



*The Personal Computer
Personal Series*

Asynchronous Communications Support

First Edition (December 1981)

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CHAPTER 1. INTRODUCTION

The Asynchronous Communications Support program (or Communications Program) turns an IBM Personal Computer with an Asynchronous Communications Adapter into a terminal that can communicate with a wide variety of computers that support the American Standard Code for Information Interchange (ASCII). It permits access to the VM/370 and TSO operating systems operating on IBM computers equipped with appropriate interface hardware. Access to these systems can be either by local cable connection or over remote common carrier lines. The Communications Program also can be used for communication between two IBM Personal Computers, again through local connection or a remote hookup. The Upload/Download Facility in the program permits the transfer of data or program files (in a textual format) between an IBM Personal Computer and a VM/370 or TSO system or between two Personal Computers.

Phases of Operation

The Communications Program operates in two phases, (1) *Terminal Selection* and (2) *Terminal Operation*. After the program is loaded, the *Terminal Selection Phase* begins. You are first presented with a series of menus for the choice of terminal parameters. In the simplest case (for example, connecting two IBM Personal Computers) you need to specify only the line bit (character transmission) rate. In other cases, you may wish to define a special purpose terminal by selecting from the menus a variety of other parameters such as parity and line turnaround characters. Once a terminal is specified for a particular system, its definition can be stored as a file on diskette and recalled for subsequent terminal sessions.

After the terminal parameters are specified (or loaded from a diskette file), the *Terminal Operation Phase* of the program is started. In this phase a communication link is established with another computer (called the "host" computer). Once this link is established, the lines of text you type and those received from the host computer are displayed on the screen of your IBM Personal Computer. Transmission and other errors are reported to you on the bottom line of the screen. A control key permits you to go into Upload/Download mode so files can be uploaded (sent) from the IBM Personal Computer to the host or downloaded (received) from the host.

In addition to being a ready-to-use terminal communication system, the Communications Program makes it easy for you to add your own extensions. Both portions of the program that sets up the terminal parameters and that which runs as a terminal are written in BASIC. If you are familiar with BASIC, you can easily modify these portions of the program to add, for example, new defined

PREFACE

This reference manual explains how to use the IBM Personal Computer Asynchronous Communications Support program. It provides you with the following information about the program:

- Requirements
- Selecting and running terminals
- Creating and running your own specified terminal
- Communicating with host systems
- Communicating with another IBM Personal Computer or another personal computer
- Sending files back and forth between computers

Assumptions

This manual assumes that you are already familiar with the terminal operation for the particular host system that you will be connected to. You should refer to the host system manual to understand how to use that system. Also, this program uses some of the facilities of the IBM Personal Computer DOS and BASIC. Rather than repeat selected portions of the DOS and BASIC manuals, at times we refer you to those manuals.

Organization of This Manual

This manual has seven chapters and one appendix.

Chapter 1 has some introductory information about the program as well as directions on how to use the keyboard and how to configure and copy the program diskette.

Chapter 2 describes how to load and run the program, selecting terminals, starting terminals, and communicating with other computers.

Chapter 3 discusses transferring files between the IBM Personal Computer and host systems or another IBM personal Computer and also describes how to recover portions of transferred files should a disconnect occur.

Chapter 4 contains troubleshooting and debugging information.

Chapter 5 describes how the program works, the terminal protocols, and the operation of transferring files.

Chapter 6 tells you how to change the program for specified terminals and how to create your own specified terminal.

Chapter 7 describes how to talk to the Base Program that controls the terminal interface with the various communications lines.

Appendix A lists the error messages that you may encounter when using this program.

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terminals to the displayed menus or to change the logic of a terminal protocol. The Base Program portion of the Communications Program has a well-documented interface so you can write your own communications application programs entirely in BASIC.

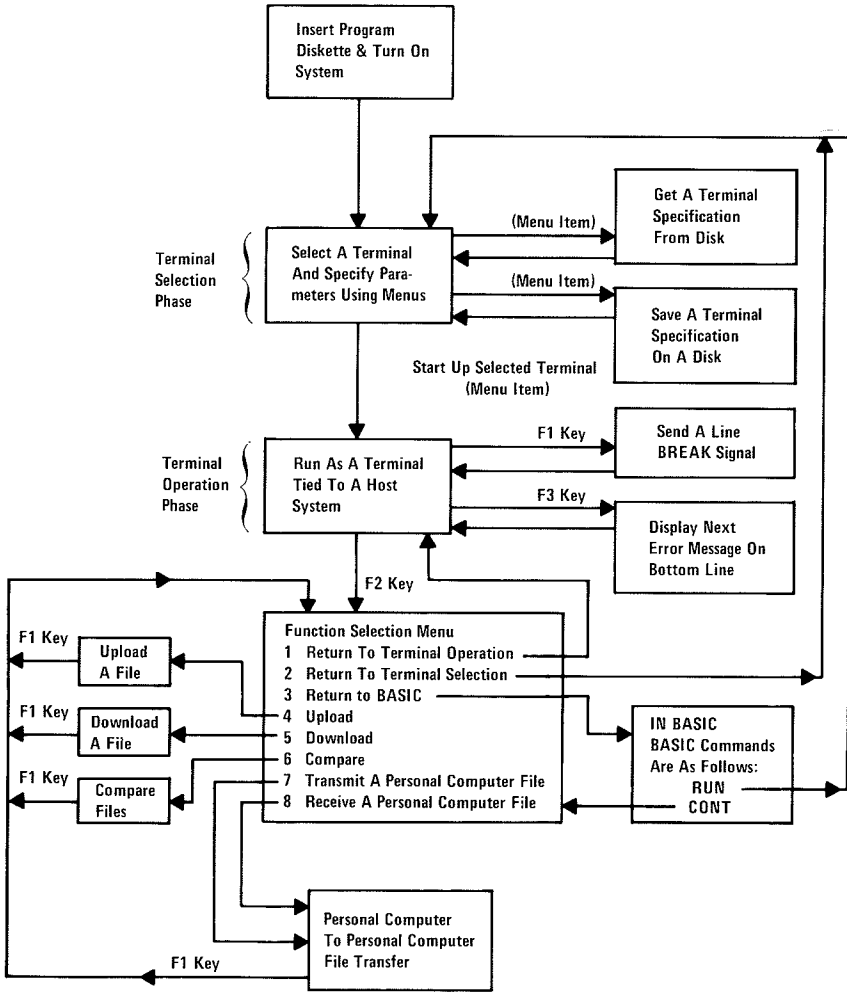
Explanation of Diagram

The diagram, Functions of the Communications Program, shows the various phases of operation of the Communications Program. A quick inspection of the diagram gives you an overview of the Communications Program. At the top is the Terminal Selection Phase. In this phase you may select a terminal and specify its parameters using selection menus. Note that two menu items permit you to save a terminal specification on a diskette file and to retrieve such a specification for later use. The terminal Selection Phase is described in detail in the first part of Chapter 2.

In the middle of the diagram is the Terminal Operation Phase. You enter this phase from the Terminal Selection Phase by selecting the **Start Up Selected Terminal** menu item. In this phase you operate as a terminal tied to a host system. There are three useful function keys that operate when you are in the Terminal Operation Phase.

The F1 key sends a BREAK signal on the communications line. The F3 key displays the next error message on the bottom line of the screen. The F2 key takes you to the Function Selection Menu. You can find the details of the operation of these keys later in this chapter.

At the bottom of the diagram is the Function Selection Menu, your access to more function in the Communication Program. The first three items on this menu give you different ways of escaping from



Functions of the Communications Program

(or returning to) operation as a terminal. They are described in detail in Chapter 2 in the section “Escaping from and Returning to Terminal Operation.”

By picking one of items 4, 5, or 6 on the Function Selection Menu you may upload, download or compare files. These menu items and their operation are described in the first part of Chapter 3.

Finally, if you are in communication with another IBM Personal Computer, you can exchange files with that computer by selecting either Item 7 or Item 8 on the Function Selection Menu. The operation of these functions is described in Chapter 3 in the section “Transferring Files between IBM Personal Computers”.

We suggest that you use this diagram both as a guide when reading the rest of this manual and as a reference index to the manual when you are using the Communications Program.

Required Hardware and Software

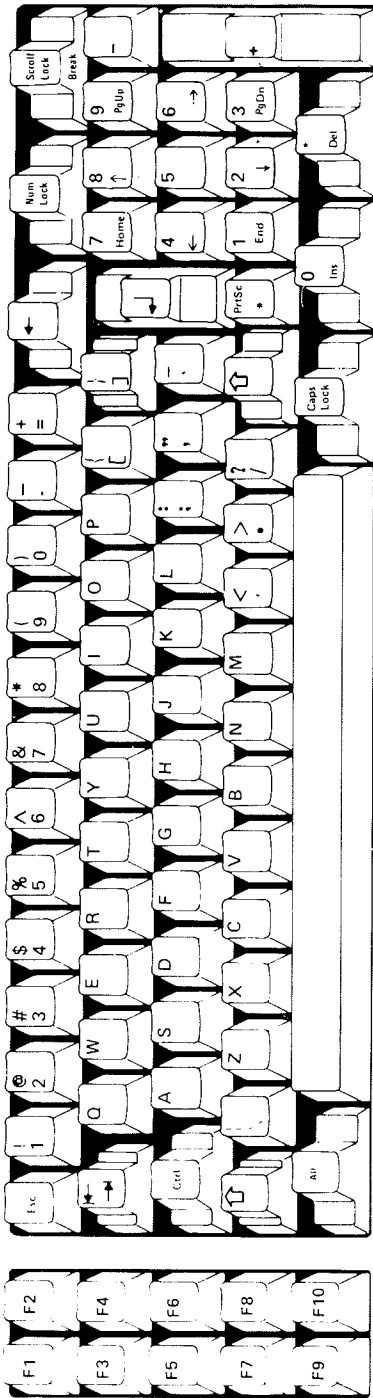
You need the following to operate the Asynchronous Communications Support Program (called the Communications Program):

- An IBM Personal Computer with at least 64 KB of memory and at least one diskette drive.
- An Asynchronous Communications Adapter
- A full duplex telephone modem (typically with an acoustic coupler) or a direct cable connection to a local host computer. (Communications using half duplex modems is not supported.)
- A cable to connect the Asynchronous Communications Adapter to the modem or to the direct cable connection.
- Disk Operating System (DOS) and Disk BASIC language.
- The Asynchronous Communications Support diskette containing the following files:
 - The Communications BASIC program (TERMINAL.BAS)
 - The Communications Base Program (RS232INT.BAS)
 - Terminal Specification files—VMMOD.TER, TSOMOD.TER and PCMOD.TER
 - Batch programs AUTOEXEC.BAT and UPDATE.BAT and the file MESSAGE

Using The Keyboard When Running as a Terminal

This section describes the use of the keys on the IBM Personal Computer keyboard when you are operating the Communications Program as a terminal.

The keyboard is divided into three areas, (1) the *typewriter* area in the middle, (2) ten *function keys* on the left side of the keyboard, and (3) the *numeric keypad* on the right side.



The IBM Personal Computer Keyboard

Typewriter Keyboard

The typewriter area of the keyboard behaves much like a typewriter with the letter, numbers and special characters. Capital letters, and the special characters shown above the numbers on the number keys, are typed by holding down either of the Shift keys (⇧) and pressing the desired key. These characters are transmitted to the host computer as they are typed.

The Enter Key

The key with the ↵ symbol on it is the carriage return key. It is referred to as the *Enter* key in this manual.

When operating as a half duplex terminal (for example, a VM/370 terminal), the Enter key signals the host computer that you have completed transmission of a line of input and switches the terminal from SENDING to RECEIVING mode. When operating as a full duplex terminal, pressing the Enter key transmits a carriage return (or other line end character) to the host computer.

Special Symbols

There are some special symbols on this keyboard that you won't find on a regular typewriter, such as [and]. And some characters are not where you might expect them to be if you're used to using a typewriter. For example, the uppershift comma (,) is not a comma, but the < symbol.

Uppercase

There is no normal Shift Lock key on this keyboard. The Caps Lock key, to the right of the Space Bar, is similar to a Shift Lock key, but it only gives you

capital letters. It does not give uppershift characters on any other keys. After you press this key, you continue to get capital letters until you press it again. You can get lowercase letters when in Caps Lock state by pressing and holding one of the Shift keys. When you release the Shift key, you'll go back to Caps Lock state.

Backspace

The Backspace key, with the symbol ←, on the upper row of the typewriter area, behaves somewhat differently from the Backspace key on a typewriter. It not only backspaces, it erases from the screen what you've typed. It also transmits the backspace character (Hex 08) to the host computer. As the characters that you delete on the screen with the backspace were already sent to the host computer, the host computer should be programmed to discard one character for each backspace received.

PrtSc

Below the Enter key is a key labeled PrtSc on top and * on the bottom. *PrtSc* stands for *Print Screen*. When the keyboard is in lowershift, pressing this key causes an asterisk to be typed. In uppershift, however, this is a special key that causes a copy of what is on the screen to be printed on the printer.

IMPORTANT: Use the PrtSc Key only when you are not receiving output from the host computer. The operation of the IBM Personal Computer is inhibited during the printing of the screen and a receive buffer overflow could result.

Other Shifts

In addition to the Shift keys which change the keyboard from lowershift to uppershift, there is one other shift key you can use on the typewriter keyboard, the Ctrl (Control) key. To use it, hold the Ctrl key, then press the desired key. Then you can release both keys.

The Ctrl key is used to transmit to the host computer certain codes and characters not otherwise available from the keyboard. For example, Ctrl-G (obtained by pressing Ctrl and G simultaneously) is the "bell" character. When this character is received by the IBM Personal Computer, the speaker beeps. You could transmit this character to the host system as a character that would be embedded in a text file. When that file is sent back to the IBM Personal Computer the speaker beeps when the Ctrl-G character is encountered.

Many computer systems use these control characters for special purposes. You should understand how they are handled by your host system before using them.

Using Function Keys When Running as a Terminal

There are three keys that you need to know about when running as a terminal. They are the Function Keys *F1*, *F2*, and *F3* on the upper left corner of the keyboard. These keys operate as follows:

F1 – Communications Line Attention

Pressing this key produces a BREAK signal on the communications line. This signal is generally used to interrupt processing on the host system. The F1 key is also used to interrupt file transfer operations (like Upload or Download).

F2 – Go to Function Selection Menu

When this key is pressed, you are presented with a menu that permits selection of the Upload, Download or Compare functions. Also, you may return to Terminal Mode, to the Terminal Selection Phase of operation, or to BASIC. The section, “Escaping from and Returning to Terminal Operation,” discusses this menu in more detail.

F3 – Display Error Message

Error messages are displayed on the bottom line of this screen. If another message is produced while one is being displayed, it is kept in a list. Pressing F3 replaces the displayed message with the next one on the list.

If there is a message on the list waiting to be displayed, an * is displayed to the left of the current message. You hear a tone (beep) each time a message is displayed or added to the list. See the section “Dynamic Messages at the Bottom of the Screen” in Chapter 4 for further details. These three function keys are all you need for most terminal operations.

Keys F4, F5, and F6 provide additional function.

F4 – Enable/Disable Receive Error Checking

As described in Chapter 4, under “Enabling/Disabling Receive Errors,” certain dynamic error messages may be either enabled or disabled. If these messages are disabled, pressing the F4 key enables them. If these messages are enabled, pressing the F4 key disables them. At system startup, these messages are *disabled*. When a change in enable/disable status is made, an appropriate message is displayed at the bottom of the screen.

F5 – Force to Sending State

When operating as a half duplex terminal in the RECEIVING state, pressing this key forces the program to SENDING state. This key should not normally be needed as a Communications Attention (F1) usually performs the same function.

F6 – Enable/Disable Hex Listing

When operating as a terminal, pressing F6 sets the Communications Program so each line of text transmitted to the IBM Personal Computer from the host system is displayed as normal text followed by the hexadecimal codes for each of the characters. Characters that were specified for deletion (see “First, Second and Third Characters to be Deleted” in Chapter 2) are not displayed. To turn off this mode of operation, press the F6 key again.

IMPORTANT: The BASIC Terminal Program takes significantly longer to process a line in Hex Listing mode than in normal mode. When using this mode for bit rates of greater than 300 bits/sec., buffer overflow may occur.

Function Keys F7 to F10 are disabled, not used.

Using The Numeric Keypad

You may use the Num Lock key to set the numeric keypad so it works like a calculator keypad. Pressing the *Num Lock* key shifts the numeric keypad into its own “uppershift” mode, so that you get the numbers 0 through 9 and the decimal point, as indicated on the keytops. The numeric keypad is disabled except when in this numeric mode.

Special Key Combinations

You should be aware of the special functions of the following combinations of keys:

Ctrl-Break

This combination interrupts program execution and returns to BASIC. In general, this function should only be used when there is no other way of recovering from a problem with the Communications Program.

Alt-Ctrl-Del

This combination performs a *System Reset*. In other words, it is the same as switching the computer from off to on. All three keys must be pressed at the same time. After a System Reset, the Communications Program is reloaded. Thus, this function should be used only if no other means of problem recovery works.

What You Must Do First

We mentioned that you would need DOS. The Communications Program diskette that you purchased contains only a maintenance program and the program itself. Before you can run the program you must add some DOS programs to the Communications Program diskette.

Also, to download during your session you must use diskettes formatted by DOS.

Putting the DOS Programs onto the Program Diskette

The procedure you are about to follow assumes you are starting with your system turned off. There are two different procedures depending on whether your system has one diskette drive or two. In either procedure you will need to press the Enter key when you are finished typing an entry. The procedure for initially putting the DOS programs on the program diskette and for updating the diskette (if you get a new version of DOS someday) is the same.

Procedure for a Single Diskette Drive System

1. Put the DOS diskette in the drive.
2. Turn on the system.

The system responds:

Enter today's date (m-d-y):

3. Enter the date. For example if today were July 6, 1982 you would type: 7-6-82

The system responds:

The IBM Personal Computer DOS
Version 1.00 (C)Copyright IBM Corp 1981

A>

4. Type:

b:update

The system responds:

Insert diskette for drive B: and strike
any key when ready

5. Remove the DOS diskette and insert the Communications Program diskette.
6. From this point, you are alternately told to insert either the DOS diskette or the program diskette several times until all the needed DOS programs are put onto the program diskette. When the system tells you to "Insert diskette for drive A: and strike any key when ready", insert the DOS diskette. When it says "Insert diskette for drive B: and strike any key when ready", insert the program diskette. When all the DOS programs are finally on the Communications Program diskette, the system responds:

Your program diskette contains the needed DOS programs. While you still have your DOS diskette available, use the DOS DISKCOPY command and make a backup copy of your program diskette. Also, if you intend to use the Download

function, you may need to format some blank diskettes which you can do now too with the DOS FORMAT command.

A>

The following shows what you see on the screen when you put the DOS programs on the Communications Program diskette:

```
Enter today's date (m-d-y): 7-6-82
IBM Personal Computer DOS
Version 1.00 (C)Copyright IBM Corp 1981
```

A>b:update

Insert diskette for drive B: and strike any key when ready

A>a:sys b:

Insert diskette for drive A: and strike any key when ready

Insert diskette for drive B: and strike any key when ready

System transferred

A>copy a:command.com b:

Insert diskette for drive A: and strike any key when ready

Insert diskette for drive B: and strike any key when ready

1 File(s) copied

A>copy a:date.com b:

Insert diskette for drive A: and strike any key when ready

Insert diskette for drive B: and strike any key when ready

```
1 (File(s) copied  
A>copy a:basic.com b:
```

Insert diskette for drive A: and strike any key when ready

Insert diskette for drive B: and strike any key when ready

```
1 File(s) copied  
A>type b:message
```

Your program diskette contains the needed DOS programs. While you still have your DOS diskette available, use the DOS DISKCOPY command and make a backup copy of your program diskette. Also, if you intent to use the Download function, you may need to format some blank diskettes which you can do now too with the DOS FORMAT command.

A>

Procedure for a Two Diskette Drive System

1. Put the DOS diskette in Drive A.
2. Put the Communications Program diskette in Drive B:

3. Turn on the system.

The system responds:

Enter today's date (m-d-y):

4. Enter the date. For example, if today were July 6, 1982, you would type: 7-6-82

The system responds:

The IBM Personal Computer DOS
Version 1.00 (C)Copyright IBM Corp 1981

A>

5. Type:

b:update

When all the DOS programs are copied to the Communications Program diskette, the system responds:

Your program diskette contains the needed DOS programs. While you still have your DOS diskette available, use the DOS DISKCOPY command and make a backup copy of your program diskette. Also, if you intend to use the Download function, you may need to format some blank diskettes which you can do now too with the DOS FORMAT command.

A>

The following shows what you see on the screen when you put the DOS programs on your Communications Program diskette:

Enter today's date (m-d-y): 7-6-82
The IBM Personal Computer DOS
Version 1.00 (C)Copyright IBM Corp 1981

A>b:update

A>a:sys b:
System transferred

A>copy a:command.com b:
1 File(s) copies

A>copy a:date.com
1 File(s) copies

A>copy a:basic.com b:
1 File(s) copied

A>type b: message

Your program diskette contains the needed DOS programs. While you still have your DOS diskette available, use the DOS DISKCOPY command and make a backup copy of your program diskette. Also, if you intend to use the Download function, you may need to format some blank diskettes which you can do now too with the DOS FORMAT command.

A>

CHAPTER 2. GETTING STARTED

Before going on, if you have not put the DOS programs on the Communications Program diskette, then go to Chapter 1 and perform this task because the Communications Program will not run without the DOS programs.

Loading the Communications Program

To load the Communications Program, do this:

1. Insert the Communications Program diskette in the diskette drive (Drive A for a two drive system).
2. Turn on the computer.
3. When the screen displays:

```
A>date  
Current date is 00-00-80  
Enter new date:
```

Type in the date in the form mm-dd-yy, where: mm is the month, dd is the day and yy is the last two digits of the year (for example, 81 for 1981).

4. After you enter the date, the Communications Program loads and begins execution. It immediately loads the Base Program of the package. The Base Program is file RS232INT.BAS on the program diskette.
5. You then see the message:

```
What screen width (40 or 80 characters) do you wish?
```

Answer this request by entering either 40 or 80. You should use a width of 80 characters unless the monitor you are using cannot display 80 characters legibly.

6. The first of the selection menus is now displayed.

7. If you wish to use a separate diskette for saving or loading terminal specifications or for transferring files, you may now remove the Communications Program diskette from the drive and insert your new diskette. When specifying filenames, remember that the default diskette drive is Drive A.

Selecting a Terminal

When you start up the Communications Program, you are in the *Terminal Selection Phase*. You are given a series of menus used for selecting the desired terminal that the IBM Personal Computer will simulate and the detailed features of that terminal. Although the items in the menus are, for the most part, self-explanatory, this section discusses all of them in detail.

Using Menus during Terminal Selection

There are three levels of menus you see during the Terminal Selection Phase. The first-level menu lists the different terminal types that can be selected. When one of these possible terminals is selected, a second-level menu lists the terminal options that can be specified for the selected terminal. When one of those options is selected, a third-level menu lists the possible choices for that option.

Half or Full Duplex Terminal Protocols

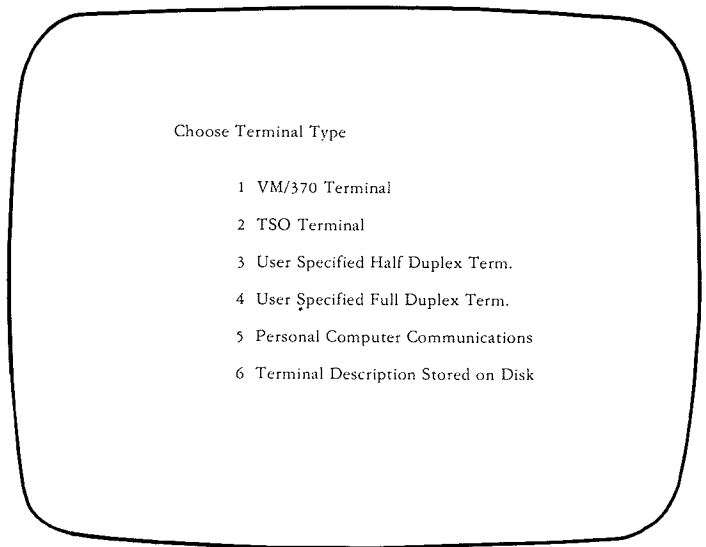
Before discussing the terminals you can select, let's describe the difference between half and full duplex terminal operation. There are two protocols used by most computer systems for asynchronous communication. A protocol is simply the set of rules set up for passing information back and forth between computers. A half duplex protocol assumes there is one circuit wire between the two computers that must be used for both sending and receiving. Though there may actually be separate physical circuits for sending and receiving, a half duplex protocol only requires one.

A full duplex protocol assumes there are two circuits available, one for transmission in each direction. With full duplex transmission, each computer can be sending information simultaneously. With half duplex transmission, rules must be set up so that transmission takes place in only one direction at a time.

The terminal execution portion of the Communications Program has a separate routine for each of these protocols. See Chapter 5 for more details on these two protocols.

Terminal Selection Menu

The Terminal Selection Menu looks like this:



VM/370 Terminal

A terminal that operates with the IBM VM/370 System Control Program running on an IBM computer. For a discussion of the protocol used by the VM/370 terminal see "Chapter 5. How Terminal Communications Works."

TSO Terminal

A terminal that operates with the IBM MVS TSO System Control Program running on an IBM computer. Again, this terminal is discussed in more detail in Chapter 5.

User Specified Half Duplex Term

Selecting this menu item lets you specify all of the pertinent parameters for a half duplex protocol terminal.

User Specified Full Duplex Term

Selecting this menu item lets you specify all of the pertinent parameters for a full duplex protocol terminal.

Personal Computer Communications

This menu item selects a full duplex terminal protocol so two IBM Personal Computers with appropriate features can talk to each other. Obviously, both machines should use the Asynchronous Communications Support and each should select this terminal type. This terminal protocol can also be used for talking to other terminals or non-IBM personal computers.

Terminal Description Stored on Disk

This choice recalls a terminal specification stored on a diskette file. When selected, you are asked for the name of the file where the specification is stored. The file is accessed and the parameters of the specified terminal are loaded. You are then given a menu that lets you change those parameters or lets you start up the specified terminal.

The program attempts to load the terminal description from the file *name.TER*. Here *name* is the specified file name. If you wish to specify the diskette drive on which the file resides, prefix the name with A: or B:. If the prefix is omitted, the program looks for the file on Drive A. See “Save Current Terminal Specification” later in this chapter for how terminal specifications are stored.

Terminal Parameter Selection Menu — Half Duplex

Once you select a particular terminal, you are given a menu listing the parameters that you can specify for that terminal. The number of items presented in this menu will vary depending on the terminal.

If you request **User Specified Half Duplex Term.** from the Terminal Selection Menu, the following menu is displayed:

Choose a Terminal Feature

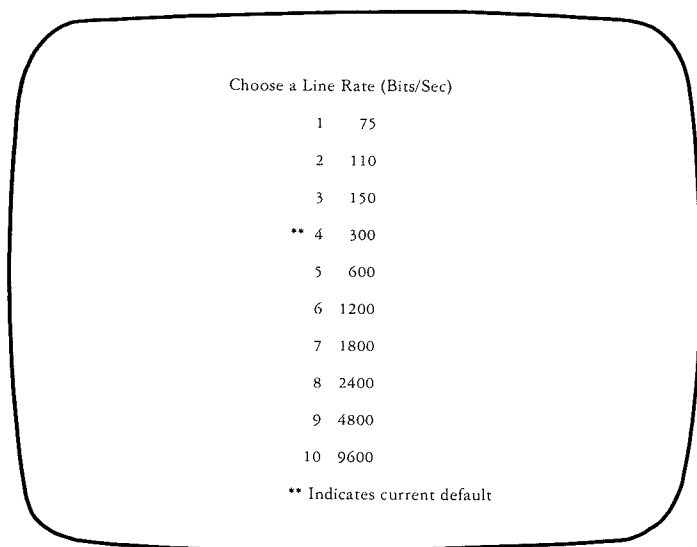
- 1 Line Bit Rate
- 2 Type of Parity Checking
- 3 Number of Stop Bits
- 4 Line Turnaround Char. Sent to Host
- 5 Line Turnaround Char. Sent by Host
- 6 First Character to be Deleted
- 7 Second Character to be Deleted
- 8 Third Character to be Deleted
- 9 Line End Character Sent by Host
- 10 Start up Selected Terminal
- 11 Return to Terminal Selection Menu
- 12 Save Current Terminal Specification

Note: You need to understand some rather technical concepts to determine what the settings should be for some of the items in this menu. If you are unfamiliar with these concepts, someone at the computer center where your host computer is located should be able to help you. Another good way of determining settings is to check the equivalent setting on an ASCII terminal that you *know* works with the host computer you are planning to use.

Line Bit Rate

The line bit rate describes the rate (speed) at which characters are sent on the transmission line. The higher this rate, the faster the transmission will be. Generally, this rate is determined by the bit rate that the transmission equipment will handle and/or the bit rates available at the input ports for the computer being accessed by a terminal.

When you select Line Bit Rate, you are given the following menu:



Choose a Line Rate (Bits/Sec)

1	75
2	110
3	150
** 4	300
5	600
6	1200
7	1800
8	2400
9	4800
10	9600

** Indicates current default

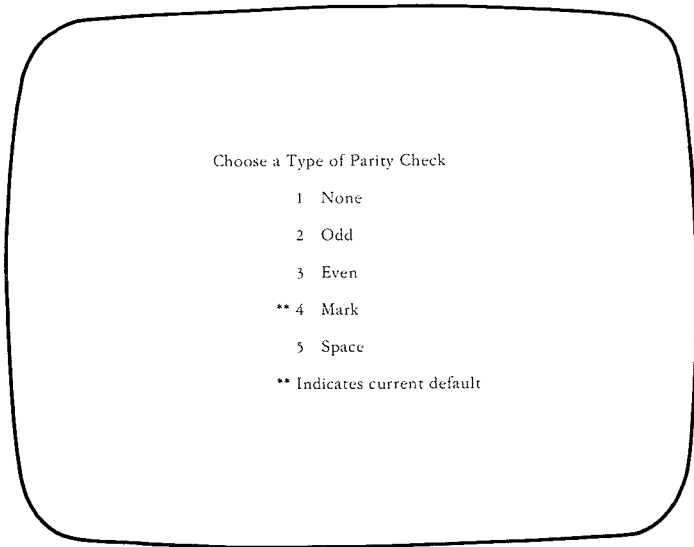
Notes: 1. Often bit rates are referred to as *baud* rates. Thus a *300 baud acoustic coupler* would typically transmit at 300 bits/second.

2. While higher bit rates can be selected, operation without a loss of data (except when listing a file at the terminal) is supported only for rates of 2400 bits/second and lower. Listing a file at the terminal is supported only for rates of 1200 bits/second and lower.

Type of Parity Checking

Characters transmitted over an asynchronous communications line are sent serially as sequences of ones and zeroes (represented by two different voltage levels) representing each character. A parity bit is a bit that is added onto each character transmitted so the character may be checked for accuracy at the receiving end. Usually you set the parity to match that expected by the host computer. The Communications Program lets you set this parity bit in a number of different ways.

If you select the **Type of Parity Checking** menu item, you are given the following menu:



None. No parity bit is added to the character transmitted. If None is specified, 8 bits of data are transmitted for each character. For all other parity specifications (as described below) the 7 low-order bits of the character are transmitted together with the parity bit. (In general, for the 128 character ASCII character set, 7 bits are sufficient for each character transmitted.)

Odd. The parity bit is set so the sum of all of the bits (including parity) of the character transmitted is odd.

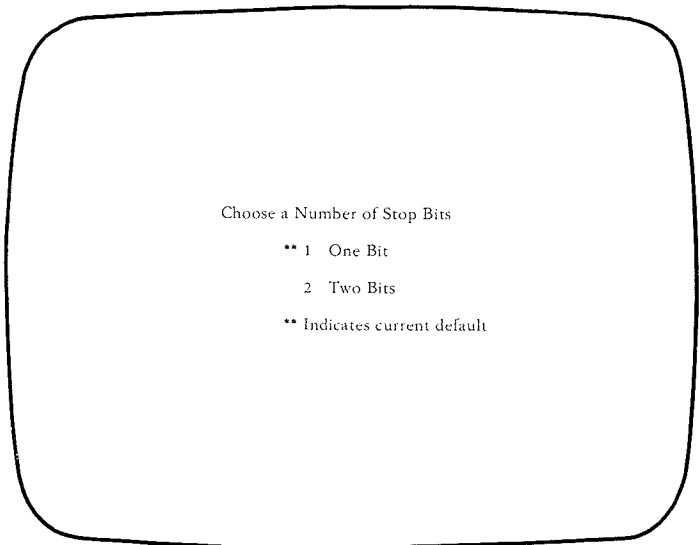
Even. The parity bit is set so the sum of all of the bits (including parity) of the character transmitted is even.

Mark. The parity bit is always set to 1.

Space. The parity bit is always set to 0.

Number of Stop Bits

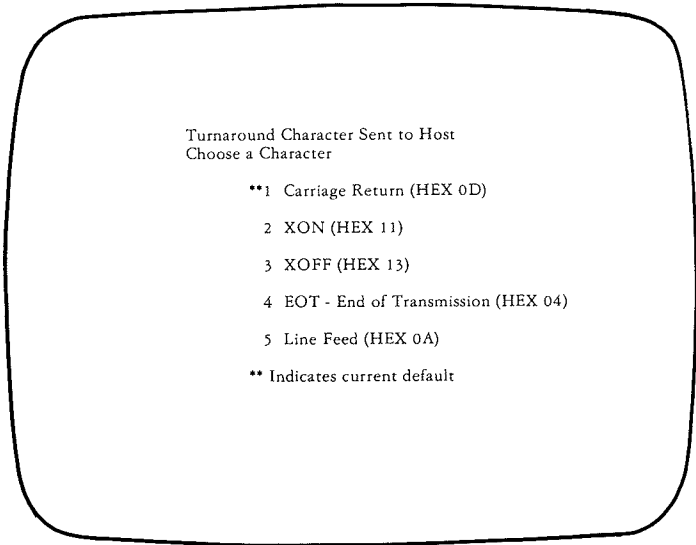
In asynchronous transmission, one or two extra bits are always placed on the end of each character transmitted. These bits let the receiver detect the beginning of the next transmitted character. Usually, only one stop bit is required, but the Communications Program lets you select either 1 or 2 stop bits with the following menu:



Note: If 110 bits/sec. line bit rate is selected, the number of stop bits is always 2.

Line Turnaround Char. Sent to Host

You tell the host computer that you have completed the typing a line of text at the terminal, by pressing the Enter key. When you press the Enter key, the program translates the character produced by this keystroke to the character selected from the following menu:



For a half duplex protocol terminal, this turnaround character signifies to the host computer the end of transmission from the terminal. The host computer assumes it can go into *Sending* mode (transmitting its reply to the line just sent) and the terminal will be in *Receiving* mode.

For a full duplex protocol terminal, the turnaround character indicates the end of a line of input sent to the host computer. Typically the host computer takes action on that line and sends back a response. However, for many host computer systems, you may continue to transmit input from your terminal while the host computer is processing the previous line. Thus, one or more lines (each ending with a turnaround character) might be stacked in an input buffer of the host computer awaiting processing.

Note: The XON and XOFF characters that are used as turnaround characters are being used simply as control characters to signal a specific event to the host computer (or to your IBM Personal Computer). This use should not be confused with the use of these characters in the XON/XOFF support described in a section that follows. Specifically, VM/370 and TSO do not use the XON/XOFF support as described below. They may, however, use the XON or XOFF control characters for their own control purposes.

Line Turnaround Char. Sent by Host

With half duplex protocol, the host computer transmits a character to indicate it is ending its transmission and the terminal can begin its transmission. The same menu described above in "Line Turnaround Character Sent to Host" is also available for this turnaround character.

The line turnaround character from the host is only used in the half duplex protocol. It signifies that the host computer has completed its response and will not transmit any information until it receives a line of input from the terminal ending as described in "Line Turnaround Characters Sent to Host." The

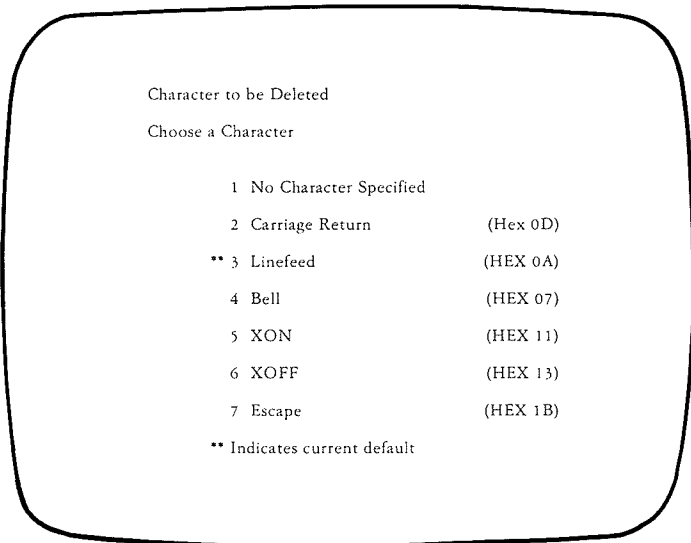
output from the host may, however, contain more than one line of text; these lines are separated by line end characters. (See "Line End Characters Sent by Host" later in this section.)

First, Second, and Third Characters to be Deleted

In communicating with a host computer, the host may transmit characters to a terminal that you do not want displayed on the screen. The Communications Program always deletes any Rubout characters (Hex 7F) detected in the text stream.

There are three menu items on the Feature Selection menu: **First Character to be Deleted**, **Second Character to be Deleted** and **Third Character to be Deleted**. If you select any one of these items, the menu of possible characters for deletion given below is displayed. For each of the **Character to be Deleted** menu items, you may choose one character to be deleted. Thus, you can delete a maximum of three different characters in addition to Rubout.

This is the menu displayed when you select any of the **Characters to be Deleted** items:



Note: If **No Character Specified** is selected, no character is deleted for that menu item.

For example, when specifying a terminal to operate with a VM/370 host system, you might wish to delete Rubouts, Linefeeds, and XOFF characters. Rubouts are always automatically deleted. From the **First Character to be Deleted** menu you would select **Linefeed**. From the **Second Character to be Deleted** you would select **XOFF**. The **Third Character to be Deleted** Menu would be left at the default setting of **No Character Specified** because only two characters need be deleted.

Line End Characters Sent by Host

The character selected from this menu specifies the end of line character sent from the host computer. This character indicates that a new line should be started on the terminal display.

Many host systems transmit both a carriage return and a linefeed character at the end of each line. In general, one of these characters should be deleted (see “**First, Second, and Third Characters to Be Deleted**”, above) and the other specified as the line end character sent by host.

The characters that can be selected for line end characters are the same as those for “**Line Turnaround Characters Sent to Host**” discussed above.

Start up of Selected Terminal

Selecting this item ends the Terminal Selection Phase of operation and starts up a terminal. The terminal started is the one with the currently specified parameters, (that is, either the one you may have just specified parameters for or the one that was just loaded from diskette). The section “**Starting Up as a Terminal**” covers this operation in detail.

Return to Terminal Selection Menu

Selecting this option returns you to the Terminal Selection Menu.

IMPORTANT: All terminal parameters that were changed are lost unless a terminal specification was stored as a diskette file.

Save Current Terminal Specification

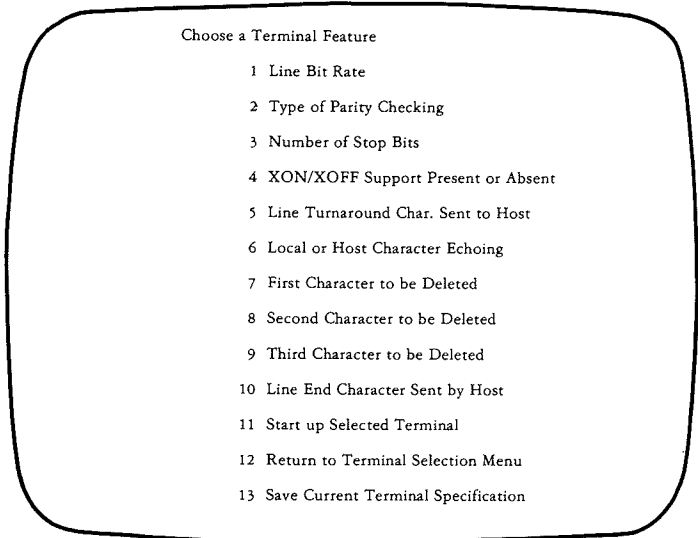
Choose this item to save the current terminal specification on a diskette file. You are asked the name of the file on which the specification is to be saved. When you enter the filename, the specification is stored on the file *name. TER* on the diskette in Drive A. Here *name* is the specified filename.

To place a file on a diskette in a specific drive, you can specify the drive letter as a prefix followed by a colon. Thus, giving the name *b:myterm* would save the terminal specification on file MYTERM. TER on the diskette in Drive B.

A saved specification can be loaded (see the previous section “Terminal Selection Menu”), modified, and stored back on the diskette under the same or a different name.

Terminal Parameter Selection Menu — Full Duplex

If you request **User Specified Full Duplex Terminal** from the Terminal Selection Menu, the following menu of parameters is given:

- 
- A rounded rectangular box containing a list of terminal features. The list is titled "Choose a Terminal Feature" and contains 13 numbered items.
- Choose a Terminal Feature
 - 1 Line Bit Rate
 - 2 Type of Parity Checking
 - 3 Number of Stop Bits
 - 4 XON/XOFF Support Present or Absent
 - 5 Line Turnaround Char. Sent to Host
 - 6 Local or Host Character Echoing
 - 7 First Character to be Deleted
 - 8 Second Character to be Deleted
 - 9 Third Character to be Deleted
 - 10 Line End Character Sent by Host
 - 11 Start up Selected Terminal
 - 12 Return to Terminal Selection Menu
 - 13 Save Current Terminal Specification

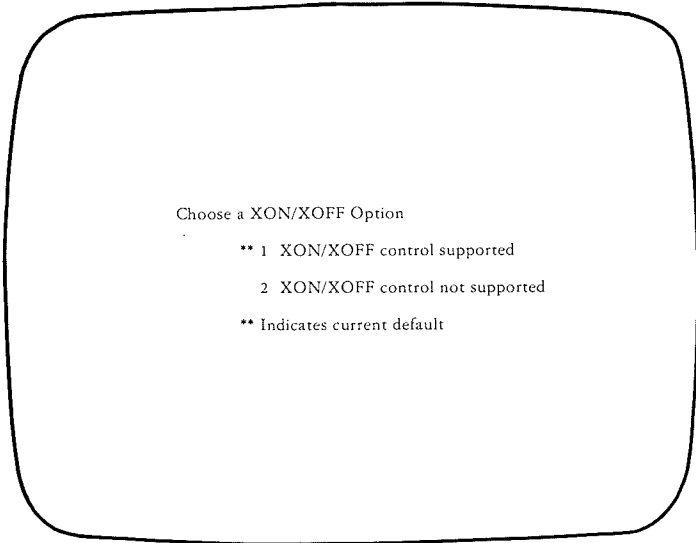
All of the items in this menu were already described in this chapter except for **XON/XOFF Support Present or Absent** and **Local or Host Character Echoing**.

XON/XOFF Support Present or Absent

The XON/XOFF support is part of a full duplex protocol. It is commonly used by many computer systems in talking with terminals (or other computer systems.) It lets a computer or a terminal signal another remote computer or terminal to stop transmitting data or to restart transmission.

The rules for this protocol are simple. When the IBM Personal Computer wishes a remote machine to stop transmitting, it sends XOFF (a Hex 13). When it wants the remote machine to start sending again, it sends XON (a Hex 11). The IBM Personal Computer also follows these rules during data transmission. If it is transmitting and receives an XOFF from the remote machine it stops until it receives an XON.

If you choose the **XON/XOFF Support Present or Absent** menu item, the following menu is displayed:



If you select **XON/XOFF control supported**, the terminal protocol follows the rules just discussed. An XOFF is sent by the IBM Personal Computer when there is danger of the receive buffer in the Base Program overflowing. When there is again a safe amount of space left in this buffer, an XON is sent.

If you select **XON/XOFF control not supported**, this feature is turned off. Any system that does not support XON/XOFF must either transmit at a bit rate which the Communications Program can handle, or use some other protocol to guarantee that transmitted data will not be lost.