

• TTY
• Communications
• Software Library Manual



Texas Instruments Professional Computer

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TTY Communications
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Preface

The *TTY Communications* manual describes how to use your Texas Instruments Professional Computer to communicate with another computer using TTY protocol. Although this manual is written for someone who has never used a computer to communicate with another computer, you need to read the *Texas Instruments Professional Computer Operating Instructions*. A novice can bring together all the necessary equipment, connect it, and run a sample session with this manual. An experienced TTY user can also find it useful.

Chapter 1 introduces you to TTY communications. It describes how communications in general works and specifically how TTY works. It also lists all the equipment you need to communicate using TTY protocol.

Chapter 2 helps you get your computer ready to communicate.

Chapter 3 describes the various parameters you must set before you conduct a TTY session.

Chapter 4 describes the various commands you use to send and receive information during a TTY session.

Chapter 5 guides you through a sample TTY session, listing all the necessary steps from plugging in the computer to ending the session.

Appendix A describes, in depth, how the TTY protocol works. This appendix is intended for the communications professional who needs to know how the Texas Instruments Professional Computer uses the TTY protocol.

Appendix B lists error messages you may receive during a TTY session, and gives you information you need to correct the error.

Appendix C is a quick reference guide for the parameters used in TTY. The alphabetical listing describes each parameter in depth.

Appendix D contains instructions on using the Texas Instruments Internal Modem.

Appendix E lists the mnemonics for the control characters.

Appendix F deals with modem considerations.

Appendix G contains the international to national character cross reference tables.

The glossary defines many of the technical terms used in this manual.

The index helps you find information quickly.

Other publications that you may need when you use this manual are as follows.

- *Texas Instruments Professional Computer Operating Instructions* (TI Part No. 2238421-0001)
- *MS™-DOS Operating System* manual (TI Part No. 2238442-0001)
- *Synchronous-Asynchronous Communications Board* option manual (TI Part No. 2223206-0001)
- *Internal Modem* option manual (TI Part No. 2223256-0001)

If anything is unclear in this manual, or if you have problems with your computer, please jot the problems down on one of the Product Comment Sheets and send it to us.

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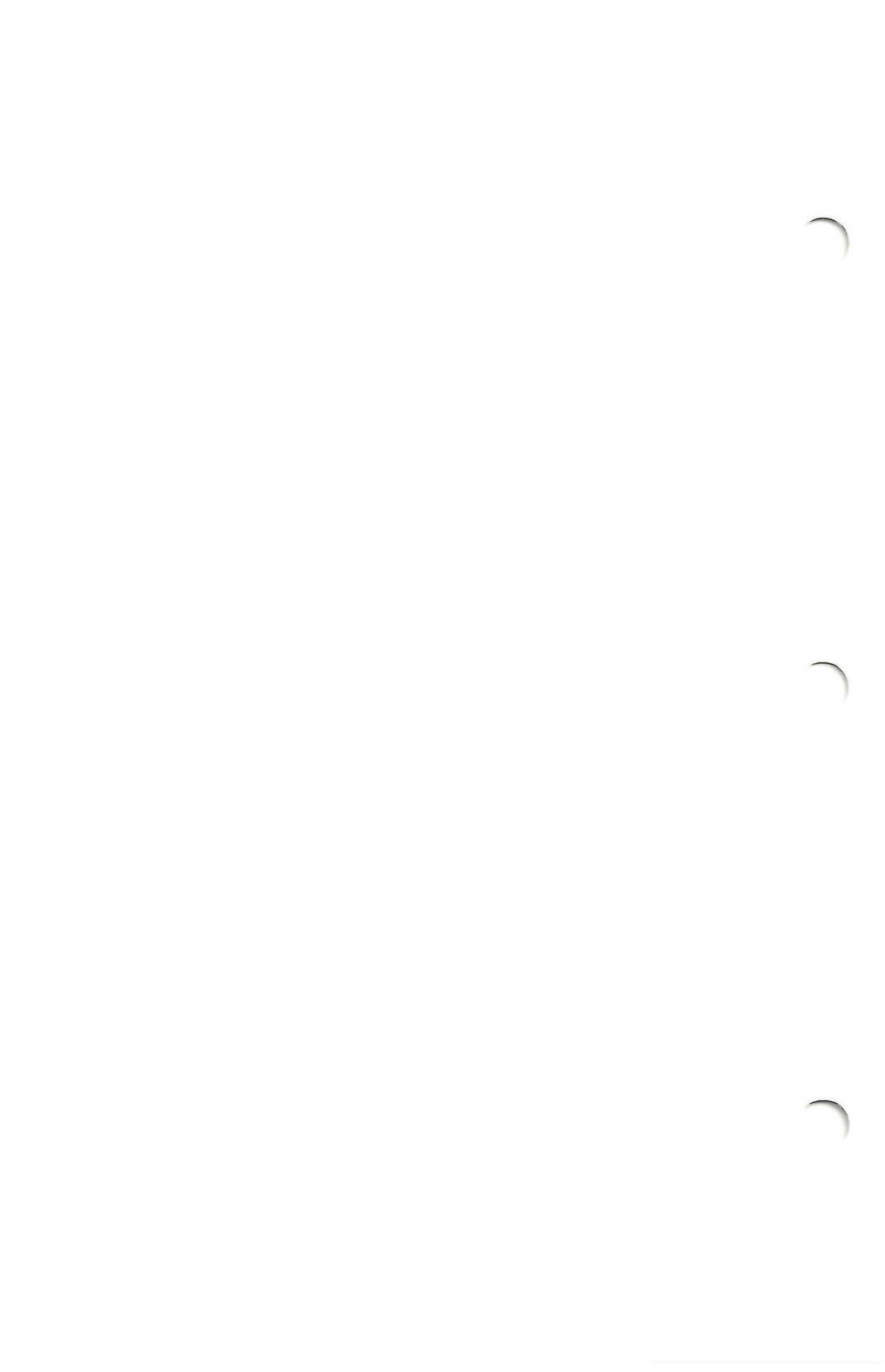
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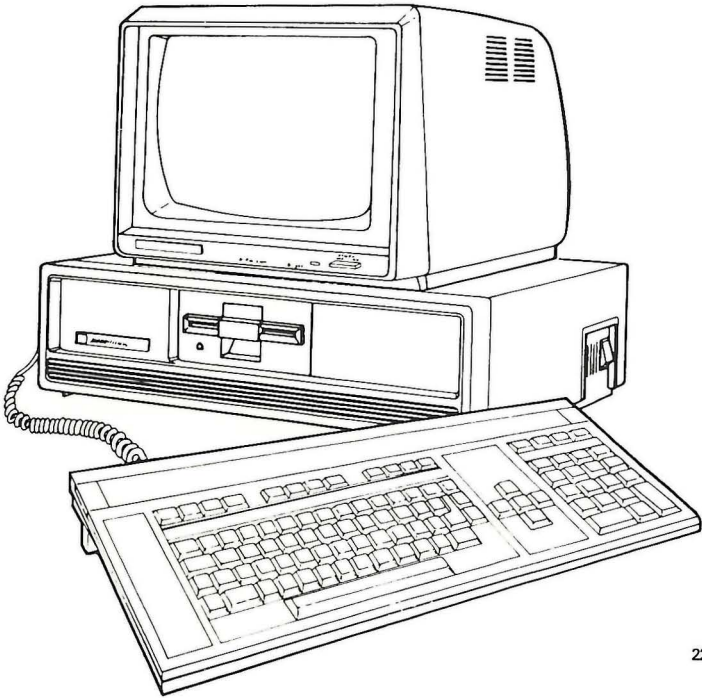
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WHAT IS “COMMUNICATIONS”?

The Texas Instruments Professional Computer functions as an independent computer. You can enter, store, process, and display data without using another computer. However, you may want to connect your Texas Instruments Professional Computer, shown in the following figure, to another computer to send or receive data. This transfer of information between computers is called data communications.



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How Data Communications Works

If you want to communicate with someone, the two of you must agree on some aspects of communication before you start. First, you must agree to speak a language that you both understand. Second, you must speak at the proper time because you want to speak only when the other person listens. Third, you must arrange for the method of communication: in person, by telephone, or by letter.

In data communications, you face these same issues when you want two computers to communicate. They must speak a common "language," speak and listen at the proper time, and communicate with the proper equipment. In data communications, languages called communications protocols deal with these issues.

How TTY Communications Works

TTY (Teletypewriter) is one of many different protocols. Protocols are generally divided into two types: synchronous and asynchronous.

In synchronous protocols, data is sent in large blocks. You can place the data in queues, so that the communications line will not be idle very long. Because data can be sent in large blocks and in rapid succession, a synchronous protocol is very efficient. Synchronous protocols are best suited for applications needing to send (and receive) a lot of information on a regular basis.

An asynchronous protocol, such as TTY, sends the data one character at a time. TTY cannot place data into queues. TTY is best suited for applications that require relatively small amounts of information and at irregular intervals. TTY is suited for applications that require the two computer operators to interact.

What TTY Does

The TTY communications software has the following features.

- Sends or receives data in most standard speeds up to 9600 bits per second. That is about 44 double-spaced typewritten pages of text per minute.
- Operates under manual or remote control, so your computer can communicate with or without your presence.
- Restarts from abnormal communication line conditions automatically, so an unattended computer can reattempt an interrupted session.
- Provides automatic telephone calling or answering, if you have a Texas Instruments internal modem.
- Features programmable keys, which save time by reducing lengthy character sequences to short key-strokes.

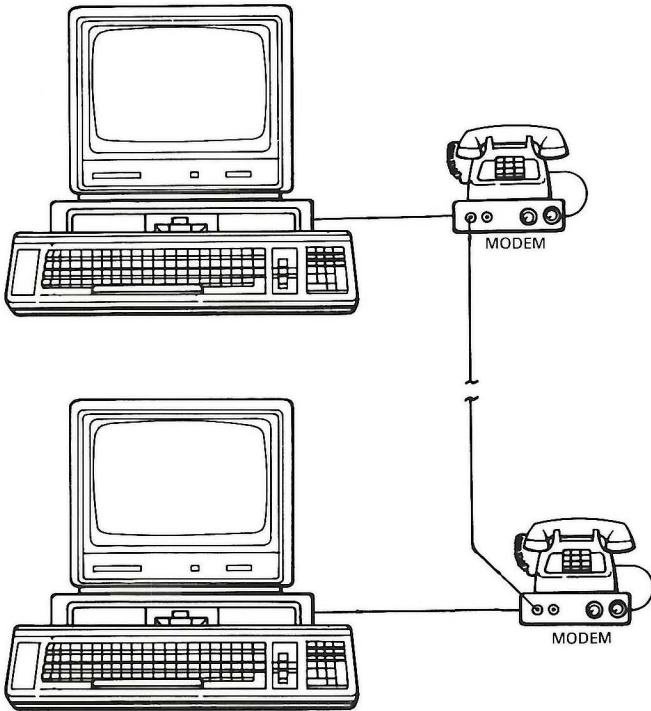
NECESSARY EQUIPMENT

To communicate using TTY, you need the following equipment. Chapter 2 describes each piece of equipment and shows you how to find out if each piece is installed.

- Texas Instruments Professional Computer, equipped with at least one diskette drive
- MS-DOS diskette (in *MS-DOS Operating System* manual)
- Diagnostic diskette (in *Texas Instruments Professional Computer Operating Instructions*), so you can determine if you have the necessary options

-
- TTY communications diskette
 - Expansion random-access memory (RAM) board - 64K bytes
 - Synchronous-asynchronous communications board (sync-async comm board) or Texas Instruments internal modem
 - Communication link, which consists of the following.
 - Communication lines
 - Modems (optional)
 - Telephones (optional)
 - Communication cables

The following figure shows a typical arrangement of this communications equipment.



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INTERNATIONAL ENVIRONMENT

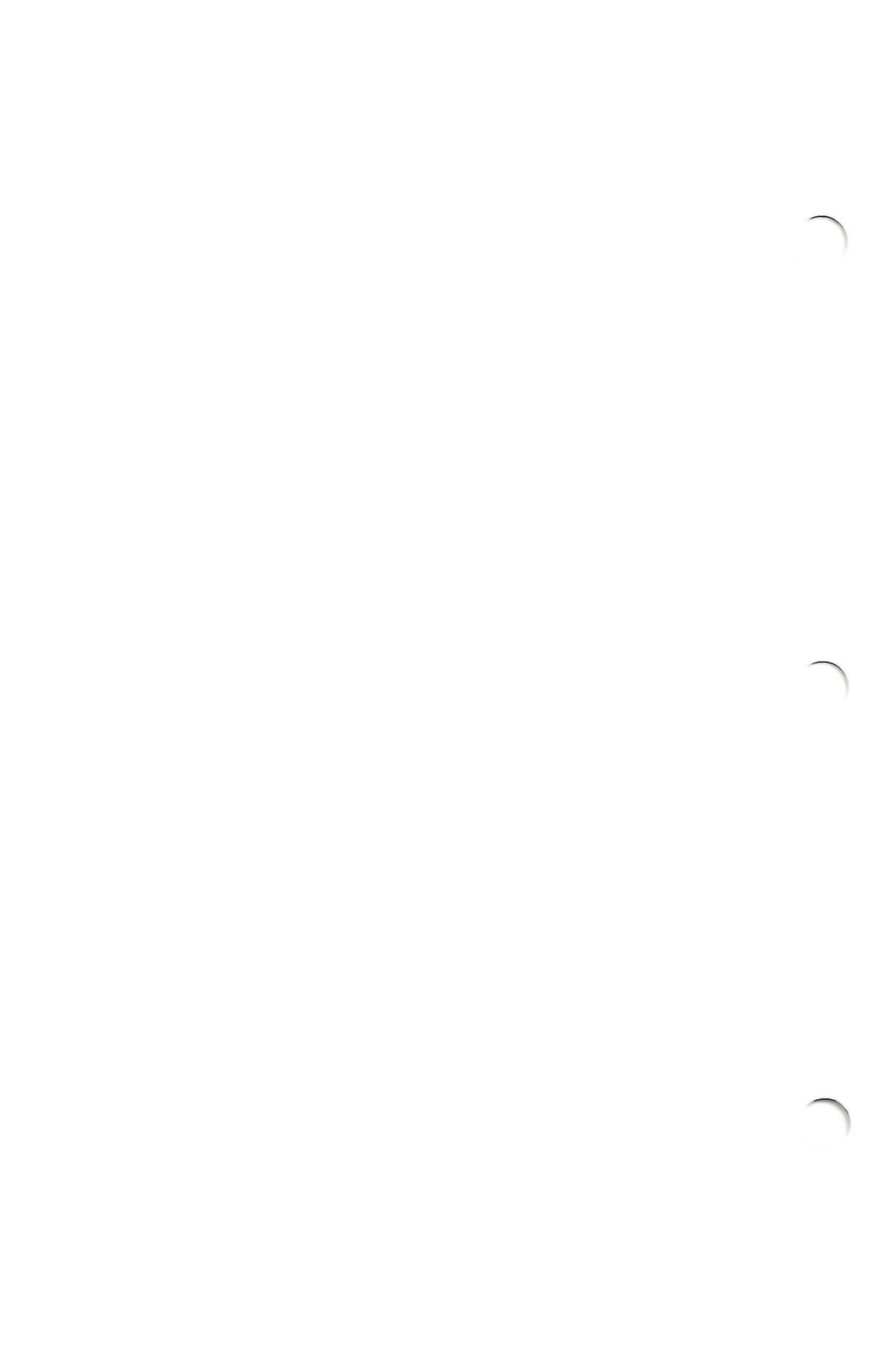
The modems, which can be used with your computer, will vary depending on the country. For example, direct connect modems are not allowed in certain countries.

- External Bell modems (Bell 103, Bell 212) can only be used in the USA and Canada.
- In European countries, Comite Consultatif International de Telegraphique et Telephonique (CCITT) compatible modems must be used. For example:
 - CCITT V.21, 300 bps, full-duplex
 - CCITT V.22, 1200 bps, full-duplex
- Texas Instruments internal modems may not be approved by the Telecommunications Regulatory Agency of your particular country. Appendix D contains more details on internal modems and their restrictions.

Appendix F contains more information on available modems.

Getting Ready

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INTRODUCTION

This chapter gives you a step-by-step procedure to get your computer ready to communicate in TTY protocol. Because you may have already completed some of these steps when you set up your computer, it may not be necessary to perform the whole procedure. To find out where to start, answer the questions below.

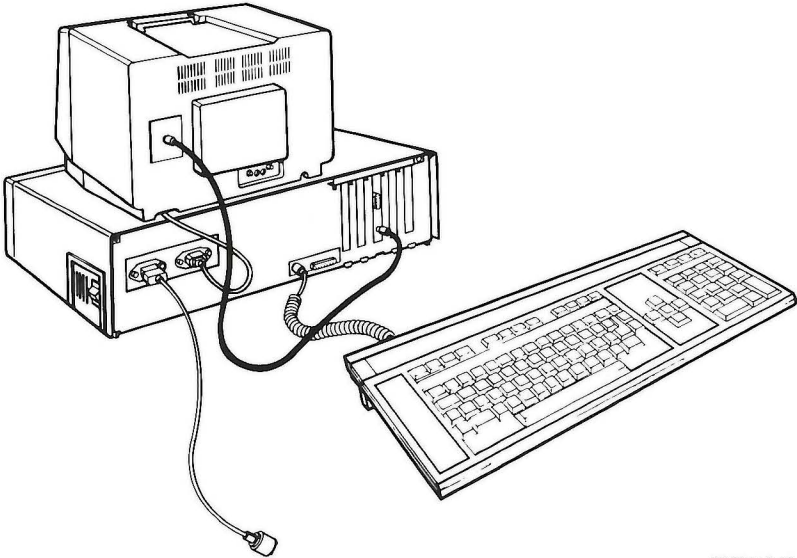
1. Are the country specific keyboard and the display unit connected to the system unit? If they aren't, start at the section entitled "Assembling the Equipment" in this chapter.
2. Do you know if you have all the necessary equipment and options? If you don't, start at the section entitled "Determining the Configuration" in this chapter.
3. Do you know what type of communication link you have? Are all the communications cables attached? If not, start at the section entitled "Attaching the Cables" in this chapter.
4. Have you turned on the system, loaded MS-DOS, and loaded the communications diskette? If you haven't done all of these, start at the section entitled "Loading the Software" in this chapter.
5. Do you know the names of the files you want to send or receive during the session? If not, start at the section entitled "Preparing Files" in this chapter.

If you answered "yes" to all of these questions, skip to Chapter 3.

If at any time the equipment doesn't do what this manual says it should, consult the list of error codes in Appendix B. If the information there doesn't help you, consult the *Texas Instruments Professional Computer Operating Instructions*. Then, if necessary, call a Texas Instruments Authorized Dealer.

ASSEMBLING THE EQUIPMENT

Make sure your equipment is properly cabled, as shown in the following figure. If it isn't, refer to Chapter 2 in the *Texas Instruments Professional Computer Operating Instructions* to find out how to set up your computer.



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DETERMINING THE CONFIGURATION

Determining the system configuration involves finding out what options are installed in your computer. You need the following information about your computer before you can begin communicating with another computer.

- Is a sync-async comm board installed in the system unit?
- Is a Texas Instruments internal modem installed in the system unit?

-
- What is the port number of your sync-async comm board or internal modem? (We explain port numbers later in this chapter.)
 - Is an expansion RAM board installed in the system unit?

To obtain this information, follow the procedure below. This procedure requires the diagnostics diskette, which is included with the *Texas Instruments Professional Computer Operating Instructions*. The diagnostics diskette contains software that lists the installed options and locates malfunctions in your computer.

1. Insert the diagnostics diskette into diskette drive A (the drive on the left). Close the diskette-drive door.
2. Place the system unit **ON/OFF** switch in the **ON** position. Wait 10 to 35 seconds until the main diagnostics menu appears on the display, as shown below.

```
Texas Instruments Professional Computer DIAGNOSTICS
Version 1.45 (C) Copyright Texas Instruments, Inc. 1983
```

```
Overall Unit Test           Yes    No
Memory Test                 Yes    No
CRT Test                    Yes    No
CRT Graphics Test          Yes    No
Parallel Printer Test       Yes    No
Keyboard Test               Yes    No
Diskette Verify Test        Yes    No
Diskette Read/Write test    Yes    No
Communication Port(s) Test  Yes    No
Winchester Format/Surface Analysis test Yes    No
Winchester Checkout/Verify test Yes    No
Display System Configuration Yes    No
Print Test Results          Yes    No
```

```
Select appropriate test(s) and press ENTER...
```

A computer menu is like a restaurant menu. Instead of offering you a choice of foods, however, it offers you a choice of functions your computer can perform at that time.

Different versions of the diagnostics (with different menus) exist. Therefore, your main diagnostic menu may be slightly different from the previous example. However, all the versions have the test you run next.

3. Select “No” for every test except the Display Configuration Test. To select either a “Yes” or “No” value, use the cursor-control keys (Left Arrow, Right Arrow, Up Arrow, and Down Arrow) to position the cursor over the value you want, and then press the **RETURN** key. When you have selected the Display System Configuration Test, press the **ENTER** key (on the numeric keypad).

NOTE

Throughout this manual, the word “press” means to momentarily push down a key and then release it. “Press and hold” means to push down a key and hold it down while performing some other stated action (similar to typing an uppercase character using the **SHIFT** key on a standard typewriter). Lastly, “type” means to type whatever we specify, letter by letter.

During the Display System Configuration Test, your computer scans itself to determine the amount of memory it has and what options are installed. Because your computer can have many different configurations (combinations of options), your display may differ from the following example.

Texas Instruments Professional Computer
System Configuration

ROMs installed :

V1.23 SYSROM (c) Copyright Texas Instruments Inc. 1983

RAM installed: 256 K bytes

OPTIONS installed:

Diskette drive 1, 2 side(s), 40 tracks

Diskette drive 2, 2 side(s), 40 tracks

300 bps Modem port 2

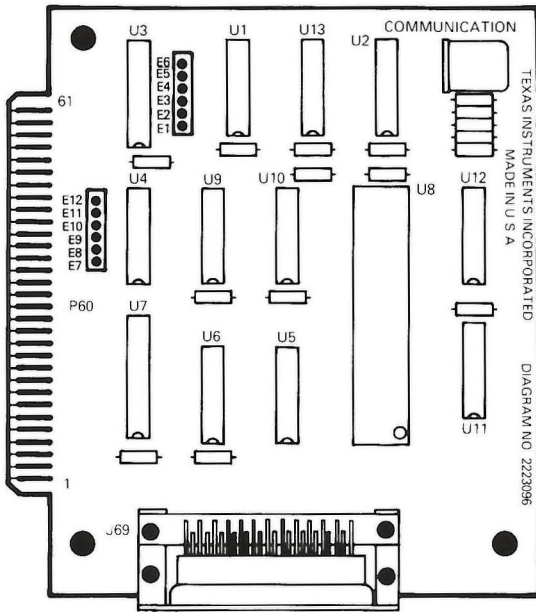
System Configuration Code - 0173400000

Press any key to return...

4. Check the list of options installed that appears on your display. Do you have a sync-async comm board or an internal modem board? A sync-async comm board appears on the display as Serial Communication Port. A port number (in this display a 1) also appears. An internal modem board appears on the display as "Modem Port," followed by a port number. Write down this number. It should be either a 1, 2, or 3. If it's a 4, the configuration of the board must be changed. Instructions for changing the configuration of this option are given in Chapter 2 of the *Synchronous-Asynchronous Communications Board* option manual and the *Internal Modem Board* option manual.

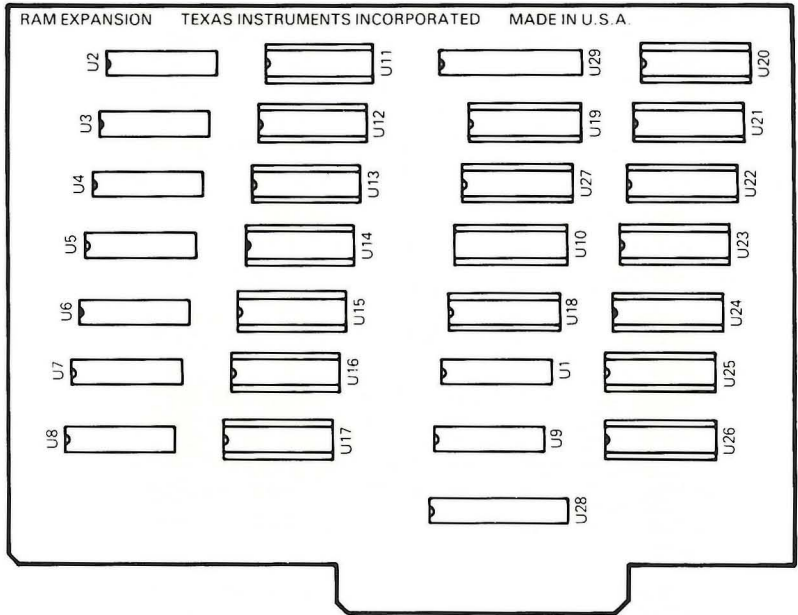
The sync-async comm board enables your computer to communicate with another computer. This board, shown in the following figure, is located inside the system unit with the other option boards.

Alternately, your computer may be equipped with an internal modem. An internal modem performs all the same functions as a sync-async comm board and an external modem. If your computer doesn't have an internal modem and you intend to communicate over telephone lines, your sync-async comm board needs an external modem. For more information about the internal modem, consult the *Internal Modem* option manual or Appendix D, "Using an Internal Modem."



5. Check the line on the System Configuration display that shows "RAM installed" to see how much RAM memory you have. You need at least 128K bytes of RAM to communicate. If fewer than 128K bytes are indicated, you need to install an expansion RAM board.

An expansion RAM board, shown in the following figure, adds more internal memory to your computer. This allows the TTY program and the MS-DOS operating system to fit into the internal memory. The smallest expansion RAM board (64 kbytes) gives you more than enough internal memory to hold MS-DOS and the TTY program.



2223205-1

6. After you have checked for the necessary options, press any key. The main diagnostics menu appears on the display. You can now leave the diagnostic program. Press the **ESC** key one or more times until the prompt "**A>**" appears.
7. Remove the diskette from diskette drive A. (Make sure the red in-use light isn't on when you do this.)

ATTACHING THE CABLES

In this section you attach all the cables necessary to connect your Texas Instruments Professional Computer to the communications link. A communications link consists of all the communications equipment attached to the two computers, and includes the following equipment.

- Communications line
- Cables

-
- Modems (optional)
 - Telephones (optional)

The following are the three kinds of communications links.

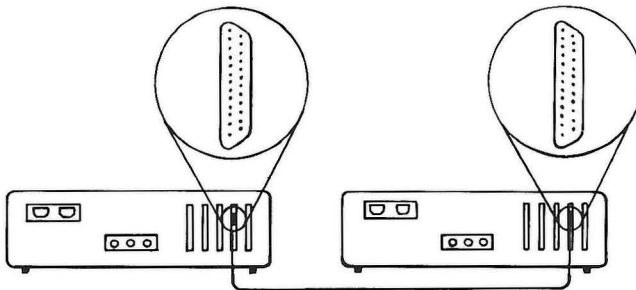
- Direct connect
- Dedicated
- Switched

The following pages describe these communications links and show you what cables and equipment you need for each type of link. You can obtain the necessary cables from a Texas Instruments Authorized Dealer. Before you connect any of the cables, make sure your system unit is not plugged into an ac receptacle.

Direct-Connect Link

A direct-connect line provides a direct communication link between two computers located a short distance apart, usually less than 15 m (50 ft).

If you have a direct-connect link, attach the cable shown (TI Part No. 2233020-0001) from the 25-pin connector on your sync-async comm board to the 25-pin connector on the sync-async comm board on the other computer, as shown in the following figure.



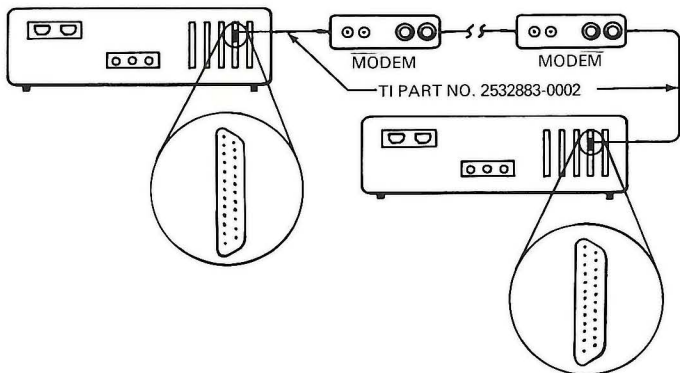
TI PART NO. 2230504-0001

Dedicated Link

A dedicated link is similar to a direct-connect link, but the computers are located too far apart to use a direct-connect line. Instead, the computers are connected by a leased telephone company line. The telephone company line is “hardwired” between the two computers; that is, it is not usually connected to any switching equipment.

To enable the information to travel over the line, a dedicated line requires a modem. A modem translates digital signals from a computer into analog signals that can be sent over the telephone line. A modem also translates analog signals received over the telephone line into digital signals your computer can understand. The full-duplex modems you can use are listed in Appendix F, “Modems”. You can’t use half-duplex modems.

If you use a dedicated link, attach the cable shown (TI Part No. 2233021-0001) from the 25-pin connector on the sync-async comm board to your modem as shown in the following drawing. Refer to your particular modem instruction manual to find out how the attachments to the modem should be made.

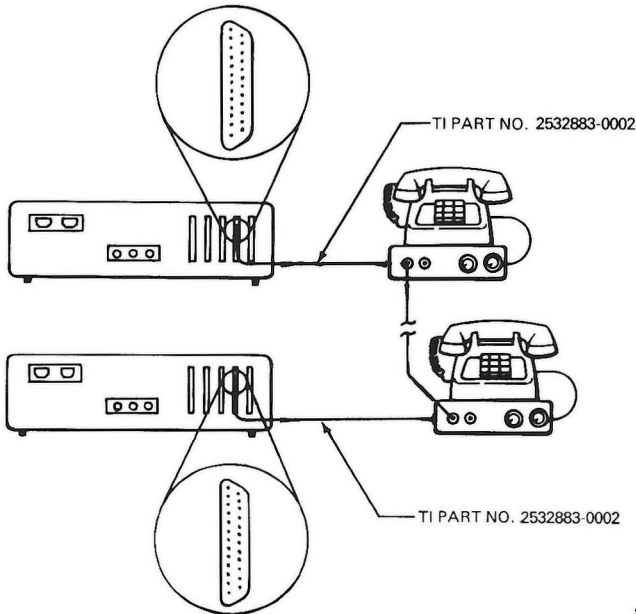


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Switched Link

A switched link requires a modem and a telephone, and can use a typical telephone line. It's called a switched link because the telephone company switches the physical path the information travels each time you make a telephone call. The modem allows your signals to travel over the telephone lines, and the telephone allows you to choose with which computer you are connected.

If you use a switched link with an external modem, attach the cable shown (TI Part No. 2532883-0002) from the 25-pin connector on the sync-async comm board to your modem, as shown in the following illustration. Refer to your particular modem instruction manual to find out how the attachments to the modem should be made.

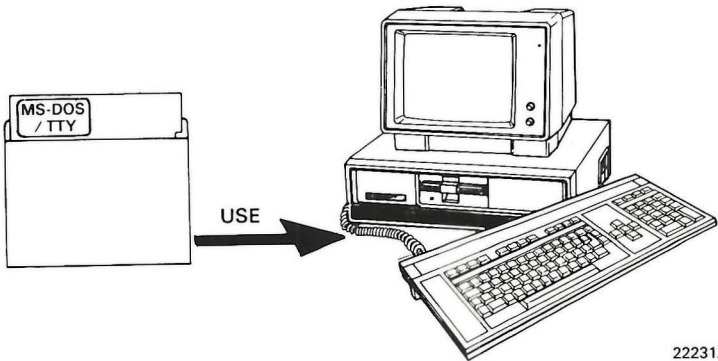
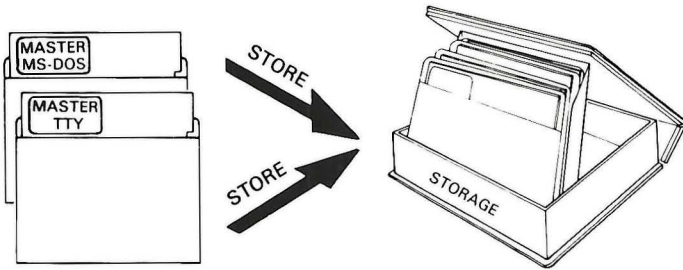
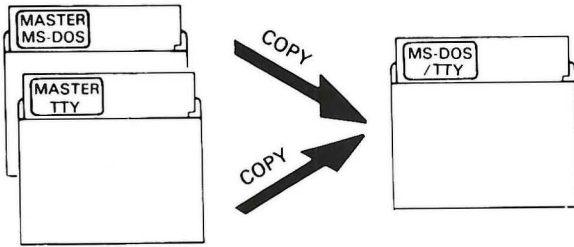


2223122-3

You may have an internal modem instead of an external modem. For information on how to connect the cables for an internal modem, see Appendix D, "Using an Internal Modem."

LOADING THE SOFTWARE

You are now ready to load the software on the TTY diskette, located in the back of this manual. If you have never used this TTY diskette, you need to do the following: copy MS-DOS and TTY together onto a single separate diskette, and store the master TTY and MS-DOS diskettes in a safe place. Putting MS-DOS and TTY onto the same diskette allows you to “boot up” the computer and start a TTY session without changing diskettes.



Chapter 3 of the *Texas Instruments Professional Computer Operating Instructions* shows you how to make an MS-DOS/TTY diskette.

To load the MS-DOS/TTY diskette, use the same procedure you use to load MS-DOS. If you have already loaded MS-DOS, you should insert the MS-DOS/TTY diskette into the default drive. The letter before the greater-than sign in the command prompt designates the default drive. For example, if your prompt is `A>`, diskette drive A is the default drive.

PREPARING FILES

You now need to prepare the files you want to send to the other computer. In addition to following the rules on filenames given in Chapter 3 of the *Texas Instruments Professional Computer Operating Instructions*, avoid giving your files any of the following names. They are filenames reserved for use by MS-DOS.

- PRN
- LST
- CON
- AUX
- NUL

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STARTING THE PROGRAM

The first step in communicating is starting the TTY program. To do this, make sure you have loaded the MS-DOS/TTY diskette and turned on the computer. After you have initialized MS-DOS and a prompt is displayed (for example, **A>**), type the command,

COMTTY

to start the TTY program. After you type COMTTY, the main TTY menu appears on the display, as shown in the following figure.

A screenshot of a computer terminal window with a black border. The text is displayed in a monospaced font. The content is as follows:

```
Texas Instruments Professional Computer

      TTY Communications

Version 1.20 (C) 1983,84 Texas Instruments

F1:HELP  F2:SETUP  F3:START          F12:EXIT
```

Function Keys

When the display shows the main communications menu as in the previous figure, the following words and numbers appear at the bottom of the display.



```
F1:HELP  F2:SETUP  F3:START                F12:EXIT
```

The F1, F2, F3, and F12 represent the function keys at the top of your keyboard. The words following them represent what happens when you press that particular key. In this example, the function keys allow you to do the following.

- Use the **HELP** key to get more information about your choices.
- **SET UP** a file of parameters. A parameter is a variable that is given a constant value for a session and controls some aspect of the session.
- **START** the TTY session with a previously created parameter file or with the default parameters. Default values are the “built-in” parameter values your computer assumes you want if you don’t specify any values.
- **EXIT** the TTY program and return to MS-DOS.

NOTE

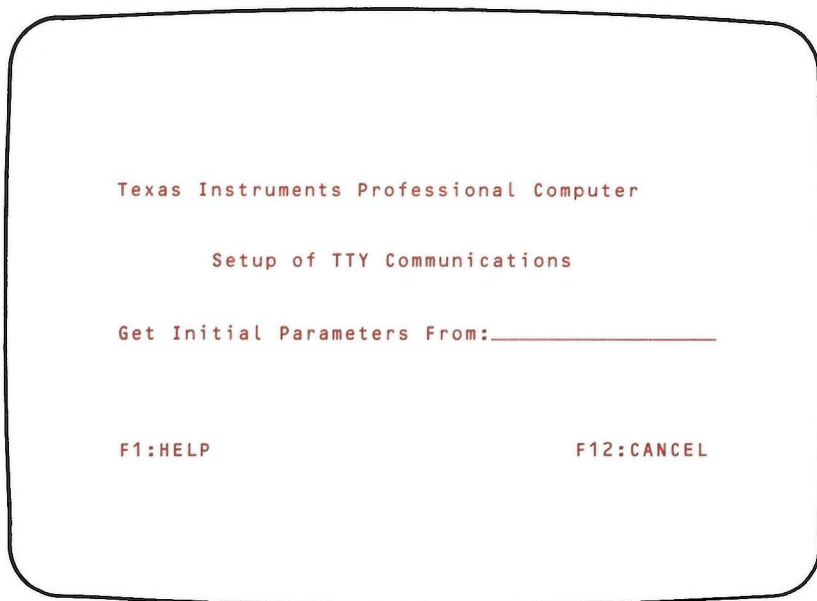
The function key assignments change during a TTY session, so you should periodically check the bottom of the display to make sure you press the correct key.

Depending on the computer with which you want to communicate, it is possible to start a communications session now with the default parameters. We are going to discuss the Setup function next, however, because there may be many times in which you will need to use the Setup function first.

Basic Setup Function

The parameters determine the manner in which the TTY session is run. After you set the values for the parameters, save them in a parameter file. You can then use the parameter file for subsequent sessions.

To set up the parameters for the session, press the SET UP key, **F2**. The following display appears.



You have two possible sources for the initial parameters. The first is a parameter file that you have already created; the second is the default parameters. To get the default parameters, press the **RETURN** key. The following display appears.

```
Texas Instruments Professional Computer

Setup of TTY Communications

Port           : 1   2   3
Speed          : 110  300 1200 2400
                4800 9600 AUTO
Stop Bits     : 1   2
Parity        : ODD  EVEN MARK SPACE NONE
Check Parity  : ON   OFF
Character Set  : National International
Country code  : USA  NOR  DNK  SWE  FIN  CHE  ESP
Dialing Mode  : Pulse Tone
Dialing Procedure : Manual Automatic
Phone Number

F1:HELP F2:NEXT MENU           F11:SAVE F12:CANCEL
```

This is the start of parameter setup. You have several options at this point.

- Get help information about the parameters on the display by pressing the **HELP** key, **F1**.
- Cancel what you have done. If you decide you don't want to set up parameters, press the **CANCEL** key, **F12**. You then return to the main communications menu.

-
- Change the parameters on this display. Refer to the next section in this chapter entitled “First Parameter Display” for a description of how to change the parameters and a brief description of each parameter.
 - Move to the next parameter display by pressing the NEXT MENU key, **F2**. Beginning with the section in this chapter entitled “Second Parameter Display,” we describe the parameters shown when you do this.
 - Save the currently selected set of parameters by pressing the SAVE key, **F11**. You can do this now or after you have modified the parameters. When you press the SAVE key, the following display appears.

Texas Instruments Professional Computer
Setup Of TTY Communications

Save Parameters In: _____

F1:HELP

F3:PREVIOUS MENU

F12:CANCEL

In the “Save Parameters In:” field, type the name of the file where you want to store these parameters. For example, you might type

DAILY.PRM

If DAILY.PRM is the name of an existing file, the new parameters that you specify replace the parameters in DAILY.PRM. If DAILY.PRM doesn't exist, your computer creates a new file named DAILY.PRM on the diskette in the default drive, and the parameters you specify go into it. If you want to put the parameter file on a nondefault diskette, include the drive name in the filename. For example, if the default drive is drive A and you want the file to go to drive B, type the following:

B:DAILY.PRM

After you save these parameters, you won't need to use the Setup function again unless you want to change the parameters you have selected. The next time you want to conduct a TTY session with the parameters in DAILY.PRM, type COMTTY followed by the name of the parameter file:

COMTTY DAILY.PRM

If you need several different sets of parameters, use the Setup function to create several different parameter files.

The default parameters allow you to communicate with most other computers. If the remote computer has unusual default parameters, or if you want to take advantage of some of the special features Texas Instruments TTY offers, you need to change your parameters. To change these parameters, you need to understand how the parameter displays are arranged and how they are changed.

How to Change Parameters

All the parameter displays have the same basic layout. The session parameters are on the left side of the display and the parameter values are on the right side of the display. The parameter values are in fields, which are areas on a display where you enter information. Fields in computer displays are of two kinds: point-select and type-in.

In a point-select field, your computer displays a list of the acceptable values for each parameter. For example, in the previous parameter display, the port can be either 1, 2, or 3. To choose the value you want, move the cursor until it covers the value you want, and press the **RETURN** key.

In a type-in field, you type the value yourself because the parameter has too many possible parameter values to list. After you have typed the parameter value you want, press the **RETURN** key.

To include a control character in a type-in field that allows control characters, you must type the control character mnemonic enclosed in angle brackets rather than typing the control character itself. For example, a carriage return is placed in a field by typing **<CR>** instead of pressing the **RETURN** key. If you want to include an angle bracket in a field, you must enclose it in angle brackets. For example, if you want your ABM to be **<AB**, your field must be **<<>AB**. The following table lists the control characters and their mnemonics.

Control Character**Mnemonics**

Start of Heading	SOH
Start of Text	STX
End of Text	ETX
End of Transmission	EOT
Enquiry	ENQ
Positive Acknowledge	ACK
Bell	BEL
Backspace	BS
Horizontal Tab	HT
Line feed	LF
Vertical Tab	VT
Form Feed	FF
Carriage Return	CR
Shift Out	SO
Shift In	SI
Data Link Escape	DLE
Device Control 1	DC1
Device Control 2	DC2
Device Control 3	DC3
Device Control 4	DC4
Negative Acknowledge	NAK
Synchronize	SYN
End of Transmission Block	ETB
Cancel	CAN
End of medium	EM
Substitute	SUB
Escape	ESC
File Separator	FS
Group Separator	GS
Record Separator	RS
Unit Separator	US
Space	SP
Delete	DEL

NOTE

Quotation marks (“”) can be used in a field, but you must use two quotation marks in a row to get one.

The fields that accept control characters are: ABM, programmable keys, mapped characters, transmit new line, and receive new line. Although a control character mnemonic with angle brackets may be five characters long, it is represented in your computer as one character. Therefore, a field that has a limit of six characters, for example, can use a string of 30 characters to represent six characters.

If you type a value that your computer doesn't understand, your computer displays an error code. Appendix B lists all the error codes and their explanations.

You can use the **INS** key and **DEL** key in type-in fields. You can also use the clear field sequence. To clear a field, press and hold the **SHIFT** key, and then press the **DEL** key.

Now that you know how to enter information into fields, you can change the parameter values to suit your communications needs.

FIRST PARAMETER DISPLAY

The following paragraphs describe the TTY session parameters shown in the first parameter display. For more information on the parameters, refer to Appendix A, "TTY in Depth."

Texas Instruments Professional Computer

Setup of TTY Communications

```
Port           : 1   2   3
Speed          : 110  300 1200 2400
                4800 9600 AUTO
Stop Bits      : 1   2
Parity         : ODD  EVEN MARK  SPACE  NONE
Check Parity   : ON   OFF
Character Set  : National International
Country code   : USA  NOR  DNK  SWE  FIN  CHE  ESP
Dialing Mode   : Pulse Tone
Dialing Procedure : Manual Automatic
Phone Number
```

F1:HELP F2:NEXT MENU

F11:SAVE F12:CANCEL

Port

You may have more than one sync-async comm board in your computer. If each board is connected to a different computer, you need to be able to select the right board. For this reason, each board has a different port number. (A port in a computer is a device through which information comes in or goes out.) The port number is 1, 2, or 3, depending on a jumper setting on your communication board. For most sync-async comm boards, the switch is set to 1. The section in Chapter 2 entitled "Determining the Configuration" describes how to determine your port number.

NOTE

The port number isn't related to the option slot location of the communication board. The port number depends entirely on a switch setting on the communication board.

Speed

This parameter sets the speed (in bits per second) at which you communicate. The values for this parameter are 110, 300, 1200, 2400, 4800, 9600, and AUTO.

You may choose the AUTO value only if you have a Bell 212 compatible modem. If you choose the AUTO value, your computer communicates in either 300 or 1200. If your computer is originating the call, the modem selects 1200 bits per second (bps). If your computer is receiving the call, the modem selects either 300 or 1200, depending on the speed the calling computer is using.

Stop Bits

Stop bits are sent after each character to indicate where the character ends. The stop bit parameter determines the number of stop bits you send after each character. The number of stop bits sent must match the number sent by the remote computer.

Parity and Check Parity

The parity parameters, parity and check parity, affect the error-detecting process of your computer, which is called parity checking. The check parity parameter determines whether or not parity checking is performed on incoming data. The parity parameter determines the type of parity used in the error-checking bit in transmission and reception. If a parity error is detected, the computer records the character in question in the files as this character:

—
—
—

This character has the decimal code of 240.

You can see a running count of the parity errors by using the Statistics command described in Chapter 4. For the meaning of each parity value, refer to the parameter descriptions in Appendix A, “TTY in Depth.”

Character Set

You can transmit and display either your national character set or the ISO international character set which is identical to the U.S.A. ASCII character set. Appendix G contains the International to National Character Cross Reference.

- NATIONAL which causes the national character set to be selected.
- INTERNATIONAL which causes the ISO international character set to be selected. Here, the currency sign is a \$.

NATIONAL is the default value.

Country Code

When a country code is selected, the national character set for that country is selected. The codes and meanings are as follows:

USA	United States of America
NOR	Norway
DNK	Denmark
SWE	Sweden
FIN	Finland
CHE	Switzerland
ESP	Spain

US is the default value.

Dialing Mode

The dialing mode parameter controls whether the internal modem (if it is installed) uses tone (pushbutton) or pulse (rotary dial) dialing.

Dialing Procedure

If you have an external modem, this parameter is ignored. If you have an internal modem, you can choose either manual or automatic dialing procedure. With manual dialing, the internal modem waits 10 seconds for you to dial the phone number starting from the time you press the **RETURN** key in the Start function. If the call has not been completed after 10 seconds, the computer displays an error code.

If you choose automatic dialing procedure, the internal modem dials the telephone number that you specified in the parameters. If you didn't specify a phone number, the modem goes into automatic answer mode.

Phone Number

If you specify the phone number parameter, the internal modem "dials" the number for you. If you don't have an internal modem, you should not specify a telephone number. The telephone number can be any sequence of numbers up to 30 digits. The sequence can include "+", "-", "*", and "#" as separators. A "+" means your computer will wait for an additional dial tone before dialing the rest of the number. This is necessary, for example, if you have a telephone system that requires you to dial a number to get an outside line. The "-" is a visual separator only, and is ignored by your computer. For example, if you type 9+713-555-1212, the internal modem "dials" a 9, waits until it gets a dial tone, and then dials the next 10 digits without pausing.

SECOND PARAMETER DISPLAY

When you press the NEXT MENU key, **F2**, from the first parameter display, the following display appears.

```
Texas Instruments Professional Computer
```

```
Setup of TTY Communications
```

```
Answer Back Message : _____  
Call Answer ABM      : ON   OFF  
Call Origination ABM : ON   OFF  
Secured AMB         : ON   OFF  
Transmit New Line   :  
<CR><LF> _____  
Receive New Line    : <CR><LF> _____  
Remote Device Control : ON   OFF  
Remote Commands     : ON   OFF  
Keyboard            : ON   OFF
```

```
Printing of Completions: ON   OFF
```

```
Normal Disconnect Batch File : _____  
Abnormal Disconnect Batch File : _____
```

```
F1:HELP F2:NEXT MENU F3:PREVIOUS MENU F11:SAVE F12:CANCEL
```

Answerback Message

The answerback message (ABM) is a message that your computer can send when it answers or originates a call. The ABM is sent whenever your computer receives an ENQ character. The ABM has many possible uses, but it is frequently used to identify your computer to the remote computer. The remote computer is the one to which your computer is connected.

Call Answer ABM

If you set the call answer ABM parameter to On, the answerback message is sent when your computer answers a telephone call from another computer. If it's set to Off, the answerback message is not sent.

Call Origination ABM

If you set the call origination ABM parameter to On, the answerback message is sent when your computer calls another computer. If the parameter is set to Off, the ABM isn't sent.

Secured ABM

If secured ABM is on, the ABM is not shown on your display when your computer sends it. When secured ABM is off, it is displayed like normal transmitted data.

Transmit New Line

The transmit new line parameter determines what characters are sent from your computer when you press the **RETURN** key (the end of a record). Usually the sequence is a carriage return followed by a line feed, but you can set it to be any sequence up to 10 characters long. See Appendix E, "Key Mnemonics," for a list of mnemonics you use to represent control characters.

Receive New Line

The receive new line parameter is the opposite of the transmit new line parameter. The receive new line parameter defines the sequence of characters that your computer is to interpret as a new line sequence. When a new line sequence is received, the cursor is moved to the left margin of the next line on the data transfer display, and an end-of-record is generated in the receive text file. The receive new line parameter can be up to two characters long.

Remote Device Control

If you set the remote device control parameter to On, a remote computer can send device control characters (DC1, DC2, DC3, DC4, and ENQ), to control the send and receive operations in your computer. These characters are sent and received when a computer is temporarily too busy to send or receive data. When a computer receives one of the busy characters (DC3, DC4), it stops sending or receiving data. It waits for the other computer to send a ready character (DC1, DC2) before it resumes sending or receiving. The ENQ character is used to request that your computer send the ABM.

If your computer encounters a DC3 character when it is sending a file, it stops sending and waits until it receives a DC1 from the remote computer before resuming the send operation.

Unless you are sending or receiving data that includes device control characters, you should set remote device control to On. It helps prevent loss of data when used in conjunction with DC1-DC3 busies, especially at high speeds. Refer to Appendix A for more information on the device control characters.

Remote Commands

If you set the remote commands parameter to On, a computer in a remote location can use escape sequences to control your computer. It can cause your computer to execute remote commands, as well as change the dynamic parameters of the session. For a complete description of the escape sequences and what they can do, refer to the section in Chapter 4 entitled “Remote Commands.”

Keyboard

The keyboard parameter turns the keyboard on and off. If the keyboard parameter is set to Off, you can't use the keyboard. The keyboard is usually turned off before unattended operation, so that accidentally touching the keyboard won't interrupt the session. In unattended operation, a remote computer uses escape sequences to control the operations of your computer. At the end of the unattended operation, the remote computer normally turns your keyboard back on.

Printing of Completions

The printing of completions parameter determines whether your computer prints event completion messages. An event completion is the completion of a function, such as the sending or receiving of a file. If you set this parameter to On and you have a printer, the printer prints a verification of the completion immediately after it occurs.

Normal Disconnect Batch File

A normal disconnect batch file contains MS-DOS commands that your computer executes when a normal disconnect occurs. A normal disconnect occurs when the host computer ends the session after sending and receiving all the necessary files. Using this parameter, you can program your computer to start an activity automatically every time you finish a TTY session. If you specify a normal disconnect batch file, the file you specify must be a batch file, that is, it must have a .BAT extension.

Abnormal Disconnect Batch File

The abnormal disconnect batch file contains MS-DOS commands that your computer executes every time an abnormal disconnect occurs. An abnormal disconnect occurs every time your computer receives something other than a normal disconnect sequence. If you specify an abnormal disconnect batch file, the file you specify must be a batch file; that is, it must have a .BAT extension.

WARNING

Please check that all the commands present in your current “AUTOEXEC.BAT” file are included in the disconnect batch files. Therefore, when the disconnect (normal/abnormal) condition occurs, the “AUTOEXEC.BAT” file (if it exists) will be replaced by the disconnect batch file specified above.

The conditions that can cause an abnormal disconnect are the following:

- Error limit — too many parity/framing errors
- Inactivity time-out — there has been too much inactivity on the line
- Failsafe time-out — usually happens when the modem isn't working right
- Line disconnected — caused when the host disconnects (the DSR signal drops) without using a disconnect sequence or when the telephone line goes dead.

These conditions are discussed in more detail in the next section.

THIRD PARAMETER DISPLAY

When you press the NEXT MENU key, **F2**, while you are in the second parameter display, the following display appears.

```
Texas Instruments Professional Computer

      Setup of TTY Communications

Busy Handling           : DC1-DC3  REVERSE CHANNEL (None)
Busy Sense             : 0      1
Inactivity Timeout     : 0_____seconds
Error Limit            : 0_____
Failsafe Disconnects  : ON      OFF
DLE-EOT Disconnect    : ON      OFF
EOT Disconnect        : ON      OFF
Display of Transmitted Data: ON      OFF
Display of Received Data : ON      OFF

F1:HELP  F2:NEXT MENU  F3:PREVIOUS MENU  F11:SAVE  F12:CANCEL
```

Busy Handling

The busy handling parameter determines how your computer (and any device to which it is connected) indicates that it is busy and temporarily cannot receive data. The choices of parameter values are reverse channel (SCA-SCF), DC1-DC3, or none. Reverse channel busy handling is reserved for direct-connect systems because modems don't handle SCA-SCF signals. Choose DC1-DC3 busy handling for systems using modems. The choice you make must match the method of busy handling that the remote computer uses.

Busy Sense

When reverse channel busy conventions are used, the busy sense parameter affects the sense of the SCA and SCF signals that signify a busy condition. If you set busy sense to 0, your computer turns the output signal SCA off when it is busy. If you set busy sense to 1, your computer turns SCA on when it is busy. Likewise, your computer monitors the input signal SCF to see if the computer from which the SCF signal comes is busy. If you set busy sense to 0, your computer interprets SCF being turned off as a signal the remote computer is busy. If you set busy sense to 1, your computer interprets SCF being turned on as a signal the remote computer is busy.

Inactivity Time-out

The inactivity time-out parameter determines the maximum amount of time the line can be inactive before your computer disconnects the line. If you set this parameter to 0, your computer doesn't break the connection regardless of how long the period of inactivity.

Error Limit

The error limit parameter sets the limit on the number of parity and framing errors that can occur before an abnormal disconnect sequence occurs. A framing error can be caused by any of the following.

- Noise on the line
- Setting the wrong number of stop bits in the parameters
- Using two modems that are set to different speeds

If you set the error limit to 0, your computer won't break the connection regardless of how many errors occur.

Failsafe Disconnects

When you set the failsafe disconnects parameter to On, your computer automatically disconnects under certain error conditions. The error conditions that cause disconnection are CTS and DCD time-outs. These time-outs are usually caused by a defective modem.

DLE-EOT Disconnect

If you set the DLE-EOT disconnect parameter to On, your computer disconnects when it receives a DLE-EOT sequence. This is a normal disconnect.

EOT Disconnect

If you set the EOT disconnect parameter to On, your computer disconnects when it receives an EOT. This is a normal disconnect.

Display of Transmitted Data

When the display of transmitted data parameter is set to On, your computer displays all the information that you transmit. This parameter is also known as local echoing or local copy.

Display of Received Data

When the display of received data parameter is set to On, your computer displays all the information that you receive.

PROGRAMMABLE KEYS DISPLAY

Use the following display to define the programmable keys. The programmable keys are accessed by pressing and holding the **SHIFT** key while pressing one of the 12 function keys. You can define each of these keys to be a different ASCII character sequence up to 32 characters long. The definitions you choose are valid as long as you use the parameter file that has these definitions. If any control characters, such as carriage return, are included, they must be enclosed in angle brackets, like this: `<CR>`. Mnemonics are included in the 32 character count. Thus, `<CR>` uses four characters. If you want to include an angle bracket in a field, you must enclose it in angle brackets. For example, if you want your key to be `<AB`, your field must be `<<>AB`. Quotation marks (") can be used in the key definitions, but you must use two quotation marks in a row to get one to appear.

```
Texas Instruments Professional Computer
```

```
Setup of TTY Communications
```

```
Programmable Keys      (0 - 32 Characters)
```

```
SHIFT F1  : _____  
SHIFT F2  : _____  
SHIFT F3  : _____  
SHIFT F4  : _____  
SHIFT F5  : _____  
SHIFT F6  : _____  
SHIFT F7  : _____  
SHIFT F8  : _____  
SHIFT F9  : _____  
SHIFT F10 : _____  
SHIFT F11 : _____  
SHIFT F12 : _____
```

```
F1:HELP F2:NEXT MENU F3:PREVIOUS MENU F11:SAVE F12:CANCEL
```

CHARACTER REPLACEMENT

The following parameter display allows you to replace automatically any character you send or receive with another character, a process known also as mapping. You can delete characters also. You can replace only single characters, not character sequences, and you can replace them only with single characters. A character can be mapped several times. However, only the last mapping will work.

To “map” a character, enter the character to be replaced under the column labeled “Character.” Mnemonics for characters, such as CR for carriage return, must be included in angle brackets (<>). Refer to Appendix E, “Key Mnemonics,” for a list of mnemonics for characters. Type the replacement character directly across from the character to be replaced, in the column labeled “Replace with.” If you want to delete the character, type two angle brackets with nothing in between, <>, in the “Replace with” field.

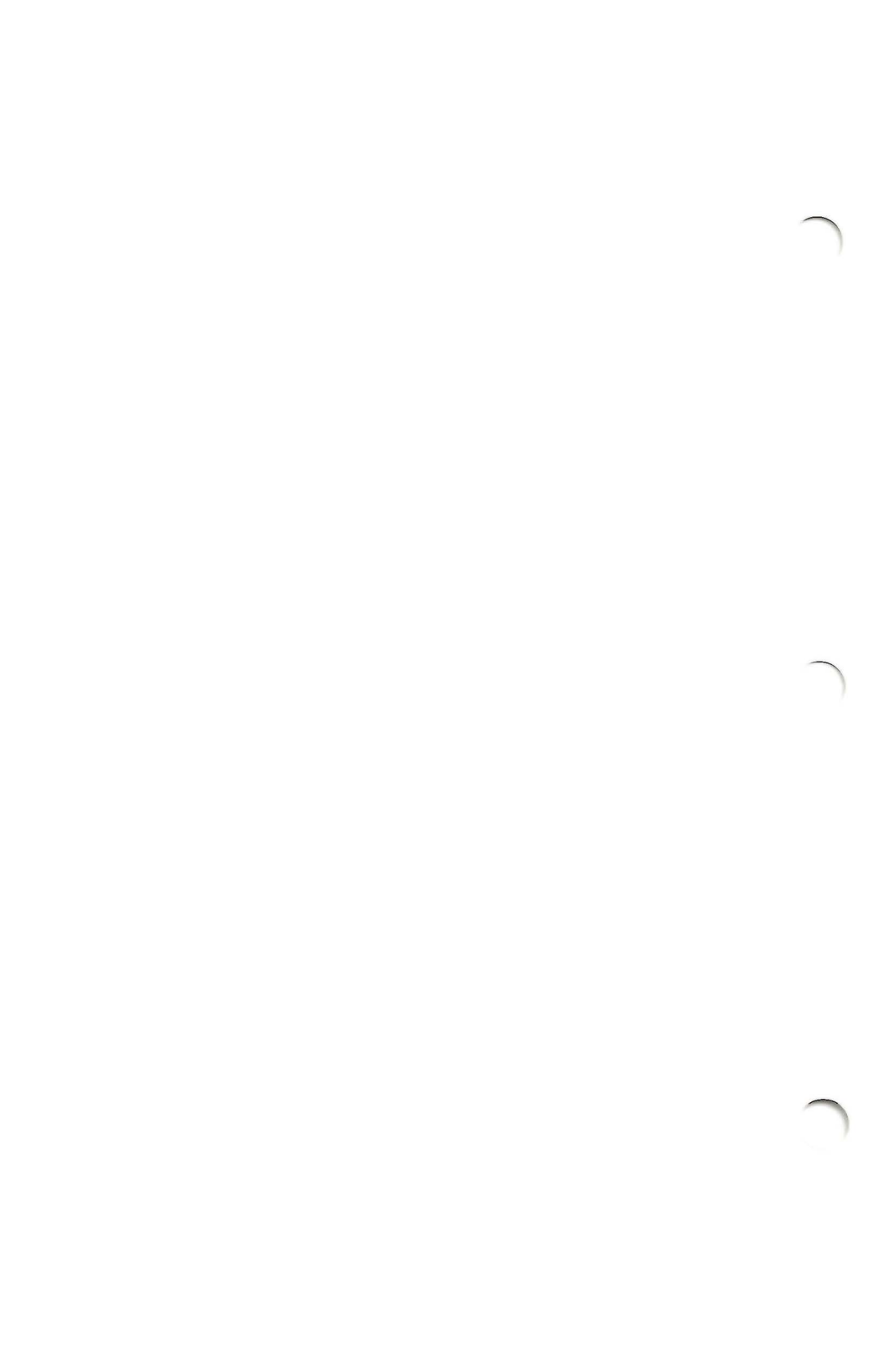
Texas Instruments Professional Computer			
Setup of TTY Communications			
Transmit		Receive	
Character	Replace with	Character	Replace with
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

F1:HELP F3:PREVIOUS MENU F11:SAVE F12:CANCEL

SUMMARY

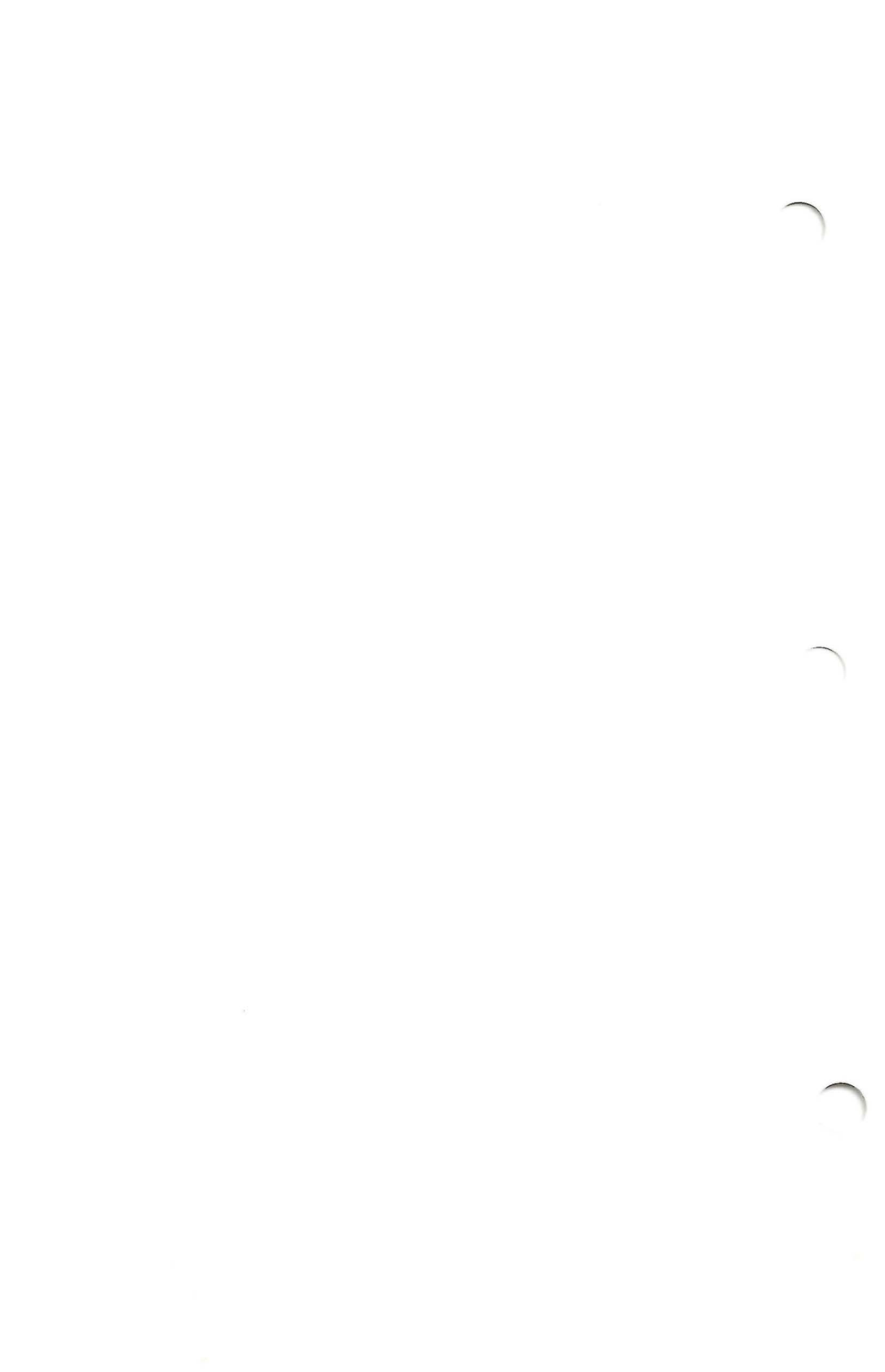
The following table lists all the parameters, their range of values, and their default values, in the same sequence as they appear on the displays. Note that NONE means the default value is None, and none means there is no default value.

Parameters	Range	Default
Port	1, 2, 3	1
Speed	110, 300, 1200, 2400 4800, 9600, AUTO	300
Stop Bits	1, 2	1
Parity	ODD, EVEN, MARK, SPACE, NONE	EVEN
Check Parity	ON, OFF	OFF
Character Set	National, International	National
Dialing Mode	Pulse, Tone	Tone
Dialing Procedure	Manual, Automatic	Automatic
Phone Number	0 – 32 digits and separa- tors	none
Answer Back	0 – 32 character string	none
Message (ABM)		
Call Answer ABM	ON, OFF	OFF
Call Origination ABM	ON, OFF	OFF
Secured ABM	ON, OFF	OFF
Transmit New Line	0 – 10 character string	<CR><LF>
Receive New Line	0 – 2 character string	<CR><LF>
Remote Device		
Control	ON, OFF	ON
Remote Commands	ON, OFF	ON
Keyboard	ON, OFF	ON
Printing of	ON, OFF	OFF
Completions		
Normal Disconnect	See text	none
Batch File		
Abnormal Disconnect	See text	none
Batch File		
Busy Handling	DC1 – DC3, Reverse Channel, None	None
Busy Sense	0, 1	0
Inactivity Time-out	0 – 999	0
Error Limit	0 – 999 errors	0
Failsafe Disconnects	ON, OFF	ON
DLE-EOT Disconnect	ON, OFF	OFF
EOT Disconnect	ON, OFF	OFF
Display of	ON, OFF	OFF
Transmitted Data		
Display of	ON, OFF	ON
Received Data		
Programmable Keys	0 – 32 character string	none
Mapped Characters	Characters mapped	



Running a Session

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INTRODUCTION

Communications in TTY protocol has three phases: connection, communication, and termination. During connection, you start the TTY session by establishing connection with the other computer. During communication, you send or receive data. During termination, you end the TTY session.

CONNECTION

COMMUNICATION

TERMINATION

CONNECTION

After you have specified the TTY session parameters, you can start the TTY session with the Start function. When you press the START key, **F3**, the following display appears. It prompts you for the parameter filename.

```
Texas Instruments Professional Computer
```

```
Start of TTY Communications Session
```

```
Parameter Filename : _____
```

```
F1:HELP
```

```
F12:CANCEL
```

If you type the name of a parameter file you created with the Setup function, your computer conducts the session according to those parameters. If you press the **RETURN** key without specifying a parameter filename, your computer uses the default set of parameters when it conducts the session. However, you should not do either one until you have read the following sections on originating and answering a call. If you plan to call the remote computer, read the section entitled "Originating a Call." If you plan to answer a call from the remote computer, read the section entitled "Answering a Call."

Originating a Call

This section lists the various procedures for calling a remote computer. The procedure you use depends on what type of link you have. The four links listed below each require a different procedure.

- Nonswitched link (dedicated link or a direct-connect link)

-
- Switched link with external modem
 - Switched link with internal modem (auto-dialing)
 - Switched link with internal modem (manual dialing)

The procedures for the first two links are described below. The procedures for the two internal modem links are in Appendix D, “Using an Internal Modem.”

Nonswitched Link

If you have a nonswitched link (no telephone), follow the procedure below to establish connection with the other computer.

1. Make sure the other computer is connected, turned on, and ready to communicate.
2. Press the START key, **F3**.
3. Type the parameter filename you want to use and press the **RETURN** key. For example, type the following,

SAMPLE

and press the **RETURN** key. If the file is on a diskette in a nondefault drive, you need to specify the drive it’s in. For example, if the parameter file **SAMPLE** is on drive B and the default drive is drive A, type the following,

B:SAMPLE

and press the **RETURN** key.

Switched Link with External Modem

If you have a switched line with an external modem, the originate procedure that you use depends on your modem. The following is a sample procedure, but you should follow the directions given with your modem.

1. Press the **START** key, **F3**.
2. Type the parameter filename you want to use and press the **RETURN** key. For example, type the following,

SAMPLE

and press the **RETURN** key. If the file is on a diskette in a nondefault drive, you need to specify the drive it's in. For example, if the parameter file **SAMPLE** is on drive **B** and the default drive is drive **A**, type the following,

B:SAMPLE

and press the **RETURN** key.

3. Pick up the telephone receiver.
4. Pull up the exclusion key (if one exists) on the telephone. The exclusion key is one of the small pillars that pop up when you pick up the handset.
5. Dial the telephone number of the other computer.
6. This step varies, depending on whether a modem or a person answers the phone.

If you hear a modem tone when the telephone is answered, hang up the receiver. A modem tone is a steady, high-pitched sound.

If a person answers the telephone, tell that person to put the telephone in the data mode (by pulling up the exclusion key). When the other telephone is in the data mode, you hear the modem answer tone. Hang up the receiver.

Answering a Call

If the remote computer is going to originate the call, perform the following procedure.

1. Press the START key, **F3**.
2. Type the parameter filename you want to use, and press the **RETURN** key. For example, type the following

SAMPLE

and press the **RETURN** key. If the file is on a diskette in a nondefault drive, you need to specify the drive it's in. For example, if the parameter file **SAMPLE** is on drive B and the default drive is drive A, type the following,

B:SAMPLE

and press the **RETURN** key.

3. Wait for the other computer to call. Most external modems automatically answer a call. When the other computer calls, the data transfer display appears on your computer.

The Connection Process

After you press the START key, your computer attempts to make connection with the other computer. During this time, the connection display (shown in the following figure), shows the progress of the connection process. Your computer will be either connecting or dialing.



```
Texas Instruments Professional Computer
      TTY Session Status
(CONNECTING) DIALING IDLE SENDING RECEIVING DISCONNECTED

                               F12: CANCEL
```

When the computers connect, you are ready to transfer data. If the computers don't connect, the status display shows the reason for the failure of the call (for example, busy or no answer). If you have problems connecting, refer to the section in Appendix B entitled "Connection Errors" for the error codes and their explanations.

COMMUNICATING

During the communicating phase, you send and receive data. You may send and receive information by the character or by the file.

To send information by the character, type what you want to send on the data transfer display (discussed below). Every time you type a character in the data transfer display, the character is transmitted to the remote computer.

To send or receive information by the file, use the function keys. You can use the following functions during the communicating phase.

- Help
- Send
- Receive
- Status
- Statistics
- Files
- Disconnect

Data Transfer Display

The data transfer display (shown in the following figure) shows data as it is sent or received. Transmitted data is interspersed with the received data on the display when you are sending and receiving at the same time. To keep the data from being interspersed, you can set to Off either of the two display parameters, Display of Transmitted Data or Display of Received Data.

F1:HELP F2:SEND F3:RECEIVE F4:STATUS F5:STATISTICS F6:FILES F12:DISCONNECT

You may send information from the data transfer display by typing with the keyboard. Whatever you type is sent to the remote computer, except when you are sending a file or the remote computer is busy. Also, remote control commands and device control characters (described later) are not displayed.

The following table lists the control characters, their decimal number in the ASCII chart, their mnemonics, the key strokes needed to display them, and the characters that appear on the display when you access them.

Dec. #	Control Character	Mnemonics	Key Strokes	Display Character
1	Start of Heading	SOH	CTRL A	☺
2	Start of Text	STX	CTRL B	☹
3	End of Text	ETX	CTRL C	♥
4	End of Transmission	EOT	CTRL D	◆
5	Enquiry	ENQ	CTRL E	♣
6	Positive Acknowledge	ACK	CTRL F	♠
7	Bell	BEL	CTRL G	◆
8	Backspace	BS	CTRL H	⬮
9	Horizontal Tab	HT	CTRL I	◇
10	Line Feed	LF	CTRL J	▣
11	Vertical Tab	VT	CTRL K	⋈
12	Form Feed	FF	CTRL L	♀
13	Carriage Return	CR	CTRL M	♫
14	Shift Out	SO	CTRL N	⌂
15	Shift In	SI	CTRL O	⚙
16	Data Link Escape	DLE	CTRL P	▶
17	Device Control 1	DC1	CTRL Q	◀
18	Device Control 2	DC2	CTRL R	↕
19	Device Control 3	DC3	CTRL S	!!!
20	Device Control 4	DC4	CTRL T	⚡
21	Negative Acknowledge	NAK	CTRL U	⊗
22	Synchronize	SYN	CTRL V	■

Dec. #	Control Character	Mnemonics	Key Strokes	Display Character
23	End of Transmission Block	ETB	CTRL W	⏏
24	Cancel	CAN	CTRL X	⏏
25	End of Medium	EM	CTRL Y	⏏
26	Substitute	SUB	CTRL Z	⏏
27	Escape	ESC	CTRL [⏏
28	File Separator	FS	CTRL \	⏏
29	Group Separator	GS	CTRL]	⏏
30	Record Separator	RS	CTRL 6	⏏
31	Unit Separator	US	CTRL -	⏏
32	Space	SP	Space Bar	⏏
127	Delete	DEL	Delete Key	⏏

2223121 5

In addition to using the control key combinations to generate these characters, you may also hold the **ALT** key while typing the decimal number (using the numeric keypad) in the chart to get the character.

Help

Pressing the HELP key, **F1**, displays a file of information about the functions and parameters you use during a TTY session. The Help function has been designed so that you get the information you want when you want it. If you are looking at the setup parameters, for example, the display explains what those parameters mean. If you are looking at the main communications menu, the display explains the functions available from that display.

To view the help files, you must have your TTY diskette in the default diskette drive. If the file has more information than can fit on one display, press the MORE HELP key, **F1**, to view all of the file. The following figures are examples of help files.

Texas Instruments Professional Computer

In this Setup menu you specify the name of the file that has the parameters you want to modify. If you have not yet created a parameter file, press RETURN to get the default set of parameter values.

PARAMETERS

Get Initial Parameters From - Type the filename that has the parameters to be modified or press RETURN to get the default parameters.

FUNCTIONS

F12: CANCEL - Cancels the Setup operation and returns control to the main TTY communications menu.

F12: CANCEL HELP

Texas Instruments Professional Computer

This Setup menu has parameters for TTY communications that depend on the characteristics of your computer and the remote computer. Default values have been chosen for typical TTY operations.

PARAMETERS

Port - Select the number of the port you use for TTY communications. If you do not know which ports are installed, display the system configuration using the diagnostics diskette.

Speed - Select the number of bits per second at which TTY will communicate. AUTO enables the automatic baud rate selection of 300 or 1200 for use with Bell 212 compatible modems.

Stop Bits - Select the number of stop bits to be used.

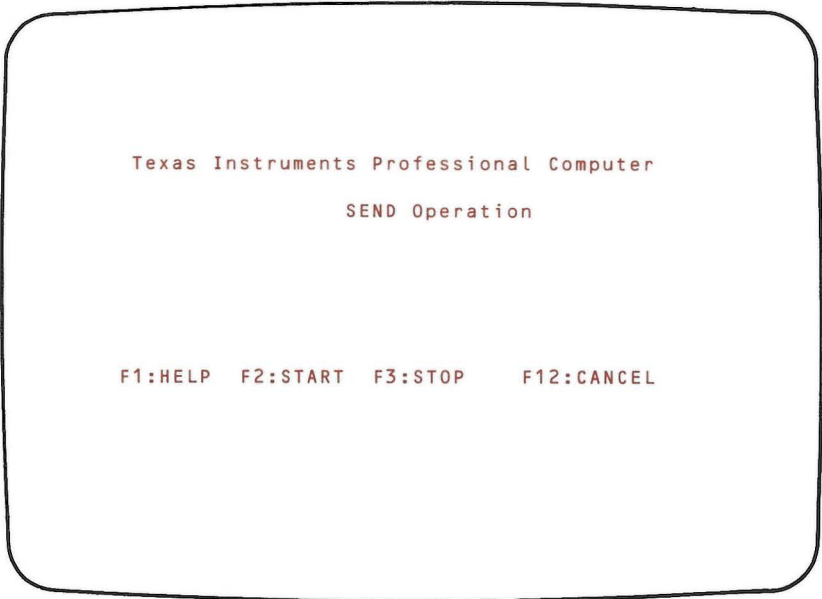
Parity - Select the parity to be used for character transmission and reception.

F1: MORE HELP

F12: CANCEL

Send

The Send function sends information from the file you specify to the other computer. To invoke the Send function, press the SEND key, **F2**. The following display appears.



From this display you can do the following.

- Get Help on the Send function
- Start sending the contents of a file
- Stop (abort) sending the contents of a file
- Cancel the Send function

To start sending a file, press the START key, **F2**. Type the name of the file you wish to send. You can modify the file parameters if you need to, or you can press the **ENTER** key to take the default values.

Texas Instruments Professional Computer

SEND Operation

Filename : _____
File Format : TEXT UNFORMATTED
Record Length : 0____ bytes

F1:HELP F2:START F3:STOP F12:CANCEL

The filename can be any file in your computer. If the file is not in a default drive, you must include the drive designator in the filename (for example, B:ORDERS.TXT).

The file format must be text or unformatted. Select text format for any MS-DOS file that delimits its record by a <CR><LF>, which is usually a file containing text. Select unformatted format for files containing a stream of unformatted data.

Record length is the number of characters on a line, and is between 0 and 32767 characters. After each line, your computer sends the Transmit New Line sequence. If 0 is chosen, a Transmit New Line sequence will not be sent after any lines. You cannot leave this parameter blank. You should specify a record length only when you choose unformatted file format, because only unformatted data has a fixed number of characters per line.

After you enter the parameters and press the **RETURN** key, the computer starts sending the contents of the file and returns to the data transfer display. If the display of transmitted data parameter is On, the contents of the file are displayed as they are sent. While the file transfer is in progress, you can't use any keys on the keyboard except the function keys.

After you have finished sending all the data in the file, the send process automatically stops. If you stop a send operation in the middle of a transmission, the computer doesn't send any more of the data in the file. To stop a send operation, press the SEND key, **F2**, and then press the STOP key, **F3**. To retransmit the file, use the Send function again and specify the filename again.

If your send operation isn't successful, refer to Appendix B for the error codes you see and their explanations.

Receive

In TTY communications, you must prepare your computer if you want to save any data that you receive. When you use the Receive function, give your computer the information it needs to receive the data, such as where you want the data stored and what type of data it is. If you do not use the Receive function, you can watch the data on the data transfer display as it comes in, but you won't have a permanent record of the data. To get the receive menu shown below, press the RECEIVE key, **F3**.

```
Texas Instruments Professional Computer

      RECEIVE Operation

Filename      : _____
Save Mode     : REPLACE APPEND
Record Length : TEXT UNFORMATTED

F1:HELP      F12:CANCEL
```

Pressing the START RECEIVE key, **F2**, displays the parameter menu shown below. Enter the name of the file to which you want the data received. You can then either modify the parameter or press the **ENTER** key to use the default values.

Texas Instruments Professional Computer

RECEIVE Operation

Filename : _____
Save Mode : REPLACE APPEND
File Format : TEXT UNFORMATTED

F1:HELP

F12:CANCEL

The filename is the name of the file into which you want the information you are receiving to be put.

The save mode parameter determines whether the information coming in will replace the contents of the file you have specified or be added to the end of the file.

The file type parameter determines whether the file you put the data in is a text file or an unformatted file. Text format should be selected for any MS-DOS file that delimits each record by a <CR><LF>, which is usually a file containing text. Unformatted format should be selected for files containing a stream of unformatted data.

Sometimes a remote computer attempts to send special characters to you. If you don't prepare your computer properly, your computer interprets these characters as commands to perform functions. To get these characters interpreted as data instead of as commands, you

must set the proper parameters during setup. The following table shows you how to set parameters if you plan to receive any of the following characters or data types.

Characters	Parameters
Control (DC1, DC2, DC3, DC4, ENQ)	Remote Device Control = Off
Escape (ESC1, ESC2...)	Remote Commands = Off
Binary data	File Format = Unformatted Remote Commands = Off Remote Device Control = Off Leave Receive New Line blank

When you set the remote device control parameter to Off, you can run into problems if the two computers are communicating at high speeds. When the remote device control parameter is set to On, the remote computer can sense when you are getting information too fast and can halt temporarily.

Start the receive operation shortly before you plan to receive the data. After you press the **START RECEIVE** key, **F2**, your computer returns to the data transfer display. When all the data has been received, go back to the receive menu and Pressing the **STOP RECEIVE** key updates the receive file; that is, it takes the data out of temporary storage and places it in the file you specified. If you press the **STOP RECEIVE** key, **F3**, while data is still coming in, you will be able to see it come in on the data transfer display but you will have no permanent record of it. If you press the **START RECEIVE** key, **F2**, while data is still coming in, further data is stored in the newly specified receive file.

If your receive operation isn't successful, refer to Appendix B for the error codes and their explanations.

Status

The status display indicates the session status and the completion of key events. The session status is indicated by the highlighting of one or more of the status conditions. The completion of key events is indicated by a completion message (for example, SEND complete). As each operation completes, the completion status is sent to the printer if the printing of completions parameter is on. The completion status is also placed on the completion list on the status display. This information continues to be displayed and updated until the session is terminated. When you press the CANCEL key, **F12**, the computer returns to the data transfer display. For a list of the possible completion messages, refer to Appendix B, "Error Codes."

```
Texas Instruments Professional Computer
```

```
TTY Session Status
```

```
CONNECTING DIALING IDLE SENDING RECEIVING DISCONNECTED
```

```
Line connected successfully - call originated
```

```
Send started - RWH.PRM
```

```
Send completed - RWH.PRM
```

```
Abnormal disconnection - line disconnected
```

```
F1:HELP
```

```
F12:CANCEL
```

Statistics

A typical statistics display appears in the following figure. The two rows with numbers on them contain statistics on the progress of the TTY session. A parity or framing error is an indication that some of the received data is in error. Parity and framing errors are discussed in Appendix A, "TTY in Depth." Receiver overruns occur when characters are coming in faster than your computer can handle them. This sometimes happens at high speeds when the remote device control parameter is turned off or the busy handling parameter is set to none. A receiver overrun indicates that data has been lost.

The row above the function menu line gives the names of several modem signals. For example, CTS is an acronym for the Clear-To-Send signal. The display shows the acronym in reverse video, high intensity when the corresponding modem signal is active.

```
Texas Instruments Professional Computer
      TTY Session Statistics

      Parity/Framing Errors : 5
      Receiver Overruns    : 0

      DTR   DSR   RTS   CTS   DCD   SCF   SCA

      F1:HELP                F12:CANCEL
```

Note that the statistics display does not maintain the instantaneous state of the modem signals. The display is periodically (once a second) updated with a snapshot of the state of the control signals. The statistics display may not show signal transitions lasting less than a second.

Files

With the Files function, you can perform some common MS-DOS file operations without exiting TTY. Otherwise, you would need to terminate the TTY session every time you wanted to perform one of the functions. For example, if you wanted to look at a file, you would have to end the TTY session, use the MS-DOS command, TYPE, to show the file, reenter the TTY session, and then send the file.

What the Files Function Does

With the Files function, you can perform the six file operations in the following list. You can't perform any of the files functions while you are receiving remote commands that also perform file operations (create, delete, rename, or receive). When a conflicting file operation is performed, an error code appears.

- Create a file.
- Delete a file.
- Rename a file.
- Show the contents of a file.
- List the files in a directory.
- Print the contents of a file.

The Create, Delete, Show, and Print functions each prompt for a filename. The Rename function prompts for the old name of the file along with the new name the file is to be given. The Directory function (DIR) prompts you for a directory name and gives you the contents of the directory.

The Show and Directory functions work the same way the MS-DOS commands TYPE and DIR work. With the Show and Directory functions, you can use an asterisk to look at a family of files. You can also use the Directory function to show the contents of a diskette by typing the drive designator (A:, B:, C:, D:, or E:) instead of the filename. You should use the Show and Directory functions only when you are not sending or receiving data.

How to Use the Files Function

The following display appears when you press the FILES key, **F6**.

Texas Instruments Professional Computer

File Operations

F1:HELP F2:CREATE F3:DELETE F4:RENAME F5:SHOW F6:DIR F7:PRINT F12:CANCEL

Choose the operation you want to execute, and press the appropriate key. The display then requests the filename(s) or drive identifier you want. For example, the Create File Operations display appears in the following figure.

Texas Instruments Professional Computer

Create File

Filename: _____

F12: CANCEL

Type the filename or drive identifier. When you press the **RETURN** key, the operation (in this example create) executes and you return to the files display.

Pause and Continue Functions

If the computer displays the data too fast, use the PAUSE key, **F2**, to freeze the display temporarily. When you want to continue, press the CONTINUE key, **F3**.

F2: PAUSE F3: CONTINUE F12: CANCEL

TERMINATING

A TTY session can be terminated manually, normally, or abnormally. These three methods of terminating a TTY session are explained below.

You cause a manual disconnect when you press the DISCONNECT key, **F12**. The computer asks you if you are sure you want to disconnect, as shown in the following display. Use the cursor control keys to position the cursor over either the “yes” or “no” and press the **RETURN** key. If you answer “yes” your computer disconnects. In this case, neither the normal nor the abnormal disconnect batch files you may have specified during parameter setup are executed.

A screenshot of a terminal window showing a red prompt text: "Are you sure you want to disconnect? yes no". The text is centered and the window has rounded corners.

A normal disconnect occurs when the remote computer sends a normal disconnect sequence to your computer. An abnormal disconnect occurs when the error limit is exceeded or some other major problem is encountered. After either of these two disconnects occur, the appropriate batch file is executed if you have specified a normal or abnormal disconnect batch file. If you have an AUTOEXEC.BAT file and have specified a disconnect batch file, the AUTOEXEC.BAT file will be lost when you disconnect.

If you haven't specified a disconnect batch file, your computer shows the disconnect status display. A message appears to indicate whether the disconnect was normal or abnormal, and the cause of the disconnect. For example, you might get the following disconnect message.

A screenshot of a terminal window showing a red message text: "Abnormal Disconnect - line disconnected". The text is centered and the window has rounded corners.

AUTOMATIC CONTROL

You have already learned how to enter TTY communications, specify parameters, and execute functions. The Texas Instruments Professional Computer can do some of these tasks for you automatically.

If you would like to cut down on the time you spend preparing to communicate, you can get your computer to do much of the preparation. You need only to make a change to your MS-DOS/TTY diskette. Use EDLIN to create the MS-DOS file AUTOEXEC.BAT (if it doesn't exist already) on your MS-DOS/TTY diskette. Put the following command into the file.

COMTTY < filename>

where < filename> is the name of the parameter file that contains the parameters for the session.

For example, if you regularly send files to your company headquarters, you can automatically prepare for execution on power-up with the following procedure.

1. Create a parameter file, which we'll call HDQ.PRM.
2. Put the command **COMTTY HDQ.PRM** into the AUTOEXEC.BAT file. Make sure the HDQ.PRM file is on the MS-DOS/TTY diskette.

Now, to establish connection with your headquarters computer, just do the following.

1. Insert the prepared diskette and close the diskette-drive door.
2. Place the power switch in the **ON** position.

The MS-DOS commands in the AUTOEXEC.BAT file are executed on power-up, which causes execution of the COMTTY program. After the program is executed and the connection is established, the data transfer display should appear.

REMOTE COMMANDS

With the TTY program, a remote computer can control some of the basic operations of your computer. The remote computer can cause your computer to:

- Send the contents of one of your files to the remote computer.
- Receive data from the remote computer to one of your files.
- Change the current values of some session parameters.
- Create a file on your computer.
- Delete a file on your computer.
- Rename a file on your computer.

With these commands, someone at a remote location can conduct an entire TTY session with your Texas Instruments Professional Computer without your help. However, these commands cannot be executed when you are performing local file operations.

To receive remote commands, you must do the following.

- Set the remote commands parameter to On.
- Set the receive new line sequence to match the transmit new line sequence of the remote computer.
- Establish connection with the remote computer.

To gain control of your computer, the remote computer sends the escape sequence, ESC 0. The command to be executed follows the ESC 0 sequence immediately and is terminated by the defined receive new line character sequence.

The following paragraphs describe how to write a remote command to be sent to a Texas Instruments Professional Computer. You cannot send a remote command to delete, rename, or create a file if you are performing local file operations with the Files function.

Command Format

The remote command format is:

```
<ESC>0COMMAND <parameter> =<value>, <parameter> =<value>, ...<RNL>
```

where <ESC> represents the escape character and where <RNL> is the defined receive new line sequence.

A typical remote command is:

```
<ESC>0DELETE FILE = A: ORDERS<RETURN>
```

In cases where parameters in addition to the filename are required (for example, Send and Receive commands), the additional parameters must follow the filename (de-limited by a comma or space) and must be of the form PARM = VALUE. The parameters supported for the remote Send and Receive commands are the same as supported by the local Send and Receive functions. Typical command messages follow:

```
<ESC>0SEND OPERATION = START FILE = MAIL<RNL>
```

```
<ESC>0RECEIVE OPERATION = START FILE = INMAIL<RNL>
```

```
<ESC>0CREATE FILE = A: claims<RNL>
```

```
<ESC>0RENAME OLD = A: oldname NEW = A: newname<RNL>
```

With the exception of filenames and record lengths, only the first three characters of command parameters and values are significant. That is, the command

```
<ESC>0SEN FIL=ORDERS<RNL>
```

is equivalent to:

```
<ESC>0SEND FILE=ORDERS<RNL>
```

After executing a command, your computer maintains the completion status of the command in case the remote computer requests it. To request the status, the remote computer sends the ESC1 sequence. Appendix B lists the possible statuses in the section entitled, "Command Error Codes," and describes how to correct errors. Typical messages appear below.

```
** 00 **<TNL>      Normal completion  
** 10 **<TNL>      Invalid command
```

Table of Remote Commands

The following table lists the commands you can use in remote control, their parameters, the range for the parameter values, and their default values.

Commands	Parameters	Range of Values	Default
SEND	OPERation	START, STOP	none
	FILE	existing filename	none
	FORmat	TEXT UNFormatted	TEXT
	LENGth	0—32767	none
RECEIVE	OPERation	START, STOP	none
	FILE	< filename>	none
	SAVe Mode	REPlace APPend	REPlace
	FORmat	TEXT UNFormatted	TEXT
CREATE	FILE	non-existing filename	none
RENAME	OLD	old filename	none
	NEW	new filename	none
DELETE	FILE	existing filename	none

SUMMARY

As you know, you can run a TTY session many different ways. The following figure summarizes the possibilities.

CONNECTION

- Auto-dialing
- Manual dialing
- Auto-answer

COMMUNICATION

Local Commands

- Send
- Receive
- Help
- Status
- Statistics
- Files
- Disconnect

Remote Commands

- Send
- Receive
- Create

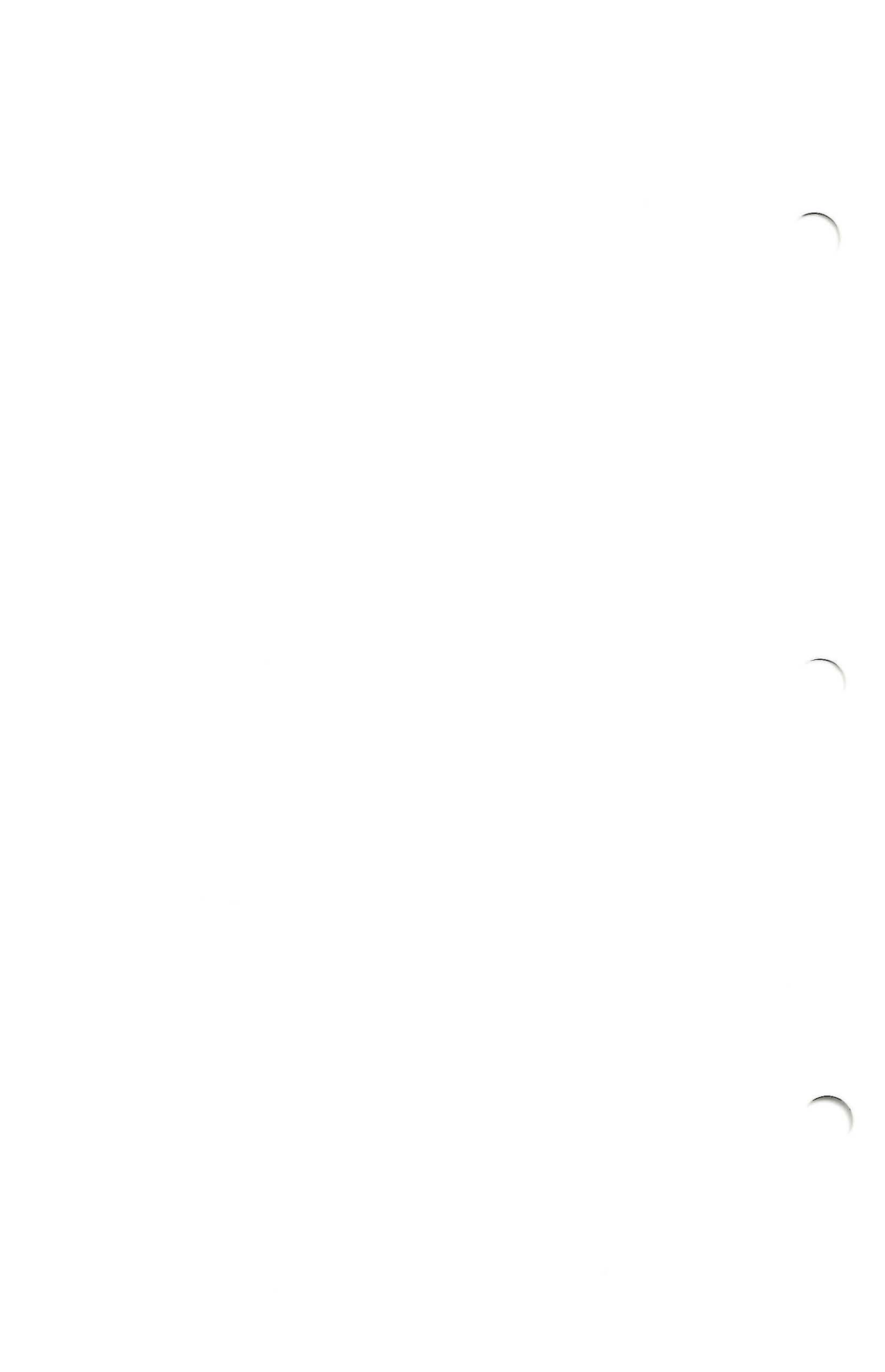
-
- Rename
 - Delete

TERMINATION

- Manual disconnect
- Normal disconnect
- Abnormal disconnect

Sample TTY Session

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Assemble	5-4
Communication Link	5-4
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Set Up	5-5
Load the MS-DOS/TTY Diskette	5-5
Set Up the Parameters	5-6
Establish Connection	5-7
Switched Link	5-7
Nonswitched Link	5-8
Send/Receive Files	5-8
Terminate Communications	5-11



INTRODUCTION

This chapter contains a sample TTY session so you can practice what you have learned. You may also use this sample as a checklist for your first few sessions. If you don't remember how to do something, consult Chapter 2, 3, or 4.

GENERAL DESCRIPTION

A TTY session consists of the following steps.

1. Connect all the system cables and cords (unnecessary after the first time).
2. Assemble the communications link (unnecessary after the first time).
3. Set up a parameter file (optional).
4. Establish connection.
5. Send/receive files.
6. End the TTY session.

The rest of this chapter covers these steps in more detail.

CONNECT

Because your computer probably already has all the hardware connected, you need only make sure that all of the following cables and cords are attached to the system unit.

- Keyboard cable
- Display unit power cord

-
- Display unit video-signal cable
 - System unit power (don't plug this into the wall power outlet yet)

ASSEMBLE

Communication Link

Refer to the following lists and make sure that you have connected the cables that match your type of communication link. The part numbers for the cables can be found in Chapter 2 of this manual.

Direct-Connect Link

- Sync-async comm board to the sync-async comm board

Dedicated Link

- Sync-async board to modem
- Modem to wall telephone outlet
- Power cord for modem

Switched Link

- Sync-async board to modem
- Modem to wall telephone outlet
- Power cord for modem
- Telephone to modem

If you have an internal modem, see Appendix D, "Using an Internal Modem."

Determining Configuration

Follow these steps to find out if you have the options necessary to communicate using TTY.

1. Insert the system unit power cord into the ac receptacle.
2. Load the diagnostics diskette and place the system unit **ON/OFF** switch in the **ON** position.
3. Execute the display configuration test to find out which options are installed. Make sure you have at least 128 kbytes total memory. Also make sure you have a sync-async comm board or an internal modem.
4. Note the port number of the sync-async comm board or internal modem.
5. Remove the diagnostics diskette.

SET UP

To set up a session, do the following:

1. Load the MS-DOS/TTY diskette.
2. Set up a TTY session parameter file if you need one.

Load the MS-DOS/TTY Diskette

Load your MS-DOS/TTY diskette into diskette drive A. If you don't have an MS-DOS/TTY diskette, refer to Chapter 3 of the *Texas Instruments Professional Computer Operating Instructions* for the procedure for creating an MS-DOS/TTY diskette. Put in the date and time. When you're prompted with **A>**, type the following.

COMTTY

Set Up the Parameters

To set up the parameters, do the following.

1. When the main communications menu appears on the display, press the SETUP key, **F2**.
2. When the get parameters display appears, press the **RETURN** key.
3. You can now create a modified set of parameters. Position the cursor over the port number of the sync-async comm board you noted in the display configuration test.
4. Press the **RETURN** key.
5. In this example, we're going to assume that you need to specify more parameters. Change the parameter values to fit your needs and then press the NEXT SCREEN key, **F2**.
6. Continue to modify the parameters as needed.
7. When you have modified all the parameters you want to, press the SAVE key, **F11**.
8. To save the parameters chosen, type a filename on the save parameters line. For this session, type

A>SAMPLE

and press the **RETURN** key.

The TTY session parameters you have chosen are stored in the file SAMPLE (or whatever name you choose) on the diskette in drive A. You must make sure, however, that drive A has a diskette in it and that the diskette isn't write-protected. After the computer saves the parameters, the main communications menu appears. You're ready to establish connection with the other computer.

ESTABLISH CONNECTION

The connection procedure that you use depends on what kind of communication link you have. Follow the procedure below that corresponds to your communication link.

Switched Link

If you have a switched line with an external modem, the originate procedure you use depends on your modem. A sample procedure is given below, but you should follow the directions given with your modem. If you have an internal modem, see Appendix D for the proper procedure.

1. Press the **START** key, **F3**.
2. Type the parameter filename you want to use. For example, type

A> SAMPLE

and press the **RETURN** key.

3. Pick up the telephone receiver.
4. Pull up the exclusion key.
5. Dial the telephone number of the other computer.
6. This step varies, depending on whether a modem or a person answers the phone. If you hear a modem answer tone when the telephone is answered, hang up the receiver.

If a person answers the telephone, tell that person to place the telephone in the data mode. When the other telephone is in the data mode, hang up the receiver.

Nonswitched Link

If you have a direct-connect or dedicated link (no telephone), follow the procedure below to establish connection with the other computer.

1. Make sure the other computer is connected, turned on, and ready to communicate.
2. Press the START key, **F3**.
3. Type the parameter filename you want to use. For example, type the following.

A>SAMPLE

Press the **RETURN** key. You can start sending and receiving files.

SEND/RECEIVE FILES

With the data transfer display showing, you can now transfer information. Let's use the Send function first.

1. Press the SEND key, **F2**.
2. Press the START key, **F2**. The send parameter menu appears on the display. The cursor is on the line labeled filename.
3. Type **A>SAMPLE** and press the **RETURN** key. You are now in the file format field.
4. Position the cursor over the parameter value, TEXT, and press the **RETURN** key.
5. Press the **RETURN** key again.

-
6. If you set the display of transmitted data parameter to On during parameter setup, the following display appears.

```
PAR POR=1 TNL=""<CR><LF>" RNL=""<CR><LF>" INA=0 ERR=0 LOC=ON
```

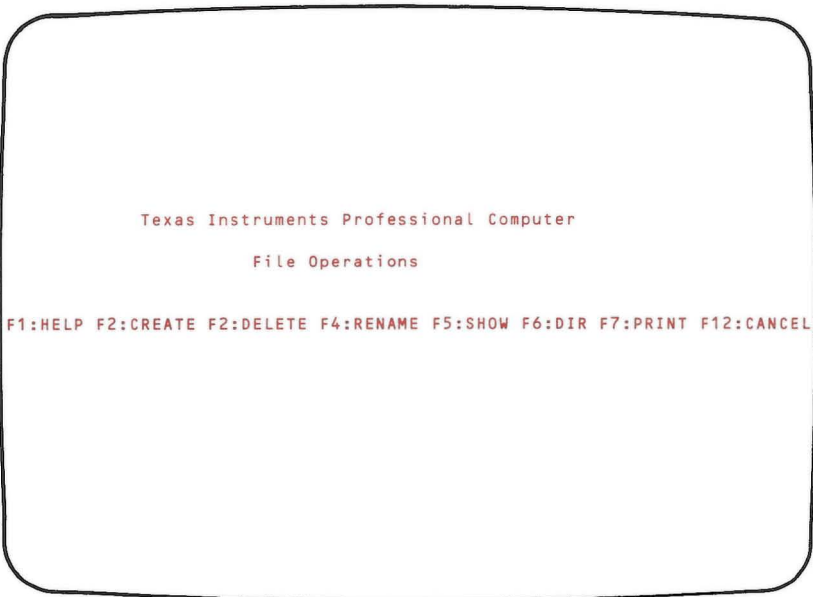
```
F1:HELP F2:SEND F2:RECV F4:STATUS F5:STATISTICS F6:FILES F12:DISCONNECT
```

Let's use the Receive function next.

1. Press the RECEIVE key, **F3**.
2. Press the START key, **F2**. The receive parameter menu appears on the display. The cursor is on the line labeled filename.
3. Type A>RECV and press the **RETURN** key. You are now in the save mode field.
4. Position the cursor over one of the parameter values, Replace or Append, and press the **RETURN** key. You are now in the file format field.
5. Position the cursor over one of the parameter values, TEXT or UNFORMATTED, and press the **RETURN** key.

-
6. If you set the display of received data parameter to On during parameter setup, the data the remote computer is sending should appear on the display.
 7. When the last of the data is sent, press the RECEIVE key, **F3**, and then press the STOP key, **F3**.

Now let's try using the Files function to create a file. When you press the FILES key, **F6**, the following display appears.



1. Check the bottom of the display to see which function key controls the Create function. In this display, the **F2** key controls the Create function. When you press the CREATE key, **F2**, the computer responds with a request for a filename.

-
2. Type the following or some other unused filename.

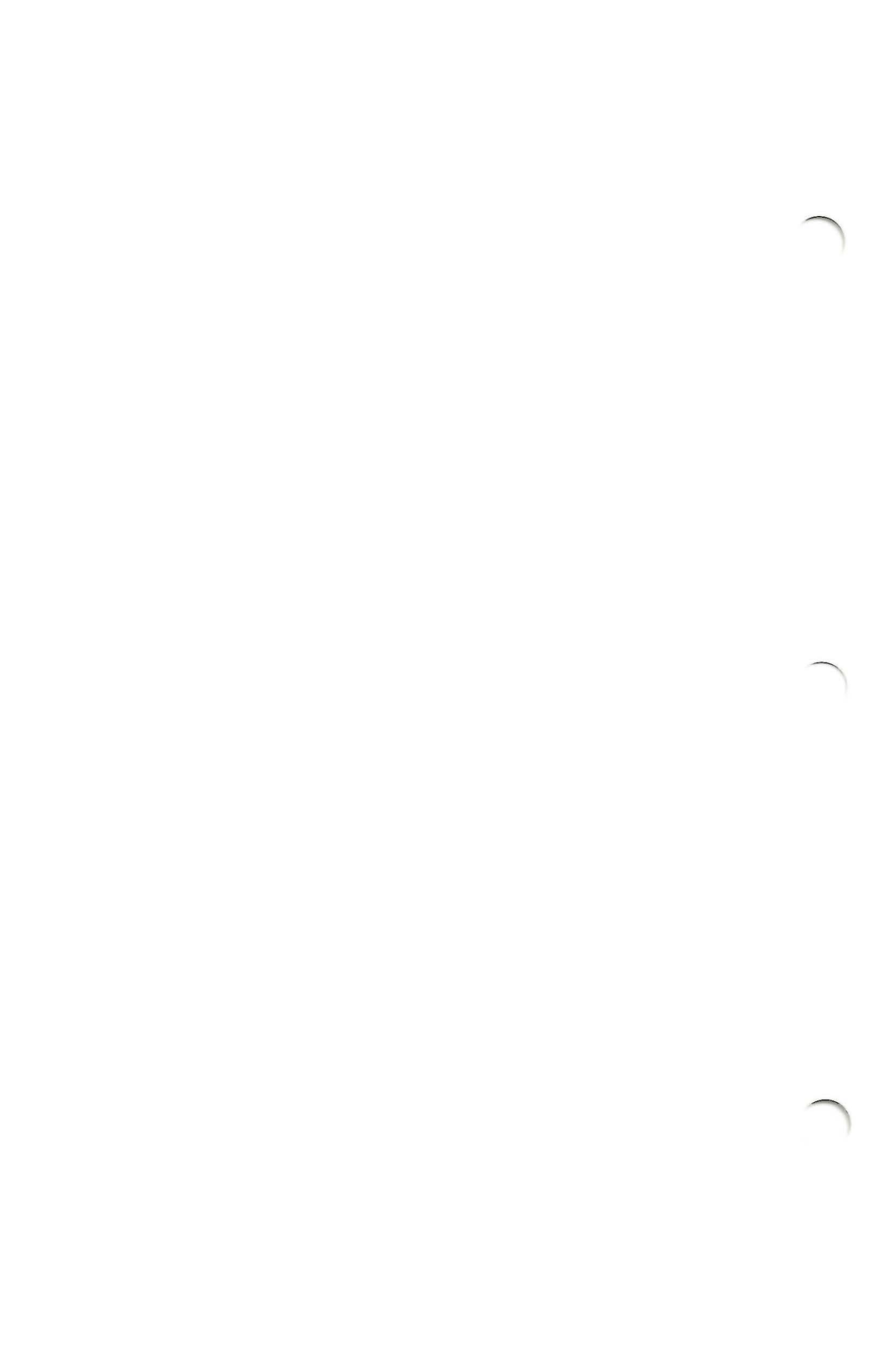
A> TEST

Press the **RETURN** key. The filename, A> TEST, stays on the display until the program creates the file. You then return to the file operations display.

3. Press the CANCEL key, **F12**, to return to the data transfer display.

TERMINATE COMMUNICATIONS

Because we have done all we want in this TTY session, we now end it. Press the DISCONNECT key, **F12**. You are asked if you want to disconnect. To answer “yes,” position the cursor over the word “yes” using the cursor control keys and press the **RETURN** key. You return to the TTY main menu. Press the EXIT key, **F12**, and you return to MS-DOS. You have just completed a TTY session.



TTY In Depth

INTRODUCTION

Appendix A describes the TTY protocol in depth. It gives a short overview of basic TTY theory and explains the mechanics of attended and unattended TTY sessions. If you are a novice, this appendix teaches you more about TTY communications. If you are an experienced communications professional, this appendix shows you how TTY is implemented on the Texas Instruments Professional Computer. To help you find information, Appendix A is outlined below.

COMMUNICATIONS THEORY

- Serial Data Transfer

 - Signals

 - Data

 - Parity

 - Framing Bits

- RS-232-C Interface Signals and Circuits

 - Data Terminal Ready and Data Set Ready

 - Request-to-Send and Clear-to-Send

 - Data-Carrier-Detect

 - SCA and SCF

ATTENDED OPERATION

- Connection

- Sending and Receiving

- Disconnection

 - Manual

 - Normal

 - Abnormal

UNATTENDED OPERATION

- Connection

- Sending and Receiving

- Disconnection

REMOTE CONTROL

- Remote Command Status
- Remote Device Control
- Display of Received Data
- Display of Transmitted Data
- Keyboard
- Sending of ESC as Data

COMMUNICATIONS THEORY

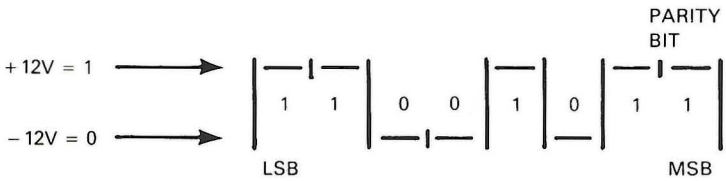
The synchronous-asynchronous communications board allows the Texas Instruments Professional Computer to communicate with other electronic devices that are external to the computer. Some of these other devices are data terminal equipment (DTE) such as terminals, printers, or another computer or data communication equipment such as a modem. The synchronous-asynchronous communications board may be controlled by programs such as the TTY communications program as well as programs written by the user that control the operation of the communications board.

The TTY protocol is character-oriented. In other words, data is sent a character at a time instead of in blocks of characters. Asynchronous protocols do not require synchronized timing of the character. The character can arrive at any time. Instead, codes are placed at the beginning and end of each data character. These codes tell the devices when a character begins and ends. The asynchronous signal may be a little less efficient than the synchronized signal in that there are more bits per character transmitted. This may result in a somewhat slower transmission rate overall.

Because you usually run at slower speeds with asynchronous protocols, they can use regular telephone lines. However, if you run a synchronous or asynchronous protocol at over 4800 bps, you may need leased lines with conditioning or a modem with equalization electronics to minimize background noise.

Serial Data Transfer

In serial data transfer, data is transmitted and received over one line in each direction, one bit after another. The movement of bits from one point to another as a single string is called serial data transfer. Most manufacturers produce computers, terminals, printers, plotters, and communication equipment that use serial data transfer. The following figure illustrates serial data transfer.



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Signals

Each character sent through the communications board in asynchronous mode transmits as a series of bits (determined by voltage levels in the signal). The first bit is the “start bit,” a low voltage signal. This bit informs the remote device that a character is being transmitted.

Data Signal

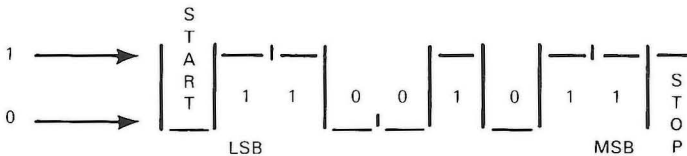
Eight “data bits” immediately follow the start bit. These bits are represented by a sequence of “high” and “low” voltages. This sequence represents the actual character code being transmitted. The default is eight bits because the Texas Instruments Professional Computer handles data in eight-bit groups. If the external device should happen to send data in groups other than eight bits, you will be unable to communicate with that device unless it is configured to transmit eight-bit data.

The eight data bits are followed by a stop signal that informs the remote device that the transmission of the character is complete. This stop signal may be one bit (the default value) or two bits that are transmitted as “high” voltages. You must determine the remote device requirements to select the proper number of stop bits. Since the stop bits are high and the start bit is low, when a high-to-low transition takes place, the computer assumes that a new character has started.

Parity

If you enable parity check and set parity to ODD or EVEN, the most significant bit in the eight-bit data stream becomes the parity bit. The parity bit is used for error checking. If parity checking is used, characters are represented by seven bits. For example, the seven-bit binary sequence 1010011 represents the character “S.”

The number of ones in a code sequence plays an important role in selecting the parity bit. An even number of ones (four) appear in the code sequence for the character “S.” If you set the parity parameter to ODD, the computer will put a one into the eighth bit (parity bit) position, resulting in an odd number of ones in the transmitted eight-bit data stream. The final eight-bit sequence transmitted for the character S is 11010011, as shown in figure below.



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When parity is set to ODD, every character transmitted must have an odd number of ones in the eight-bit sequence. Thus if the receiving device is checking parity, it expects to receive data sequences with an odd number of ones in them. If a received character has an even number of ones in it, the remote device knows that the message was garbled during transmission and that one bit changed. If two bits change, the number of one bits remains odd and the error goes undetected. Of course, when parity is set to EVEN, the signal transmitted always contains an even number of ones.

The sending and receiving devices must agree as to whether or not parity is going to be checked. The Texas Instruments Professional Computer defaults to no parity checking. The parity-checking parameter must be enabled if parity is to be checked.

If parity is checked, the type of parity (ODD or EVEN) must be the same on each device. You can see that if one device is sending even parity characters and the other is expecting odd parity, every character received is interpreted as an error. Your Texas Instruments Professional Computer defaults to EVEN parity.

If parity is enabled, the seven data bits can be used to represent a total of 128 different characters. Because the standard typewriter keyboard consists of 96 characters, 128 character representations are more than sufficient. This leaves 32 character codes available for special characters such as EOT (ASCII end-of-transmission control character).

In some cases, it may be necessary to transmit the full complement of eight bits, which allows for up to 256 different character codes. In this

case, parity checking is not possible since the parity bit is now considered part of the data stream. It is necessary to indicate that the full eight bits is to be interpreted as the character code. This is done by setting the parity parameter to NONE.

Two more optional settings are available for parity: the MARK and SPACE parity bits. If MARK is selected, the parity bit is always filled with a "1", while SPACE results in a "0" in the parity bit. These options are used if the remote device requires a special form of parity.

Framing Errors

Another problem that may occur is difficulty in determining which of the bits that arrive from a remote device constitute the eight data bits. If a data bit is for some reason considered a start bit, the next eight bits are assembled as the data bits representing a character. This results in a character made up of parts of two characters (the end of one and the beginning of another). The ninth bit in this sequence is a data bit that is interpreted as the stop bit for the newly assembled character, rather than as a data bit from the next character. If this bit is a zero, the error checking circuit will detect an error. "Framing" is the process of establishing which eight-bit sequences constitute the character code. If there is a failure in this process, the error condition is called a framing error. However, framing errors can also be caused when the two computers are communicating at different speeds.

RS-232-C Interface Signals and Circuits

The RS-232-C interface uses a 25-pin D connector. Various pins on the connector are used to exchange data signals and controlling signals between the computer and an external device. The following figure illustrates the arrangement of the 25 pins on the connector. The following table summarizes the signals that are sent over these pins.

13	12	11	10	9	8	7	6	5	4	3	2	1
.
.
25	24	23	22	21	20	19	18	17	16	15	14	

Pin No.	Circuit	Name
1	AA	Protective ground
2	BA (TD)	Transmitted data
3	BB (RD)	Received data
4	CA (RTS)	Request-to-send
5	CB (CTS)	Clear-to-send
6	CC (DSR)	Data set ready
7	AB	Signal ground
8	CF (DCD)	Data carrier detect
11	SCA/CH	Secondary request-to-send/ Speed select
12	SCF/CI	Secondary data carrier detect/ Data signal rate detector
15	DB	External transmit clock
17	DD	External receive clock
20	CD (DTR)	Data terminal ready
22	CE (RI)	Ring indicator
23	CH	Speed select
24	DA	External transmit clock

Your Texas Instruments Professional Computer can communicate with full duplex modems using these standard EIA RS-232-C control signals as defined. Full-duplex modems can transmit and receive data simultaneously. In a full-duplex modem, both receive-control and transmit-control signals are active at all times during a session.

The statistics display shows the state of the modem control signals to help you troubleshoot problems with the modem interface. Signals are represented by mnemonics that are highlighted when the corresponding signal is active. The following paragraphs describe the signals you can view on the statistics display.

Data Terminal Ready and Data Set Ready

Your computer activates Data Terminal Ready (DTR) upon the start of the session to indicate to the modem that the computer is ready to establish connection. The modem sends back Data Set Ready (DSR) when it establishes connection with the modem of the remote computer. (Data set is another name for modem.)

Your computer turns DTR off when it is finished communicating and wants the modem to disconnect the line. When the modem notes that the DTR signal is off, it turns off the DSR signal. If the DSR signal is turned off while DTR is on, an abnormal disconnect occurs.

Request-to-Send and Clear-to-Send

The computer activates the Request-to-Send (RTS) signal to tell the modem that it is ready to transmit data. When you are using a full-duplex modem, the RTS signal remains active throughout the entire session. The modem responds by sending the Clear-to-Send (CTS) signal to the computer to indicate that it is ready

to transmit data to the remote computer. If the CTS signal is off for more than 10 seconds during a transmission and the failsafe time-outs are enabled, an abnormal disconnect sequence occurs.

Data-Carrier-Detect

The modem activates this signal to indicate to your computer that it has detected a carrier frequency from the remote modem. When you are using a full-duplex modem, DCD is active during the entire session.

Secondary Request to Send and Secondary Received Line Signal Detector

Your computer activates the secondary request to send signal (SCA) when the receive buffer is 128 characters away from being full and the busy handling parameter is set to SCA-SCF. This tells the remote computer that your computer temporarily can't take any more data. This signal returns to off when all the receive buffers are empty.

The Secondary Received Line Signal Detector (SCF) is activated by the other computer to indicate that the remote computer is busy because its buffers are full and that your computer should stop sending until SCF is turned off.

When the busy handling parameter is set to SCA-SCF, the busy sense parameter controls the sense of the SCA and SCF signals that signify a busy condition. If you set busy sense to 0, a computer turns the output signal SCA off when it is busy. If you set busy sense to 1, a computer turns SCA on when it is busy. Likewise, your computer monitors the input signal

SCF to see if the computer from which the SCF signal comes is busy. If you set busy sense to 0, your computer interprets SCF being turned off as a signal the remote computer is busy. If you set busy sense to 1, your computer interprets SCF being turned on as a signal the remote computer is busy. The following table illustrates these relationships.

When Sense =	0	1
Busy when SCA...	off	on
Busy when SCF...	off	on

ATTENDED OPERATION

Attended operation means you control the send and receive operations on your computer.

Connection

When you begin the session by completing the Start function, your computer tries to make connection with the remote computer. During connection, the status display shows how the connection process is progressing. If you have an internal modem and have specified auto-dialing and a phone number, the display initially shows dialing. If the dialing process fails, the status display shows the reason for the failure. The following are the possible causes of a failure to connect.

- Phone line is busy
- Call is not answered
- Phone number is inoperative
- Inoperative modem
- There is no modem answer tone

-
- Incorrect modem speed
 - A modem is not installed
 - Manual phone call not placed
 - No dial tone

When the computer finishes dialing and the two computers connect, the display shows Idle as the current status.

Send/Receive

At the beginning of the session, you may want to send the answerback message. From the data transfer display you can send the ABM when you press 1 while holding the **CTRL** key. You also have the choice of sending data from the keyboard or from a file.

When you send data from the keyboard, the computer sends each character as you type it. When you press the **RETURN** key after typing a line of information, the transmit new line sequence is sent. This indicates to the remote computer that a record has ended. The transmit new line sequence, which is specified during parameter setup, is an ASCII character string of 0 to 10 ASCII characters. For most applications, the transmit new line sequence is a carriage return followed by a line feed (<CR> <LF>). Regardless of what you specify the transmit new line sequence to be, however, the cursor on your display performs a carriage return, line feed; that is, it moves to the left margin of the next line. What is shown on the display of the remote computer, however, is dependent on the remote computer.

When you use the function keys to send data from a file, the computer sends the file a record at a time. If the file is in text format, your computer adds the transmit new line sequence whenever it encounters an end of

record. The amount of characters in a text record is variable. If the file is unformatted, your computer adds the transmit new line sequence after a fixed number of characters. The number of characters is determined by the record length parameter.

You can receive data in one of three ways: to the display, to a file, or to the display and a file. Whichever you choose, your computer scans the incoming data for the receive new line sequence. If your computer detects a receive new line sequence, it replaces the receive new line sequence with an end of record character. If you have specified unformatted data in the receive parameters, the receive new line sequence is discarded and not replaced with any characters.

Disconnection

The three types of disconnects you can have in attended mode are manual, normal, and abnormal.

Manual

A manual disconnect occurs when you press the EXIT key, **F12**, and answer “yes” to the disconnect question. Your computer immediately stops sending and receiving data, and shuts off all output signals to the modem and remote computer. If you manually disconnect, your computer won’t execute the normal disconnect batch file or the abnormal disconnect batch file. The remote computer, however, interprets your manual disconnect as an abnormal disconnect and may execute an abnormal disconnect sequence, if it exists.

Normal

Any of the following conditions cause normal disconnect.

- Reception of EOT with EOT disconnect parameter enabled
- Reception of DLE-EOT with DLE-EOT parameter enabled.

In either case, your normal disconnect batch file is executed if it exists.

Normally the remote computer initiates a normal disconnect by sending an EOT or DLE-EOT. You can't cause your computer to undergo a normal disconnect. However, you can cause a normal disconnect at the other computer by sending an EOT or DLE-EOT, depending on how the remote computer is configured.

Abnormal

An abnormal disconnect is caused if one of the following error conditions occurs. (Note that all of these conditions are variable by parameters except line disconnects.)

- Error limit is exceeded
- Inactivity time-out expires
- Failsafe time-out expires
- Line disconnects (DSR circuit drops)

When the error limit parameter is exceeded, your computer executes an abnormal disconnect. The error limit includes parity/framing errors and receiver overruns.

When the inactivity parameter is exceeded, your computer executes an abnormal disconnect. Inactivity is defined as amount of time since the last character was sent.

Failsafe time-outs occur when the CTS or DCD signals drop during a session. These two should always be on during a session; usually your modem is at fault if either of these signals go inactive.

The DSR circuit drops for one of two main reasons. It drops if the telephone connection goes dead. The DSR also drops if the remote computer quits sending and receiving without going through a disconnect sequence. In other words, the other computer may drop the DSR and not send either a EOT or a DLE-EOT, causing your computer to abnormally disconnect.

UNATTENDED OPERATION

Unattended operation means a remote computer controls the sending and receiving of the data.

Connection

For your Texas Instruments Professional Computer to be run by a remote computer, your computer must be able to connect automatically. You must have either an external modem that answers calls automatically, or you must have the Texas Instruments Internal Modem. When your modem "answers" the telephone, the remote computer that is calling raises the DTR signal. Your computer then sends a successful connection message to the status display. The display then shows the data transfer display.

Sending and Receiving

During an unattended operation, a remote computer primarily uses the ESC 0 sequence to control the sending and receiving of data from your computer. It may, however, use other escape sequences (discussed later in this appendix) to control the values of some of your parameters.

One cautionary note about unattended sending and receiving using TTY: the only way a remote computer can know when you have finished sending data (in response to a remote send command) is to examine the data itself. You may need to place a trailing message at the end of your file.

The four device control characters (DC1, DC2, DC3, DC4) regulate the send and receive operations. The DC1 and DC3 characters allow a receiving computer to temporarily halt (and resume) a session when it is receiving information too fast to store. For DC1 and DC3 to control the send process, the remote device control parameter must be on and the busy handling parameter must be set to DC1-DC3. The DC2 and DC4 characters allow a transmitting computer to control the receive operation of your computer.

It is useful to think of the device control characters as complementary pairs. The DC1 and DC3 characters control the send process; the DC2 and DC4 characters control the receive process. The DC1 and DC2 characters resume their respective processes; the DC3 and DC4 characters stop their respective processes. The following table illustrates these relationships.

	Send	Receive
Resume	DC1	DC2
Stop	DC3	DC4

The DC1 character is the send ready character. If your computer receives this character, it resumes sending data from the currently defined send file.

The DC2 character is the record on character. If your computer receives this character, it resumes receiving data to the appropriate receive file.

The DC3 character is the send busy character. If your computer receives this character on the communication channel, it stops sending information immediately. Your computer must receive a DC1 character from the remote computer before it will resume sending information.

If you place a DC3 character in a file that you send, your computer stops sending the file when it encounters the DC3. Your computer resumes sending when it receives a DC1 from the remote computer. Note that this process works only when a DC3 is sent from a file, not from the keyboard. Also note that the DC3 character is not actually sent.

The DC4 character is the record off character. If your computer receives this character, it continues to receive the data to the display, but your computer immediately stops storing data in the receive file. When the remote computer sends the DC2 character, your computer resumes receiving data to the specified receive file. If the receive file was reassigned during this time, your computer stores the information at the beginning of the new file. With this character a remote computer can specify what will be saved.

The DC1, DC2, DC3, DC4, and ENQ characters are discarded after their associated control function is performed. (Receiving an ENQ causes the ABM to be sent.) If the remote device control parameter is off these characters are treated as data.

Disconnection

In unattended mode, only two types of disconnects occur: normal and abnormal. Manual disconnects don't occur.

If you have specified a normal or abnormal disconnect file in the parameters, your computer goes through the following procedure when it disconnects.

1. Any data remaining in route is directed to the intended destinations before the session is terminated. For example, any data you are receiving is sent to the file before the disconnect occurs.
2. A file called AUTOEXEC.BAT is created on the diskette in the default drive.
3. The name of the appropriate normal or abnormal disconnect file is transferred to the AUTOEXEC.BAT file.
4. Your computer disconnects.
5. Your computer reboots. It looks in drive A for an MS-DOS disk. If your computer doesn't find this diskette, it looks in drive B, and then drive C, and so on until it finds an MS-DOS disk.
6. If an AUTOEXEC.BAT file exists on the MS-DOS disk, it is executed.

Because of this procedure you need to take some precautions. If you already have an AUTOEXEC.BAT file on your communications diskette, rename the file to prevent having it written over by this procedure. Also, make sure that you either have your MS-DOS/TTY diskette in the booting drive or that the diskette in the booting drive doesn't have an AUTOEXEC.BAT file on it.

REMOTE CONTROL

In the section entitled “Remote Commands” in Chapter 4 you learned how a remote computer can control your computer (and vice versa) through the use of the ESC 0 sequence. Your computer actually supports many other escape sequences besides the ESC 0 sequence. These other escape sequences control the state of some of the session parameters. The following table describes what these escape sequences do.

ESC 0	Causes the command immediately following the ESC 0 to be executed.
ESC 1	Requests status of the last command.
ESC 2	Enables Remote Device Control.
ESC 3	Disables Remote Device Control.
ESC 4	Enables display of received data.
ESC 5	Disables display of received data.
ESC 6	Enables display of transmitted data.
ESC 7	Disables display of transmitted data.
ESC 8	Enables keyboard.
ESC 9	Disables keyboard.
ESC ESC	Allows a single ESC to be treated as data.

Remote Command Status

When a remote computer sends an ESC 1, your computer responds by sending the status of the last remote command that it executed. The status of the command is displayed as a two-digit number. A list of these codes and their definitions is given in Appendix B, “Error Codes.”

Remote Device Control

When a remote computer sends an ESC 2 sequence, the remote computer can use device control characters to temporarily halt and resume the send and receive operations. When the remote computer sends an ESC 3 sequence, you can send device control characters within data without causing your computer to execute the functions of the control characters.

The device control characters DC1 and DC3 control the operation of the send file; device control characters DC2 and DC4 control the operation of the receive file. It should be noted that device control characters can't initiate the sending or receiving of a file. Device control characters control only the sending and receiving of files that have already begun transmission. To initiate the sending or receiving of files, a remote computer must use remote commands.

Display of Received Data

When a remote computer sends an ESC 5 sequence, none of the data the remote computer sends you is shown on your display. You may, however, look at the information later if it is stored to a file. When a remote computer sends an ESC 4 sequence, all information the remote computer sends is shown on the display.

Display of Transmitted Data

When a remote computer sends an ESC 7 sequence, none of the information you send, whether it is sent by you or by remote command, shows on your display. The only exception to this is the transmit new line sequence, which is always displayed in the data transfer display. When a remote computer sends an ESC 6 sequence, it enables your computer to display the characters it transmits.

Keyboard

When the remote computer sends an ESC 9 sequence, your computer keyboard is disabled so that no data can be sent from the keyboard or with the function keys. This allows the remote computer to conduct a TTY session without accidental interference from your keyboard disrupting the session. When the remote computer is finished communicating with your computer, it sends an ESC 8 to enable your keyboard.

Sending of ESC as Data

When an ESC is to be interpreted as data, the remote computer inserts two ESCs into the data being sent. If a number follows a double ESC, the sequence will not be interpreted as an escape sequence.

Error Codes

This appendix lists the codes you can get using the TTY program and the action needed to correct the error.

CONNECTION ERRORS

The following error codes may appear during connection.

Dialing connection failure - phone line
busy

Wait and try again.

Dialing connection failure - call not
answered

Check the phone number to see if it is correct. Try again later.

Dialing connection failure - inoperative
phone number

An inoperative phone number error has many possible causes, including any of the following:

- The telephone cord is not hooked to the modem
- The manual originate mode was selected but no call was placed within 20 seconds.
- The command was not accepted by the modem (for example, trying to set up 1200 baud in a 103 modem).
- No response from modem to any of the various commands.

-
- Telephone call was placed but was lost (for example, the line was busy, no ring).
 - The hardware is malfunctioning on the modem board.

Dialing connection failure - no dial tone detected

No dial tone was detected.

Dialing connection failure - incorrect modem speed

The speed parameter you specified does not match the modem speed. The command was not accepted by the modem (for example trying to set up 1200 baud in a modem).

Dialing connection failure - no modem answer tone

The call was answered but the remote modem has not supplied an answer tone. Either the modem is defective or you have reached a wrong number. Check the number and try again.

Dialing connection failure - modem not installed

Your modem either isn't connected correctly or it doesn't exist. If a modem is there, check the connections.

Dialing connection failure - inoperative modem

Your modem isn't working correctly. Try using a different modem.

Dialing connection failure - manual phone call not placed

The manual originate mode was selected, but no call was placed within 20 seconds.

DISCONNECT ERRORS

The following error codes may appear during disconnection.

Normal disconnect - file access error on
<filename>

The normal disconnect batch file couldn't be found, opened, or read.

Abnormal disconnect - file access error
on <filename>

The abnormal disconnect batch file couldn't be found, opened, or read.

Abnormal disconnect - line disconnected

The connection was broken. Dial the number again and restart the session.

Abnormal disconnect - error limit
exceeded

Too many parity and framing errors occurred on the line. There are several possible causes. You may have specified the wrong number of stop bits, in which case you need to reset the number of stop bits. The line may have a lot of interference on it, in which case you should try again with a different connection. You may have set the speed parameter wrong, in which case you need to match your modem speed to the remote modem speed.

Abnormal disconnect - inactivity time-out

No communication occurred on the line for longer than a specified period of time. Either reset the inactivity time-out parameter for a longer time period or don't wait so long between file transfers.

Abnormal disconnect - failsafe time-out

You probably have a defective modem.

Normal disconnect - DLE-EOT or EOT
received.

The remote computer has terminated the session.

SESSION ERRORS

The following error codes may appear during a communications session.

File not found or device error

A file by the specified name could not be found.

Invalid Parameter file

An MS-DOS device name (PRN, CON, NUL, AUX or LST) has been specified as a filename extension or the specified file doesn't contain valid parameters.

Operation not allowed while files are in
use

Create, Delete, or Rename operation attempted while files are in use.

No communications board

A communications board could not be found at the specified port.

Printer not available

Data could not be printed.

Create file failed

Number of files exceeds directory size or disk is full.

Rename file failed

Diskette may be write protected etc.

Delete file failed

The file does not exist or it is write-protected.

Invalid directory

The directory must be an allowable drive designator (A, B, C, D, or E) or a valid directory name.

Cannot close current file

Either the diskette is bad or the diskette does not have enough room for the file.

Cannot create receive file

The diskette is write-protected or the diskette does not have enough room for the file.

No receive file defined

You pressed the STOP RECEIVE key and the computer wasn't receiving.

No send file defined

You pressed the STOP SEND key and the computer wasn't sending.

Receive file same as send file

The receive file cannot be the same as the send file.

File already exists

Choose a different filename.

FORM ERRORS

The following errors may appear when you are changing parameters.

Not enough characters in field

Too many characters in field

Non-alphabetic character in field. Must be A-Z or a-z

Character in field is not a number. Must be 0-9

Number is less than minimum required

Number is greater than maximum allowed

Character in field is not valid. Must be 0-9, -, +, *, or #

Character in field is not valid for filename.

Character in field is control character or not ASCII

Both parts of character pairs not mapped.

Function string not valid.

REMOTE COMMANDS

When a remote computer uses remote commands to control your computer, the remote computer can request the status of the last command sent. The possible error codes that your computer can return are the following. Note that only asterisks and numbers are sent, not the explanation.

*** 00 ***

Successful Completion

*** 17 ***

Operation not allowed while files are in use

*** 18 ***

File not found or device error

*** 19 ***

Invalid filename

*** 32 ***

Create file failed

*** 33 ***

Delete file failed

*** 34 ***

Rename file failed

*** 36 ***

Bad parameter in command

*** 37 ***

Bad verb in command

*** 38 ***

File already exists

*** 95 ***

Cannot close current file

*** 96 ***

Cannot create receive file

*** 97 ***

No receive file defined

*** 98 ***

No send file defined

*** 99 ***

Receive file same as send file

Parameter Guide

For computers to communicate with other external electronic devices, certain conventional procedures must be established. These conventions help to ensure that messages sent from one device are correctly received by the other. This chapter provides an in-depth look at the teletype-compatible (TTY) communications protocol used by your Texas Instruments Professional Computer. This protocol consists of a system of signals and codes that conform with the Electrical Industry Association (EIA) RS-232-C standard interface. These codes and signals are controlled by software parameters as well as by hardware in the sync-async communications board. When communicating with an external device, these parameters may be changed by the user so that the commands and codes used by your computer are compatible with those of the external device.

The parameters used in TTY communications may be described as either static or dynamic. The static parameters are set before the communications session begins and do not change during the session. The dynamic parameters are subject to change by the remote computer as the session progresses.

The parameters are listed in alphabetical order. They are formatted in the following manner to make accessing the appropriate information easier.

- Parameter: The parameter designation is presented.
- Values: The possible values of the parameter are listed.
- Default: The assumed value of the parameter if there is no change.
- Purpose: The purpose of the parameter is described.
- Comments: A brief explanation of the parameter is provided to help you in understanding how the parameter works.

PARAMETERS

Parameter:	Abnormal disconnect filename
Value:	Some MS-DOS batch filename
Default:	None
Purpose:	Indicates the name of the MS-DOS batch file to be executed if an abnormal disconnection occurs.
Comments:	<p>The abnormal disconnect filename parameter is activated when the connection is disrupted by some means other than a normal disconnection sequence. If an abnormal disconnect filename is specified, the TTY program is terminated. MS-DOS is rebooted, causing the MS-DOS commands stored in the AUTOEXEC file to be executed.</p> <p>The AUTOEXEC file contains the filename. When the filename is executed, an MS-DOS operating system diskette containing the specified filename must be installed in the system default disk drive unit.</p> <p>This option is used mainly for unattended operation. If a filename is not designated, the TTY program displays the disconnect TTY menu and waits for further instructions from the operator.</p>

Parameter: Answerback memory

Value: 0 – 32 character string

Default: None

Purpose: To store an answerback message.

Comments: The ABM message is transmitted whenever an enquire (ENQ) character is received or when the answerback trigger option is activated automatically. If the display of transmitted data (local copy) parameter is On and the secured ABM parameter is Off, the ABM message is displayed as it is transmitted.

Parameter:	Busy handling
Value:	DC1-DC3, SCF-SCA, or NONE
Default:	NONE
Purpose:	Specifies whether or not the busy condition is monitored. If monitoring is used, specify DC1-DC3 or reverse channel SCF-SCA monitoring.
Comments:	<p>When you select the DC1-DC3 busy signal, the device control character DC1 is defined as the ready indicator and the DC3 character is designated as the busy indicator.</p> <p>DC1 is transmitted as the ready signal when the receive buffer is empty. DC3 is transmitted as the busy signal when there is room for only 128 characters remaining in the receive buffer.</p> <p>If the remote device control dynamic parameter is Off, DC1-DC3 busy handling does not take place.</p> <p>When SCF-SCA busy signal is selected, the SCF input circuit is monitored for a busy signal with transmission of every character from the remote station. The SCA output signal informs the remote computer if the master unit is ready or busy. The busy sense parameter specifies the sense of the signals used to indicate the busy condition.</p>

Parameter:	Busy sense
Value:	0 or 1
Default:	0
Purpose:	Affects the sense of the secondary request to send signal (SCF) and the secondary received-line signal detector (SCA) that indicates a busy signal when reverse-channel busy conventions are used.
Comments:	<p>If busy sense is 0 and SCA-SCF busy handling is selected, circuit SCF is monitored during transmission for a busy signal (SCF = OFF) from the remote computer.</p> <p>If busy sense is 0 and SCA-SCF busy handling is selected, your computer turns off circuit SCQ to indicate a busy condition to the remote computer.</p> <p>If busy sense is 1 and SCA-SCF busy handling is selected, your computer interprets SCF = ON as a busy signal.</p> <p>If busy sense is 1 and SCA-SCF busy handling is selected, your computer turns SCA on as a busy signal.</p>

Parameter:	Call answer answerback message (ABM)
Value:	ON or OFF
Default:	OFF
Purpose:	Enables the automatic answerback that is initiated when a call is automatically answered.
Comments:	If the call answerback ABM parameter is enabled when the computer automatically answers an incoming call, the answerback message created using the ABM parameter is transmitted to the remote device. The ring indicator (RI) signal is used as an indication that the call is being answered and did not originate locally.

Parameter:	Call originate answerback message (ABM)
Value:	ON or OFF
Default:	OFF
Purpose:	Allows the transmission of the answerback memory (ABM) message when a call originates locally.
Comments:	When the call originate ABM parameter is enabled, the ABM message is automatically transmitted when the computer originates a call.

Parameter: Check parity

Value: ON or OFF

Default: OFF

Purpose: Specifies whether to check received characters for parity.

Comments: Parity is checked if check parity is On and the parity parameter is set to ODD or EVEN. If a parity error is detected, the character is recorded in the files as the graphics character with the decimal value 240.

—
—
—

Parameter:	Character Set
Value:	NATIONAL or INTERNATIONAL
Default:	NATIONAL
Purpose:	Defines the character set to be used. If the reply is NATIONAL, the national version of the ISO character set is used. If the reply is INTERNATIONAL, the international reference version of the ISIO character set is used.
Comments:	The currency sign used in the ISO international reference character set is \$. This character set is identical to the USA ASCII set, and the two options are the same in the USA and Canada.

Parameter: Country Code

Value: USA NOR DNK SWE FIN CHE ESP

Default: USA

Purpose: Allows you to select your national version of the ISO character set.

Parameter: Data-link escape—End of transmission (DLE-EOT) character disconnect.

Value: ON or OFF

Default: OFF

Purpose: Enables the data link escape end of transmission disconnection sequence.

Comments: When the DLE-EOT character disconnect parameter is enabled, the computer disconnects the communications line when the DLE-EOT character combination is received. This results in a normal disconnection.

Parameter:	Dialing mode
Value:	TONE or PULSE
Default:	TONE
Purpose:	Determines whether the modem uses tone or pulse dialing. Some older phone systems may require pulse dialing.

Parameter:	Dialing procedure
Value:	Manual or Automatic
Default:	Automatic
Purpose:	Determines whether the modem call or answer procedure is automatic. See the Internal Modem appendix for more information.

Parameter:	Display of received data
Value:	ON or OFF
Default:	ON
Purpose:	Specifies whether or not received characters are displayed.
Comments:	When the display of received data is enabled, all characters are displayed as they are received.

Parameter:	Display of transmitted data
Value:	ON or OFF
Default:	OFF
Purpose:	Specifies whether or not transmitted characters are displayed.
Comments:	When the display of transmitted data parameter is enabled, all characters are displayed as they are transmitted. Control functions are not performed when transmitted data is displayed.

Parameter:	End-of-transmission (EOT) disconnect
Value:	ON or OFF
Default:	OFF
Purpose:	Enables a disconnect when the end-of-transmission (EOT) character is received.
Comments:	When the EOT disconnect parameter is enabled, the computer disconnects the communications line when the EOT character is received. This results in a normal disconnection.

Parameter:	Error threshold
Value:	0 — 999 errors
Default:	0
Purpose:	Specifies the number of parity errors, framing errors, and receiver overruns allowed before an abnormal disconnection occurs.
Comments:	<p>A value of 0 (the default value) means that a disconnect does not occur regardless of the number of errors.</p> <p>If the number of errors equals the threshold, an abnormal disconnection results.</p>

Parameter:	Failsafe disconnect
Value:	ON or OFF
Default:	ON
Purpose:	Enables the failsafe disconnect option.
Comments:	<p>If the failsafe disconnect parameter is enabled (ON), the computer disconnects the communication line under various error conditions. All time-outs associated with this feature are enabled.</p> <p>The failsafe time-outs include the clear-to-send (CTS) and the data-carrier-detect (DCD) time-outs. If either of these signals remains Off for a predefined period of time during the session, a failsafe disconnection occurs.</p> <p>If the failsafe disconnect parameter is Off no time-out occurs and there is not a failsafe disconnection on these signals.</p>

Parameter:	Inactivity time-out
Value:	0 — 999 seconds
Default:	0
Purpose:	Enables or disables the time-out disconnect due to inactivity.
Comments:	The inactivity time-out parameter specifies the number of seconds of inactivity allowed to elapse before an abnormal line disconnection occurs. A value of 0 disables the timeout.

Parameter: Keyboard

Value: ON or OFF

Default: ON

Purpose: Alters the status of the keyboard.

Comments: When the keyboard parameter is On, the operator can transmit data by typing on the keyboard if a file is not being transmitted. This allows the operator access to control operations by using the function keys, special keys, or specific key sequences.

If the keyboard parameter is Off, the keyboard is disengaged and data cannot be transmitted by typing on the keyboard. Function-key operations are also suspended. This allows unattended operation where the display and send/receive devices are controlled using the device control characters from the communication channel.

Parameter:	Mapped characters
Value:	Characters that are mapped
Default:	None
Purpose:	Allows specified, transmitted, or received characters to be replaced by other characters or to be deleted from the data stream.
Comments:	The character-mapping information is indicated by the mapping parameters. When data is received, characters are converted according to the mapping parameters before any other character recognition takes place. In transmitted data, character conversion is the last thing to happen before sending the character over the communication line.

Assigning the mapping parameters requires the use of the mapping menu. Characters to be changed are entered into the fields designated "Characters." In some cases, mnemonic codes for characters (such as CR for the carriage-return character) must be entered. This requires that the mnemonic code be enclosed in angle brackets, <CR>.

The corresponding "Map to" field is used to specify the replacement character. If you type two angle brackets with nothing in between, <>, the specified character is deleted from the data stream.

Only a single character (or its mnemonic code) may be entered into any mapping field. The additional space displayed in the field is used to enter a mnemonic code.

Parameter:	Normal disconnect filename
Value:	Some MS-DOS batch filename
Default:	None
Purpose:	Indicates the name of the MS-DOS batch file to be executed if a normal disconnection occurs.
Comments:	<p>The normal disconnect filename parameter is activated after any normal disconnection occurs. When a normal disconnect filename is specified and a normal disconnect occurs, the TTY program is terminated. MS-DOS is rebooted, causing the MS-DOS commands stored in the AUTOEXEC file to be executed.</p> <p>The AUTOEXEC file contains the contents of filename. When filename is executed, an MS-DOS operating system diskette containing the specified filename must be installed in the system default disk drive unit.</p> <p>This option is used mainly for unattended operation. If filename is not designated, the TTY program displays the disconnect TTY menu and waits for further instructions from the operator.</p>

Parameter: Parity

Value: ODD, EVEN, MARK, SPACE, or NONE

Default: EVEN

Purpose: Selecting EVEN or ODD determines if the parity bit is to be set so that there is an even number of ones or an odd number of ones in the binary character representation. The parity bit may be set to one by selecting MARK or set to a zero by selecting SPACE.

Comments: Although the parity parameter is independent of the parity check parameter, they complement each other during operations. If parity check is ON, the parity is checked when parity is set to ODD or EVEN. The use of MARK, SPACE, or NONE disables parity checking. If NONE is selected, eight-bit data is transmitted and received, and the parity bit is ignored.

Parity is used to ensure that the message sent is the same as the one received. The transmitting computer sets the parity bit in the binary code as specified by the value of parity. If one of the bits is changed during transmission, the receiving computer finds the binary code is not even when the parity is EVEN (or not odd if parity is ODD). This indicates to the receiving computer that some error has been introduced during transmission of the character.

Parameter:	Phone number
Value:	0—32 characters including numerals and separators. Allowable separators are + and -, *, and #.
Default:	None
Purpose:	Stores the telephone number of the remote station to be contacted.
Comments:	The plus (+) tells the computer to pause and wait for a dial tone before continuing to dial the number. This is used when a number must be dialed to get an outside line. The hyphen (-) is used only for visual separation of the numerals in the number and is ignored by the computer.

Parameter:	Port
Value:	1, 2, or 3
Default:	1
Purpose:	Selects the port through which the computer will communicate.
Comments:	The port number is determined by the position of a jumper on the synchronous-asynchronous communications board. It is not related to the slot occupied by the board. Refer to the <i>Synchronous-Asynchronous Communication Board</i> option manual for details concerning the positions of the jumpers to set the port number.

Parameter:	Printing of completions
Value:	ON or OFF
Default:	OFF
Purpose:	Enables a log of the completed events to be printed on a line printer.
Comments:	When enabled, the status-display completion messages are sent to the line printer. Printing of completions occurs even if the status is not displayed at the time the event occurs.

Parameter:	Programmable function keys
Value:	0 — 32 characters
Default:	None
Purpose:	Defines character strings to be stored and recalled using the 12 SHIFT-FUNCTION keys.
Comments:	<p>Character strings are assigned to each of the 12 function keys using the programmable key menu. These strings can be up to 32 Characters long. When the specified SHIFT-FUNCTION key is pressed, the corresponding character string is returned and transmitted just as though the string had been typed from the keyboard.</p> <p>If a value is not entered for a particular function key, that key is undefined and pressing the key will not have any effect.</p>

Parameter:	Receive new line
Value:	0 – 2 ASCII characters
Default:	<CR><LF> (carriage return/line feed)
Purpose:	Defines the receive new line character sequence.
Comments:	The receive new line parameter allows special character sequences to be used to inform the computer that a new line is being transmitted. When the receive new line character sequence is encountered in the communications data stream, an end-of-record mark is inserted in the receiving file and a carriage-return/line-feed sequence is printed on the display.

Parameter:	Remote commands
Value:	ON or OFF
Default:	ON
Purpose:	Enables commands from the remote device to be received.
Comments:	When this parameter is On, the remote device is allowed to send commands or any of the controlling ESC key sequences to the Texas Instruments Professional Computer. This allows the remote device to control the activity of the computer. When Off, the remote device cannot control the operation of the computer.

Parameter:	Remote device control
Value:	ON or OFF
Default:	ON
Purpose:	Enables control of the computer by a remote device using the DC1, DC2, DC3, and DC4 characters.
Comments:	<p>When the remote device control parameter is ON and DC1-DC3 busies are enabled, the operations of the send file may be controlled by DC1 or DC3 signals received from the communications line. When a DC3 signal is received from the remote device, any ongoing transmission will stop within five characters.</p> <p>The operations of the receive file may be controlled by DC2 and DC4 received from the communications line.</p> <p>When a busy indication (DC3) is sent to the remote device, data transmission should cease within 128 characters to prevent data loss. Your computer waits for a “ready” indication (DC1) before resuming data transmission. You can include DC3 characters in the file, which causes your computer to stop sending until it receives a DC1.</p>

Parameter: Secured ABM

Value: ON, OFF

Default: OFF

Purpose: Determines whether or not the transmitted
ABM is displayed on the data transfer
display.

Parameter:	Speed
Value:	110, 300, 600, 1200, 2400, 4800, 9600, and AUTO bits per second
Default:	300 bits per second
Purpose:	Establishes the communication rate for the TTY communication program.
Comments:	The speed parameter sets the rate at which the computer transmits and receives data. This rate is expressed in bits per second (bps). The remote device must be set to the same rate for communication to be successful.

AUTO is one of the choices for the speed parameter. It provides full-duplex operation with a Bell 212A compatible data set designed to accept dual baud rates.

When a call originates locally, the data signal rate selector (CH) is held ON to enable high-speed transmission and reception. When a call is answered, the modem indicates the speed selection using the CI signal.

When the AUTO speed option is selected, it is assumed that the modem used is a Bell 212A and does not use reverse-channel signals for the secondary request to send signal (SCF) and the secondary received line signal detector (SCA).

Parameters:	Stop bits
Value:	1 or 2
Default:	1
Purpose:	Specifies the number of stop bits used to inform the computer when a character's bit pattern is complete.
Comments:	If speed is set to 110 bps, the number of stop bits must be set to two.

Parameter: Transmit new line

Value: 0 – 10 ASCII characters

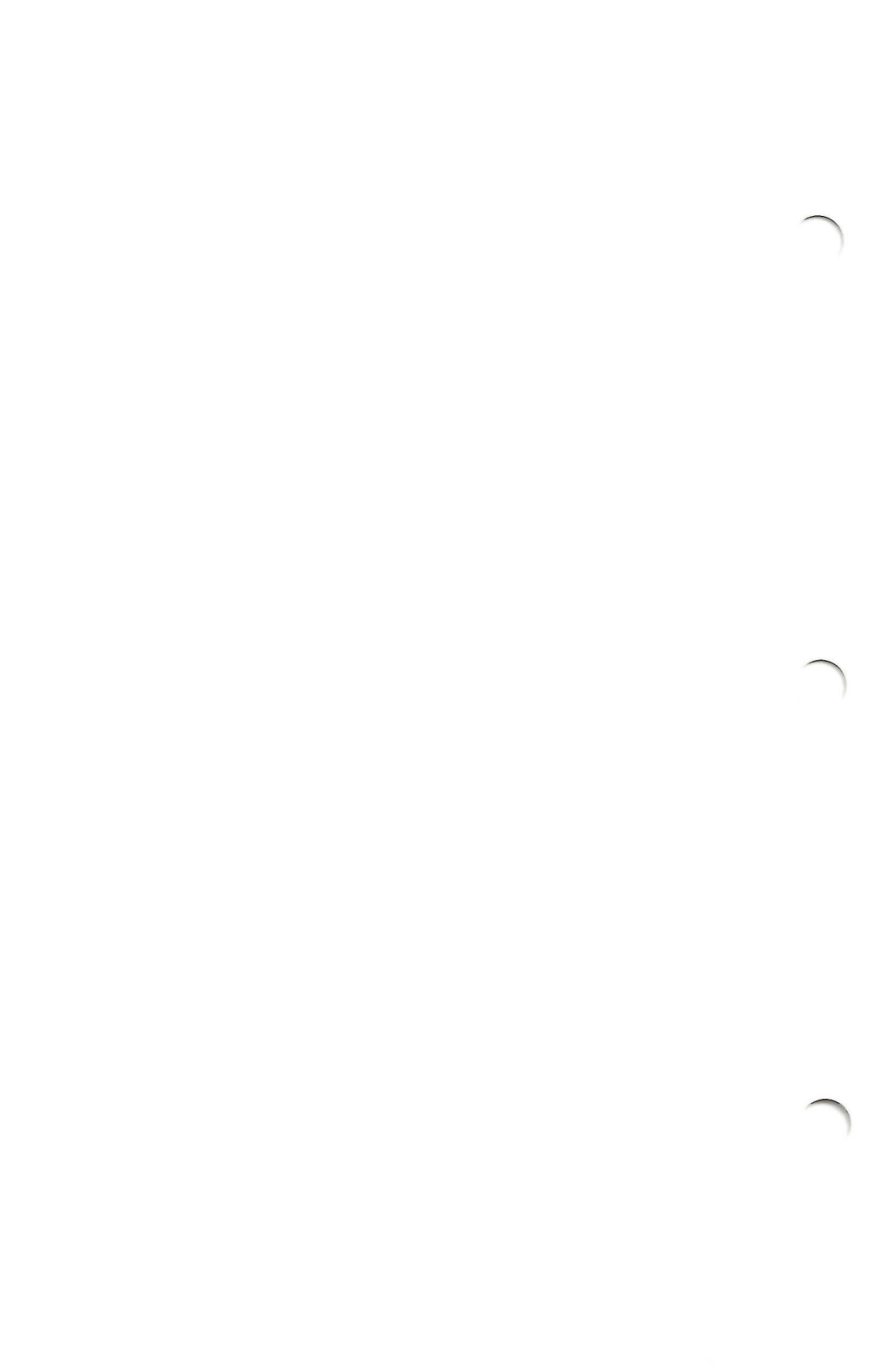
Default: <CR><LF> (carriage return/line feed)

Purpose: Defines the transmit new line character sequence.

Comments: The transmit new line parameter allows a specified character string to replace the **RETURN** key code and the end-of-record code in a file. Any time the **RETURN** key is pressed, or when an end-of-record code is encountered in the send file, the specified transmitting new line character sequence is added to the transmitted data after the record is sent.

If the local copy parameter is enabled, a carriage-return/line-feed sequence is included in the local copy data when a transmit new data character sequence is encountered in the data stream.

This feature creates the appropriate end-of-record code for the remote device. This also saves keystrokes when the computer is operating on a channel that requires a specific character sequence at the end of each line.



Using an Internal Modem

INTERNATIONAL

Texas Instruments internal modems are not approved for use in the United Kingdom and Europe and cannot be used.

USA AND CANADA

The following describes an internal modem approved for use in the USA and Canada, for the Texas Instruments Professional Computer and explains its use with the TTY Communications software package.

Introduction and Overview

The internal modem gives you a reliable means of communication between your Texas Instruments Professional Computer and the outside world. The internal modem greatly simplifies your TTY operations.

Other benefits of installing a modem include:

- Enabling automatic dialing (auto-dial), controlled by the TTY communications applications program
- Providing automatic answering (auto-answer) of incoming calls
- Providing direct connection to the telecommunication lines through a standard modular telephone jack and cable

-
- Eliminating the need for a telephone set used exclusively with the modem. You may plug a telephone set into the option board if you wish, but it is not necessary for operation
 - Providing compatibility with Bell 212A or 103 data sets
 - Providing compatibility with both tone- and pulse-dial switching systems
 - Enabling manual dialing capability, when required for control and coordination

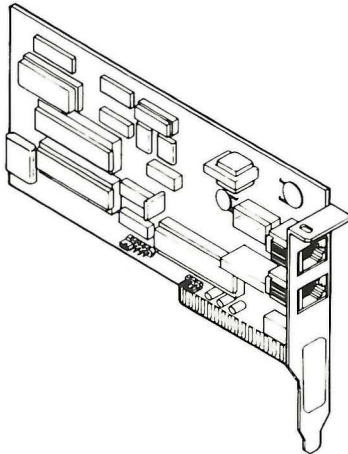
Description

Two types of internal modems can be used with TTY Communications. One modem is a Bell 212A compatible modem providing serial, binary, synchronous and asynchronous, full-duplex communications. The baud rates of the modem are 300 and 1200. The other modem is a Bell 103J compatible modem providing serial, binary asynchronous, full-duplex communications. Its baud rate is 300 bps. The technical term for the modulation technique employed is dibit phase-shift keying (DPSK). In this type of keying, the phase of the modulated carrier is changed for every two bits (dibit = 2 bits) of information, so we use the term “dibit” phase-shift keying. The receiving modem must be able to detect the phase change of the carrier. These terms are primarily of interest to technical persons; you do not need to know them to operate the modem using the TTY Communications software package.

Connecting Your Internal Modem

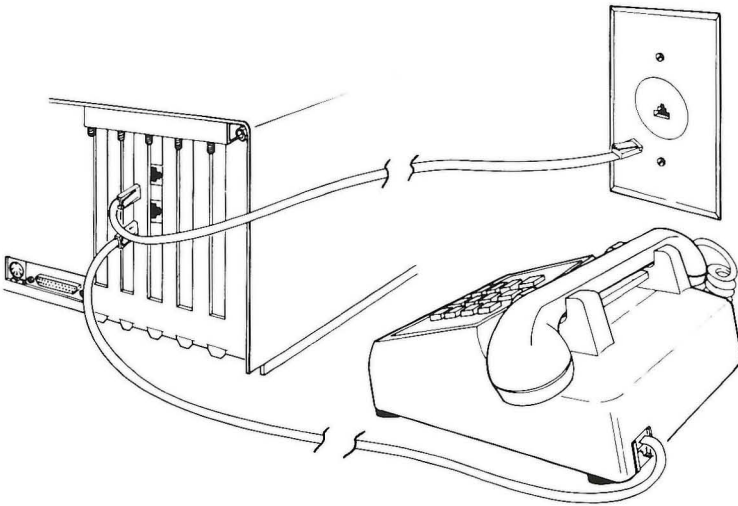
Connecting the internal modem to a telephone line is simple and straightforward. Use the telephone-type cord with a modular plug on each end (furnished with the internal modem option kit), and follow these steps.

- Connect one end of the telephone cordset to the modem board. The option plate of the modem board is visible from the back plate of the system unit. As the following illustration shows, there are two modular telephone-type jacks, or sockets on the option plate. Both are wired in parallel, so it doesn't matter which one you use.



2223256-5

-
- Connect the free end to a modular telephone wall jack.
 - If you want to, you may connect a standard telephone set to the remaining jack on the option plate on the back of the system unit. The following illustration shows the locations of the jacks and proper connections.



2223256-12

Checking the Configuration

You may verify the configuration of your computer simply by selecting the “Display System Configuration” on the diagnostics diskette. Follow the instructions for loading and using the diagnostics diskette contained in your *Texas Instruments Professional Computer Operating Instructions*. You can determine the following information from the Display System Configuration.

- The presence or absence of an internal modem
- The port number for which the internal modem is programmed (For instructions on changing the port number of your modem, refer to Chapter 2 of your *Internal Modems* manual.)
- The presence of a sync-async communications board option (If this option board is also installed, make certain that it is assigned a different port number from the internal modem port number. No two options boards may use the same port number.)

A typical system configuration display looks like this:

```
Texas Instruments Professional Computer
      System Configuration

ROMs installed :

V1.23 SYSROM (c) Copyright Texas Instruments Inc. 1983

RAM installed: 256 K bytes

OPTIONS installed:
  Diskette drive 1, 2 side(s), 40 tracks
  Diskette drive 2, 2 side(s), 40 tracks
  300 bps Modem port 2

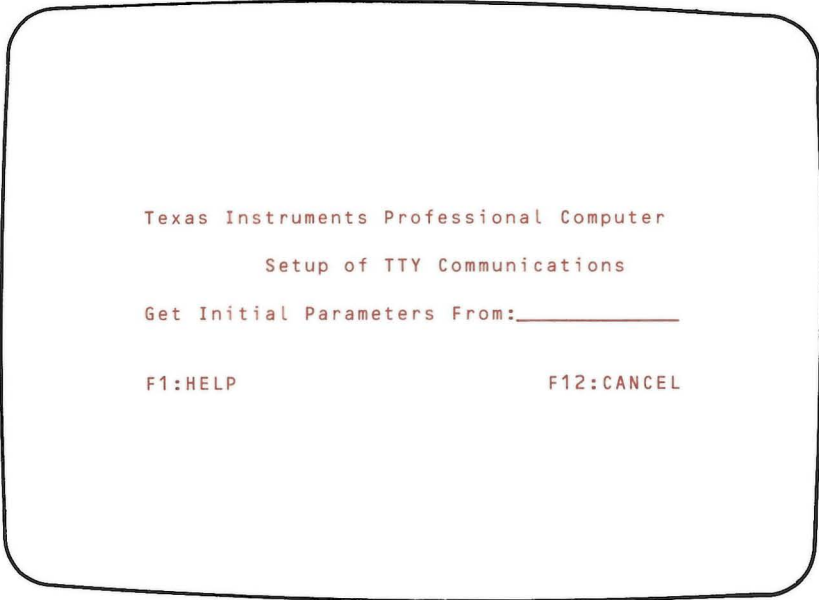
System Configuration Code - 0173400000

Press any key to return...
```

Instructions for Use

This section presents the menus displayed when you use version 1.10 (or a later version) of the TTY Communications software package. If you are not familiar with the setup and operating steps, refer to Chapter 3 and 4 of this manual, and Chapters 1 and 2 of the *Internal Modems* manual.

After you load the TTY program and press the **F2**, **SETUP** key, the following display appears.



```
Texas Instruments Professional Computer
      Setup of TTY Communications
Get Initial Parameters From: _____

F1:HELP                                F12:CANCEL
```

Setting Up Parameters with the Internal Modem

Type the name of the file that you want to change and press the **RETURN** key. (If you do not have a parameter file, press the **RETURN** key and complete the standard setup procedure described in Chapter 3.) The following display appears.

Texas Instruments Professional Computer

Setup of TTY Communications

Parameters	Values
Port	: 1 2 3
Speed	: 110 300 1200 2400 4800 9600 AUTO
Stop Bits	: 1 2
Parity	: ODD EVEN MARK SPACE NONE
Check Parity	: ON OFF
Character set	: National International
Country code	: USA NOR DNK SWE FIN CHE ESP
Dialing Mode	: Pulse Tone
Dialing Procedure	: Manual Automatic
Phone Number	:

F1:HELP F2: NEXT MENU F11:SAVE F12:CANCEL

The following steps provide detailed instructions for setting up the internal modem parameters for the TTY Communications program.

1. The setup display for the TTY includes fields for entering the dialing procedure (automatic or manual). *Automatic* dialing enables storing of the desired destination telephone number (with up to 32 digits) as part of the setup parameters. Automatic calling and modem connection simplify TTY communications sessions. Select *Manual* dialing if you do not wish to establish a parameter file for seldom-used phone numbers, or if voice coordination with an operator on the remote computer is necessary.

-
2. You may select either *Tone* or *Pulse* dial type. Select *Tone* if you have a Touch-Tone® , or dual-tone multifrequency type of telephone system characterized by a pushbutton dial and audible tones generated when you press dial buttons. Select *Pulse* if you have a rotary dial or pulse-type telephone system. Note that many telephone switching centers will accept either tone or pulse dial. Always select *Tone* if possible, since it is faster and more efficient.

 3. A space is provided for entering a telephone number. This is used in the *automatic* dialing procedure only. You may enter up to 32 digits. You can use the “+”, “.”, “*”, and “#” symbols as separators for the telephone number. A “+” tells the computer to wait for an additional dial tone before dialing the rest of the number. Use this symbol if you are calling from a business telephone that requires you to dial a number to get an outside line. The “.” is a separator that you may use for your own convenience. The computer ignores it. For example, if you wish to call from a business extension to a long-distance number, enter a + or - as in the following example.

(9 + 1-213-555-1212)

In this example the modem dials 9 for an outside line, waits for the second dial tone, and then dials the remaining numbers.

Here's a second example in which a long distance call is placed and charged against a calling card account number.

(9 + 0-213-555-1212 + 71389530009999)

After you complete the last field on the display, continue to change the parameter displays as described in Chapter 3 in the section entitled "How to Change Parameters."

4. When you finish changing the parameters, press the **ENTER** key on the numeric keypad, or press the **RETURN** key when you are in the last field of the display page. The following display appears.

```
Texas Instruments Professional Computer
      Setup Of TTY Communications

Save Parameters In: _____

F1:HELP                                F12:CANCEL
```

5. Store the parameters you have selected by typing a filename. Choosing a descriptive filename will make it easier for you and others to identify this file later. For example, a parameter file used exclusively to transmit a weekly report could have this filename:

WKLYRPT.PRM

The extension name “PRM” indicates the file is a parameter file. This is helpful in identifying parameter files when you are displaying a disk directory.

MS-DOS will not accept more than eight characters for the filename, or more than three characters for the extension. Separate the filename from the extension with a period.

6. Press the **RETURN** key or the **F12** key to exit the Setup Parameters display and return to the main menu.

Starting Communications with the Internal Modem

When you press the **START** key, **F3**, the display prompts you to enter a filename. Type the parameter filename you wish to use. If the file is not in the default drive, specify the drive. For example, if drive A is the default drive, and the parameter file is in drive B, type the following:

B:SAMPLE.PRM

Manual Dialing

If you select manual dialing, lift the exclusion key (the grooved hang-up button in the cradle of your data phone or key telephone set) and dial the telephone number of the remote computer. When you hear the tone, replace the handset and press the **RETURN** key. The disk drive accesses the file and the computer immediately begins to establish connection with the remote computer. If the connection is not made within 20 seconds, the computer displays the following error code.

Dialing connection failure - manual phone call not placed.

NOTE

It is best to use either a data circuit and dataphone, a single-line phone without extensions, or a standard telephone line and telephone set with the exclusion key feature. Using a multiline telephone, or a telephone with extensions, causes various problems, from disconnects to garbled text.

Automatic Dialing

If you specify the Automatic dialing procedure, and include a telephone number, the computer begins dialing as soon as you enter the parameter filename from the start of TTY communications display.

Automatic Answering

You can set up your computer to answer an expected call from a remote computer by following this procedure.

1. Set up your file parameters in the normal manner. Select Automatic dialing procedure, but do not enter a telephone number. Simply press the **RETURN** key to leave the phone number field blank. This prepares the computer to receive a call.
2. Press the **START** key, **F3**, then type the parameter filename.
3. Press the **RETURN** key. Your computer is now ready to receive a call.

Error Codes

You may encounter the following error codes when you use the internal modem with the TTY Communications software package.

`Phone line busy`

The called telephone number is busy. Try again later.

`Call not answered`

The called telephone number does not answer. This could be caused by several different problems, including:

- Use of the wrong telephone number.
- Problems with the switched telephone link.
- Problems with the remote modem, connections, or setup.
- The remote computer or modem being OFF or having a fault.

`Inoperative phone number`

The call was not successfully completed. Recheck the number and try again. If this message repeats, check the modem.

`No dial tone detected`

The connection was never made.

`Incorrect modem speed`

The speed you specified does not match your modem speed.

Inoperative modem

Your modem is not working.

No modem answer tone

The called number was not automatically answered by another modem. Recheck the number dialed and try again. If the called number operates manually, the originating computer should also.

Modem not installed

Your computer does not have the internal modem option installed.

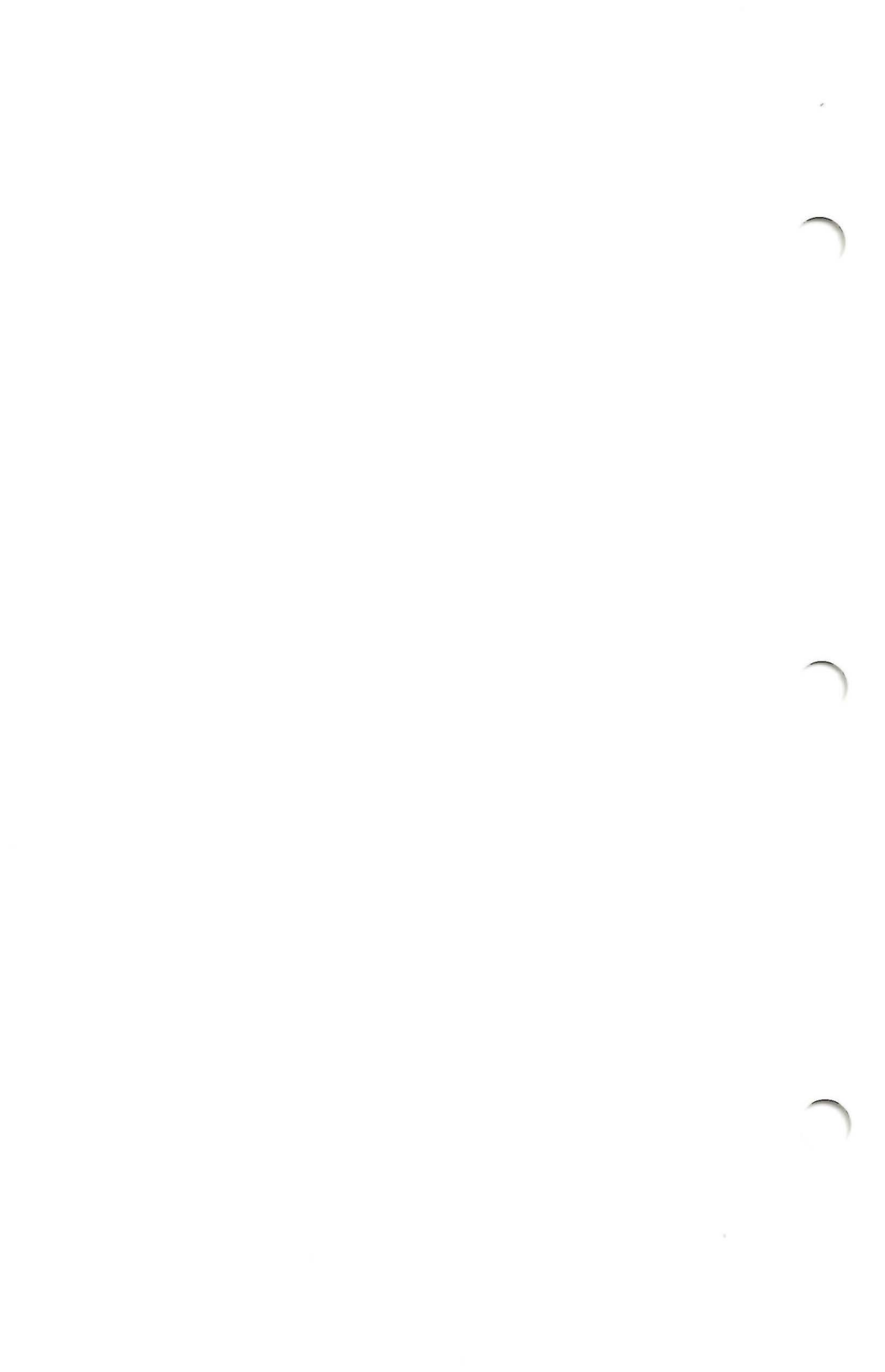
Manual phone call not placed

A phone call was not placed when manual mode was selected.

Key Mnemonics

The following table lists the control characters, their decimal number in the ASCII chart, their mnemonics, the key strokes needed to display them, and the characters that appear on the display when you access them.

Dec. #	Control Character	Mnemonics	Key Strokes	Display Character
1	Start of Heading	SOH	CTRL A	
2	Start of Text	STX	CTRL B	
3	End of Text	ETX	CTRL C	
4	End of Transmission	EOT	CTRL D	
5	Enquiry	ENQ	CTRL E	
6	Positive Acknowledge	ACK	CTRL F	
7	Bell	BEL	CTRL G	
8	Backspace	BS	CTRL H	
9	Horizontal Tab	HT	CTRL I	
10	Line Feed	LF	CTRL J	
11	Vertical Tab	VT	CTRL K	
12	Form Feed	FF	CTRL L	
13	Carriage Return	CR	CTRL M	
14	Shift Out	SO	CTRL N	
15	Shift In	SI	CTRL O	
16	Data Link Escape	DLE	CTRL P	
17	Device Control 1	DC1	CTRL Q	
18	Device Control 2	DC2	CTRL R	
19	Device Control 3	DC3	CTRL S	
20	Device Control 4	DC4	CTRL T	
21	Negative Acknowledge	NAK	CTRL U	
22	Synchronize	SYN	CTRL V	
23	End of Transmission Block	ETB	CTRL W	
24	Cancel	CAN	CTRL X	
25	End of Medium	EM	CTRL Y	
26	Substitute	SUB	CTRL Z	
27	Escape	ESC	CTRL [
28	File Separator	FS	CTRL \	
29	Group Separator	GS	CTRL]	
30	Record Separator	RS	CTRL ^	
31	Unit Separator	US	CTRL _	
32	Space	SP	Space Bar	
127	Delete	DEL	Delete Key	



Modems

This appendix provides a list of the external modems available for the Texas Instruments Professional Computer and where to seek further advice.

USA AND CANADA

Modem Considerations

The external modems which can be used in the USA and Canada are full-duplex, 300 or 1200 bps, asynchronous modems. Permitted external modems are the Bell 103, the Bell 212, the Vadic 3451, or their equivalents. Texas Instruments internal modems can also be used.

DENMARK

Modem Considerations

The external modems, which can be used on the Public Switched Telephone Network (PSTN) or on leased lines, are the following:

- CCITT V.21, 300 bps, full-duplex, asynchronous
- CCITT V.22, 600 or 1200 bps, full-duplex, asynchronous
- CCITT V.23, 600 or 1200 bps, full-duplex, asynchronous

The modems are supplied by Post-og Telegrafvaesenet (P & T), however, modems up to 300 bps can also be supplied by Kjoebenhavns Telefor Aktieselskab, Jydsk Telefon — Aktieselskab, and Fyns Kommunale Telefon-selskab.

The Texas Instruments internal modem is not approved and cannot be used on the public network.

For further information contact:

Central Telecommunications Services
Marketing Co-ordination, Traffic and Accounting Office
Farvergade 17
DK-1007 Koebenhavn K

FINLAND

Modem Considerations

The external modems, which can be used on the Public Switched Telephone Network (PSTN) or on leased lines are the following:

- CCITT V.21, 300 or 600 bps, full-duplex, asynchronous
- CCITT V.22, 1200 bps, full-duplex, asynchronous
- CCITT V.23, 600 or 1200 bps, half-duplex, asynchronous

The modems are supplied by the Posti-ja Telehallitus (PTT). Privately supplied modems are allowed in special circumstances, but must be checked and accepted by the PTT.

Texas Instruments internal modems are not approved and cannot be used on the public network.

For further information contact:

Posti-ja Telehallitus
Yleinen Teleosasto
Verkkosuunnittelutoimisto/datajaos
PL 526
SF-00101 HELSINKI 10

NORWAY

Modem Considerations

The external modems, which can be used on the Public Switched Telephone Network (PSTN) or on leased lines are the following:

- CCITT V.21, 200 or 300 bps, full-duplex, asynchronous
- CCITT V.22, 600 or 1200 bps, full-duplex, asynchronous
- CCITT V.23, 600 or 1200 bps, full-duplex, asynchronous

Modems are leased from the Norwegian Telecommunications Administration.

Texas Instruments internal modems are not approved and cannot be used on the public network.

SPAIN

Modem Considerations

The external modems, which can be used on the Public Switched Telephone Network (PSTN) or on leased lines are the following:

- CCITT V.21, 200 or 300 bps, full-duplex, asynchronous
- CCITT V.22, 1200 bps, full-duplex, asynchronous
- CCITT V.23, 600 or 1200 bps, full-duplex, asynchronous

Modems are supplied by the Compañia Telefonica Nacional de Espana (CTNE). For further information contact the local area office of the CTNE. manufacturer, who has obtained BT approval.

Texas Instruments internal modems are not approved and cannot be used on the public network.

SWEDEN

Modem Considerations

The external modems, which can be used on the Public Switched Telephone Network (PSTN) or on leased lines are the following:

- CCITT V.21, 200 or 300 bps, full-duplex, asynchronous
- CCITT V.22, 1200 bps, full-duplex, asynchronous
- CCITT V.23, 600 or 1200 bps, full-duplex, asynchronous

Modems are leased by the Swedish Telecommunications Administration (STA), although in special circumstances privately owned modems are allowed. For further information contact the local area office of the CTNE. manufacturer, who has obtained BT approval.

Texas Instruments internal modems are not approved and cannot be used on the public network.

For further information contact:

Telecommunication Headquarters
Marketing Department
S-123 86 FARSTA

SWITZERLAND

Modem Considerations

The external modems, which can be used on the Public Switched Telephone Network (PSTN) or on leased lines are the following:

- CCITT V.21, 300 bps, full-duplex, asynchronous
- CCITT V.22 (version C), 1200 bps, full-duplex, asynchronous
- CCITT V.23, 600 or 1200 bps, full-duplex, asynchronous

Standard modems are leased by the PTT, however privately owned modems may be used if they are approved by PTT.

Texas Instruments internal modems are not approved and cannot be used on the public network.

For further information contact:

PTT General Directorate
Telecommunications
Berne

G

International to National Character Cross Reference

This appendix contains a cross reference table of the international to national character set for the Texas Instruments Professional Computer. These tables included the ISO hexadecimal codes, international ISO character set, national ISO character set and the extended character set hex codes.

INTERNATIONAL TO DENMARK/NORWAY CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set Denmark/Norway	#	\$	@	Æ	Å	^	`	æ	ø	å	~	
Extended Character Set Hex Code	23	24	40	92	A6	8F	5E	60	91	ED	86	7E

2281308

INTERNATIONAL TO FINLAND/SWEDEN CHARACTER CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set Finland/Sweden	#	ö	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Extended Character Set Hex Code	23	A7	90	8E	99	8F	9A	82	84	94	86	81

2281309

INTERNATIONAL TO FRANCE CHARACTER CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set France	£	\$	à	°	Ç	§	^	`	é	ù	è	¨
Extended Character Set Hex Code	9C	24	85	F8	87	15	5E	60	82	97	8A	FE

2281310

INTERNATIONAL TO GERMANY CHARACTER CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set Germany	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
Extended Character Set Hex Code	23	24	15	8E	99	9A	5E	60	84	94	81	E1

2281311

INTERNATIONAL TO ITALY CHARACTER CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set Italy	£	\$	°	Ç	é	^	ù	à	ò	è	ì	
Extended Character Set Hex Code	9C	24	15	F8	87	82	5E	97	85	95	8A	8D

2281304

INTERNATIONAL TO SPAIN CHARACTER CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set Spain	#	\$	@	ı	Ñ	ı	^	`	°	ñ	Ç	~
Extended Character Set Hex Code	23	24	15	AD	A5	A8	5E	60	F8	A4	87	7E

2281305

INTERNATIONAL TO SWITZERLAND CHARACTER CROSS REFERENCE

ISO Hexadecimal Code	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
International ISO Character Set	#	\$	@	[\]	^	`	{		}	~
National ISO Character Set Switzerland	£	\$	à	é	Ç	è	^	`	ä	ö	ü	..
Extended Character Set Hex Code	9C	24	85	82	87	8A	5E	60	84	94	81	FE

2281306

Glossary

abort — to end a program and return control to the operating system, usually when a mistake or malfunction occurs.

analog — the representation of a variable or an item by means of a physical quantity, such as a continuously varying voltage. The physical quantity that represents the variable behaves as some function of the variable. (Contrast to **digital**).

ASCII (American Standard Code for Information Interchange) — an eight level (7 bits + parity) code. The ASCII code represents each letter, number, and symbol as a binary number.

asynchronous transmission — transmission in which information characters arrive at irregular intervals of time (usually bracketed by start elements and stop elements). (Compare to **synchronous transmission**.)

auto-call — feature that allows a terminal to initiate a call automatically over a switched (telephone) line.

backup copy — a copy of a file that is stored for use in case the original file is destroyed.

baud, baud rate — a measure of data-transfer rate, equal to the number of discrete conditions or signal events per second. (See bits per second.)

binary digit — see **bit**.

bit — the abbreviation for **binary digit**. A bit is either of the number characters 0 or 1. Like Morse code, in which series of dots and dashes represent letters and numbers, combinations of bits represent the letters and numbers in your files.

bit per second — the bit transfer rate or the number of bits transferred per unit time. For most professional computer applications, the bit transfer rate in bps is the same as baud rate.

boot — to get a system running from a *coldstart*, in a manner like “pulling oneself off the ground by tugging on one’s bootstrap.”

byte — a binary element string of eight bits, usually operated upon as a unit.

character — one symbol of a set of elementary symbols, such as a letter of the alphabet; a character is made up of a group of seven bits (ASCII and CCITT code) or eight bits (EBCDIC).

code — a system of symbols (bits) for representing data (characters).

control character — a character that controls the handling of data.

cursor — a movable spot of light on a display unit, usually indicating your position on the display.

data — a general term for any type of information.

data communications — the movement of computer-encoded information by means of communications transmission systems.

data-link — the communications links, modems, and controls of the computers connected to the line, used in the transmission of information between two computers.

data set (modem) — a device that performs modulation/demodulation and control functions to enable transmission over telephone lines between two data-processing devices.

dedicated line — a line that isn't switched, that is, a data path that has the same physical route for each use. (Contrast to switched line.)

default value — the value automatically chosen by the computer when no explicit choice is made.

delimiter — a character that separates and organizes elements of data.

digital — the representation of numerical quantities by means of *discrete integer numbers*. It is possible to express in digital form all information stored, transferred, or processed by a dual-state condition; for example, On/Off, Open/Closed, or True/False. (Contrast to analog.)

directory — the table of contents of a file system designed to allow convenient access to specific files.

duplex — describes two operations, such as transmitting and receiving; full duplex means simultaneous transmission and reception; half duplex means transmission or reception, but not both at the same time.

EBCDIC — (Extended Binary Coded Decimal Interchange Code) an 8-bit, 256-character code used in transmission of binary data.

EIA — (Electronic Industries Association) the EIA Standard RS-232-C defines interconnection interfaces for terminals.

field — an area in a record (see **record**) or form treated as a unit.

file — a group of related records handled as a unit.

full-duplex line — a communication link capable of transmitting full-duplex line in two directions simultaneously.

half-duplex line — a communication link capable of transmitting full-duplex line in both directions, but not at the same time.

hardware — physical equipment, as opposed to a computer program or method of use, for example, mechanical, electrical, magnetic, or electronic devices.

host computer — (also host) the primary or controlling computer to which the computer is connected by cable for communications.

identification (ID) characters — characters sent by a station on a switched line to identify the station.

job — a task submitted for a computer to do. It usually contains all necessary instructions, files, and data to complete the task.

k — an abbreviation for the prefix kilo; for example, 1 000 in decimal notation.

K — in storage capacity, an abbreviation meaning two to the tenth power, which is 1 024 in decimal notation.

Kb — kilobyte.

KHz — kilohertz. A unit of frequency equal to 1 000 hertz.

line — describes cables or telephone lines, over which data is transmitted to, and received from, the computer.

load — to enter data into memory or into registers.

magnetic disk — a flat circular plate with a magnetizable surface layer on which data can be stored by magnetic recording (for example, a diskette or a Winchester disk).

message — in data communications, an amount of information that contains a predefined beginning and end.

modem — (modulator/demodulator) a device that modulates and demodulates signals transmitted over communication facilities. The modulator is included for transmission and the demodulator for reception. A modem is used to permit digital signals to be sent over analog lines. (Also called a data set.)

modulation — the process by which some characteristic of one wave is varied in accordance with another wave or signal. This technique is used in modems to make computer signals compatible with communications facilities.

network — a series of points connected by a communication line.

open — to prepare a file for processing, for example, editing.

operating system — software that controls the execution of computer programs and that may provide scheduling, debugging, input and output control, accounting, storage assignment, data management, and related service. Sometimes called Supervisor, Executive, Monitor, Master Control Program depending on the computer manufacturer.

parameter — a variable that is given a constant value for a specific purpose or process.

program — a series of instructions written to solve a problem. Also, to design, write, and test computer programs.

protocol — a formal set of conventions or rules governing the format, timing, and error control to facilitate message exchange between two communicating processes.

queue — a line formed of items in a system waiting to be processed.

RAM — random-access memory.

read — to get data from a storage device.

record — a collection of fields; the information relating to one area of activity in a data processing activity. For example, all information on one inventory item. Sometimes called item.

ROM — read-only memory.

run — to process a task. For example, a computer runs a program.

scrolling — the continuous vertical or horizontal movement of data across the display unit.

software — a set of computer programs, procedures, rules, and associated documentation concerned with the operation of network computers. For example compilers, monitors, editors, and utility programs. (Compare to hardware.)

switched line — a communications line where the physical path of the messages may be different with each use, such as in a public telephone network.

synchronous transmission — transmission in which the data characters and bits are transmitted at a fixed rate with the transmitter and receiver synchronized.

syntax — the format, or rules, in which instructions must be presented to the data processing equipment.

text — a sequence of characters forming part of a transmission sent from the data source to the data sink, and contains the information to be conveyed.

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NOTES

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GARANTIA LIMITADA – MEDIO DE INFORMACION
(SOFTWARE MEDIA)

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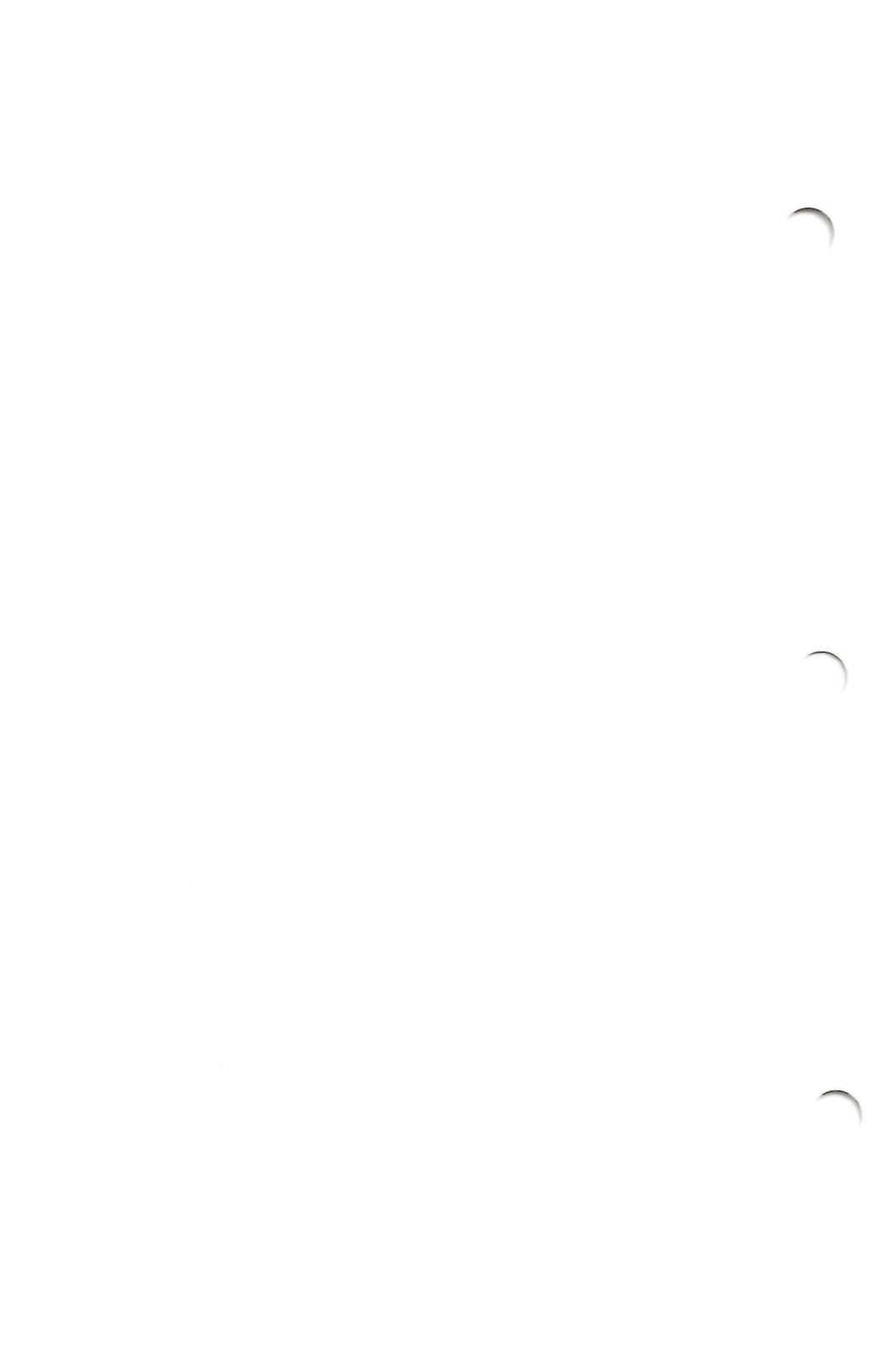
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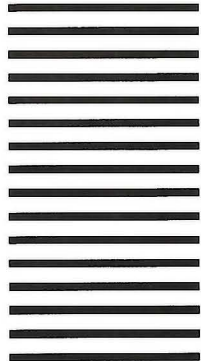


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