FCS field error is invalid and is ignored.
- A frame with more than 60 characters in the message field is invalid and is ignored.
- For every valid V.25 Bis Call Request command frame received, the modem responds with one response frame if the call attempt fails, with one exception. If a connection does occur, the modem responds with either no response frame or one response frame, depending on the setting of the "Xn cmdword (see page 12-30).

  The exception occurs when the modem is configured for "X3. The modem responds with an extra VAL response immediately after the call request to show that the command was valid.

  Note: If the modem is set to "X2, the EN parameter (see the dial string parameters for "CRI -Call Request with ID" on page 13-8) changes the setting to "X3 *one* call attempt.
- The Request List and some of the Configuration commands result in multiple response frames. The final frame's poll/final bit is set to poll rather than final if the modem has been configured to have messages turned **off**.
- The address and control bytes used in a command frame are used in any response frame associated with that command.
- When the modem receives a valid command frame, it ignores another command frame until it has completed sending its response back to the attached DTE or until the connection is ended whichever occurs last.
- The modem automatically detects whether each command frame is NRZ- or NRZI-encoded and follows suit for its response (if any).
- Command and response frames contain inserted zero bits as required by HDLC. The receiving entity (modem or DTE) must strip these extra zero bits.

V.25 Bis Commands during a Connection

If the modem is configured properly, see "\In -Imbedded Commands (Synchronous)" on page 12-34, it will accept V.25 Bis commands during a connection if the address, control, and header are the same as those shown in Figure 14-1 on page 14-1 and the frame is NRZ-encoded. After the command is run, the modem returns to its connect state.

BSC Frames

V.25 Bis commands and responses are carried in the message field of the BSC frame. The format of this frame is as shown in Figure 13-2.

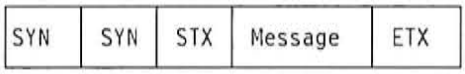


Figure 13-2. Frame Structure of Commands and Responses (BSC)

SYN X'16'. Binary '00010110'.

STX X'02'. Binary '00000010'.

Message Data. Must be an integer number of 60 or fewer 8 bit characters. Acceptable characters are shown in Table 13-1 on page 13-5 (for V.25 Bis commands), Table 13-2 on page 13-9 (for V.25 Bis command parameters), and Table 13-3 on page 13-12 (for V.25 Bis responses).

ETX X'83'. Binary '10000011'.

Framing Rules

- A frame with a parity error is invalid and is ignored. V.25 Bis specifies odd parity for BSC frames.
- A frame with more than 60 characters in the message field is invalid and is ignored.
- For every valid V.25 Bis Call Request command frame received, the modem responds with one response frame if the call attempt fails, with one exception. If a connection does occur, the modem responds with either no response frame or one response frame, depending on the setting of the "Xn cmdword (see page 12-30).

  The exception occurs when the modem is configured for "X3. The modem responds with an extra VAL response immediately after the call request to show that the command was valid.

  Note: If the modem is set to "X2, the EN parameter (see the dial string parameters for "CRI -Call Request with ID" on page 13-8) changes the setting to "X3 *one* call attempt.
- The Request List and some of the Configuration commands will result in multiple response frames.
- When the modem receives a valid command frame, it ignores another command frame until it has completed sending its response back to the attached DTE or until the connection is ended, whichever occurs last.
- The modem automatically detects whether each command frame is NRZ- or NRZI-encoded and follows suit for its response (if any).

Asynchronous Frames

V.25 Bis commands and responses are carried in the message field of the Asynchronous frame. The format of this frame is as shown in Figure 13-3.

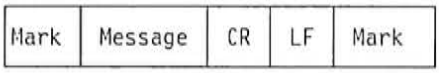


Figure 13-3. Frame Structure of Commands and Responses (ASYNC)

Mark Communication Line idle state.

Message Data. Must be an integer number of 60 or fewer 10 bit characters. The character format is one start bit followed by 8 data bits and one stop bit. Acceptable characters are shown in Table 13-1 on page 13-5 (for V.25 Bis commands), Table 13-2 on page 13-9 (for V.25 Bis command parameters), and Table 13-3 on page 13-12 (for V.25 Bis responses).

CR X'8D'. Binary '10001101'. (even parity). Carriage Return character.

LF X'0A'. Binary '00001010. (even parity). Line Feed character.

Framing Rules

- A frame with more than 60 characters in the message field is invalid and is ignored.
- For every valid V.25 Bis Call Request command frame received, the modem responds with one response frame if the call attempt fails, with one exception. If a connection does occur, the modem responds with either no response frame or one response frame, depending on the setting of the "Xn cmdword (see page 12-30).

  The exception occurs when the modem is configured for "X3. The modem responds with an extra VAL response immediately after the call request to show that the command was valid.

  Note: If the modem is set to "X2, the EN parameter (see the dial string parameters for "CRI -Call Request with ID" on page 13-8) changes the setting to "X3 *one* call attempt.
- The Request List and some of the Configuration commands result in multiple response frames.
- When the modem receives a valid command frame, it ignores another command frame until it has completed sending its response back to the attached DTE or until the connection is ended, whichever occurs last.
- The message field in the command frame must not be preceded by any spurious data. A command frame preceded by any data other than another command frame is rejected with an 'INV' response.

V.25 Bis Commands during a Connection

Commands can be accepted during a connection if the modem is configured to accept an asynchronous escape sequence. See Chapter 12, "Attention Command Set" on page 12-1 for details.

Commands and Parameters

Message Field

Character Alphabet for Dial Strings

For V.25 Bis message fields, Table 13-1 on page 13-5, Table 13-2 on page 13-9 and Table 13-3 on page 13-12 show the valid parameters with individual characters expanded to 8 bits each (7 data bits plus one parity bit). The characters are ASCII characters. BSC V.25 Bis commands and responses use odd parity. In HDLC V.25 Bis command frames, the modem ignores the parity bit of characters in the message field. The modem uses odd parity for all HDLC V.25 Bis response frames. In Asynchronous V.25 Bis command frames, the modem ignores the parity bit of characters in the message field. The modem uses the data format for which it has been configured to send all Asynchronous V.25 Bis response frames.

Message Fields in Commands

The modem returns a response with a message field of 'INV' to the attached DTE when:

- The message field of a command frame is invalid for any reason other than length.
- An attempt is made to set the modem to a mode not allowed in a particular country.

The command is not run and the modem does not go off-hook.

Table 13-1. V.25 Bis Commands

Command	Hex Value (Odd/Even Parity)	Description
CIC	434943/C3C9C3	Connect Incoming Call
CNL	43CE4C/C34ECC	Local Configuration
CNR	43CE52/C34ED2	Remote Configuration
CRI	435249/C3D2C9	Call Request with ID
CRN	4352CE/C3D24E	Call Request with Number
CRS	4352D3/C3D253	Call Request using Stored Number
DIC	C44943/44C9C3	Disregard Incoming Call
PRN	D052CE/50D24E	Program Number
RLD	524CC4/D2CC44	Request List of Delayed Numbers
RLF	524C46/D2CCC6	Request List of Forbidden Numbers
RLN	524CCE/D2CC4E	Request List of Numbers

CIC -Connect Incoming Call

Format: `CIC`

Function: This command instructs the modem to go off-hook and attempt to handshake as an answer mode modem. The modem attempts to handshake on the switched network when it receives this command even if there is no incoming call. If a DIC command is in effect, it is cleared by this command. To run this command:

- The Data Terminal Ready (DTR) interface signal must be active.
- The modem must be in the DATA mode.
- The modem must not be in TEST mode.

Parameters: None

Responses: If the connection is not established, the modem sends a call failure indication (CFI) to the attached DTE to show the reason for the call failure. For information on CFI responses, see Table 13-3 on page 13-12.

If the connection is established, the modem either sends no response or the 'CNX' response depending on the modem configuration options chosen. This option can be changed via the front panel, the "Xn command, or the V.25 Bis CNLx...x command. For information about the "Xn command, see page 12-30. For information about the CNLx...x command, see "CNL -Local Configuration" on page 13-6.

CNL -Local Configuration

Format: CNLp...px...x

Function: This command provides a framework to enable AT cmdwords to be sent to and run by a local modem. For information about the different AT cmdwords, see "Cmdwords and Parameters" on page 12-3.

Parameters

p...p The string of password(s) which may be required by the local modem before the command can be run. Some of the AT cmdwords require either the modem's local password or the maintenance password before they can be run. If one of the passwords is required, it must follow the CNL in the message field of the frame, for example CNLb293.... If both passwords are required, the modem's local password must come first followed immediately by the maintenance password, for example CNLb293mmmm.... Both passwords must be four characters long. For more information about passwords and their format, see page 12-28.

A semicolon is required after the password string in certain cases. If present, it is used to separate the password string from the cmdword string. If both passwords are present, the semicolon is not required. The semicolon is required when only one password or no password is present, and the first cmdword in the command string is a A, B, C, D, or E cmdword. That is, it is a hexadecimal character. Nothing is allowed between the L of CNL and the first character of the local modem's password string.

x...x A string of AT cmdwords. Any of the AT cmdwords described in "Cmdwords and Parameters" on page 12-3 can be used except the A/, "I, "W, and &V cmdwords. Besides, if the modem is set for pure synchronous operation, the CNL cmdword can not be used to change the &M option.

Responses: Result codes from the AT cmdwords are compacted into a single response (like the case for multiple AT commands in a single AT command line). For example, if three AT cmdwords are sent as parameters in a single CNL command, only one VAL is returned.

If the response to a single AT cmdword is a text message, each such text message is sent to the attached DTE separately. These messages may be sent as multiple frames.

VAL This response is returned for all valid parameters when no text messages are generated by the AT cmdwords being run. The VAL is also sent as the last frame in a multiple frame response.

INV This response is returned if the command contains invalid parameters.

INVBL If extended responses are allowed, this response is returned when the modem's local password supplied in the command is incorrect.

INVBM If extended responses are allowed, this response is returned when the maintenance password supplied in the command is incorrect.

INVBR If extended responses are allowed, this response is returned if the remote modem's local password is found to be invalid by the remote modem.

INVNA If extended responses are allowed, this response is returned when the configuration attempt is not accepted by the remote modem.

If extended responses are not allowed, the INV response is returned instead of the INVXX responses. For more information on extended V.25 Bis responses, see "″Xn -Extended V.25 Bis Indications" on page 12-30.

CNR -Remote Configuration

Format: `CNRp...px...x`

Function: This command provides a framework for AT cmdwords to be given to a local modem and run by a remote modem. For information about the different AT cmdwords, see "Cmdwords and Parameters" on page 12-3.

Parameters

p...p The string of password(s) required by the remote modem before the command can be run. The remote modem's local password is always required in this command. It must follow the CNR in the message field of the frame, for example `CNRb293...`, and must be four characters long. The maintenance password may also be required. If present, it must follow the local password, for example `CNRb293mmmm...`, and must also be four character long. For more information about passwords and their format, see "″P -Change Password" on page 12-28.

A semicolon can be present after the password string but is not required. If present, it is used to separate the password string from the cmdword string. If both passwords are present, the semicolon is not required. If the maintenance password is not present, the semicolon is not required when the first cmdword in the command string is not an `A`, `B`, `C`, `D`, `E`, or `F` cmdword, that is, it is not a hexadecimal character. Nothing is allowed between the R of CNR and the first character of the remote modem's password string.

x...x A string of AT cmdwords. The only AT cmdwords that are not allowed are: `I`, `O`, `Sn?`, `"Dn`, `"En`, `"P`, `"Sn`, `\S`, `&Tn`, `&V`, `"Fnn`, `"Gmn`, `"Hnn`, `"I`, `"Lmn`, `\B`, `\O`, `\P`, `\U`, `\Y`, `\Z` and `%TXlnn`. These AT cmdwords are invalid parameters. For more information on AT cmdwords, see "Cmdwords and Parameters" on page 12-3.

Responses: Result codes from the AT cmdwords are compacted into a single response (like the case for multiple AT commands in a single AT command line). For example, if three AT cmdwords are sent as parameters in a single CNR command, only one VAL is returned.

VAL This response is returned for all valid parameters.

INV This response is returned if the command contains invalid parameters.

INVBL If extended responses are allowed, this response is returned when the remote modem's local password supplied in the command is incorrect.

INVBM If extended responses are allowed, this response is returned when the maintenance password supplied in the command is incorrect.

INVNA If extended responses are allowed, this response is returned when the configuration attempt is not accepted by the remote modem.

INVNR If extended responses are allowed, this response is returned if the local modem could not get a meaningful response or any response from the remote modem.

INVBR If extended responses are allowed, this response is returned if the remote modem's local password is found to be invalid by the remote modem.

If extended responses are not allowed, the INV response is returned instead of the INVXX responses. For more information on extended V.25 Bis responses, see ""Xn -Extended V.25 Bis Indications" on page 12-30.

Notes:

1. A data connection must be established with the remote modem before the CNR command is issued.
2. When the CNR command is issued, the frame must contain the appropriate escape sequence in order for the modem to recognize it as a command and not as data. For more information on escape sequences, see "Entering Commands during a Connection" on page 8-5.

CRI -Call Request with ID

Format: `CRIx...x;i...i`

Function: This command instructs the modem to attempt to originate a switched network connection. It can include both a dial string and an identification number in the command message field. The telephone number to be dialed is a part of the dial string. The identification number, if present, is ignored by the 7855-10 modem. It does not have to be included in the command.

To run this command:

- The Data Terminal Ready (DTR) interface signal must be active.
- The modem must be in the DATA mode.
- The modem must not be in TEST mode.

Parameters

x...x This parameter is the dial string. It is a variable length parameter that includes the dialable digits, which make up the telephone number to be dialed, and the dial string parameters defined in Table 13-2 on page 13-9. The modem assumes the first string of dialable digits in this parameter is the telephone number.

i...i This parameter is the identification field supported by V.25 bis. It is ignored in the 7855-10 modem.

Table 13-2. Dial String Parameters for V.25 Bis Call Request Commands

Parameter	Hex Value (Odd/Even Parity)	Description
0	B0/30	
1	31/B1	
2	32/B2	
3	B3/33	
4	34/B4	
5	B5/35	
6	B6/36	
7	37/B7	
8	38/B8	
9	B9/39	
#	23/A3	Used for Tone dialing only
*	2A/AA	Used for Tone dialing only
:	BA/3A	Wait for Dial Tone (maximum set by parent modem)
<	BC/3C	Pause for the value of register S8
=	3D/BD	Pause for three seconds
>	3E/BE	'Flash' for 0.7 ± 0.1 s (country-dependent)
&	26/A6	'Flash' for 0.7 ± 0.1 s (country-dependent)
P	D0/50	Dial next digits using pulses
T	54/D4	Dial next digits using tones
DB	C4C2/4442	Defeat busy signal detection for rest of this call
ABab	C1C2cdef/4142cdef	Set cancel timer or use default value
EN	45CE/C54E	Enable use of extended indications for this call
FB	46C2/C642	Use fall-back speed for this call
RCgh	5243ijkl/D2C3ijkl	After dialing ends, cancel the call after ijkl rings
SS	D3D3/5353	Turn speaker **on** until carrier, this call only
;	3B/BB	Parameter delimiter
	80/00	Presentation character without meaning
	20/A0	Presentation character without meaning
.	AE/2E	Presentation character without meaning
,	2C/AC	Presentation character without meaning
-	AD/2D	Presentation character without meaning

Notes:

1. Default values are shown for the '>', '<', and '=' characters. National requirements may cause the IBM 7855-10 to change the meaning of these characters.
2. The '*' cannot replace the '#' in V.25 Bis commands.

ABab This parameter sets the value to be used in the modem's call cancel timer. It can have values from AB00 through AB99. If no ABab parameter is used in a command or if AB00 is used, the modem's default call cancel timer is used. If AB01 through AB99 is used in a command, then the call cancel timer value is set to 1 through 99 seconds for that call only. The timer controlled by this parameter behaves the same as the S7 timer from the AT command set. The modem uses the S7 value as its default if no AB parameter is present in the command.

The modem searches for two digits after the "AB". If it finds only one followed by a non-numeric digit, it assumes the digit is preceded by a 0.

If there are two consecutive numeric digits after the "AB", the modem assumes that both digits are part of the parameter.

If the call is established before the call cancel timer expires, the timer is cancelled. If the call is not successfully established when the call cancel timer expires, a 'CFI' indication is returned to the attached DTE.

This parameter is ignored by the modem if national requirements do not allow the call cancel timer to be modified.

DB This parameter allows the modem to operate when nonstandard call progress signals or noise signals are encountered during the connection process. For example, if the modem interprets a ringback tone as a busy signal, the call attempt is ended incorrectly. It instructs the modem to monitor the telephone line for only the dial tone and the ringback tone during the remainder of the call.

EN This parameter allows the modem to use additional parameters in the response associated with this command. These extended parameters are in addition to those parameters defined in the V.25 Bis standard. If the EN parameter is not present in the command, then the modem will only use the defined 'official' parameters in any response associated with the command. The extended response parameters associated with this V.25 Bis implementation are defined in ""Xn -Extended V.25 Bis Indications" on page 12-30.

FB This parameter forces the modem to try to create the connection at a speed of one lower than its preferred telephone line speed. It affects the speed of only the call attempt associated with the command that contains the parameter. The modem returns to its original speed setting when the call attempt or the connection ends - whichever occurs last. For more information on telephone line speeds, see pages 8-6 and 12-12.

RCgh This parameter instructs the modem to end the call attempt after the specified number of rings has occurred. It can have values from RC00 through RC99. If no RCgh parameter is used in a command, then the modem does not end a call attempt because of the number of rings that the modem has detected.

If RC00 is used in a command, then the modem does not end a call attempt because of the ringback count. If RC01 through RC99 is used in a command, then after all dialing is completed, the modem counts the number of ringback signals. If this count reaches the value specified, the modem hangs up and issue a CFI response.

If the call is established before the count value is reached, the counter is reset. If the call is not successfully established when the count value is reached, a 'CFI' indication is returned to the attached DTE.

The modem searches for two digits after the "RC". If it finds only one followed by a non-numeric digit, it assumes the digit is preceded by a 0. If there are two consecutive numeric digits after the "RC", the modem assumes that both digits are part of the parameter.

This parameter is ignored by the modem if national requirements do not allow the ringback counter value to be modified.

SS This parameter instructs the modem to turn **on** its speaker when it goes off-hook to run the call command. The modem turns **off** the speaker when the call attempt is abandoned or when the modem transfers to data

mode - whichever occurs first. The speaker volume is set to the modem's default value. For more information on speaker volume, see "Ln -Level (Volume)" on page 12-8.

; The semicolon is a parameter delimiter. It is required only to show the end of a string of digits when the next parameter is to be another digit as might be done in a CRI command with a telephone number followed immediately by an identification number.

Note: When the semicolon is used with the parameters DB through SS in Table 13-2 on page 13-9, the parameter order becomes important. The telephone number must follow these parameters. If the number is placed before these parameters in the dial command, the parameter is ignored.

An example:

```
CRNRC03;9027 cancels the call after three rings.
CRN9027;RC03 does not cancel the call after three rings.
```

: This parameter instructs the modem to wait awhile before continuing to dial. The waiting period is the shorter of:

- The time until dial tone is detected.
- The time until the modem's 'wait before dialing' timer expires. For more information about this timer, see "S6 -Wait Before Blind Dialing" on page 12-57.

If dial tone is detected, the modem will dial the remaining digits in the dial string. If the timer expires before dial tone is detected, the modem cancels the command and sends a CFI response to the attached DTE.

P This parameter instructs the modem to enter pulse dial mode. In this mode the dialable digits that follow the 'P' in the dial string are dialed using pulses until dialing is finished or a 'T' is met in the dial string - whichever occurs first.

T This parameter instructs the modem to enter tone dial mode. In this mode the dialable digits that follow a 'T' in the dial string are dialed using tones until dialing is finished or a 'P' is met in the dial string - whichever occurs first.

In V.25 bis, the '<', '=', and '>' parameters are called separators and are not defined except as 'for national use'. The definitions shown below are those required by Germany. These values are used as the default values in this modem. If a particular country's regulatory agency has defined a different set of definitions for these parameters, the modem will automatically use these definitions when it is configured for that country.

< This parameter instructs the modem to pause for the length of time defined in register S8 before continuing to dial. For more information on register S8, see "S8 -Dial Pause Time" on page 12-58. It can be used to force the modem to dial regardless of the presence of dial tone. The modem remains off-hook and quiet during the pause.

= This parameter instructs the modem to pause for three seconds before continuing to dial. It can be used to force the modem to dial regardless of the presence of dial tone. The modem remains off-hook and quiet during the pause.

> This parameter instructs the modem to go on-hook for 0.7 seconds and then off-hook again. This is called a 'flash' and is usually used to signal the phone system to return a dial tone. When the modem is back off-hook again, it 'listens' for dial tone for up to three seconds before proceeding with the next parameter. If dial tone is detected before the three seconds are up, the modem continues running the dial command.

Responses

Table 13-3. Responses for V.25 Bis Call Request Commands

Parameter	Hex Value (Odd/Even Parity)	Description
ET	4554/C5D4	Engaged tone (busy) detected
RT	5254/D2D4	Ringing underway at cancel time
AB	C1C2/4142	Abort timer timed out before connection
CB	43C2/C342	Modem busy
NT	CE54/4ED4	Answer tone not detected by cancel time
DE	C445/44C5	Dial tone error (usually no dial tone)
NS	CED3/4E53	Number not stored
DLC	C44C43/44CCC3	Delayed Call
FC	4643/C6C3	Forbidden Call
INV	49CED6/C94E56	Invalid
CFI	434649/C3C6C9	Call failure indication
CNX	43CE58/C34ED8	Connection established
INC	49CE43/C94EC3	Incoming call detected

INV The invalid response is normally sent when the modem has received an invalid command or command parameter. Usually, this response means the modem can not run the command because of a situation external to the modem.

CFICB This response is sent when the modem is busy and can not run a valid dial command. However, it is sent only if the modem's activity leaves it enough processing power to detect the incoming command. Usually, use of this response means that something local to the modem is preventing the command from being run.

CFIAB This response is used if the cancel timer expires after answer tone was detected and before the modem is ready for data transfer.

CFIET This response shows a busy signal (engaged tone) was detected. When the modem detects a busy signal, it immediately returns this response and hangs up.

Note: If the DB (defeat busy) parameter was included in the command dial string, the modem is not allowed to detect a busy signal.

CFIRT This response is sent if the modem thought the other end had not answered when the cancel timer expired. In other words, when the cancel timer expired, the modem was still detecting the ringback signal. This response is also used if the modem ends a call attempt because the ring counter reached its limit.

CFINT This response is sent when the cancel timer expires and one of the following conditions is met:

- The modem had not detected an answer tone
- The modem was not detecting a ringback
- The modem had detected a dial tone every time it waited for a dial tone.

For example, this situation could occur if a person answers the phone at the remote location.

CFIDE This response is sent if when the modem's cancel timer expires, the modem did not detect dial tone during at least one 'wait for dial tone' period and did not detect:

- A busy signal
- An answer tone
- A ringback signal.

For example, this situation could occur if the phone line cable is disconnected from the rear of the modem.

Also, this response is sent if when the cancel timer expires, the modem has detected dial tone when there should not have been any dial tone and the modem did not detect:

- A busy signal
- An answer tone
- A ringback signal.

For example, this situation could occur if the telephone number is tone dialed on a pulse dial line.

Note: Since the 'DE' parameter is not part of the CCITT V.25 Bis standard, the modem uses it only in responses to commands that include the 'EN' parameter in the dial string. If the 'DE' response is not allowed, the modem uses the 'NT' parameter in its place.

CFIFC This response shows that phone calls to the number specified in the dial string are forbidden either forever or until the number is manually cleared from the modem.

DLC nnn This response is sent when further call attempts to the telephone number, specified in the call request, must be delayed from 1 to 999 minutes. The modem does not automatically dial the number when the time limit expires.

CNX nnnnn

This response shows a connection is established with a connection speed of nnnnn bps. The modem's use of CNX without a speed parameter and CNXnnnnn is controlled by the setting of the "Xn cmdword. For more information about the "Xn cmdword, see ""Xn -Extended V.25 Bis Indications" on page 12-30.

CRN -Call Request with Number

Format: CRNx...x

Function: This command instructs the modem to attempt to originate a switched network connection. It is a subset of the CRI command. It includes only a dial string in the command message field. The telephone number to be dialed is a part of the dial string. To run this command:

- The Data Terminal Ready (DTR) interface signal must be active.
- The modem must be in the DATA mode.
- The modem must not be in TEST mode.

Parameters

x...x This parameter is the dial string and it is a mandatory parameter. It is a variable length parameter that includes the dialable digits, which make up the telephone number to be dialed, and the dial string parameters defined in Table 13-2 on page 13-9. The modem assumes the first string of dialable digits in this parameter is the telephone number. The dialable digits are mandatory while the dial string parameters are optional.

The dial string parameters used in the CRI command dial string are also valid for the CRN command. For a description of these parameters, see "CRI -Call Request with ID" on page 13-8 and Table 13-2 on page 13-9.

Responses: The responses used for the CRN command are the same as those used for the CRI command. For a description of these responses, see "CRI -Call Request with ID" on page 13-8 and Table 13-3 on page 13-12.

CRS -Call Request Using Stored Number

Format: CRSnn

Function: This command instructs the modem to attempt to originate a switched network connection using the dial string in one of the nonvolatile memory locations. To run this command:

- The Data Terminal Ready (DTR) interface signal must be active.
- The modem must be in the DATA mode.
- The modem must not be in TEST mode.

Parameters

nn
20-39
The 20 available V.25 Bis storage locations. The dial strings stored in these locations are stored using the PRN command (see 13-15).

Responses: The responses used for the CRS command are the same as those used for the CRI command with the addition of the CFINS response.

NS This response means that the memory location specified in the command is empty.

For a description of the remaining responses, see "CRI -Call Request with ID" on page 13-8 and Table 13-3 on page 13-12.

DIC -Disregard Incoming Call

Format: DIC

Function: This command instructs the modem not to auto-answer an existing incoming call. When the incoming ring condition ends, the effect of this command ends too.

Parameters: None

Responses: The VAL response is returned if this command is sent when an incoming call is present.

An INV response is returned if this command is sent when there is no incoming call.

PRN -Program Number

Format: PRNnn;x...x

Function: This command can be used to store or delete a dial string from a V.25 Bis memory location. Such a dial string can be up to 54 characters long.

Parameters

nn; This parameter can have values from 20 through 39 and must be followed by a semicolon if a dial string is present in the command. If a dial string is present, it specifies the memory location to be used to store the dial string. If the dial string is not present, it specifies the memory location to be cleared. Again, the semicolon is not required if the goal is to clear a memory location.

x...x This parameter is the dial string to be stored. It is a variable length parameter that includes the dialable digits, which make up the telephone number to be dialed, and the dial string parameters defined in Table 13-2 on page 13-9. The dialable digits are mandatory while the dial string parameters are optional. If this parameter is not present, the memory location is cleared.

The dial string parameters used in the CRI command dial string are also valid for the PRN command. For a description of these parameters, see "CRI -Call Request with ID" on page 13-8 and Table 13-2 on page 13-9.

Responses:

VAL This response is returned if the memory location and dial string are valid.

INV This response is returned for all invalid parameters.

RLD -Request List of Delayed Numbers

Format: RLD

Function: This command is used to show any telephone numbers that have been delayed and the length of delay time remaining. In some countries, the modem is forbidden to re-dial a telephone number until after a specified amount of time has elapsed. Such numbers are placed in a delay list until the delay has expired and they can be removed.

If an attempt is made to dial a number on this list, a DLCnnn response is returned by the modem.

Parameters: None.

Responses

VAL Unless the command itself is invalid, this response frame is always be sent.

INV This response is sent only if the command is invalid.

LSD A list of delayed numbers. If there are delayed numbers stored in the modem, this is a multiple frame response.

In asynchronous operation, the list is formatted for DTE display in the following form (note: this example shows one number with a 1 minute delay):

```
 NO.  PHONE - DELAY TIME                NO.  PHONE - DELAY TIME
____ ____________________               ____ ____________________
LSD 1;          42841     1
VAL
```

Synchronous V.25 Bis LSD response frames have one telephone number and delay time in each response frame. If there is one delayed number as shown above, two frames are returned. The first is of the form:

```
 LSD 1;          42841     1
```

The second frame is of the form:

```
 VAL
```

If there are no delayed numbers, only the VAL is returned during both synchronous and asynchronous operation.

RLF -Request List of Forbidden Numbers

Format: RLF

Function: This command is used to show a list of numbers that can not be dialed from the modem until the number is cleared via manual intervention at the front panel of the modem. For more information on resetting forbidden calls, see "The Major Branches of the Tree" on page 6-9.

Parameters: None.

Responses

VAL Unless the command itself is invalid, this response frame is always be sent.

INV This response is sent only if the command is invalid.

LSF A list of forbidden numbers. If there are forbidden numbers stored in the modem, this is a multiple frame response.

During asynchronous operation, a list is returned formatted for DTE display in the following form (this example shows a single forbidden number):

```
 NO.  PHONE                                         NO.  PHONE
_____ __________________                           _____ __________________
LSF 1;            40861
VAL
```

Synchronous V.25 Bis LSF indications have one telephone number in each response frame. If there is one forbidden number as shown above, two frames are returned. The first is of the form:

```
LSF 1;            42841
```

The second frame is of the form:

```
VAL
```

If there are no forbidden numbers, only the VAL is returned during both synchronous and asynchronous operation.

RLN -Request List of Numbers

Format: RLNnn

Function: This command is used to show the contents of one or all of the V.25 Bis directories. These directories were loaded by the PRN command.

Parameters

nn

20-39 The 20 available V.25 Bis storage locations. The dial strings stored in these locations were stored using the PRN command (see 13-15).

none If no parameter is present, the request is for all storage locations.

Responses

VAL Unless the command itself is invalid, this response frame is always be sent.

INV This response is sent if the command or command parameter is invalid.

LSNnn;x...x

A list of storage locations followed by the stored telephone number if one is present. This is a multiple frame response. 'nn' is the storage location number and 'x...x' is the contents of the storage location. If all memory locations are shown, each one is of the same form (note: this example shows a number stored in location 20):

```
LSN20;12345
LSN21;
 .
 .
 .
LSN39;
```

Synchronous V.25 Bis responses have one LSN response in each response frame. If no number is stored in a location, the response frame is of the form:

```
LSN20;
```

If a number is stored in a location, the response frame is of the form:

```
LSN20;5551212
```

If the request is for a single directory location, the modem responds with two response frames. The first one showing the directory entry as described above. The second frame is of the form:

```
VAL
```

If the request is for all directory locations, the modem returns 21 response frames. The last frame is of the form:

```
VAL
```

Chapter 14. LPDA Command Set

This chapter describes the IBM Link Problem Determination Aid (LPDA) commands implemented in the IBM 7855-10. These commands provide a means for an attached DTE to command the modem to automatically dial a telephone number and report back if the call was not successful.

To use LPDA commands, the 7855 modem must be configured for synchronous operation and the DTE interface behavior of the modem must match the needs of the DTE as discussed in "Commands and Signaling" on page 5-1. Normally, DSR will have to be set to be "always active" when the modem is configured for switched network operation.

Message Format

Synchronous Data Link Control (SDLC) Frames

The modem supports a subset of the SDLC architecture explained in the *SDLC General Information manual*, GA27-3093.

The commands and responses exchanged between the modem and the DTE use SDLC Non-Sequenced Information frames. The format of these frames is as shown in Figure 14-1.

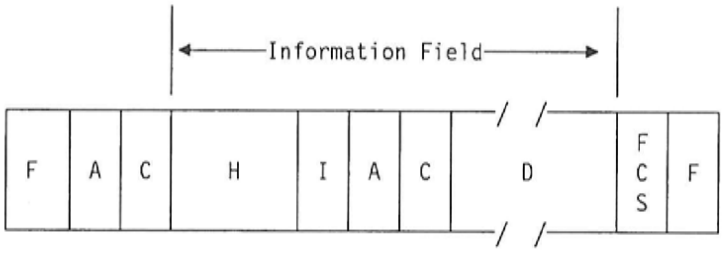


Figure 14-1. Command Information Field Structure

Flag X'7E'. Binary '01111110'.

Address and Control
X'FD1B'. Binary '1111110100011011' (neglecting zero bit insertion). Use of these two bytes signifies the command is an LPDA command which should be checked for validity and run accordingly.

FCS 16-bit cyclic redundancy check based on the polynomial $X^{16} + X^{12} + X^5 + X^1$.

Information Field Format / Command

The command information field contains the following:

H Header (8 bytes)
I Identifier (2 bytes)
A Modem Address (2 bytes)
C Command code (1 byte)
D Data field (optional, length is command dependent).

Note: Fields specified as not used are not checked by the modem, and can contain any data pattern.

Header X'0510420821841042'. This byte pattern is required to identify the SDLC frame as an LPDA command frame.

Identifier The Identifier field is two bytes long and structured as follows:

- Byte 0

  Bit 0: Must be coded as a 1.
  Bit 1: Not used by the modem.
  Bit 2: Command flag. Must be coded as 0.
  Bits 3,4,5: Not used by the modem.
  Bits 6,7: Must both be coded as a 0.

- Byte 1: Not used by the modem.

Modem Address
This field is two bytes long. It is saved by the modem and used in the response.

Command Code
This field is one byte long and contains the command code to be run by the modem.

Data Field
The length and contents of the data field are command dependent.

Information Field Format / Response

The Response Information field contains the following fields:

H Header (2 bytes)
I Identifier (2 bytes)
A Modem address field (2 bytes)
C Command code (1 byte)
SB Sense Byte (1 byte)
D Data field (optional, length is command dependent).

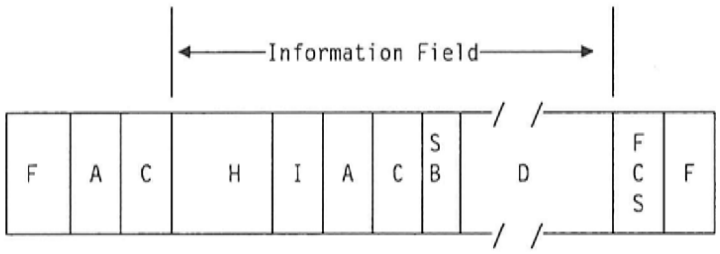


Figure 14-2. Response Information Field Structure

Header The header field contains two sub-fields:

- Length field: 1 byte (hexadecimal) containing the number of bytes in the response including itself and up to but not including the FCS field. The length will always be either X'0C' or X'08'.
- Key field: This field is 1 byte long and must contain X'50'.

Identifier The Identifier field is two bytes long, with the following format:

- Byte 0:
  bit 0: Always 1.
  bit 1: Always 0.
  bit 2: Always 1. Shows a response.
  bit 3:
  - 0 The command has been correctly run.
  - 1 An exception has occurred during the processing of the command. The exception and its effect on the response data are reported in the Sense Byte.

  bits 4-7: Always 0.
- Byte 1: Always 0.

Modem Address
This field is two bytes long. The same value received in the command frame will be used in the response frame.

Command Code
This field is one byte long. The same value received in the command frame will be used in the response frame.

Sense Byte
The Sense Byte contains a return code that describes the results of the command operation. The following values are applicable to all commands. Other return codes are specific to individual commands and are defined under the description of those commands.

X'00'	Command was run successfully.
X'01', X'02', X'03'	Reserved.
X'04'	An unsupported command code, a command code other than X'21'or X'22', was received. The command was not run.
X'05',X'06'	Reserved.
X'08'	The contents of the command data field were not valid. The command was not run and no response data is provided in the response.
X'09' through X'0F'	Reserved.

Data Field
The length and contents of the Data field are command dependent.

Framing Rules

- Commands are sent to the modem from the DTE. Responses are sent to the DTE from the modem.
- A frame with an address, control, or FCS field error is invalid and will be ignored.
- If a command is valid and the modem runs it, a positive response is returned to the DTE. If the command is invalid or the modem cannot run it, a negative response that contains an error code is returned to the DTE.
- Each command and response is conveyed by a single frame. The modem does not accept a new command from the DTE until a response to the previous one has been returned to the DTE.
- If a Dial command causes a successful connection, the modem enters data mode following transmission of the response to the DTE.

- If a connection is not successfully established, or for commands not resulting in connections, a modem configured for switched network operation returns to the disconnected (idle) state following transmission of the response to the DTE. A modem configured for nonswitched operation returns to normal non-switched operation if a dial command fails. The modem can accept another command or support a manual call procedure after a dial command fails to establish a connection.

LPDA Dial Command

Format: X'21'nnnn...

Function: This command instructs the modem to attempt to originate a switched network connection. The modem goes off-hook and searches for a dial tone. When dial tone is found, the modem dials the number specified in the dial string. The command data field may contain up to 58 bytes.

Parameters

nn

0-9 X'0' through X'9'. Dial digits packed two per byte.

S X'E2'. This parameter causes a delay of up to the number of seconds specified in register S6. Dialing continues only when dial tone is received by the modem. If dial tone is not detected during the delay time, the modem terminates the command and goes on-hook. For more information on register S6, see "S6 -Wait Before Blind Dialing" on page 12-57.

V X'E5'. This parameter causes the modem to go on-hook for .7 seconds and then off-hook again. This is called a 'flash' and is usually used to signal the phone system to return a dial tone. When the modem is back off-hook again, it waits for dial tone for up to three seconds before proceeding with the next parameter. If dial tone is detected before the three seconds are up, the modem continues running the dial command.

W X'E6'. This parameter instructs the modem to pause for the length of time defined in register S8 before continuing to dial. For more information on register S8, see "S8 -Dial Pause Time" on page 12-58. It can be used to force the modem to dial regardless of the presence of dial tone. The modem remains off-hook and quiet during the pause.

s X'A2'. This parameter instructs the modem to turn **on** its speaker if and when it goes off-hook to run the call command. The modem turns off the speaker when the call attempt is abandoned or when the modem transfers to data mode, whichever occurs first. The speaker volume is set to the modem's default value. For more information on speaker volume, see "Ln -Level (Volume)" on page 12-8.

u X'A4'. This parameter forces the modem to create the connection at a speed of one lower than its preferred telephone line speed. It affects the speed of only the call attempt associated with the command that contains the parameter. The modem returns to its original speed setting when the call attempt or the connection ends, whichever occurs last. For more information on telephone line speeds, see "The Telecommunication Line Speed" on page 8-6 and "&Amn -Preferred Telco Speed" on page 12-12.

\ X'E0'. This parameter allows the modem to operate when non-standard call progress signals or noise signals are found during the connection process. For example, if the modem interprets a ringback tone as a busy signal, the call attempt will terminated incorrectly. It instructs the modem to monitor the telephone line for only the dial tone and the ringback tone during the remainder of the call.

X X'E7'. The dial digits following the X up to the next T are to be dialed using pulse dialing.

T X'E3'. The dial digits following the T up to the next X are to be dialed using tone dialing. The dial digits # and * cannot be packed into a single nibble, therefore, they are represented as follows:

- # - The character Y (X'E8')
- * - The character Z (X'E9').

U X'E4'. The two bytes immediately following the U contain the cancel call timeout value in seconds. The timeout period is specified by the digits 0 through 9 packed two digits per byte. Only the three right-most nibbles of the two bytes contain the timeout value. The first nibble of the first byte is ignored. If an cancel call timeout is not specified in the command or if the value specified is 0, the modem will use the default cancel timer value. Values greater than 99 produce an cancel time of 99 seconds.

If the cancel call timeout period is sufficiently short, the modem may not have time to identify the reason for a failed call, or the modem may terminate the call before the telephone system has time to complete the call connection.

C X'C'. This nibble is used to show the end of the dial string. Any data following this parameter will be ignored. The use of this parameter is not mandatory. This nibble can be used at the end of the dial string to place the command message field on a byte boundary as required by the modem.

D X'D'. This nibble instructs the modem to wait for a dial tone before continuing to dial digits. It is inserted between dial digits when an intermediate dial tone is expected. This parameter does the same function as the S parameter described previously.

F X'F'. This nibble is an alignment parameter. It may be placed anywhere in the dial string to place the command message field on a byte boundary. It serves no other function.

B X'B'. This nibble is an alignment parameter. It may be placed anywhere in the dial string to place the command message field on a byte boundary. It serves no other function.

t X'A3'. This byte is ignored by the modem.

v X'A5'. This byte is ignored by the modem.

w X'A6'. This byte is ignored by the modem.

x X'A7'. This byte is ignored by the modem.

Any other code received in the dial string is considered to be invalid. The command is canceled and an error code is returned to the DTE.

The S, W, or D can either precede the dial digits or be intermixed with the digits in the string as required.

Adaptive dialing is used only on the first dial command after a modem reset and only if X or T is not present at the beginning of the dial string. If X or T is specified, the modem will use the dialing method described by these parameters. Adaptive dialing means the first two digits are dialed using tone dialing. If the dial tone disappears, the remaining digits are dialed using tone dialing. If the dial tone does not disappear, all digits are dialed using pulse dialing. If the dial tone has not disappeared after all digits have been dialed, the command is canceled and the appropriate error code is returned to the DTE.

Dial Command Sense Bytes

In the response to the Dial command, the Sense Byte can contain the following error codes:

X'00' - X'06' These sense bytes were defined in "Information Field Format / Response" on page 14-2.

X'07' This sense byte is sent if an empty dial command is received. That is, no dialable digits were included after the dial command.

X'08' This sense byte is normally sent when the modem has received an invalid command or command parameter. It is also used if there is no stored ID and the modem is being used in a country that requires use of an ID field. Usually, this response means the modem cannot run the command because of a situation external to the modem.

X'0C' This sense byte is sent if a call out command is sent when a switched network connection already exists.

X'10' - X'12' Reserved.

X'13' This sense byte is used if the cancel timer expires after answer tone was detected and before the modem is ready for data transfer. It is also used when the cancel timer expires and the modem:

- Had not detected answer tone
  and
- Was not detecting ringback
  and
- Had detected a dial tone every time it waited for dial tone.

X'14' - X'17' Reserved.

X'18' This sense byte is sent if when the modem's cancel timer expires, the modem did not detect a dial tone during at least one 'wait for dial tone' period and did not detect:

- A busy signal
- An answer tone
- A ringback signal.

Also, this sense byte is sent if, when the cancel timer expires, the modem had detected a dial tone when there should not have been any dial tone and the modem did not detect:

- A busy signal
- An answer tone
- A ringback signal.

X'19' Reserved.

X'1A' This sense byte shows a busy signal was detected. When the modem detects a busy signal, it immediately returns this response and hangs up. If the \ (defeat busy) parameter was included in the command dial string, the modem is not allowed to detect a busy signal.

X'1B' Reserved.

X'1C' This sense byte is sent if the modem thought the other end had not answered when the cancel timer expired. In other words, when the cancel timer expired, the modem was still detecting the ringback signal.

X'1D' The modem is busy and cannot run a valid dial command. However, this response is sent only if the modem's activity leaves it enough processing power to detect the incoming command. Usually, use of this response means that something local to the modem is preventing running of the command.

Response Data Field

When a sense byte other than X'00' is sent in the response, there is no response data field. When a call attempt is successful, a sense byte of X'00' is sent in the response and a data field is included. The format of this data field is as follows:

Bytes 0-1: Modem type - X'7855'
Byte 2: Modem model code - X'10'
Byte 3: Always 0.

LPDA Disconnect Command

Format: X'22'

Function: This command instructs the modem to drop the data connection and go on-hook.

Parameters: None.

Disconnect Command Sense Byte

In the response to the Disconnect command, the Sense Byte can contain only the following error code:

X'08' This sense byte is sent when the modem has received an invalid command.

Response Data Field

When a sense byte other than X'00' is sent in the response, there is no response data field. When the disconnect is successful, a sense byte of X'00' is sent in the response and a data field is included. The format of this data field is as follows:

Bytes 0-1: Modem type - X'7855'
Byte 2: Modem model code - X'10'
Byte 3:

- X'00' if the modem is on-hook when the command is issued.
- X'80' if the modem is off-hook when the command is issued.

Chapter 15. LCD Messages

This chapter shows how the LCD configuration messages are related to AT commands.

The table below shows the configuration and \S messages in alphabetical order so you can look up the meaning of those that are not clear. When a command or S register is shown, it means that using the left arrow key when the LCD shows the message causes the command to execute or the S register to be updated. When a \S number is shown, it refers to the results of \S0 and \S1 commands.

Table 15-1 (Page 1 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
7200 bps.....NO	%H0	0	7200 bps is not allowed for FF and fallback. See page 12-46 for details. In the tree structure, this message is shown on page 6-27.
7200 bps.....YES	%H1	0	7200 bps is allowed for FF and fallback. See page 12-46 for details. In the tree structure, this message is shown on page 6-27.
7855 Using..BOTH	\Q3	0	Modem uses RFS and character flow control. See page 12-39 for details. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
7855 Using..CHAR	\Q1	0	Modem uses character flow control. See page 12-39 for details. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
7855 Using..NONE	\Q0	0	Modem uses no flow control. See page 12-39 for details. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
7855 Using...RFS	\Q2	0	Modem uses RFS flow control. See page 12-39 for details. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
Accept RL.....NO	&T5	0	Deny request for remote loop test. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
Accept RL....YES	&T4	0	Allow remote loop test. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
Accepted..ALWAYS	\C1,\C3	0	Accept an ECL connection attempt always. See page 12-32 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Accepted.CONNECT	\C0,\C2	0	Accept an ECL connection attempt immediately after physical connection. See page 12-32 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Adaptation			Tree structure entry for adaptation for the telecommunication line. In the tree structure, this message is shown on page 6-26.
Allow 7200 bps			Tree structure entry to determine if 7200 is allowable. In the tree structure, this message is shown on page 6-27.
Answer Tone			Force modem to transmit answer tone. In the tree structure, this message is shown on page 11-10.
Answering			Tree structure entry to enable or disable auto-answering. In the tree structure, this message is shown on page 6-25.
Async Characters			Tree structure entry to set asynchronous characters. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Async Cmd Echo			Tree structure entry to enable or disable command echo. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Async Data Path			Tree structure entry to determine asynchronous DTE-modem path. In the tree structure, this message is shown on page 6-22.
Async DTE Speed			Tree structure entry to determine asynchronous DTE speed. In the tree structure, this message is shown on page 6-22.

Table 15-1 (Page 2 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Async Format.XXX		1	Asynchronous character format. In the tree structure, this message is shown on page 11-10.
Async Format.Xxx	&B	0	Number of data bits in asynchronous format. See page 12-13 for details. In the tree structure, this message is shown on page 6-22.
Async Format.xXx	&B	0	Parity bit in asynchronous format. See page 12-13 for details. In the tree structure, this message is shown on page 6-22.
Async Format.xxX	&B	0	Number of stop bits in asynchronous format. See page 12-13 for details. In the tree structure, this message is shown on page 6-22.
Async Speed Msg			Tree structure entry to set speed used in asynchronous CONNECT message. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Async V.25 Bis			Tree structure entry to set modem for asynchronous V.25 Bis operation. In the tree structure, this message is shown on page 6-12.
Asynchronous			Tree structure entry for setting asynchronous escape sequence. In the tree structure, this message is shown on page 6-22
Asynchronous AT	%L2	0	Select asynchronous AT command set. See page 12-48 for details. In the tree structure, this message is shown on page 6-12.
AT Msg...NUMERIC	V0	0	Terse result codes. See page 12-10 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
AT Msg.....WORDS	V1	0	Verbose result codes. See page 12-10 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Attachment			Tree structure entry for attachment to telecommunication line. In the tree structure, this message is shown on page 6-25.
Auto Answer...NO	S0=0	1	Disable auto-answer. See page 12-55 for details. In the tree structure, this message is shown on page 6-25.
Auto Answer..YES	S0=xxx	1	Enable auto-answer. See page 12-55 In the tree structure, this message is shown on page 6-25.
Automatic Change			Tree structure entry for automatic change to the telecommunication line. In the tree structure, this message is shown on page 6-27.
Block Size....64	\A0	0	Maximum ECL block size is 64 characters. See page 12-31 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Block Size...128	\A1	0	Maximum ECL block size is 128 characters. See page 12-31 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Block Size...192	\A2	0	Maximum ECL block size is 192 characters. See page 12-31 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Block Size...256	\A3	0	Maximum ECL block size is 256 characters. See page 12-31 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Break Signals			Tree structure entry to set response when a break arrives. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
<BS>.....xxx	S5=xxx	1	Back space character. See page 12-57 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Busy for Local			Tree structure entry for setting operation during local loop test. In the tree structure, this message is shown on page 11-1.
Cable Wrapped	&T9		Initiate test of 4-wire nonswitched line with telco cable wrapped. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
Call Abort...xxx	S7=xxx	1	Handshake time out timer. See page 12-57 for details. In the tree structure, this message is shown on page 6-25.
Call End...LOCAL	Y0	0	Do not send special signal when switched network connection ends. See page 12-11 for details. In the tree structure, this message is shown on page 6-25.
Call End..REMOTE	Y1	0	Send special signal when switched network connection ends. See page 12-11 for details. In the tree structure, this message is shown on page 6-25.
Call Progress			Tree structure entry to set modems use of call progress capabilities. In the tree structure, this message is shown on page 6-25.

Table 15-1 (Page 3 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Call Tone.....NO	%X0	1	Do not send V.25 calling tone when originating switched network connection. See page 12-54 for details. In the tree structure, this message is shown on page 6-25.
Call Tone...V.25	%X1	1	Send V.25 calling tone when originating switched network connection. See page 12-54 for details. In the tree structure, this message is shown on page 6-25.
Calling Timer			Tree structure entry to set handshake time out timer. In the tree structure, this message is shown on page 6-25.
Calling Tone			Tree structure entry to enable or disable V.25 calling tone. In the tree structure, this message is shown on page 6-25.
Calling Tone			Force modem to transmit calling tone. In the tree structure, this message is shown on page 11-10.
CD loss(/10).xxx	S10=xxx	1	Carrier loss timer. See page 12-58 for details. In the tree structure, this message is shown on page 6-25.
Change			Tree structure entry to change parameters protected by maintenance password. In the tree structure, this message is shown on page 11-10.
Change Password			Tree structure entry to change local password. In the tree structure, this message is shown on page 9-4.
Change Timing			Tree structure entry to change timing for FF and SNBU. In the tree structure, this message is shown on page 6-27.
Char Pass-thru			Tree structure entry to allow flow control characters to pass-through the modem. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
Character....xxx	%Axxx	0	ECL handshake cancel character. See page 12-43 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Character....xxx	%Pxxx	0	Parity/Speed Character. See page 12-49 for details. In the tree structure, this message is shown on page 6-22.
Check Line....NO	%R0	1	Do not check nonswitched line during SNBU connection. See page 12-49 for details. In the tree structure, this message is shown on page 6-27.
Check Line...YES			Check nonswitched line at intervals during SNBU connection. See page 12-49 for details. In the tree structure, this message is shown on page 6-27.
Check(x5min).xxx	%Rxxx	1	Time interval for checking nonswitched line and for fall forward. See page 12-49 for details. In the tree structure, this message is shown on page 6-27.
Checksum xxH	I1		Compute memory checksum. See page 12-7 for details. In the tree structure, this message is shown on page 11-1.
Clear/Reset Pass	&C0		Clear all command lists and reset local password to default value. See page 12-22 for details. In the tree structure, this message is shown on page 9-4.
Cmd Echo.....OFF	E0	0	Disable asynchronous command echo. See page 12-7 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Cmd Echo.....ON	E1	0	Enable asynchronous command echo. See page 12-7 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Commands,Results			Tree structure entry to select asynchronous command and response formats. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Compression...NO	%C0	0	Do not negotiate to do MNP class 5. See page 12-43 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Compression..YES	%C1	0	Negotiate to do MNP class 5. See page 12-43 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Connect Char..NO	%D0	0	Do not send parity/speed character. See page 12-44 for details. In the tree structure, this message is shown on page 6-22.
Connect Char.YES	%D1	0	Send parity/speed character. See page 12-44 for details. In the tree structure, this message is shown on page 6-22.
<CR>.....xxx	S3=xxx	1	Carriage return character. See page 12-56 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Data Quality...x		1	Quality of telco line connection. In the tree structure, this message is shown on page 11-10.

Table 15-1 (Page 4 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Data Type			Tree structure entry to determine data type for idle and connect state. In the tree structure, this message is shown on page 6-22.
DataFlow Control			Tree structure entry to determine type of asynchronous flow control. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
DataFlow Control			Tree structure entry to enable or disable modem-to-modem flow control. In the tree structure, this message is shown in Figure 6-12 on page 6-24.
Detect.....ALL	X4	0	Enable all call progress capabilities. See page 12-10 for details. In the tree structure, this message is shown on page 6-25.
Detect.....BUSY	X3	0	Enable BUSY detection. See page 12-10 for details. In the tree structure, this message is shown on page 6-25.
Detect....D TONE	X2	0	Enable DIALTONE detection. See page 12-10 for details. In the tree structure, this message is shown on page 6-25.
Detect...NEITHER	X1	0	Disable BUSY and DIALTONE detection. See page 12-10 for details. In the tree structure, this message is shown on page 6-25.
Detect.....NONE	X0	0	Disable most call progress capabilities. See page 12-10 for details. In the tree structure, this message is shown on page 6-25.
Diagnostics			Tree structure entry into diagnostics section. In the tree structure, this message is shown on page 11-1.
Dial Delays			Tree structure entry to set dialing delays. In the tree structure, this message is shown on page 6-25.
Dial Mode..ADAPT		1	Modem using adaptive dialing. In the tree structure, this message is shown on page 11-10.
Dial Mode..PULSE	P		Select pulse dialing. See page 12-9 for details. In the tree structure, this message is shown on page 6-25.
Dial Mode..PULSE		1	Modem using pulse dialing. In the tree structure, this message is shown on page 11-10.
Dial Mode...TONE	T		Select tone dialing. See page 12-10. In the tree structure, this message is shown on page 6-25.
Dial Mode...TONE		1	Modem using tone dialing. In the tree structure, this message is shown on page 11-10.
Dial or Execute	D, "E		Execute directory or dial stored number. See page 12-5 or 12-23 for details. In the tree structure, this message is shown on page 9-11.
Dialing			Tree structure entry to set type of pulse dialing. In the tree structure, this message is shown on page 6-25.
Direct Path...NO	\D0	0	Async data path is buffered. See page 12-33 for details. In the tree structure, this message is shown on page 6-22.
Direct Path..YES	\D1	0	Async data path is direct. See page 12-33 for details. In the tree structure, this message is shown on page 6-22.
Directories			Tree structure entry into directories. In the tree structure, this message is shown on page 9-11.
Directory.....xx			Specify directory in Get Directory and Send Directory command. See page 12-23 and 12-25 for details. In the tree structure, this message is shown on page 9-4. The message is also used to specify directory to view or create. See page 9-11.
Disconnect			Tree structure entry for selecting disconnect options. In the tree structure, this message is shown on page 6-25
Disconnect	H0		Terminate switched network connection. See page 12-7 for details. In the tree structure, this message is shown on page 9-11.
Disconnect.NEVER	S10=255	1	Do not disconnect if carrier is lost. See page 12-58 for details. In the tree structure, this message is shown on page 6-25.
Disconnect..RLSD	S10	1	Disconnect if carrier is lost. See page 12-58 for details. In the tree structure, this message is shown on page 6-25.

Table 15-1 (Page 5 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Do Tests			Tree structure entry into section to perform diagnostics. In the tree structure, this message is shown on page 11-1.
Dropout.....NO		1	No carrier loss since last read. In the tree structure, this message is shown on page 11-10.
Dropout.....YES		1	Carrier loss since last read. In the tree structure, this message is shown on page 11-10.
DSR (107) PSN			Tree structure entry for selection of Data Set Ready (DSR) signal control options. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DSR On....ALWAYS	&S0	0	DSR is always active. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DSR On...CONNECT	&S1	0	DSR is active only during connection. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DSR On...USUALLY	&S2	0	DSR follows DTR except during connection attempt. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DTE bps....xxxxx		1	Actual asynchronous DTE speed. In the tree structure, this message is shown on page 11-10.
DTE Counts Error			Tree structure entry into tests where DTE will check for errors. In the tree structure, this message is shown on page 11-1.
DTE Interface			Tree structure entry to set idle and connect data type. In the tree structure this message is shown on page 6-17.
DTE Interface			Tree structure entry to control DTE interface. In the tree structure this message is shown on page 6-20.
DTE Speed..TELCO	\M0	0	Speed buffering turned off: DTE speed and telco speed the same. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed.....50	\M1	0	DTE speed 50 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed.....75	\M2	0	DTE speed 75 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed....110	\M3	0	DTE speed 110 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed....135	\M4	0	DTE speed 135 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed....150	\M5	0	DTE speed 150 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed....300	\M6	0	DTE speed 300 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed....600	\M7	0	DTE speed 600 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed...1200	\M8	0	DTE speed 1200 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed...2400	\M9	0	DTE speed 2400 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed...4800	\M10	0	DTE speed 4800 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed...7200	\M11	0	DTE speed 7200 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed...9600	\M12	0	DTE speed 9600 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed..14400	\M13	0	DTE speed 14 400 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.
DTE Speed..19200	\M14	0	DTE speed 19 200 bps. See page 12-36 for details. In the tree structure, this message is shown on page 6-22.

Table 15-1 (Page 6 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
DTE Using...BOTH	\R3	0	DTE using RTS and character flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
DTE Using...CHAR	\R1	0	DTE using character flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
DTE Using...NONE	\R0	0	DTE using no flow control. See page 12-40 for details. In the tree structure, this message is shown on 6-17.
DTE Using....RTS	\R2	0	DTE using RTS flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
DTMF *			Force modem to transmit DTMF character *. In the tree structure, this message is shown on page 11-10.
DTMF #			Force modem to transmit DTMF character #. In the tree structure, this message is shown on page 11-10.
DTMF A			Force modem to transmit DTMF digit A. In the tree structure, this message is shown on page 11-10.
DTMF B			Force modem to transmit DTMF digit B. In the tree structure, this message is shown on page 11-10.
DTMF C			Force modem to transmit DTMF digit C. In the tree structure, this message is shown on page 11-10.
DTMF D			Force modem to transmit DTMF digit D. In the tree structure, this message is shown on page 11-10.
DTMF 0			Force modem to transmit DTMF digit 0. In the tree structure, this message is shown on page 11-10.
DTMF 1			Force modem to transmit DTMF digit 1. In the tree structure, this message is shown on page 11-10.
DTMF 2			Force modem to transmit DTMF digit 2. In the tree structure, this message is shown on page 11-10.
DTMF 3			Force modem to transmit DTMF digit 3. In the tree structure, this message is shown on page 11-10.
DTMF 4			Force modem to transmit DTMF digit 4. In the tree structure, this message is shown on page 11-10.
DTMF 5			Force modem to transmit DTMF digit 5. In the tree structure, this message is shown on page 11-10.
DTMF 6			Force modem to transmit DTMF digit 6. In the tree structure, this message is shown on page 11-10.
DTMF 7			Force modem to transmit DTMF digit 7. In the tree structure, this message is shown on page 11-10.
DTMF 8			Force modem to transmit DTMF digit 8. In the tree structure, this message is shown on page 11-10.
DTMF 9			Force modem to transmit DTMF digit 9. In the tree structure, this message is shown on page 11-10.
DTR (108) Drop			Tree structure entry to choose effect of DTR drop. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DTR Delay....xxx	S25=xxx	1	DTR drop timer. See page 12-59 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DTR Off..COMMAND	&D1	0	DTR drop forces modem to command state. See page 12-14 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DTR Off..IGNORED	&D0	0	DTR drop ignored. See page 12-14 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DTR Off....RESET	&D3	0	DTR drop forces modem reset. See page 12-14 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
DTR Off.....V.24	&D2	0	DTR drop forces PSN connections to end. See page 12-14 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.

Table 15-1 (Page 7 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Echo Adapt....NO	\E0	0	Cancel local echo optimization request. See page 12-33 for details. In the tree structure, this message is shown on page 6-26.
Echo Adapt...YES	\E1	0	Perform local echo optimization. See page 12-33 for details. In the tree structure, this message is shown on page 6-26.
Echo Time.....x		1	Local echo time. In the tree structure, this message is shown on page 11-10.
ECL Control			Tree structure entry for ECL control. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
ECL Message			Tree structure entry to enable or disable ECL messages. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
ECL Start.ACCEPT	\N0	0	ECL connection request accepted. See page 12-37 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-16 on page 6-28.
ECL Start.ALWAYS	\N2	0	ECL connection required. See page 12-37 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-16 on page 6-28.
ECL Start...AUTO	\N3	0	ECL attempt automatically initiated by originate modem. See page 12-37 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-16 on page 6-28.
ECL Start..NEVER	\N1	0	No ECL connection allowed. See page 12-37 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-16 on page 6-28.
End Test	&T0		End any existing test. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
End Test			End transmitter test. In the tree structure, this message is shown on page 11-10.
End Test..MANUAL	S18=0	1	Tests end manually. See page 12-59 for details. In the tree structure, this message is shown on page 11-1.
End Test...TIMER	S18	1	Timer terminates tests. See page 12-59 for details. In the tree structure, this message is shown on page 11-1.
Error Count Here			Tree structure entry to modem self tests. In the tree structure, this message is shown on page 11-1.
<ESC> (/50)..xxx	S12=xxx	1	Asynchronous escape sequence guard time. See page 12-59 for details. In the tree structure, this message is shown on page 6-22.
<ESC>.....xxx	S2=xxx	1	Asynchronous escape sequence character. See page 12-56 for details. In the tree structure, this message is shown on page 6-22.
<ESC>.....NONE	S2>127	1	Asynchronous escape disabled. See page 12-56 for details. In the tree structure, this message is shown on page 6-22.
<ESC> Sync..NONE	\I0	0	Synchronous escape sequence disabled. See page 12-34 for details. In the tree structure, this message is shown on page 6-22.
<ESC> Sync...YES	\I1	0	Synchronous escape sequence enabled. See page 12-34 for details. In the tree structure, this message is shown on page 6-22.
<ESC>.....YES	S2<128	1	Asynchronous escape enabled. See page 12-56 for details. In the tree structure, this message is shown on page 6-22.
Escape Sequence			Tree structure entry for escape sequences. In the tree structure, this message is shown on page 6-20.
<Exit Enter>			The main entry and exit point for the tree structure. The entry tree structure is shown on page 6-9. The exit tree structure is shown on page 6-11.
Fall Back			Tree structure entry for fall back control. In the tree structure, this message is shown on page 6-27.
Fall Forward			Tree structure entry for fall forward control. In the tree structure, this message is shown on page 6-27.
Fall Forward..NO	%G0	0	No fall forward allowed. See page 12-46 for details. In the tree structure, this message is shown on page 6-27.
Fall Forward.YES	%G1	0	Fall forward allowed. See page 12-46 for details. In the tree structure, this message is shown on page 6-27.

Table 15-1 (Page 8 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Fallback..ACCEPT	%F0	0	Auto fallback request accepted. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.....DTE	%F10	0	Speed controlled by DTE. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.....NO	%F9	0	Auto fallback not allowed. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback..1 RATE	%F1	0	Allowed to initiate fallback of 1 rate. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.2 RATES	%F2	0	Allowed to initiate fallback of 2 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.3 RATES	%F3	0	Allowed to initiate fallback of 3 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.4 RATES	%F4	0	Allowed to initiate fallback of 4 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.5 RATES	%F5	0	Allowed to initiate fallback of 5 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.6 RATES	%F6	0	Allowed to initiate fallback of 6 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.7 RATES	%F7	0	Allowed to initiate fallback of 7 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fallback.8 RATES	%F8	0	Allowed to initiate fallback of 8 rates. See page 12-45 for details. In the tree structure, this message is shown on page 6-27.
Fast Train....NO	%I0	0	Short training during handshaking not allowed. See page 12-47 for details. In the tree structure, this message is shown on page 6-26.
Fast Train...YES	%I1	0	Short training during handshaking allowed. See page 12-47 for details. In the tree structure, this message is shown on page 6-26.
First Delay..xxx	S6=xxx	1	Blind dial delay. See page 12-57 for details. In the tree structure, this message is shown on page 6-25.
First Setup			Tree structure entry for basic setup parameters. In the tree structure, this message is shown on page 6-12.
Flow Pass.....NO	\X1	0	Delete flow control characters from data stream. See page 12-42 for details. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
Flow Pass....YES	\X0	0	Do not delete flow control characters from data stream. See page 12-42 for details. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
Flow.....BOTH	\R3,\Q3	0	Modem and DTE using DTE signals and character flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
Flow.....CHAR	\R1,\Q1	0	Modem and DTE using character flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
Flow.....NONE	\R0,\Q0	0	Modem and DTE using no flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
Flow.....RFS	\R0,\Q2	0	Modem uses RFS flow control. See page 12-40 for details. In the tree structure, this message is shown on page 6-17.
for FF and SNBU			Tree structure entry for fall forward and SNBU timing. In the tree structure, this message is shown on page 6-27.
Forced Abort..NO	\C0,\C1	0	Do not cancel abort ECL attempt. See page 12-32 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Forced Abort.YES	\C2,\C3	0	Cancel ECL attempt if auto-fallback character arrives. See page 12-32 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
From DTE...CLEAR	\K1	0	Modem clears its buffers and delivers break. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From DTE..ESCAPE	\K0	0	Force modem to escape state. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.

Table 15-1 (Page 9 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
From DTE...QUICK	\K2	0	Deliver break to telco line ahead of data in transmit buffer. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From DTE....SLOW	\K3	0	Deliver break to telco line after data in transmit buffer. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From 7855 to DTE			Tree structure entry to control modem signals. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From Telco Line			Tree structure entry to set if modem disconnects when carrier is lost. In the tree structure, this message is shown on page 6-25.
From Telco.....0	\K0	0	Ignore break. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From Telco.CLEAR	\K1	0	Modem clears its receive buffer and delivers break. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From Telco.QUICK	\K2	0	Deliver break to DTE ahead of data in receive buffer. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
From Telco..SLOW	\K3	0	Deliver break to DTE after data in receive buffer. See page 12-35 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
General			Tree structure entry for general telco line adaptations. In the tree structure, this message is shown on page 6-26.
Get Directory	~F		Get directory from remote modem. See page 12-23 for details. In the tree structure, this message is shown on page 9-4.
Get Profile	~G		Get profile from remote modem. See page 12-24 for details. In the tree structure, this message is shown on page 9-4.
Guard Tone..NONE	&G0	0	No Guard Tone Used. See page 12-15 for details. In the tree structure, this message is shown on page 6-25.
Guard Tone 550			Force modem to transmit 550 Hz guard tone. In the tree structure, this message is shown on page 11-10.
Guard Tone...550	&G1	0	550 Hz Guard Tone Used. See page 12-15 for details. In the tree structure, this message is shown on page 6-25.
Guard Tone 1800			Force modem to transmit 1 800 Hz guard tone. In the tree structure, this message is shown on page 11-10.
Guard Tone..1800	&G2	0	1 800 Hz Guard Tone Used. See page 12-15 for details. In the tree structure, this message is shown on page 6-25.
Handshake...BELL	B1	0	Bell standard used for 1 200 and 0-300 bps connections. See page 12-4 for details. In the tree structure, this message is shown on page 6-26.
Handshake..CCITT	B0	0	CCITT standard used for 1200 and 0-300 bps connections. See page 12-4 for details. In the tree structure, this message is shown on page 6-26.
Hit.....NO		1	Impulse hit has not occurred since last read. In the tree structure, this message is shown on page 11-10.
Hit.....YES		1	Impulse hit occurred since last read. In the tree structure, this message is shown on page 11-10.
Hybrid.....xx		1	Identifies which of four echo canceler networks is active. In the tree structure, this message is shown on page 11-10.
Identification			Tree structure entry to identify microcode level and checksum and country type. In the tree structure, this message is shown on page 11-1.
Idle/Data..ASYNC	&M0	0	Data is asynchronous during idle and connect state. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and on page 6-22.
Idle/Data.AS/SYN	&M1	0	Data is asynchronous during idle; synchronous during a connection. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and on page 6-22.
Idle/Data.DS/ASY	&M3	0	Direct dial during idle; asynchronous data during a connection. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and on page 6-22.

Table 15-1 (Page 10 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Idle/Data.DS/SYN	&M2	0	Direct dial during idle; synchronous data during a connection. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and on page 6-22.
Idle/Data...SYNC	&M4	0	Data is synchronous during idle and connect state. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and on page 6-22.
Inactivity			Tree structure entry to enable or disable inactivity timer. In the tree structure, this message is shown on page 6-25.
LCD Messages			Tree structure entry to select LCD message form. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
<LF>.....xxx	S4=xxx	1	Line feed character. See page 12-56 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
LL			Tree structure entry to nonswitched telco line adaptation. In the tree structure, this message is shown on page 6-26.
LL bps..0-300 UN	&AL0	0	Preferred nonswitched line speed is 0-300 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps....600 UN	&AL1	0	Preferred nonswitched line speed is 600 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps...1200 UN	&AL2	0	Preferred nonswitched line speed is 1200 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps...2400 UN	&AL3	0	Preferred nonswitched line speed is 2400 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps...4800 UN	&AL4	0	Preferred nonswitched line speed is 4800 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps...7200 TC	&AL5	0	Preferred nonswitched line speed is 7200 bps with Trellis coding. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps...9600 TC	&AL7	0	Preferred nonswitched line speed is 9600 bps with Trellis coding. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps...9600 UN	&AL6	0	Preferred nonswitched line speed is 9600 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL bps..12000 TC	&AL8	0	Preferred nonswitched line speed is 12 000 bps with trellis coding. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
LL Change to PSN			Tree structure entry to set SNBU control. In the tree structure, this message is shown on page 6-27.
LL RLSD dBm..-xx	%Un	1	Set nonswitched carrier threshold. See page 12-53 for details. In the tree structure, this message is shown on 6-26.
LL Signal....DTR	C0	0	Drop carrier when DTR drops. See page 12-4 for details. In the tree structure, this message is shown on page 6-26.
LL Signal.....ON	C1	0	Carrier stays **on** when DTR drops. See page 12-4 for details. In the tree structure, this message is shown on page 6-26.
LL Telco Speed			Tree structure entry to set nonswitched preferred telco speed. In the tree structure, this message is shown on page 6-17 and Figure 6-12 on page 6-24.
LL Transmit			Tree structure entry to change nonswitched transmit level. In the tree structure, this message is shown on page 11-10.
LL Xmit dbm..-xx	%TXLxx	1	Set nonswitched transmit level. See page 12-52 for details. In the tree structure, this message is shown on 11-10.

Table 15-1 (Page 11 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Local Echo...-xx		1	Local echo strength. In the tree structure, this message is shown on page 11-10.
Local Loop	&T8,&T1		Initiate local loop test with or without internal error checking. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
Local Operation			Tree structure entry for setting local modem to allow remote configuration. In the tree structure, this message is shown on page 9-4.
Local Pass..▪▪▪▪			Prompt for local password. In the tree structure, this message is shown on page 9-4 and 9-11.
Lock at Exit	^R		Lock configuration keys. See page 12-29 for details. In the tree structure, this message is shown on page 6-11.
Make Busy.....NO	%B0	0	Modem will be on-hook during local loop test. See page 12-43 for details. In the tree structure, this message is shown on page 11-1.
Make Busy....YES	%B1	0	Modem will go off-hook during local loop test. See page 12-43 for details. In the tree structure, this message is shown on page 11-1.
Messages			Tree structure entry to enable or disable responses. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages.COMPACT	%V0	1	Compact LCD messages. See page 12-53 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages..NORMAL	%V1	1	Normal LCD messages. See page 12-53 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages.....OFF	\V0	0	Disable ECL messages. See page 12-41 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages.....OFF	Q1	0	Disable result codes. See page 12-9 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages......ON	\V1	0	Enable ECL messages. See page 12-41 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages......ON	Q0	0	Enable result codes. See page 12-9 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Messages...WORDS	V1	0	Verbose result codes. See page 12-10 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Modem to Modem			Tree structure entry for choosing modem to modem telco line adaptation. In the tree structure, this message is shown on 6-26.
Network......PSN	&L0	0	Switched network line interface. See page 12-16 for details. In the tree structure, this message is shown on 6-17 and in Figure 6-12 on page 6-24.
Network..LL 2W A	&L2	0	2-wire nonswitched line (answer mode) interface. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
Network..LL 2W O	&L1	0	2-wire nonswitched line (originate mode) interface. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
Network..LL 4W A	&L4	0	4-wire nonswitched line (answer mode) interface. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
Network..LL 4W O	&L3	0	4-wire nonswitched line (originate mode) interface. See page 12-16 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
New Pass....▪▪▪▪			Enter new password. In the tree structure, this message is shown on page 9-4.
No Action			Message in first setup to prevent modem reset. In the tree structure, this message is shown on page 6-12.
No Action			Entry to prevent executing a command list. In the tree structure, this message is shown on page 9-11.
No Cable Wrap	&T2		Initiate test of nonswitched network without cable. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.

Table 15-1 (Page 12 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
No Data (min).xx	\Txx	0	Value for inactivity timer. See page 12-40 for details. In the tree structure, this message is shown on page 6-25.
No Password			Tree structure entry for setting remote customize options and directory options not requiring passwords. In the tree structure, this message is shown on page 9-11 and on page 9-4.
No Speed Sense	%LO	0	Select asynchronous V.25 Bis command set without speed sensing. See page 12-48 for details. In the tree structure, this message is shown on page 6-12.
Number.....xx			Select directory number to dial or execute. In the tree structure, this message is shown on page 9-11.
On Hook.....NO	\TO		Disable inactivity timer. See page 12-40 for details. In the tree structure, this message is shown in 6-25.
On Hook.....YES	\T		Enable inactivity timer. See page 12-40 for details. In the tree structure, this message is shown in 6-25.
Operating			Tree structure entry to set ECL operating characteristics. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Other Delay..xxx	S8=xxx	1	Dial pause time. See page 12-58 for details. In the tree structure, this message is shown on page 6-25.
Overspeed.....1%	%O0	0	1% asynchronous overspeed range. See page 12-48 for details. In the tree structure, this message is shown in 6-22.
Overspeed...2.3%	%O1	0	2.3% asynchronous overspeed range. See page 12-48 for details. In the tree structure, this message is shown in 6-22.
Pass.....NONE	"S0	0	No modem security. See page 12-29 for details. In the tree structure, this message is shown on page 9-4.
Pass....REQUIRED	"S1	0	Password required. See page 12-29 for details. In the tree structure, this message is shown on page 9-4.
Pass..TELCO SHUT	"S2	0	Password required; no remote configuration allowed. See page 12-29 for details. In the tree structure, this message is shown on page 9-4.
Pass/Fail			Table structure entry to choose tests that pass or fail. In the tree structure, this message is shown on page 11-1.
Password Also	"C0		Reset password to factory default. See page 12-22 for details. In the tree structure, this message is shown on page 6-12.
Password Needed			Tree structure entry for setting secured remote customize options and for viewing and executing secured directories. In the tree structure, this message is shown on page 9-11 and in 9-4.
Password Use			Tree structure entry for setting modem security. In the tree structure, this message is shown on page 9-4.
Password ■■■■			Prompt for maintenance password when found in tree structure described on page 11-10, or a prompt for fixed modem password when found in tree structure described on page 6-9.
PBX code....xxxx	\Pxxxx	0	PBX access code for syntactic dialing. In the tree structure, this message is shown on page 11-10. See page 12-38 for details.
PBX Present			Tree structure entry to enable or disable PSN access for syntactic dialing. In the tree structure, this message is shown on page 11-10.
Pool Profile			Store changes in the pool profile. In the tree structure, this message is shown on page 6-11.
Pooling.....NO		0	Not set for modem pooling. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
Pooling.....YES		0	Set for modem pooling. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
Power On Profile			Tree structure entry to choose power **on** profile. In the tree structure, this message is shown on page 6-12.

Table 15-1 (Page 13 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Preemphasis....x	%TPx	1	Selects the amount of transmit pre-emphasis. See page 12-52 for details. In the tree structure, this message is shown on page 6-26.
Profiles Only			Reset only profiles to factory settings. In the tree structure, this message is shown on page 6-12.
Profile.....AT	&Y3	0	Load AT factory profile at power on. See page 12-21 for details. In the tree structure, this message is shown on page 6-12.
Profile.....AT	&F1		Reset working memory to AT factory profile. See page 12-14 for details. In the tree structure, this message is shown on page 6-12.
Profile.....LL	&Y5	0	Load nonswitched factory profile at power on. See page 12-21 for details. In the tree structure, this message is shown on page 6-12.
Profile.....LL	&F3		Reset working memory to nonswitched factory profile. See page 12-14 for details. In the tree structure, this message is shown on page 6-12.
Profile...NO CMD	&Y4	0	Load no command factory profile at power on. See page 12-21 for details. In the tree structure, this message is shown on page 6-12.
Profile...NO CMD	&F2		Reset working memory to no command factory profile. See page 12-14 for details. In the tree structure, this message is shown on page 6-12.
Profile....NVM 0	&Y0	0	Load profile 0 at power on. See page 12-21 for details. In the tree structure, this message is shown on page 6-12.
Profile....NVM 0	Z0		Reset working memory to profile 0. See page 12-12 for details. In the tree structure, this message is shown in 6-12.
Profile....NVM 1	&Y1	0	Load profile 1 at power on. See page 12-21 for details. In the tree structure, this message is shown on page 6-12.
Profile....NVM 1	Z1		Reset working memory to profile 1. See page 12-12 for details. In the tree structure, this message is shown on page 6-12.
Profile.....POOL			Reset working memory to pool profile. In the tree structure, this message is shown on page 6-12.
Profile..V.25Bis	&Y2	0	Load V.25 Bis factory profile at power on. See page 12-21 for details. In the tree structure, this message is shown on page 6-12.
Profile..V.25Bis	&F0		Reset working memory to V25bis factory profile. See page 12-14 for details. In the tree structure, this message is shown on page 6-12.
Profile x	"G, "L		Profile for Get Profile and Send Profile commands. See page 12-24 and 12-27 for details. In the tree structure, this message is shown on page 9-4.
Protocol...BLOCK	\L1	0	ECL block mode. See page 12-36 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Protocol..NORMAL	\L0	0	ECL stream mode. See page 12-36 for details. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
PSN			Tree structure entry to adaptation for PSN telco line. In the tree structure, this message is shown on page 6-25.
PSN Access.NOPBX	\P0	0	Modem has direct access to the public switched network. See page 12-38 for details. In the tree structure, this message is shown on page 11-10.
PSN Access...PBX		0	PSN access through a PBX for syntactic dialing. In the tree structure, this message is shown on page 11-10.
PSN bps.0-300 UN	&AP0	0	Preferred public switched network line speed is 0-300 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps...600 UN	&AP1	0	Preferred public switched network line speed is 600 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps..1200 UN	&AP2	0	Preferred public switched network line speed is 1200 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.

Table 15-1 (Page 14 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
PSN bps..2400 UN	&AP3	0	Preferred public switched network line speed is 2400 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps..4800 UN	&AP4	0	Preferred public switched network line speed is 4800 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps..7200 TC	&AP5	0	Preferred public switched network line speed is 7200 bps with trellis coding. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps..9600 TC	&AP7	0	Preferred public switched network line speed is 9600 bps with trellis coding. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps..9600 UN	&AP6	0	Preferred public switched network line speed is 9600 bps uncoded. See page 12-12 for details. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN bps.12000 TC	&AP8	0	Preferred public switched network line speed is 12 000 bps with trellis coding. See page 12-12 for details. In the tree structure, this message is shown on 6-17 and in Figure 6-12 on page 6-24.
PSN Level..FIXED	&J0	0	Public switched network transmit level is controlled by the modem. See page 12-15 for details. In the tree structure, this message is shown on page 6-25.
PSN Level...PROG	&J1	0	Public switched network transmit level is controlled by the telephone network. See page 12-15 for details. In the tree structure, this message is shown in 6-25.
PSN Telco Speed			Tree structure entry for selection of public switched network line speed. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
PSN Transmit			Tree structure entry for selection of public switched network transmit level (for service personnel only). In the tree structure, this message is shown on page 11-10.
PSN Xmit dBm.-xx	%TXPxx	1	Public switched network transmit level adjustment (for service personnel only). See page 12-52 for details. In the tree structure, this message is shown on page 11-10.
Put in Profile x			Destination for Get Profile and Send Profile command. In the tree structure, this message is shown on page 9-4.
Quick Customize			Tree structure entry for selection of telecommunication line and speed options. In the tree structure, this message is shown on 6-17.
Quiet Off Hook			Force modem off-hook without sending tones. In the tree structure, this message is shown on page 11-10.
Rate Used....DTE	&I1	0	DTE interface speed used in asynchronous CONNECT message. See page 12-15 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Rate Used..TELCO	&I0	0	Telephone line speed used in asynchronous CONNECT message. See page 12-15 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
Receiver			Tree structure entry for selection of general modem receiver options and private line receiver threshold. In the tree structure, this message is shown on page 6-26.
Receiver Setup.x	%TDx	1	Identifies general modem receiver options selected. See page 12-51 for details. In the tree structure, this message is shown on page 6-26.
Remain Unlocked			Do not lock front panel switches. In the tree structure, this message is shown on page 6-11.
Remote Customize			Main tree structure entry for selection of remote modem customizing functions. In the tree structure, this message is shown on page 9-4.
Remote Echo..-xx		1	Receive level (in dbm) of the remote echo signal. In the tree structure, this message is shown on page 11-10.

Table 15-1 (Page 15 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Remote Loop	&T6,&T7		Initiate remote loop test with or without internal error checking. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
Remote Operation			Tree structure entry for selection of remote modem customizing functions. In the tree structure, this message is shown on page 9-4.
Remote Pass.▪▪▪▪			Request for the local password of the remote modem. In the tree structure, this message is shown on page 9-4.
Reset Calls			Resets list of telephone numbers that the modem is forbidden to dial. In the tree structure, this message is shown on page 6-9.
Reset to Factory			Tree structure entry to reset profiles and password to factory default values. In the tree structure, this message is shown on page 6-12.
Retrain			Tree structure entry for selection of retrain options. In the tree structure, this message is shown on page 6-27.
Retrain.....NO	%E0	0	Do not initiate retrain sequences but respond to a received sequence. See page 12-44 for details. In the tree structure, this message is shown on page 6-27.
Retrain.....LONG	%E2	0	Attempt to retrain for up to two minutes. See page 12-44 for details. In the tree structure, this message is shown on page 6-27.
Retrain....SHORT	%E1	0	Attempt to retrain for up to thirty seconds. See page 12-44 for details. In the tree structure, this message is shown on page 6-27.
Review			Tree structure entry to allow service personnel to display the various function pages available to them. In the tree structure, this message is shown on page 11-10.
RFS (106)			Tree structure entry for selection of Ready for Sending (RFS) signal control options. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RFS On....ALWAYS	&R1	0	RFS signal follows the Data Terminal Ready signal. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RFS On...CONNECT	&R2	0	RFS signal is inactive while idle; follows RTS during a connection. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RFS On.....DELAY	&R3	0	RFS signal delayed after auto-answer. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RFS On....V.25 B	&R0	0	RFS signal follows V.25bis rules while is idle and RTS during a connection. See page 12-18 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
Ring Count...xxx	S1=xxx	1	Shows the number of incoming rings that have been detected. See page 12-55 for details.
Rings.....xxx	S0=xxx	1	Number of rings modem must detect before answering an incoming call. See page 12-55 for details. In the tree structure, this message is shown on page 6-25.
RLSD (109)			Tree structure entry for selection of Receive Line Signal Detect (RLSD) signal control options. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RLSD dBm.....-xx		1	Receive level (in dbm) of the private (leased) line receive carrier signal. In the tree structure, this message is shown on page 6-26.
RLSD On...ALWAYS	&C0	0	RLSD signal always active. See page 12-13 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RLSD On..CONNECT	&C1	0	RLSD signal is only active during a connection. See page 12-13 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
RLSD On...V.25 B	&C2	0	RLSD signal follows V.25bis rules while idle and is active during a connection. See page 12-13 for details. In the tree structure, this message is shown in Figure 6-9 on page 6-23.
Save Profile 0	&W0		Save current modem configuration in nonvolatile memory (profile 0). See page 12-20 for details. In the tree structure, this message is shown on page 6-11.
Save Profile 1	&W1		Save current modem configuration in nonvolatile memory (profile 1). See page 12-20 for details. In the tree structure, this message is shown on page 6-11.

Table 15-1 (Page 16 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Select Test			Tree structure entry for selection of modem diagnostic tests. In the tree structure, this message is shown on page 11-1.
Send Directory	~H		Send directory or command list to remote modem. See page 12-25 for details. In the tree structure, this message is shown on page 9-4.
Send Profile	~L		Send profile to remote modem. See page 12-27 for details. In the tree structure, this message is shown on page 9-4.
Signals			Tree structure entry for selection of DTE interface signal options. In the tree structure, this message is shown on page 6-20.
SNBU LL Test..NO	%Q0	0	Do not check the quality of the private (leased) line. See page 12-49 for details. In the tree structure, this message is shown on page 6-27.
SNBU LL Test.YES	%Q1	0	Check the quality of the private (leased) line periodically. See page 12-49 for details. In the tree structure, this message is shown on page 6-27.
SNBU.....ANSWER	%S4	1	SNBU operation is allowed. Auto-answer an incoming call if SNBU is necessary. See page 12-50 for details . In the tree structure, this message is shown on page 6-27.
SNBU..ANSWER ANY	%S5	1	SNBU operation is allowed. Auto-answer any incoming call. See page 12-50 for details. In the tree structure, this message is shown on page 6-27.
SNBU...CALL.0/20	%S1	1	SNBU operation is allowed. Dial using directory 0 or 20. See page 12-50 for details. In the tree structure, this message is shown on page 6-27.
SNBU...CALL.1/21	%S2	1	SNBU operation is allowed. Dial using directory 1 or 21. See page 12-50 for details. In the tree structure, this message is shown on page 6-27.
SNBU...EXEC.4/22	%S3	1	SNBU operation is allowed. Dial using command list 4 or directory 22. See page 12-50 for details. In the tree structure, this message is shown on page 6-27.
SNBU.....NO	%S0	1	Switched Network Back-UP (SNBU) operation is not allowed. See page 12-50 for details. In the tree structure, this message is shown on page 6-27.
Speaker			Tree structure entry for selection of modem speaker options. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Speaker Test	&T10		Enable speaker test. See page 12-19 for details. In the tree structure, this message is shown on page 11-1.
Specialist			Tree structure entry to allow service personnel to adjust transmit levels and activate transmitter tests. In the tree structure, this message is shown on page 11-10.
Speed Change			Tree structure entry for selection of telephone line speed change options. In the tree structure, this message is shown on page 6-27.
Speed Sense	%L1	0	Selects the V.25 Bis asynchronous command set with speed and format sensing. See page 12-48 for details. In the tree structure, this message is shown on page 6-12.
Spkr On...ALWAYS	M2	0	Speaker is always **on**. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Spkr On..CALLING	M1	0	Speaker is turned **on** during dialing and turned off when carrier is detected. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Spkr On....NEVER	M0	0	Speaker is never **on**. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Spkr On..WAITING	M3	0	Speaker is **on** during call progress and handshaking only. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Starting			Tree structure entry for selection of ECL initiation options. In the tree structure, this message is shown in Figure 6-16 on page 6-28.
Store and View	&Zn,~Wn		Stores data into or displays contents of modem directories. See page 12-21 and 12-30 for details. In the tree structure, this message is shown on page 9-11.
Synchronous			Selects synchronous modem operation. In the tree structure, this message is shown on page 6-12.

Table 15-1 (Page 17 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Synchronous			Tree structure entry for selection of synchronous escape sequence options. In the tree structure, this message is shown on page 6-22.
Telco bps...NONE		1	No telephone connection exists. In the tree structure, this message is shown on page 11-10.
Telco bps..xxxxx		1	Actual telephone line speed. In the tree structure, this message is shown on page 11-10.
Telco Flow....NO	\G0	0	Disable modem to modem flow control. See page 12-34 for details. In the tree structure, this message is shown in Figure 6-12 on page 6-24.
Telco Flow...YES	\G1	0	Enable modem to modem flow control. See page 12-34 for details. In the tree structure, this message is shown in Figure 6-12 on page 6-24.
Telco Interface			Tree structure entry for selection of telephone line interface options. In the tree structure, this message is shown in Figure 6-12 on page 6-24.
Telco Status			Tree structure entry for status display of telephone line interface parameters. In the tree structure, this message is shown on page 11-10.
Test Errors..xxx			Error count from modem self-tests. In the tree structure, this message is shown on page 11-1.
Test From Remote			Tree structure entry for selection of remote loop test option pages. In the tree structure, this message is shown on page 11-1.
Test Setup			Tree structure entry for selection of diagnostic test control options. In the tree structure, this message is shown on page 11-1.
Test Timer			Tree structure entry for selection of diagnostic test end option pages. In the tree structure, this message is shown on page 11-1.
Test Timer...xxx	S18=xxx	1	Sets run time for modem diagnostic tests. See page 12-59 for details. In the tree structure, this message is shown on page 11-1.
Test Transmitter			Tree structure entry to allow service personnel to execute transmitter tests. In the tree structure, this message is shown on page 11-10.
To Stop DTE			Tree structure entry for selection of modem to DTE flow control options. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
To Stop 7855			Tree structure entry for selection of DTE to modem flow control options. In the tree structure, this message is shown in Figure 6-11 on page 6-24.
To Telco Line			Tree structure entry for selection of disconnect signal option. In the tree structure, this message is shown on page 6-25.
Total Customize			Main tree structure entry into all customizing options. In the tree structure, this message is shown on page 6-20.
Transmitter			Tree structure entry for selection of nonswitched line transmitter options and transmit pre-emphasis. In the tree structure, this message is shown on page 6-26.
Trigger.(dBm)..2	%J2	0	A sudden 2 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..3	%J3	0	A sudden 3 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..4	%J4	0	A sudden 4 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..5	%J5	0	A sudden 5 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..6	%J6	0	A sudden 6 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..7	%J7	0	A sudden 7 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..8	%J8	0	A sudden 8 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.
Trigger.(dBm)..9	%J9	0	A sudden 9 dBm change in receive level triggers a retrain. See page 12-47 for details. In the tree structure, this message is shown on page 6-27.

Table 15-1 (Page 18 of 19). Messages from the Configuration Menus and the \S command

Message	Command or Register	\S	Description
Type of Network			Tree structure entry to select switched or nonswitched network. In the tree structure, this message is shown on page 6-17 and in Figure 6-12 on page 6-24.
Used, Not Saved			Do not store configuration changes in nonvolatile memory. In the tree structure, this message is shown on page 6-11.
User Interface			Tree structure entry for selection of modem speaker and display options. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
V.21 a			Force modem to transmit V.21 answer tone. In the tree structure, this message is shown on page 11-10.
V.21 o			Force modem to transmit V.21 originate tone. In the tree structure, this message is shown on page 11-10.
V.22 600 a			Force modem to transmit V.22 600 bps answer tone. In the tree structure, this message is shown on page 11-10.
V.22 600 o			Force modem to transmit V.22 600 bps originate tone. In the tree structure, this message is shown on page 11-10.
V.22 1200 a			Force modem to transmit V.22 1200 bps answer tone. In the tree structure, this message is shown on page 11-10.
V.22 1200 o			Force modem to transmit V.22 1200 bps originate tone. In the tree structure, this message is shown on 11-10.
V.22 Bis 2400 a			Force modem to transmit V.22 Bis 2400 bps answer tone. In the tree structure, this message is shown on 11-10.
V.22 Bis 2400 o			Force modem to transmit V.22 Bis 2400 bps originate tone. In the tree structure, this message is shown on page 11-10.
V25b Msg.....ALL	"X3	0	Extended 1988 V.25 Bis indications. See 12-30 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
V25b Msg...CFIDE	"X1	0	Extended 1984 V.25 Bis indications. See 12-30 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
V25b Msg.INC CNX	"X2	0	Basic 1988 V.25 Bis indications. See 12-30 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
V25b Msg.MINIMUM	"X0	0	Basic 1984 V.25 Bis indications. See 12-30 for details. In the tree structure, this message is shown in Figure 6-10 on page 6-23.
V.32 4800			Force modem to transmit V.32 4800 bps tone. In the tree structure, this message is shown on page 11-10.
V.32 7200			Force modem to transmit V.32 7200 bps tone. In the tree structure, this message is shown on page 11-10.
V.32 9 600TC			Force modem to transmit V.32 9600 bps trellis coded tone. In the tree structure, this message is shown on page 11-10.
V.32 9 600UN			Force modem to transmit V.32 9600 bps uncoded tone. In the tree structure, this message is shown on page 11-10.
V.32 12000			Force modem to transmit V.32 12 000 bps tone. In the tree structure, this message is shown on page 11-10.
View Only			Tree structure entry to display, not change, configuration parameters. In the tree structure, this message is shown on page 6-20.
Volume.....LOUD	L3	0	Speaker volume is loud. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Volume....MEDIUM	L2	0	Speaker volume is medium. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Volume.....QUIET	L0,L1	0	Speaker volume is quiet. See page 12-8 for details. In the tree structure, this message is shown in Figure 6-17 on page 6-28.
Vx.xxx-xxx	I3		Identifies microcode level and country code. See page 12-7 for details. In the tree structure, this message is shown on page 11-1.
Xmit Clock...DTE	&X1	0	DTE provides clock for synchronous mode. See page 12-20 for details. In the tree structure, this message is shown on page 6-22.

Table 15-1 (Page 19 of 19). Messages from the Configuration Menus and the \S command			
Message	**Command or Register**	**\S**	**Description**
Xmit Clock.SLAVE	&X2	0	Modem uses slave clocking in synchronous mode. See page 12-20 for details. In the tree structure, this message is shown on page 6-22.
Xmit Clock..7855	&X0	0	Modem provides clock in synchronous mode. See page 12-20 for details. In the tree structure, this message is shown on page 6-22.

LCD Messages Ordered by Cmdword

Refer to Chapter 12, "Attention Command Set" if you know what AT cmdword you wish to execute from the front panel but do not know where it is in the LCD menu structure.

Chapter 16. IA5 and ASCII Codes

This conversion chart shows the decimal and hexadecimal codes for 7 bit ASCII and IA5 characters.

Table 16-1 (Page 1 of 2). Asynchronous Characters

Decimal	Hex	ASCII	Decimal	Hex	ASCII
0	00	NUL	32	20	SP
1	01	SOH	33	21	!
2	02	STX	34	22	"
3	03	ETX	35	23	#/£
4	04	EOT	36	24	$/¤
5	05	ENQ	37	25	%
6	06	ACK	38	26	&
7	07	BEL	39	27	'
8	08	BS	40	28	(
9	09	HT	41	29	)
10	0A	LF	42	2A	*
11	0B	VT	43	2B	+
12	0C	FF	44	2C	,
13	0D	CR	45	2D	-
14	0E	SO	46	2E	.
15	0F	SI	47	2F	/
16	10	DLE	48	30	0
17	11	DC1	49	31	1
18	12	DC2	50	32	2
19	13	DC3	51	33	3
20	14	DC4	52	34	4
21	15	NAK	53	35	5
22	16	SYN	54	36	6
23	17	ETB	55	37	7
24	18	CAN	56	38	8
25	19	EM	57	39	9
26	1A	SUB	58	3A	:
27	1B	ESC	59	3B	;
28	1C	FS/IS4	60	3C	<
29	1D	GS/IS3	61	3D	=
30	1E	RS/IS2	62	3E	>
31	1F	US/IS1	63	3F	?

Table 16-1 (Page 2 of 2). Asynchronous Characters

Decimal	Hex	ASCII	Decimal	Hex	ASCII
64	40	@	96	60	`
65	41	A	97	61	a
66	42	B	98	62	b
67	43	C	99	63	c
68	44	D	100	64	d
69	45	E	101	65	e
70	46	F	102	66	f
71	47	G	103	67	g
72	48	H	104	68	h
73	49	I	105	69	i
74	4A	J	106	6A	j
75	4B	K	107	6B	k
76	4C	L	108	6C	l
77	4D	M	109	6D	m
78	4E	N	110	6E	n
79	4F	O	111	6F	o
80	50	P	112	70	p
81	51	Q	113	71	q
82	52	R	114	72	r
83	53	S	115	73	s
84	54	T	116	74	t
85	55	U	117	75	u
86	56	V	118	76	v
87	57	W	119	77	w
88	58	X	120	78	x
89	59	Y	121	79	y
90	5A	Z	122	7A	z
91	5B	[	123	7B	{
92	5C	\	124	7C	v/|
93	5D	]	125	7D	}
94	5E	^	126	7E	~/
95	5F	–	127	7F	DEL

Chapter 17. DTE Interface

DTE-to-Modem Interface Cable

The electrical connection from the modem to the DTE is through a 25-pin female D-connector (DB25) mounted behind the modem.

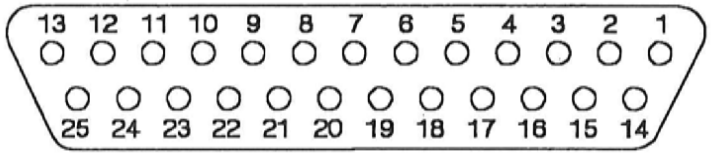


Figure 17-1. Pin Layout for the 25-Pin D-Connector

The pin assignments are shown in Table 17-1 on page 17-2.

The mechanical connection from the modem to the DTE is done with two hexagonal nuts mounted on the modem. These are threaded for UNC 4-40 in all countries that allow such threads. 7855-10 modems intended for use in countries that require the use of metric connectors have M2.6 or M3 threaded nuts. Both nuts are connected to the modem's internal earth ground.

We have not included a DTE interface cable with your modem because the connection at the DTE end of the cable is not standardized.

If your DTE does not have a cable and you have to select one, a good general rule is to pick one that has both a "foil" and a "braid" shield and that has only sufficient wires to have a wire attached to each signal that is sent by either the modem or DTE *and* used by the other. For example, if your DTE does not provide a signal on pin 18 of the interface, it would be best to use a cable that does not have a wire for that signal and if your DTE does not use the signal provided by the modem on pin 25, it would be best to use a cable that does not have that wire.

Table 17-1. DTE-to-Modem Interface Pin Assignments

Pin	EIA 232	CCITT V.24	Signal Name	Short Name	Sent from
1	–	–	Unused	–	–
2	BA	103	Transmitted Data	TD	DTE
3	BB	104	Received Data	RD	7855
4	CA/CJ	105/133	Request to Send	RTS	DTE
5	CB	106	Ready for Sending	RFS	7855
6	CC	107	Data Set Ready	DSR	7855
7	AB	102	Signal Ground	–	–
8	CF	109	Received Line Signal Detector	RLSD	7855
9	–	–	See Note	–	–
10	–	117	Standby Indicator	OH	7855
11	–	–	No Connection	–	–
12	CI	112	Data Signal Rate Selector	RS	7855
13	–	–	No Connection	–	–
14	–	–	See Note	–	–
15	DB	114	Transmitter Signal Element Timing	TCLK	7855
16	–	–	No Connection	–	–
17	DD	115	Receiver Signal Element Timing	RCLK	7855
18	LL	141	Local Loop 3 Test (Make Busy)	LL	DTE
19	–	–	No Connection	–	–
20	CD	108.2	Data Terminal Ready	DTR	DTE
21	RL	140	Remote Loop 2 Test Select	RL	DTE
22	CE	125	Calling Indicator (Ring Indicator)	RI	7855
23	CH	111	Data Signal Rate Selector	DSRS	DTE
24	DA	113	Transmitter Signal Element Timing	ECLK	DTE
25	TM	142	Test Indicate	TI	7855

Note: The modem has receivers connected to pins 9 and 14 of the interface but the modem ignores those signals except during a modem self-test when a DTE wrap plug is installed.

Signal Conventions

The DTE interface is binary and uses voltages to define the two possible interface states. Various names that are used for the two states are shown below in Table 17-2.

Table 17-2. DTE Interface Signal Conventions

Voltage	Meanings				
Positive	0	Space	On	Active	Start bit
Negative	1	Mark	Off	Inactive	Stop bit

Interface Signal Behaviors

Most of the interface leads are used in the standard ways defined by EIA-232-D and CCITT V.24. Also, the 7855-10 modem can be configured to control most of the signals it sends in nonstandard ways and it can be configured to accept nonstandard behavior of many of the signals that are sent from a DTE.

The next sections give some brief descriptions of the nonstandard interface behaviors that you can use with a 7855 modem.

Pin 04-Request to Send

A modem normally interprets this signal to mean that the attached DTE wishes to send a command or data to the modem. The modem activates the RFS signal to give the DTE permission to proceed. There are two types of nonstandard operation you can select:

- The DTE can use this signal to tell the modem to stop delivering asynchronous data (but not responses to commands). Here, when RTS is inactive, the modem stops delivering data and when RTS is active, the modem resumes delivery of data. See the `DTE Using...` messages in Table 15-1 on page 15-1 or "\Rn -V.24 Flow Control (DTE Stops Modem)" on page 12-40 for more details.
- The modem can be set to effectively ignore the state of RTS by pretending RTS is active all of the time. See the `RFS On...` messages in Table 15-1 on page 15-1 or "&Rn -RFS Control" on page 12-18 for more details.

Pin 05-Ready for Sending

Different DTEs require different behaviors of the RFS signal so several are available. See the `RFS On...` messages in Table 15-1 on page 15-1 or "&Rn -RFS Control" on page 12-18 or Table 5-2 on page 5-2 for more details.

Also, the RFS signal may be used for flow control between the modem and DTE. See the `7855 Using...` messages in Table 15-1 on page 15-1 or "\Qn -V.24 Flow Control (Modem Stops DTE)" on page 12-39 for details.

Pin 06-Data Set Ready

Options are available to select a behavior of DSR that meets the needs of various DTEs for switched network operation. For private line and SNBU operation, DSR is normally active. See the `DSR On...` messages in Table 15-1 on page 15-1 or "&Sn -Data Set Ready Control for Switched Operation" on page 12-18 or Table 5-1 on page 5-2 for more details.

Pin 07-Signal Ground

In the 7855-10 modem, signal and earth grounds are connected because we have found that doing so usually results in better telecommunication line performance than if the two grounds are left unconnected in the modem.

Pin 08-Received Line Signal Detector

DTEs must be somewhat tolerant of unexpected changes of the state of RLSD and some DTEs totally ignore the state of RLSD. However, the 7855 modem can be configured to manipulate RLSD in one of three ways as discussed in Table 5-3 on page 5-3. See the RLSD On... messages in Table 15-1 on page 15-1 or "&Cn -RLSD (Carrier Detect) Control" on page 12-13 for details.

Pin 10-Standby Indicator

If this signal is implemented in your version of the 7855-10, it indicates to the local DTE whether the modem is using the switched network interface.
The active state means that the modem is off-hook. The inactive state means that the modem is on-hook and that the switched interface is idle.

Pin 12-Data Signal Rate Selector

When a connection is established, this signal is active if the telecommunication line speed is equal to the modem's preferred speed. This signal is inactive if the line speed is slower than the preferred speed.
If no connection is established and the modem's speed is controlled by the DSRS signal on pin 23, then the pin 12 signal is same as the pin 23 signal.
If no connection is established and the modem is set to ignore pin 23, pin 12 is active.

Pin 18-Local Loopback

When a DTE activates this signal, the modem ends an existing connection and enters a V.54 loop 3 test. Data sent by the DTE is looped back by the local modem. The test ends when this pin is made inactive.

Pin 20-Data Terminal Ready

DTR can become active or it can become inactive. The modem responds differently to these two events.

DTR Becomes Active

For switched network operation, the modem will either:

- Answer an incoming call.
- Go off-hook and dial a stored telephone number or attempt to handshake if no telephone number is stored.
- Be ready to accept a command from the attached DTE.

For details about answering an incoming call, see "S0 -Rings Until Answer" on page 12-55 or the Auto Answer... or Rings... message in Table 15-1 on page 15-1. For details about configuring the modem to accept commands or dial stored numbers, see "&Mn -Communication Mode" on page 12-16 or the Idle/Data... messages in Table 15-1 on page 15-1.

During normal nonswitched operation, the modem ignores the state of DTR. However, the modem can be configured to start a nonswitched connection when DTR becomes active. This is described in "Cn -Carrier Control" on page 12-4 or see the LL Signal... messages in Table 15-1 on page 15-1.

DTR Becomes Inactive

For switched network operation, the normal modem behavior of the modem when DTR becomes inactive is to terminate any existing connection. There are other possibilities.

- The modem can do one of two types of reset.
- The modem can "escape" and get ready to accept an asynchronous command without terminating an existing connection.
- The modem can ignore the deactivation of DTR and neither reset, nor escape, nor terminate an existing switched connection.

For details about the above, see "&Dn -Data Terminal Ready Control" on page 12-14 or the `DTR off...` or `Pool...` messages in Table 15-1 on page 15-1.

For nonswitched operation, the above apply and also, the modem can be set to stop transmitting when DTR drops. This is described in "Cn -Carrier Control" on page 12-4 or see the `LL Signal...` messages in Table 15-1 on page 15-1.

Some DTEs deactivate DTR accidentally for brief periods so the 7855 modem can also be set to ignore a short "glitch" of DTR. See "S25 -Ignore DTR Drop" on page 12-59 or the `DTR Delay...` message in Table 15-1 on page 15-1 for more information.

Pin 21-Remote Loop 2 Test Select

If a modem-to-modem connection exists, the local modem sends a signal to the remote modem when the DTE activates this signal. The signal requests the remote modem to start a V.54 loop 2 test. If the remote can accept this request, data received by it is looped back over the telecommunication line to the local modem. The test ends when this pin is no longer active.

Pin 22-Calling Indicator

In the 7855, pin 22 follows the envelope of incoming rings. In other words pin 22 is active when a telephone would be ringing and pin 22 is inactive when a telephone would be silent.

Pin 23-Data Signal Rate Selector

This pin is normally ignored by the modem. However, if you change the modem to `Fallback.....DTE` from the front panel (see Figure 6-15 on page 6-27) or by using the %F10 cmdword (see "%Fn -Fallback Control" on page 12-45), then the local DTE can use this signal to change the modem's telecommunication line speed.

When used by the modem, an active pin 23 signal causes the modem to use its preferred telecommunication line speed, see "The Telecommunication Line Speed" on page 8-6. An inactive signal causes the modem to use one speed lower than the preferred line speed. For example, if the modem's preferred line speed is 9600 bps, then pin 23 can be used to switch the line speed to 7200 bps (assuming factory default configuration which allow 7200 bps).

There are limitations on controlling the line speeds with pin 23:

- The pin is ignored during diagnostics.

- Do not use this pin for a preferred line speed of 9600 bps *uncoded*. 9600 bps with *trellis* gives better telecommunication line performance.
- For nonswitched operation, you cannot change between 4800 bps and 2400 bps from one end of the telco line. We recommend using any other preferred telco speed instead of 4800 bps. Faster line speeds can be used.
- For switched operation, one modem can force the line speed to change from 4900 bps to 2400 bps, but this pin cannot force 2400 bps to 4800 bps.
- The pin is ignored while establishing a connection when the local DTE is asynchronous unless the modem is set to a fixed asynchronous DTE interface speed, see "Speed Buffering (Async)" on page 9-16.
- This pin cannot change the modem to a speed lower than 1200 bps.

Pin 24-Transmitter Signal Element Timing

A clock supplied by the DTE on this pin must be within ±0.01% of one of the modem's nominal speeds and must have a 50 ±1% duty cycle. If the modem is set to use external clocking and is set to the same nominal speed as the DTE supplied clock, the modem will phase lock to the clock signal and use it for transmission.

Chapter 18. Telecommunication Line Interfaces

We ship the modem with telecommunication cables equipped with the type of plugs we think are most common in your country. This chapter is intended to help you if your installation uses a different type of connection or if we had to send you cables that end in spade lugs rather than a plug.

This chapter also contains some information about using a 7855-10 modem with an automatic calling unit (ACU).

Direct Connection to a Telecommunication Line

The switched network connector on the back of the modem is labeled PSN and the nonswitched line connector is labeled LL. Both have eight pins.

For some countries, the modem has an additional 6-pin connector that allows a telephone handset to be plugged into the rear of the modem.

Figure 18-1 shows the rear panel connectors.

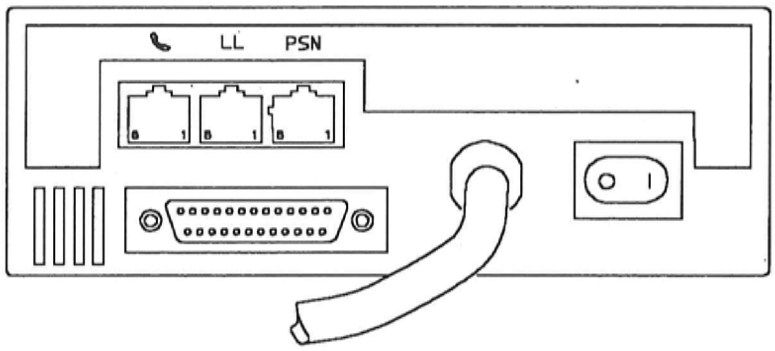


Figure 18-1. Rear Panel with Three Telecommunication Connectors

If your modem has only two rear telecommunication connectors, skip ahead to "Modems with Two Rear Connectors" on page 18-3.

Modems with Three Rear Connectors

Telephone Handset Connections

Pins 1, 2, 5, and 6 of the connector are not used.

When the modem is on-hook, pin 3 of this connector is connected to pin 5 of the switched network connector and pin 4 of this connector is connected to pin 4 of the switched network connector.

When the modem is off-hook, no signals appear on any pin of this 6-pin connector.

Switched Connections

Table 18-1. Switched Line Connector - Modems with Three Telco Connectors

Pin	Name	Description	Wire Color (Spade Lug Cables Only)
1	–	Unused.	–
2	–	Unused.	–
3	MI	Connecting this pin to pin 6 for at least 0.7 s signals the modem to be prepared to establish a connection. Disconnecting this pin from pin 6 signals the modem to start handshaking as an originator. This function is typically used by "data" type telephone sets and some ACUs to transfer a call to the modem.	–
4	Line	The modem assumes this pin is connected to one wire of the telecommunication line.	Red
5	Line	The modem assumes this pin is connected to the other wire of the telecommunication line.	White
6	MIC	See the description of pin 3. This pin is connected to ground inside the modem.	–
7	PR	Pins 7 and 8 can be used by the telecommunication services supplier to set the transmit level of the modem when the modem is configured for "programmable" operation.	–
8	PC	See the description of pin 7.	–

Nonswitched Connections

Table 18-2. Nonswitched Line Connector - Modems with Three Telco Connectors

Pin	Name	Description	Wire Color (Spade Lug Cables Only)
1	RCV1 (R)	One wire of two used for receiving signals during 4-wire operation. (Ring)	Black
2	RCV2 (T)	The other wire of the receive pair for 4-wire operation. (Tip)	Yellow
3	–	Reserved	–
4	–	Unused.	–
5	–	Unused.	–
6	–	Reserved	–
7	TX1 (T1)	One wire of two used for: • Transmitting signals during 4-wire operation • Transmitting and receiving signals during 2-wire operation.	White or Green
8	TX2 (R1)	The other wire used for: • Transmitting signals during 4-wire operation • Transmitting and receiving signals during 2-wire operation.	Red or Orange

Note: The leased line cable that ends with an 8 pin modular jack reverses the cable wires. At the telephone line end of the cable, pins 1 and 2 are the transmit pair (and receive pair for 2-wire leased lines) and pins 7 and 8 are the receive pair.

Modems with Two Rear Connectors

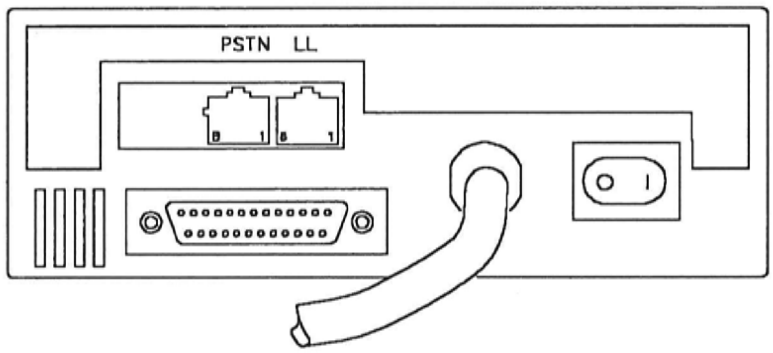


Figure 18-2. Rear Panel With Two Telecommunication Connectors

Switched Connections

Table 18-3. Switched Line Connector - Modems with Two Telco Connectors

Pin	Name	Description	Wire Color (Spade Lug Cables Only)
1	–	Unused or connected to pin 4. Country dependent.	–
2	Set1	Wired to the telephone set.	Black
3	Set2	Wired to the telephone set.	Blue or Yellow
4	Line	The modem assumes this pin is connected to one wire of the telecommunication line.	Red
5	Line	The modem assumes this pin is connected to the other wire of the telecommunication line.	White
6	–	Unused.	–
7	–	Unused.	–
8	–	Unused.	–

Nonswitched Connections

Table 18-4. Nonswitched Line Connector - Modems with Two Telco Connectors

Pin	Name	Description	Wire Color (Spade Lug Cables Only)
1	RCV1 (R)	One wire of two used for receiving signals into the modem.	Black
2	RCV2 (T)	The other wire of the receive pair.	Yellow
3	–	One wire of two used for 2 wire connections. This is electrically connected to pin 1 always.	Black
4	–	Unused.	–
5	–	Unused.	–
6	–	The other wire of two used for 2 wire connections. This pin and pin 2 are electrically identical.	Yellow
7	TX1 (T1)	One wire of two used for transmitting signals out of the modem.	White, Green, or Blue
8	TX2 (R1)	The other wire of the transmit pair.	Red or Orange

Cables and Adapters

See *IBM Signal Converters: Power Supply and Telecommunication Connections* which is IBM form number GA33-0054, for some details about the telecommunication cables we provide, and for the IBM part numbers of some of the adapters that are available to help with nonstandard telecommunication connections.

For example, if you need to use a cable with an 8-pin USOC RJ48S plug to connect to a 6-pin USOC RJ11C/W *nonswitched* telecommunication line socket, you can use the IBM eight-pin modular keyed socket to six-pin modular plug adapter, part number 11F5245.

Using an ACU

The challenge of using an ACU with a modem is that after the ACU has established the connection, the telephone line must be transferred from the ACU to the modem.

The basic requirement is that the 7855 modem must go off-hook and "hear" at least 0.1 s of the answer tone generated by the remote modem.

There are several ways to get the modem to go off-hook:

- Use a contact closure and pins of the modem's switched network interface as described above.
- Configure the modem to go off-hook and attempt to establish a connection when the DTR signal changes from inactive to active (see "&Mn -Communication Mode" on page 12-16 or the `Idle/Data...` messages in Table 15-1 on page 15-1). Since the DTR signal is generated from outside the modem, this approach requires either the ACU or the DTE to activate DTR at the right time.

The ACU controls the method and timing of the transfer of the 2 wires of the telephone line from the ACU to the modem. Remember that timing of the modem going off-hook and the transfer of the telephone line to the modem must be such that the modem receives at least 0.1 s of answer tone from the telephone line before the modem has been off-hook for 3 seconds.

Chapter 19. Parts Catalog

This chapter shows IBM part and form numbers.

Telecommunication Cables

Table 19-1. Telco Cable Part Numbers

Country and Type	Part Number
Austria switched	74F4485
Austria nonswitched, 2-wire	74F4486
Austria nonswitched, 4-wire	74F4487
Belgium switched	74F4507
Belgium nonswitched	74F4497
Denmark switched	74F4488
Denmark nonswitched	74F4489
France switched	74F4493
France nonswitched, 2-wire	74F4494
France nonswitched, 4-wire	74F4495
Italy switched	74F4498
Italy nonswitched	74F4499
Netherlands switched	74F4500
Netherlands nonswitched, 2-wire	74F4515
Netherlands nonswitched, 4-wire	74F4501
Norway switched	74F4490
Norway nonswitched, 2-wire	74F4491
Norway nonswitched, 4-wire	74F4492
Sweden switched	74F4502
Sweden nonswitched	74F4503
United Kingdom switched	74F4504
United Kingdom nonswitched, 2-wire	74F4505
United Kingdom nonswitched, 4-wire	74F4506
U.S.A. switched, 6 position	53F6095
U.S.A. switched, 8 position	53F6096
U.S.A. nonswitched, 8 position	53F6097

Modems

Table 19-2. Modem Part Numbers. These part numbers are for replacement modems without cables or documents.

Country	Part Number
U.S.A./Canada	53F6068
United Kingdom	53F6070
France	53F6071
Italy	53F6072
Japan	53F6073
Austria	53F6083
Norway	53F6084
Sweden	53F6085
Denmark	53F6086
Belgium	53F6087
Netherlands	53F6088

Miscellaneous

Table 19-3. Miscellaneous Part Numbers

Description	Part Number
Wrap Plug, DTE	53F6102
Wrap Plug, Nonswitched line	74F4508

Part 6. Abbreviations, Glossary, and Index

List of Abbreviations

<BS>	back space character
<CR>	carriage return character
<LF>	line feed character
AC	alternating current
ACU	automatic call unit
AL	analog loop
ASCII	American National Standard Code for Information Interchange
async	asynchronous
AWG	American wire gauge
bps	bits per second
BSC	binary synchronous communication
C	Celsius
CCITT	Comité Consultatif International Télégraphique at Téléphonique The International Telegraph and Telephone Consultative Committee
CD	carrier detect
cmd	command
cmdword	AT command parameter
CPU	central processing unit
CSA	Canadian Standards Association
CTS	clear to send
DCD	data carrier detect
def	default
DRSI	data rate select indicate
DSR	data set ready
DTE	data terminal equipment
DTMF	dual-tone multifrequency
DTR	data terminal ready
ECL	error checking link
EIA	Electronic Industries Association
EXCLK	external clock
F	Fahrenheit
FCC	Federal Communications Commission
HDLC	high-level data link control
hex	hexadecimal
Hz	hertz
IA5	International Alphabet 5
inf	interface
LCD	liquid crystal display
LL	leased or nonswitched line
NRZ	non-return-to-zero
NRZI	non-return-to-zero (inverted)
num	number
NVM	nonvolatile memory
PBX	private branch exchange
PDP	problem determination procedures
PKD	portable keypad display
PSN	public switched network
PSTN	public switched telephone network
RCLK	receive clock
RD	receive data
RDL	remote digital loop
RDLS	remote digital loop select
reg	register
RFS	ready for sending
RI	ring indicate
RLSD	receive line signal detector
RTS	request to send
SDLC	synchronous data link control
SNBU	switched network backup
sync	synchronous
TCLK	transmit clock
TD	transmit data
telco	telecommunication
TI	test indicate
TST	Test
UL	Underwriters' Laboratories
USOC	universal service order code
V	volts

Glossary

This glossary defines all new terms and abbreviations used in this manual. It includes terms and definitions from:

- The *IBM Dictionary of Computing*, SC20-1699.
- The *American National Dictionary for Information Processing Systems*, copyright 1982 by the Computer and Business Manufacturers Association (CBEMA). Copies may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. These definitions are identified by the symbol (A) after the definition.
- The *ISO Vocabulary - Information Processing* and the *ISO Vocabulary - Office Machines*, developed by the International Organization for Standardization, Technical Committee 97, Subcommittee 1. Definitions from published sections of the vocabularies are identified by the symbol (I) after the definition. Definitions reprinted from working documents, draft proposals, or draft international standards of ISO Technical Committee 97, Subcommittee 1 (Vocabulary) are identified by the symbol (T) following the definition, indicating that final agreement has not yet been reached among its participating members.

If you do not find the term you are looking for, refer to the index or to the *IBM Dictionary of Computing*.

A

asynchronous transmission. Data transmission in which transmission of a character or a block of characters can begin at any time but in which the bits that represent the character or block have equal time duration. Contrast with synchronous transmission. (I)

ATtention command set. A set of modem commands that must be preceded by the control characters AT.

auto-answer. Answering in which the called data terminal equipment (DTE) automatically responds to the calling signal. Synonym for automatic answering. (I)

auto-call. The process by which a device automatically dials on the switched network and then monitors the telecommunication line to determine whether a data connection occurs. Compare with auto-dial.

auto-dial. The process by which a device automatically sends addressing signals to the switched network. Compare with auto-call.

automatic calling unit (ACU). A dialing device that permits a business machine to automatically dial calls over a network. (I)

B

back up. See switched network back up.

baud. The rate of change of a carrier signal. For example, when the data speed of the 7855 modem is 9600 bps, it is changing its carrier 2400 times per second so it is a 2400 baud modem. Modems that transmit at 600 bps and slower generally have a baud rate that is identical to their data rate (that is, 600 baud for a 600 bps modem).

blind dialing. Starting to dial a fixed amount of time after going off-hook regardless of the presence of dial tone.

C

carrier. A continuous frequency that can be modulated or impressed with an information carrying signal. (I)

clear to send. A DTE interface signal referred to in this manual as Ready for Sending (RFS).

D

data communication. The transmission and reception of data. (A)

data terminal equipment (DTE). That part of a data station that serves as a data source, data sink, or both. (A)

demodulation. The process of retrieving intelligence (data) from a modulated carrier wave; the reverse of modulation. (I)

duplex. Pertaining to communication in which data can be sent and received at the same time. Synonymous with full duplex. (I)

E

ECL. A data protocol used between modems to insure the integrity of data. Generally similar to MNP as described in the CCITT V.42 recommendation.

escape sequence. When a DTE needs to interrupt data transmission to send a command to a modem, the DTE sends a special data pattern called an escape sequence to the modem. When the modem detects an escape sequence, it stops transferring data from

the DTE to the telecommunication line and expects to receive a command from the DTE.

F

Federal Communication Commission (FCC). A board of seven commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign electrical communication systems originating in the United States. (I)

flow control. The rules used by two entities to stop and start the flow of data between them.

full duplex. See duplex.

H

half-duplex. In data communication, pertaining to transmission in only one direction at a time. Contrast with duplex. (I)

host DTE. The primary or controlling processor in a user application network that is also the primary or controlling data terminal equipment.

I

interface. In the modem, the DTE shared boundary defined by functional characteristics, common physical connection characteristics, signal characteristics, and other characteristics as appropriate. (I)

L

leased line. Synonym for nonswitched line. (I)

local. Pertaining to a device accessed directly without use of a telecommunication line. In this manual, local refers to the reader's location.

local loop. A channel connecting a subscriber's equipment to line-terminating equipment in the central office exchange. (I)

M

MI and MIC. Auto-call unit interface signals.

modem. (*mo*dulator-*dem*odulator) A device that converts data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer. (I)

modem pool. A group of modems that are assigned to users one at a time. A user requesting a modem gets access to the next available one. Synonymous with pool.

modulation. The process by which a characteristic of a signal is varied according to a characteristic of another signal. (I)

N

network. In data processing, a user application network.

nonswitched line. A connection between systems or devices that does not have to be made by dialing. Contrast with switched line.

nonvolatile storage. A storage device whose contents are not lost when power is removed. (A)

O

off-hook. Activated (in regard to a telephone set or modem). A modem automatically answering on a switched network is said to go off-hook. (I)

on-hook. Deactivated (in regard to a telephone set or modem). A modem disconnecting from a switched network is said to go on-hook. (I)

P

permissive. A type of psn attachment characterized by a fixed transmit level that can not be easily adjusted from outside of the modem.

point-to-point line. A switched or nonswitched telecommunication line that connects a single remote station to a computer. (I)

pool. See modem pool.

problem determination procedure. A prescribed sequence of steps taken by a user to identify the source of a problem in a system or machine. (I)

programmable. A type of psn attachment method that allows the transmit level of a modem to be adjusted automatically to match the characteristics of the telephone line.

public switched network (PSN). Synonym for public switched telephone network.

public switched telephone network (PSTN). The telephone network that is used for voice and data connections world wide. This network makes temporary connections between two points based on one end dialing and the other end answering. In this document, PSTN includes private branch exchanges.

R

remote. Pertaining to a system, program, or device that is accessed through a telecommunication line. Contrast with local. (I)

retrain. An attempt by a modem who detects unsatisfactory signal reception to get resynchronized with the remote modem. Modems can only retrain when they are operating at 2400 bps or faster.

S

setup. The preparation of a system or machine to perform its functions. (I)

speed buffering. Refers to the condition when the speed of the modem to DTE interface is different than that of the telecommunication line speed. This only pertains to asynchronous operation. With speed buffering, the speed of the modem to DTE interface can be greater or less than the telecommunication line speed.

switched line. A telecommunication line in which the connection is established by dialing. Contrast with nonswitched line. (I)

switched network back up (SNBU). Use of the public switched telephone network to temporarily replace a nonswitched line that has failed.

synchronous transmission. In data communication, a method of transmission in which the sending and receiving of characters are controlled by timing signals. Contrast with asynchronous transmission. (I)

T

telecommunication facility. Anything used or available for use in furnishing data communication service.

telecommunication line. A telephone or other communication line that is used to send messages from one location to another.

trellis coding. An IBM invented method of making a modem signal more impervious to telecommunication line impairments than an uncoded signal can be.

typematic key. A key that repeats its function when pressed and held down. (I)

Index

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X

Y

Z

Numerics

Special Characters

Part 7. 7855-10 Configuration Tree

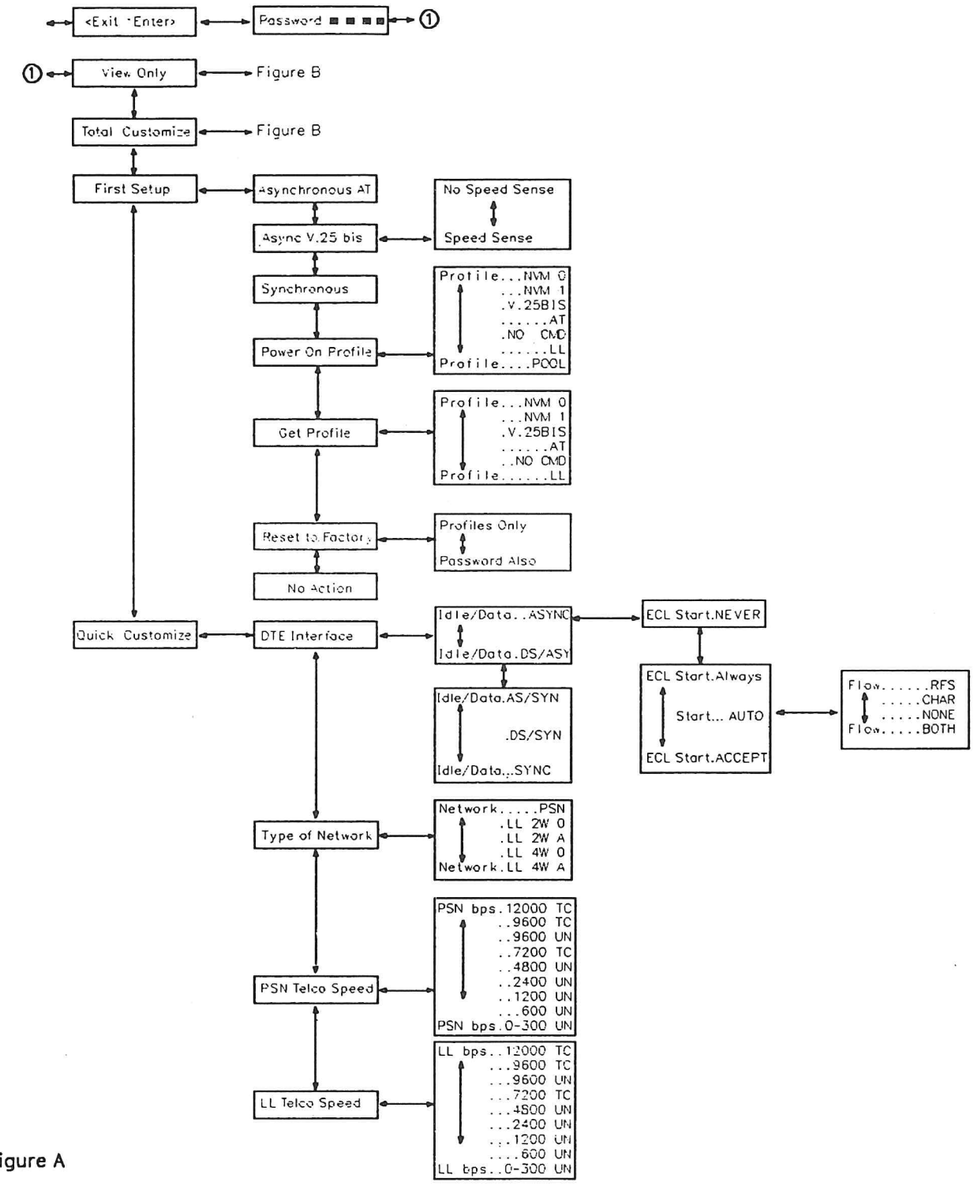

Figure A

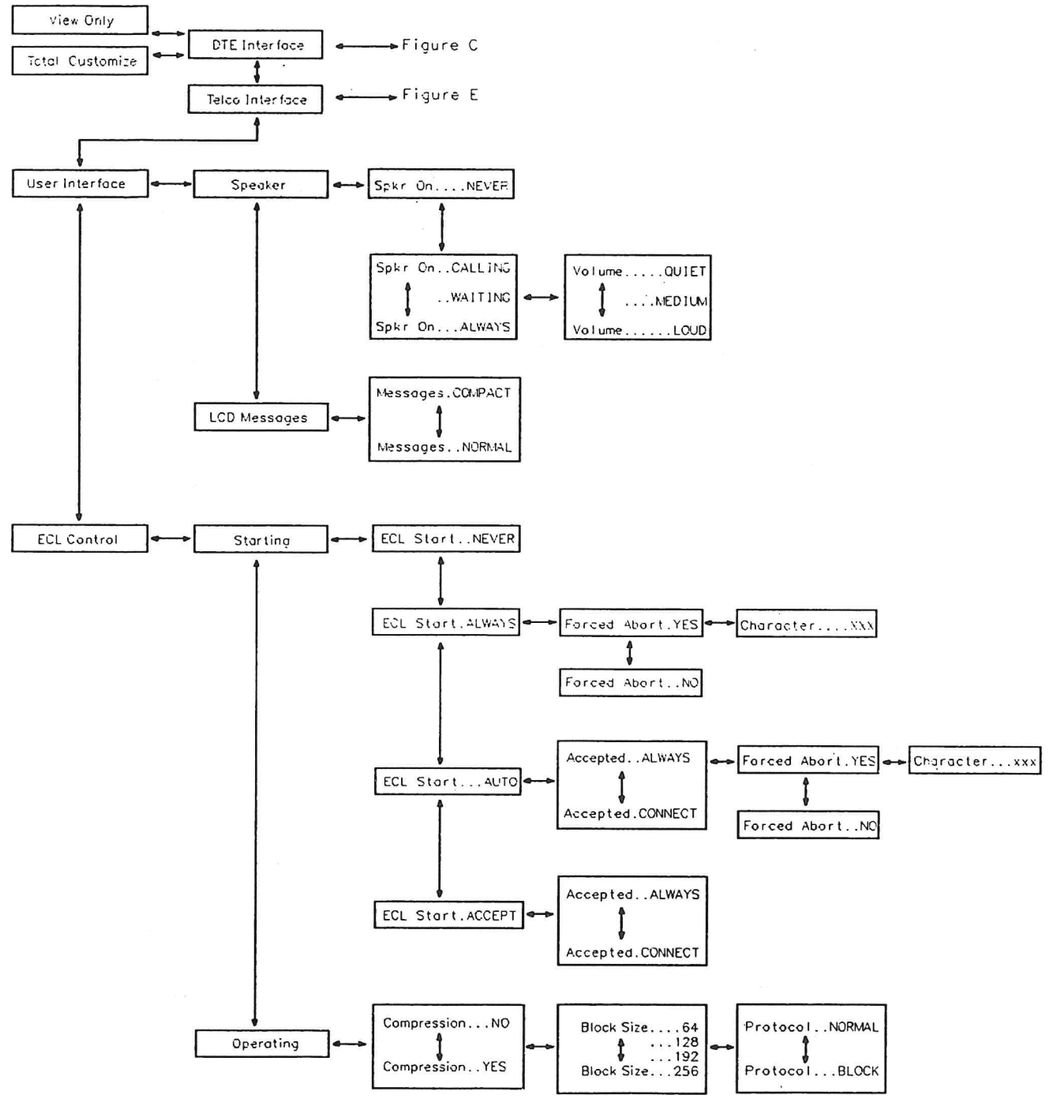
View Only
Total Customize
DTE Interface
Figure C
Telco Interface
Figure E
User Interface
Speaker
Spkr On....NEVER
Spkr On..CALLING
..WAITING
Spkr On...ALWAYS
Volume.....QUIET
....MEDIUM
Volume.....LOUD
LCD Messages
Messages.COMPACT
Messages..NORMAL
ECL Control
Starting
ECL Start..NEVER
ECL Start.ALWAYS
Forced Abort.YES
Character....XXX
Forced Abort..NO
ECL Start...AUTO
Accepted..ALWAYS
Accepted.CONNECT
Forced Abort.YES
Character...xxx
Forced Abort..NO
ECL Start.ACCEPT
Accepted..ALWAYS
Accepted.CONNECT
Operating
Compression...NO
Compression..YES
Block Size....64
...128
...192
Block Size...256
Protocol..NORMAL
Protocol...BLOCK

Figure B

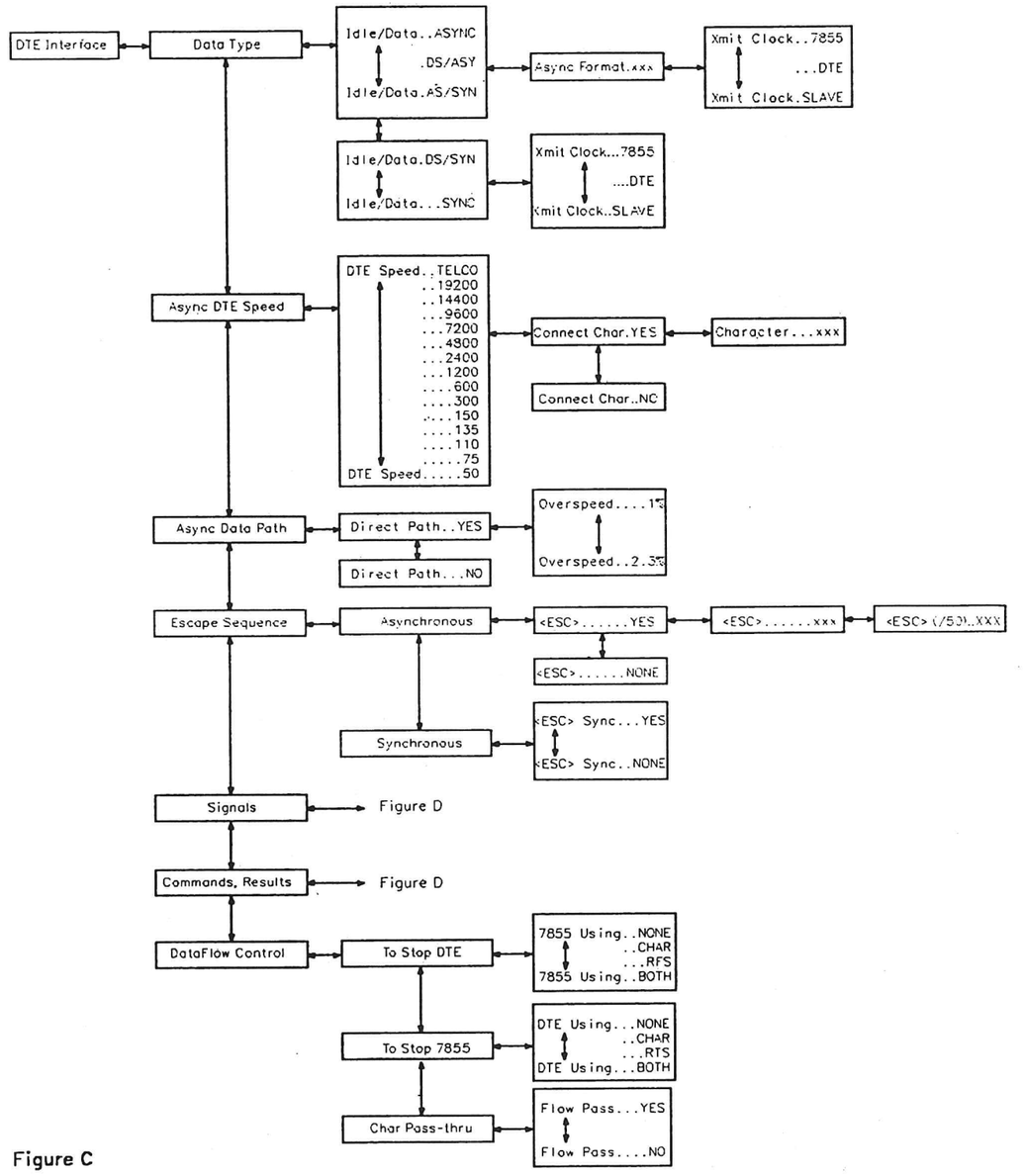
DTE Interface
Data Type
Idle/Data..ASYNC
.DS/ASY
Idle/Data.AS/SYN
Async Format.xxx
Xmit Clock..7855
...DTE
Xmit Clock.SLAVE
Idle/Data.DS/SYN
Idle/Data...SYNC
Xmit Clock...7855
....DTE
Xmit Clock..SLAVE
Async DTE Speed
DTE Speed..TELCO
..19200
..14400
...9600
...7200
...4800
...2400
...1200
....600
....300
....150
....135
....110
.....75
DTE Speed.....50
Connect Char.YES
Character...xxx
Connect Char..NO
Async Data Path
Direct Path..YES
Direct Path...NO
Overspeed....1%
Overspeed..2.3%
Escape Sequence
Asynchronous
<ESC>.....YES
<ESC>.....xxx
<ESC>.....XXX
<ESC>.....NONE
Synchronous
<ESC> Sync...YES
<ESC> Sync..NONE
Signals
Figure D
Commands, Results
Figure D
DataFlow Control
To Stop DTE
7855 Using..NONE
..CHAR
...RFS
7855 Using..BOTH
To Stop 7855
DTE Using...NONE
..CHAR
...RTS
DTE Using...BOTH
Char Pass-thru
Flow Pass...YES
Flow Pass....NO

Figure C

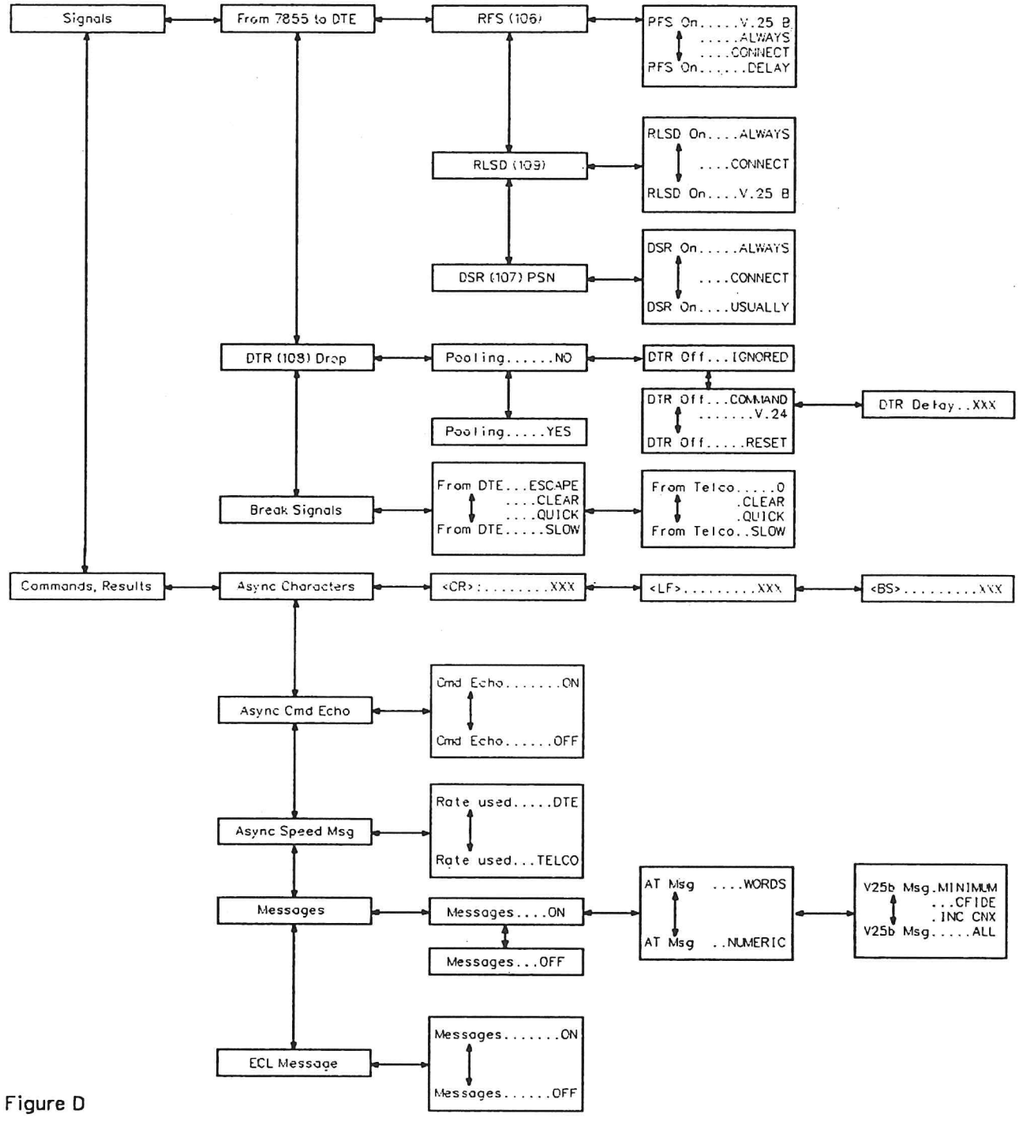
Signals
From 7855 to DTE
RFS (106)
PFS On.....V.25 B
.....ALWAYS
....CONNECT
PFS On.....DELAY
RLSD (109)
RLSD On....ALWAYS
....CONNECT
RLSD On....V.25 B
DSR (107) PSN
DSR On.....ALWAYS
....CONNECT
DSR On....USUALLY
DTR (108) Drop
Pooling.....NO
DTR Off...IGNORED
DTR Off...COMMAND
.....V.24
DTR Off.....RESET
DTR Delay..XXX
Pooling.....YES
Break Signals
From DTE...ESCAPE
....CLEAR
....QUICK
From DTE.....SLOW
From Telco.....0
.CLEAR
.QUICK
From Telco..SLOW
Commands, Results
Async Characters
<CR>:.....XXX
<LF>.....XXX
<BS>.....XXX
Async Cmd Echo
Cmd Echo.....ON
Cmd Echo.....OFF
Async Speed Msg
Rate used.....DTE
Rate used...TELCO
Messages
Messages....ON
AT Msg ....WORDS
AT Msg ..NUMERIC
V25b Msg.MINIMUM
...CFIDE
.INC CNX
V25b Msg.....ALL
Messages...OFF
ECL Message
Messages.....ON
Messages.....OFF

Figure D

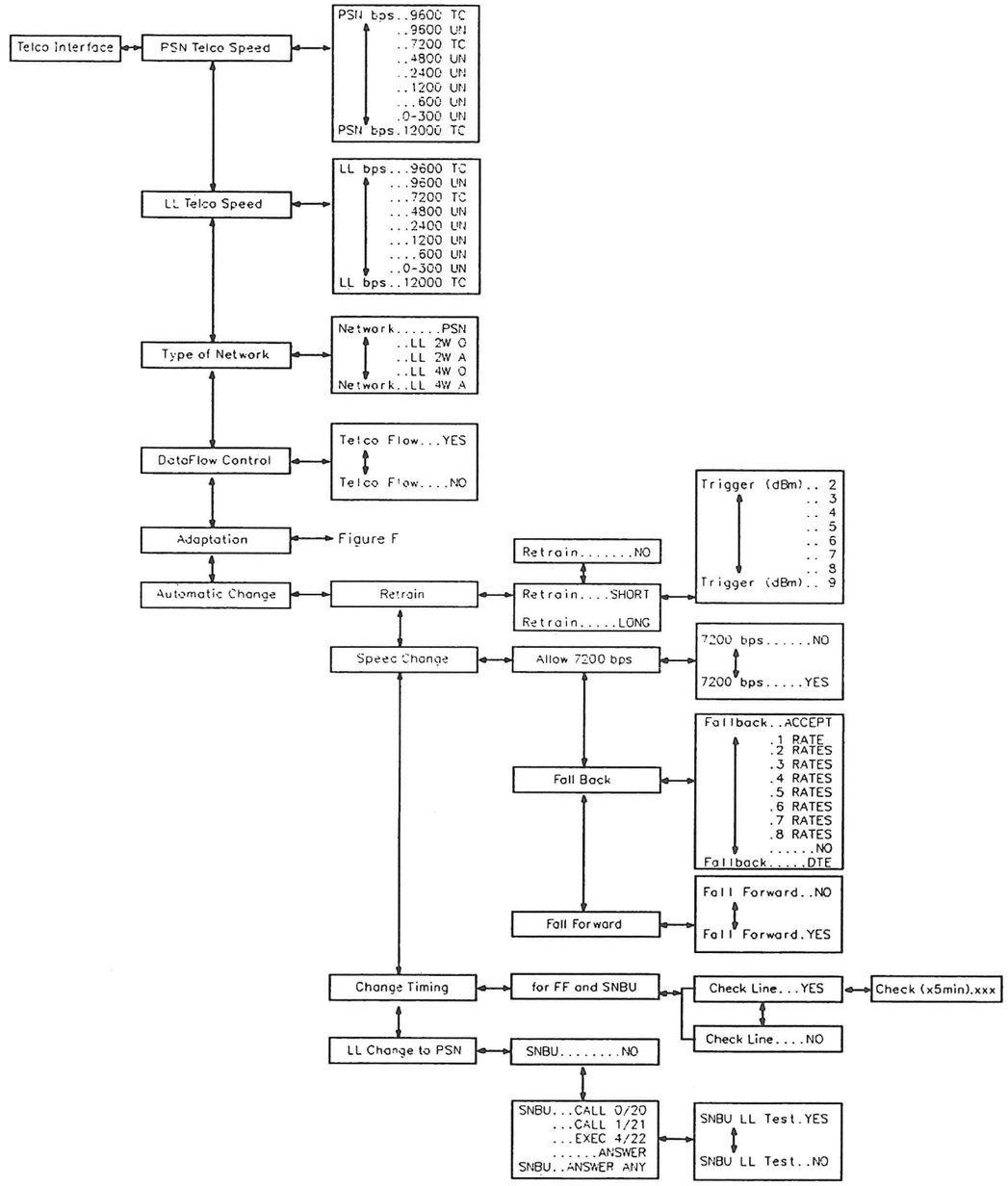
Telco Interface
PSN Telco Speed
PSN bps..9600 TC
..9600 UN
..7200 TC
..4800 UN
..2400 UN
..1200 UN
...600 UN
.0-300 UN
PSN bps.12000 TC
LL Telco Speed
LL bps...9600 TC
...9600 UN
...7200 TC
...4800 UN
...2400 UN
...1200 UN
....600 UN
..0-300 UN
LL bps..12000 TC
Type of Network
Network.....PSN
..LL 2W O
..LL 2W A
..LL 4W O
Network..LL 4W A
DataFlow Control
Telco Flow...YES
Telco Flow....NO
Adaptation
Figure F
Automatic Change
Retrain
Retrain.....NO
Retrain....SHORT
Retrain.....LONG
Trigger (dBm).. 2
.. 3
.. 4
.. 5
.. 6
.. 7
.. 8
Trigger (dBm).. 9
Speed Change
Allow 7200 bps
7200 bps.....NO
7200 bps.....YES
Fall Back
Fallback..ACCEPT
.1 RATE
.2 RATES
.3 RATES
.4 RATES
.5 RATES
.6 RATES
.7 RATES
.8 RATES
.....NO
Fallback.....DTE
Fall Forward
Fall Forward..NO
Fall Forward.YES
Change Timing
for FF and SNBU
Check Line...YES
Check (x5min).xxx
Check Line....NO
LL Change to PSN
SNBU.....NO
SNBU...CALL 0/20
...CALL 1/21
...EXEC 4/22
.....ANSWER
SNBU..ANSWER ANY
SNBU LL Test.YES
SNBU LL Test..NO

Figure E

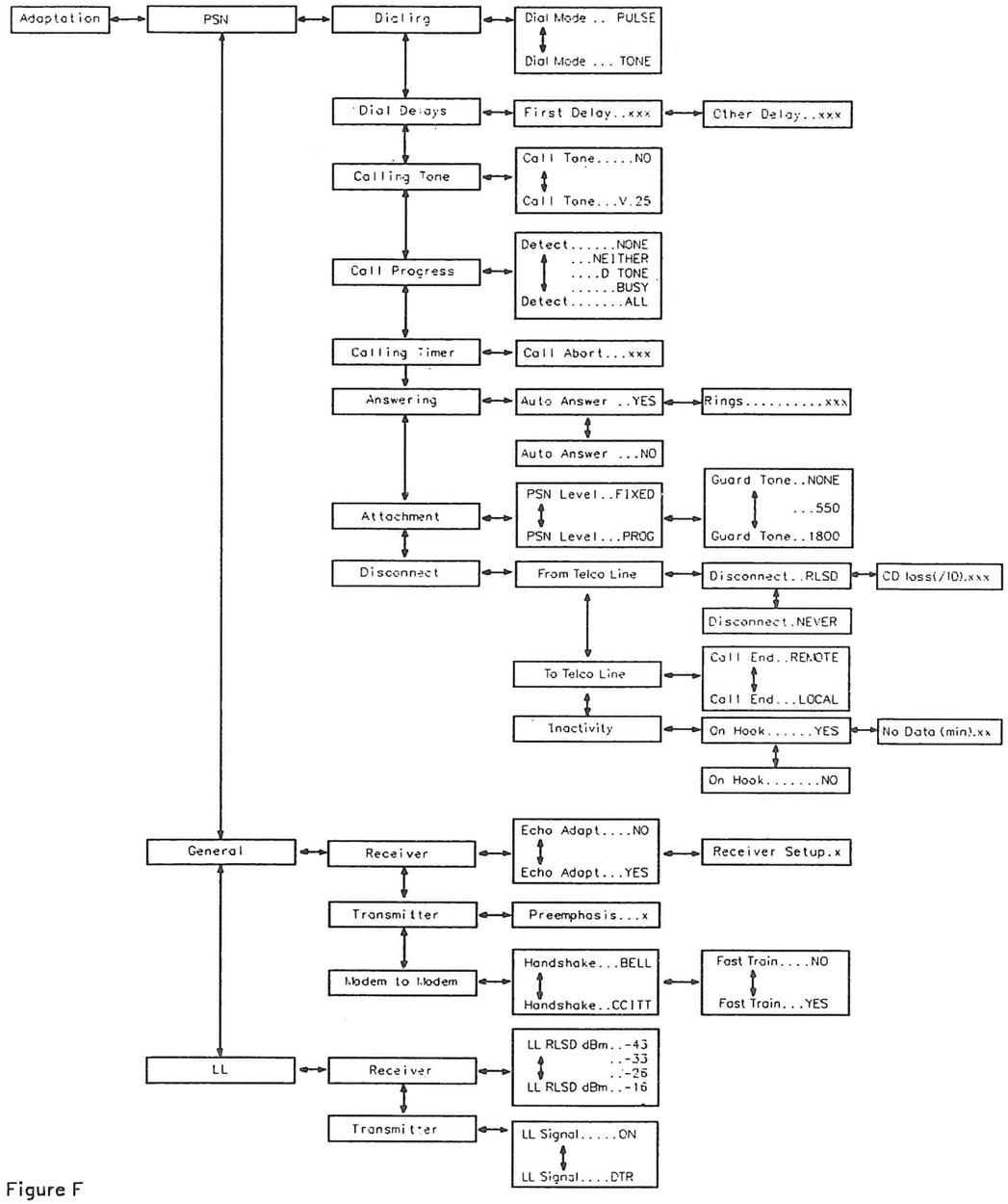
Adaptation
PSN
Dialing
Dial Mode .. PULSE
Dial Mode ... TONE
Dial Delays
First Delay..xxx
Other Delay..xxx
Calling Tone
Call Tone.....NO
Call Tone...V.25
Call Progress
Detect.....NONE
...NEITHER
....D TONE
.....BUSY
Detect.....ALL
Calling Timer
Call Abort...xxx
Answering
Auto Answer ..YES
Rings.....xxx
Auto Answer ...NO
Attachment
PSN Level..FIXED
PSN Level...PROG
Guard Tone..NONE
...550
Guard Tone..1800
Disconnect
From Telco Line
Disconnect..RLSD
CD loss(/10).xxx
Disconnect.NEVER
To Telco Line
Call End..REMOTE
Call End...LOCAL
Inactivity
On Hook.....YES
No Data (min).xx
On Hook.....NO
General
Receiver
Echo Adapt....NO
Echo Adapt...YES
Receiver Setup.x
Transmitter
Preemphasis...x
Modem to Modem
Handshake...BELL
Handshake..CCITT
Fast Train....NO
Fast Train...YES
LL
Receiver
LL RLSD dBm..-43
..-33
..-26
LL RLSD dBm..-16
Transmitter
LL Signal.....ON
LL Signal....DTR

Figure F

7855 Modem Model 10
Guide to Operation
Order No. GA33-0160-1

READER'S COMMENT FORM

We would greatly appreciate your comments about this manual.

Was this manual easy to read and understand?

Did you find the information you required?

Could you follow the instructions?

Was there anything missing?

All suggestions will be considered for the next edition of this manual. Thank you for taking the time and trouble to fill out this form.

If you would like a reply, please give details overleaf.

Note: Staples can cause problems with automated mail sorting equipment.
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GA33-0160-1

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COMMONLY USED PROCEDURES

TABLE OF CONTENTS

INSTALL SOFTWARE USING BOOTABLE BACKUP

==========

1) Power system on with key in Secure Mode. When LED is at 200 press the button to open the tape drive.

2) Insert TAPE in Tape drive.

3) TURN KEY to SERVICE MODE and the sytem will begin to access the tape drive and circulate through LED's.

   o Type 1 to activate terminal. You will be prompt'ed.

4) When Installation menu comes up select 3 to check the configuration. Should look something like below:

   United States English
   United States English
   /dev/tty0
   Tape: /dev/rmt0
   00-08-00-00 or 00-07-00-00
   00-08-00-00 and/or 00-07-00-00
   Correct Date

5) Press 0 to get back to Installation and Maintenance Menu

6) Select 1 to INSTALL AIX with Current Settings and Continue.(1/2 hour to load)

7) When complete turn key to NORMAL mode and press ENTER to reboot machine.

CREATING A BOOTABLE BACKUP

==========

EDIT FILES

1)The method for creating a tape which you can use to IPL a system is very similar to that for diskettes. There is one change that will need to be made to a file for this to function properly. Before starting the process to create an IPL'able tape, add the following lines to the file /usr/lpp/bosinst/tape2:

```
./etc/drivers/scdisk
./etc/drivers/scdiskpin
./etc/drivers/badisk
./etc/drivers/badiskpin
./etc/methods/cfgscdisk
./etc/methods/cfgbadisk
```

2)You will also need to change one of the startup scripts.
Edit the file /usr/lpp/bosinst/diskette/startup2.
There is a line in that file which needs to be commented out. The line reads:

```
rm -f /usr/bin/odmdelete
```

3)Copy /lib/libc.a to /tmp/libc.a

```
# cp /lib/libc.a /tmp/libc.a
```

(continued)

MAKING THE TAPE

Note: rmtx is used for the tape device. Substitute the appropriate number for the x.

1)Login as root.

2)The file .fs.size is used by the installation process to determine how big the logical volumes in rootvg needs to be for the installation.

Run the following command to create a .fs.size file with the current sizes of the filesystems in the rootvg volume group. If you don't do this step, then the original system defaults will be used and the installation may fail due to inadequate space. The file .fs.size will be placed in /:

```
# mkszfile
```

3)Copy the .fs.size you created in step 2 to the proper directory:

```
# cp /.fs.size /usr/lpp/bosinst/diskette/.fs.size
```

4)Either via SMIT or by using the chdev command, change the attributes of the tape drive to be block size of 512, ECC turned off, and no retention on close

```
# chdev -l rmtx -a "block_size=512"
```

(continued)

5)Run the following commands to create a BOSBOOT tape (A tape must be in the drive to run these commands):

```
# bosboot -m -p /usr/bin/tape.proto -d /dev/rmtx \
> -f /usr/bin/tape.fs -b /usr/bin/tape.image

# dd if=/usr/bin/tape.image of=/dev/rmtx.5 bs=512 conv=sync
```

6)Run the following commands to create an INSTALLATION/MAINTENANCE image on tape (A tape must be in the drive):

```
# ksh

# /usr/lpp/bosinst/diskette/mkinstdskt /usr/bin/bosinst.image

# exit

# dd if=/usr/bin/bosinst.image of=/dev/rmtx.5 bs=512 conv=sync
```

7)Run the following command to put the bootrec image on tape:

```
# dd if=/bootrec of=/dev/rmtx.5 bs=512 conv=sync
```

8)Run the following command to create a backup of the root volume group (rootvg) image and place it on tape following the IPL images.

```
# mkszfile && mksysb /dev/rmtx.4
```

(continued)

When you IPL off of the tape, make sure you choose the appropriate console device. Do not leave the selection as /dev/console. This is under option 3 of the Installation/Maintenance Menu.

One final note on the ".fs.size" file. The algorithm that is used by the installation process may change the sizes of the filesystems, depending on whether there is more than 300MB of disk space in the root volume group. If there is more than 300MB of disk space, then the installation process will add 50% to / , /usr, and /tmp and will add 9 partitions to /u. When running the mkszfile program to create a new ".fs.size" file, the first line in the file will be the word "imageinstall." By making the first line "imageinstall," the installation process will not adjust sizes of the file systems as stated in the ".fs.size" file.

BOOT RISC/6000 USING DISKETTES
==========

1) TURN KEY to SERVICE MODE.

2) Inset BOSBOOT Diskette in Disk Drive, turn POWER ON.
o System will read diskette until LED displays C07
o Type 1 to activate terminal. You will be prompt'ed.

3) Insert INSTALLATION/MAINT Diskette into Diskette Drive
o Drive will start to read diskette after it is inserted

4) When INSTALLATION/MAINT menu comes up select 5 to perform System Maintenance.

5) At prompt enter:
 # /etc/continue hdisk0

6) You are now in MAINTENANCE mode (Single User Mode)

BOOT RISC/6000 USING BOOTABLE TAPE
==========

1) TURN KEY to SECURE MODE. Power ON machine.

2) When LED shows 200, open tape drive and INSERT BOOTABLE tape. Turn KEY to SERVICE MODE.

o Type 1 to activate terminal. You will be prompt'ed.

3) When INSTALLATION/MAINT menu comes up select 5 to perform System Maintenance.

4) At prompt enter:
 # /etc/continue hdisk0

5) You are now in MAINTENANCE mode (Single User Mode)

CONFIGURE TTY FOR MODEM

Using the tool "smit" one can configure the tty1 port to answer to a modem. Here are the steps one would take.

TO ADD TTY PORT

1) login as root

2) start smit by typing:

smit devices

3) select tty on the "Devices" menu

4) select add tty on the "TTY" menu

5) When asked for Type select
tty RS232 Asyncronous Terminal

6) When asked for Parent Adapter select
sa1 Available 00-00-S2 Standard I/O Serial Port 2

7) Your should now be in the "Add a TTY" menu
Set the following features:
PORT number s2
Enable LOGIN enable
Baud rate 9600

Note: Use arrow keys to move around hit enter to save changes.
Check that messages that tty was added ok.

CONFIGURE TTY FOR DSU

Using the tool "smit" one can configure the tty2, tty3, tty4, tty5 ports to com municate with the dsu's.
Here are the steps one would take.

TO ADD TTY PORT

1) login as root

2) start smit by typing:

smit devices

3) select tty on the "Devices" menu

4) select add tty on the "TTY" menu

5) When asked for Type select
tty RS232 Asyncronous Terminal

6) When asked for Parent Adapter select
sa2 Available 00-02 8-Port Asynchronous Adapter EIA-232

7) Your should now be in the "Add a TTY" menu
Set the following features:
PORT number 0
Note: Use arrow keys to move around hit enter to save changes.
Check that messages that tty was added ok.

(continued)

CONFIGURE TTY FOR DSU (continued)

8) Repeat 1-7 above for PORT 2, PORT 4, PORT 6

9) Hit PF3 a few times until you get to the "TTY" menu
Select List All Defined TTYs, you should get the following results:

COMMAND STATUS

Command: OK stdout: yes stderr: no

Before command completion, additional instructions may appear below.

name status location description

tty0 Available 00-00-S1-00 Asynchronous Terminal
tty1 Available 00-00-S2-00 Asynchronous Terminal
tty2 Available 00-02-01-00 Asynchronous Terminal
tty3 Available 00-02-01-02 Asynchronous Terminal
tty4 Available 00-02-01-04 Asynchronous Terminal
tty5 Available 00-02-01-06 Asynchronous Terminal

CHANGE/SHOW CHARACTERISTICS of a TTY

1) Login as root

2) Start smit by typing:

smit devices

3) Select tty on the "Devices" menu

4) Select Change/Show Characteristics of a TTY on the "TTY" menu

5) Select tty1 to change/show the configuration of the tty connected to the modem.

6) Verify/Change the settings

HOW TO TEST DSU TTYs
==========

To verify the ttys you will be instructing a program to go read the serial number of the dsu attached to it. It may help you to draw a map of the tty-8port-dsu connection. The program should not just return any serial number, but the serial number of the dsu that should be connected to that port on the 8-port card.

tty2 (port 00)
----
t3sn /dev/tty2

tty3 (port 02)
----
t3sn /dev/tty3

tty4 (port 04)
----
t3sn /dev/tty4

tty5 (port 06)
----
t3sn /dev/tty5

SETUP OF IBM 7855-10 MODEM FOR RISC

The default factory configuration of the modem after power-up self-check is synchronous 9600 baud. The first step is to load the 9600 baud asynchronous AT menu (AT refers to the industry (almost) standard control character set for modems, not the one-time IBM product)). You can follow the procedure below by tracing the tree structure which begins on page 6-7 of the Guide to Operation (GA33-0160-0).

The steps for doing this are:

--Turn power on, wait for self-test to settle.
--Press both right and left arrow buttons on front panel simultaneously to display: <Exit Enter>.
--press right arrow button. Display reads: View Only
--press down arrow button to display: First Setup
--press down arrow button to display: First Setup
--press right arrow button to display: Synchronous
--press down arrow button multiple times till display reads: Asynchronous AT
--press left arrow button multiple times to save into Profile 0 and exit menu.

Now we still must change the following from the standard configuration:

E0	- Disable Command State Echo
&C1	- Track presence of data carrier
Q1	- Modem does not return result codes
&D3	- reset when an on-to-off transition of DTR occurs

(continued)

The steps for doing this are:

--Press both right and left arrow buttons on front panel
simultaneously to display: <Exit Enter>.
--press right arrow button. Display reads: View Only
--press down arrow button three times to display: Total Customize
--press right arrow button twice to display: Data Type
--press down arrow button 4 times to display: Signals
--press right arrow button twice to display: RFS (106)
--press down arrow button to display RLSD (109)
--press right arrow button
--press down arrow button till display reads: RLSD On..CONNECT
--press left arrow button twice to display: From 7855 to DTE
--press down arrow button multiple times
till display reads: DTR (108) Drop
--press right arrow button twice
--press down arrow button multiple times till display
reads DTR Off...Reset
--press left arrow button three times to display: Signals
--press down arrow button to display Commands,Results
--press right arrow button to display: Async Characters
--press down arrow button multiple times till display
reads: Async Cmd Echo
--press right arrow button
--press down arrow button till display reads: Cmd Echo.....Off
--press left arrow button multiple times to save into Profile 0
and exit menu.

This ends the modem set-up... for the RS/6000

Front Panel:

ASYN7E A 9600 a

oONH lights

SETUP OF IBM 7855-10 MODEM FOR CISCO

The default factory configuration of the modem after power-up self-check is synchronous 9600 baud. The first step is to load the 9600 baud asynchronous AT menu (AT refers to the industry (almost) standard control character set for modems, not the one-time IBM product)). You can follow the procedure below by tracing the tree structure which begins on page 6-7 of the Guide to Operation (GA33-0160-0).

The steps for doing this are:

--Turn power on, wait for self-test to settle.
--Press both right and left arrow buttons on front panel simultaneously to display: <Exit Enter>.
--press right arrow button. Display reads: View Only
--press down arrow button to display: First Setup
--press down arrow button to display: First Setup
--press right arrow button to display: Synchronous
--press down arrow button multiple times till display reads: Asynchronous AT
--press left arrow button multiple times to save into Profile 0 and exit menu.

Next:

--Press both right and left arrow buttons on front panel simultaneously to display: <Exit Enter>.
--press right arrow button. Display reads: View Only
--press down arrow button three times to display: Total Customize
--press right arrow button twice to display: Data Type
--press down arrow to display: Async Data Path
--press right arrow once
--press down arrow to display: Direct Path....YES

(continued)

SETUP OF IBM 7855-10 MODEM FOR CISCO (continued)

--press left arrow once
--press down arrow button to display: Signals
--press right arrow button twice to display: RFS (106)
--press right arrow once
--press down arrow to display: RFS on...ALWAYS
--press left arrow once
--press down arrow button to display RLSD (109)
--press right arrow button
--press down arrow button till display reads: RLSD On..ALWAYS
--press left arrow once
--press down arrow to display: DSR (107) PSN
--press right arrow once
--press down arrow to display: DSR On....ALWAYS
--press left arrow button twice to display: From 7855 to DTE
--press down arrow button multiple times
till display reads: DTR (108) Drop
--press right arrow button twice
--press down arrow button multiple times till display
reads DTR Off...Ignored
--press left arrow button three times to display: Signals
--press down arrow button to display Commands,Results
--press right arrow button to display: Async Characters
--press down arrow button multiple times till display
reads: Async Cmd Echo
--press right arrow button
--press down arrow button till display reads: Cmd Echo.....Off
--press left arrow multiple time to display: Async Cmd Echo
--press down arrow to display: Messages
--press right arrow once
--press down arrow to display: Messages.. OFF
--press left arrow to display Total Customize
--press right arrow until it stops
--press down arrow to display: XMIT clock..DTE
--press left arrow button multiple times to save into Profile 0
and exit menu.

This ends the modem set-up...for the CISCO.

Front Panel:
ASYN7EdA 9600 a
oONH oDTR oRFS lights
(DTR could be on or off)