AST-SNA™

AST RESEARCH INC.

*Complete Hardware/
Software Package Allowing
the IBM®PC to Communicate
as an IBM 3270 Terminal
in a SNA/SDLC Communica-
tions Protocol Environment*
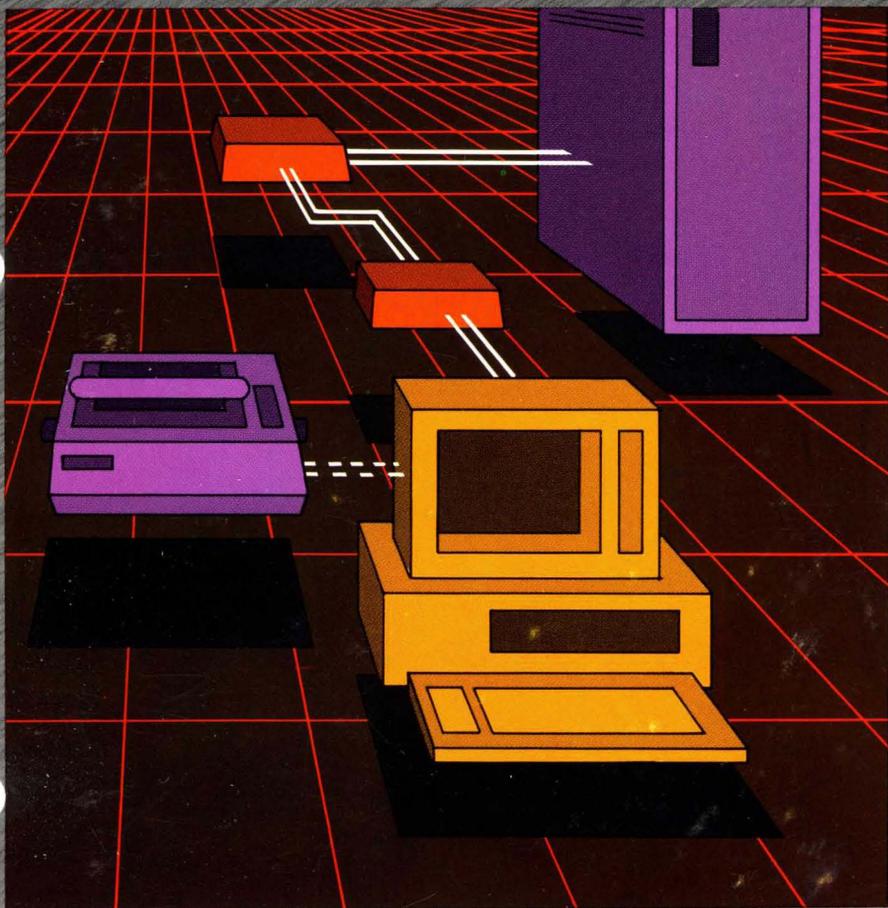
User's Manual

AST-SNA

IBM 3270 Emulation

for the

IBM Personal Computer, IBM PC-XT, and Other IBM-Compatible Systems

User's Manual
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SECTION 1

INTRODUCTION

AST-SNA™ lets you use your IBM Personal Computer (PC) as though it were an IBM® 3270 Information Display System functioning in a Systems Network Architecture (SNA) environment. With AST-SNA, you can now interface directly to an IBM or IBM-compatible mainframe (host system) running SNA.

AST-SNA supports the IBM's Systems Network Architecture (SNA) protocol implemented in the IBM 3274 terminal Control Unit. It provides your IBM PC with the following standard capabilities:

- IBM 3274 Model 51C Control Unit with Configuration B support.

- IBM 3278 Model 2 Display Station or 3279 Model 2A Color Display Station with 75- or 87-key EBCDIC (typewriter) keyboard.

- IBM 3287 Printer (Optional).

AST-SNA supports the following features:

- 1920-character display screen (24 lines x 80 columns).

- Status indicators on the 25th line.

- Audible alarm.

- Basic 3270 attribute support.

- EBCDIC line transmission.

- Printer support including: upper- and lowercase characters; host-initiated screen copy operations; local printer capability; and printer output to disk.

• Concurrent display station and printer operation.

• Monochrome or base color operation.

• Memory-resident protocol handling.

Figure 1-1 compares a typical AST-SNA configuration with a typical IBM 3274 configuration.
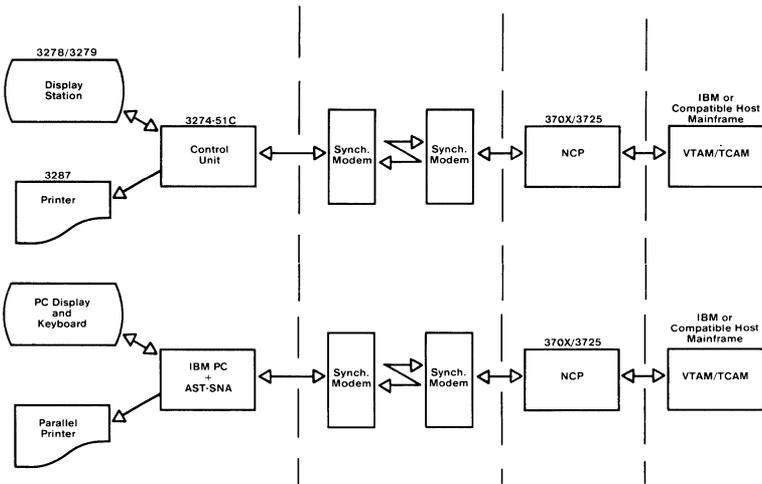
Figure 1-1. Comparison of AST-SNA and IBM 3274.

1.1 Checklist

Before getting started, check that your AST-SNA package includes the following items:

• CC-432 Advanced Communications Board.

• AST-SNA master diskette.

• AST-3270/FTS-R File Transfer System diskette.

- *CC-432 User's Manual* (No. 000140-001).

- *AST-3270/FTS-R User's Manual* (No. 000261-001).

1.2 System Requirements

In order to use AST-SNA, you must meet the hardware and software requirements listed below.

1.2.1 Hardware Requirements

The following hardware is required:

- IBM PC with a minimum of 192 kilobytes (KB) of memory.

- IBM PC monochrome or color display and keyboard.

- At least one IBM PC diskette drive.

- AST Research CC-432 Advanced Communications Board (supplied in package).

- One of the following:

    a) Compatible synchronous modems at both the remote PC end and the mainframe end. (Refer to Section 1.6.)

    b) CC-432 Advanced Communications Board configured as modem eliminator.

    c) Modem eliminator.

- IBM or IBM-compatible host system that supports remote SNA 3270 attachment.

- If printer capability is required, a parallel or serial interface printer compatible with the IBM PC, together with the appropriate type of printer port.

- Mass-terminated DB25 modem cable. (Refer to Section 2.1.4 of this manual.)

1.2.2 Software Requirements

IBM's Personal Computer Disk Operating System (PC-DOS) Version 2.0, or a subsequent version, is required to run AST-SNA. All other PC software that is required to run the package is supplied on the AST-SNA master diskette.

AST-3270/FTS-R requires the IBM host system to support either MVS/TSO or VM/CMS to perform file transfer operations.

1.3 SNA Communication Capabilities

The communication capabilities of AST-SNA include:

- Transfer rates of 1200 to 9600 bits per second (bps).

- Half-duplex SNA/SDLC protocols.

- Point-to-point switched line support (as a multipoint configuration).

- Point-to-point or multipoint leased line support (as a multipoint configuration).

1.4 Physical Connections

With AST-SNA, the IBM PC is connected to the host system directly through synchronous modems or by using the modem eliminator configuration of the CC-432 Advanced Communications Board. This eliminates the need for additional external hardware such as protocol converters or modem eliminators. It operates on switched or leased, point-to-point or multipoint lines at speeds of up to 9600 bps.

A cable (*supplied by the user*) with at least 12 conductors present and a DB25 connector on each end is used to connect the PC to the modem or host system. Note that a cable greater than 50 feet in length violates the RS-232 specification. Refer to Section 2.1, "Hardware Configuration."

The host configuration follows standard conventions when operating in a leased line environment. When AST-SNA is operated in a switched line environment, the host configuration may treat the line as leased. In this case, host operation intervention will typically be required when establishing or terminating connections. Normally, however, the SNA host environment will support switched operation, and this operation intervention is not required.

1.4.1 Local Connection Without a Modem

The CC-432 Advanced Communications Board includes a modem eliminator. The CC-432 Advanced Communications Board can be configured to allow communication to the host computer for a short distance without the need for a modem. It is recommended that you use a cable with a length of 50 feet or less.

1.4.2 Local Connection Using Limited Distance Modem

A limited distance modem (or synchronous line driver) can be used to connect two RS-232 devices over a much greater length of cable than without a modem, but it is still typically limited to less than a mile.

1.4.3 Remote Connection Using Modem

A modem that is used for remote connections operates over standard (voice grade), switched telephone lines. A wide variety of modems are available for this purpose, ranging in speeds of up to 9600 bps. A modem is placed on each end of the link. Both must be of the same type or be compatible. AST-SNA operates with most standard synchronous modems up to speeds of 9600 bps.

1.5 How To Use This Manual

This manual describes how to use AST-SNA on your IBM Personal Computer (PC). By reading this manual and the accompanying *CC-432 User's Manual,* you will learn how to install your CC-432 Advanced Communications Board, prepare your operating diskette, and run the SNA configurator program. This manual also offers guidelines for host system configuration, and takes you step-by-step through the process of logging on and off the host system.

1.5.1 Format Notation

The following conventions are used in this manual to present command statement formats:

- *Uppercase letters* indicate items (such as keywords) that you enter exactly as shown. However, you can enter those items in any combination of upper- or lowercase letters.

- *Boldface* indicates the information that you enter, as contrasted to system prompts or messages, which are shown in regular typeface. The boldface entry may be a parameter such as a file name or a key to press.

- *Square brackets ([ ])* indicate an optional term which is included or omitted at your own discretion. The brackets are entered.

- *Lowercase letters* represent parameters that are defined by the user. While the user defines the parameters, they must satisfy the conditions of the command description.

- *Angle brackets* tell you to press a key. For example, <Esc> instructs you to press the "Esc" key. You do not have to press the "Enter" key unless you are specifically told to do so.

- *System prompts* and messages are shown in color.

1.5.2 Related Reading

This manual does not attempt to describe IBM's Systems Netowrk Architecture (SNA), nor does it describe the IBM 3270 Information Display System product line. The following manuals are recommended for more information on these topics:

IBM 3270 Information Display System: 3274 Control Unit Description and Programmer's Guide, GA23-0061

IBM 3270 Information Display System 3278 Display Station Operator's Guide, GA27-2890

IBM 3270 Information Display System 3279 Color Display Station Operator's Guide, GA33-3057

This manual also does not describe AST-3270/FTS-R, which is covered in the following manual:

AST-3270/FTS-R User's Manual (No. 000261-001).

1.5.3 Manual Outline

The following outline shows this manual's organization:

SECTION 1: INTRODUCTION
Briefly discussed AST-SNA's capabilities. This section also describes product requirements, and familiarizes you with the format of the manual.

SECTION 2: HARDWARE CONFIGURATION
Notes installation procedures for the CC-432 Advanced Communciations Board which are peculiar to AST-SNA.

SECTION 3: SOFTWARE CONFIGURATION
Discusses preparing an operating diskette and configuring your PC.

SECTION 4: OPERATION
    Describes the operation of the emulation software under
    AST-SNA. Printer emulation and selection are also discussed.

SECTION 5: AST-SNA/CLUSTER OPTION
    The AST-SNA/Cluster Option, available as a separate
    product, is briefly discussed.

SECTION 6: APPLICATIONS PROGRAM INTERFACE
    Lists instructions for interfacing applications programs to
    the emulation software.

SECTION 7: TROUBLESHOOTING
    Discusses the most common problems with using AST-
    SNA and lists the procedure to be used if your product
    should ever need repair.

APPENDIX A: 3278/79 KEY FUNCTIONS
    Explains 3278/79 key fuctions, divided into types of
    functions performed (editing keys, function keys, and
    positioning the cursor).

APPENDIX B: VIDEO DISPLAY SCREEN
    Describes the formatted video display screen during
    emulation.

APPENDIX C: INTERNATIONAL KEYBOARD SUPPORT
    Outlines the program used to support and modify
    character mapping for international keyboards.

*APPENDIX D: CC-432 ADVANCED COMMUNICATIONS
BOARD INSTALLATION*
    Provides step-by-step instructions for installing the CC-432
    Advanced Communications Board that comes with your
    AST-SNA package.

APPENDIX E: HOST CONSIDERATIONS
    Two host examples are given and discussed.

APPENDIX F: GLOSSARY
    Consists of a glossary of terms used in this manual.

SECTION 2

HARDWARE CONFIGURATION

There are three main steps involved in preparing AST-SNA for operations. The first step is verifying the configuration of the CC-432 Advanced Communications Board. The second step is installing the CC-432 Advanced Communications Board in the PC. The third step is preparing an operating diskette.

The first two steps are discussed in this section. The third step is discussed at the beginning of Section 3, Software Configuration.

2.1 Hardware Configuration

The CC-432 Advanced Communications Board is designed for use in a wide variety of communication situations and with a full range of synchronous protocols. It has many options to support different modes of operation. As part of the AST-SNA package, AST Research is providing you with a copy of the *CC-432 User's Manual* to be used as a reference manual. Appendix D of this manual described the installation of the CC-432 Advanced Communications Board in detail. The remainder of this section provides information specific to AST-SNA. On several occasions, you will be referred to the figure illustrating the layout of the CC-432 Advanced Communications Board found in Appendix D.

The factory default configuration of the CC-432 is shown in Table 2-1.

Table 2-1. CC-432 Default Configuration.

I/O Address	300 hex through 30F hex
Interrupt	IRQ2

NOTE

Other devices may conflict with the values given for either the I/O address space or IRQ2. When a conflict exists, the CC-432 Advanced Communications Board can be reconfigured by changing the switch settings from the default values. Refer to Appendix D for information on how this is done.

2.1.1 Switch Selection Verification

To verify that the switch on the CC-432 Advanced Communications Board is set to its default positions, locate **S1** which is found just above the AST Research logo at the bottom of the board. (See the board layout in Appendix D.) The positions of this switch should be set as shown in Table 2-2.

Table 2-2. Switch Settings.

1	2	3	4	5	6	7	8
ON	ON	OFF	OFF	OFF	OFF	OFF	ON

2.1.2 DTE Configuration

In its factory default configuration, the CC-432 Advanced Communications Board is configured as a DTE device which must get its transmit and receive timing from a DCE device such as a modem or modem eliminator.

Two eight-position shunts should be installed at **U25** and **U27**, which are both located at the top right corner of the board (see figure in the CC-432 manual).

Jumpers should be installed at positions **1, 3** and **8**, which you will find among the nine sets of pin pairs at the top of the board (see figure in the CC-432 manual). If your board also has a jumper at any of the other six positions (position 2, 4, 5, 6, 7, or 9), the jumper should be removed and saved for future use.

The baud rate selection jumper may be installed or removed, but in either case it will not be used to provide clocking for the transmit and receive data while the CC-432 Advanced Communications Board is in DTE mode.

2.1.3 DCE Configuration

The CC-432 Advanced Communications Board can be configured as a DCE device to eliminate the need for a modem or null modem when it is connected to another DTE device, such as the host system.

In the DCE configuration, the CC-432 will use its own baud rate generator to provide transmit and receive clocks to the DTE device. Baud rate selection is performed by moving the jumper to the baud rate position indicated by the silkscreen on the board. This position is located among the six sets of pin pairs found at the top of the board (see figure in the CC-432 manual).

To enable DCE operation, the two eight-position shunts should be carefully removed from the sockets at U25 and U27 and then reinstalled in the sockets at **U26** and **U28**.

Jumpers should be installed at positions **2**, **4** and **8** (found among the nine sets of pin pairs). They should be removed if they are installed at any of the other six positions (position 1, 3, 5, 6, 7, or 9) and saved for future use.

2.1.4 Cable Description

The CC-432 requires a shielded cable assembly with at least 12 point-to-point conductors. When used with certain IBM modems, additional conductors are required, as detailed in Table 2-3.

Table 2-3. RS-232C Connector Pin List.

RS-232C Pin #			Signal Name	Direction DTE DCE
AA	1	GND	(Chassis Ground)	—
BA	2	TxD	(Transmit Data)	→
BB	3	RxD	(Receive Data)	←
CA	4	RTS	(Request to Send)	→
CB	5	CTS	(Clear to Send)	←
CC	6	DSR	(Data Set Ready)	←
AB	7	SG	(Signal Ground)	—
CF	8	DCD	(Data Carrier Detect)	←
DB	15	TxC	(Transmit Signal Timing)	←
DD	17	RxC	(Receive Signal Timing)	←
*	18	TEST	(Test)	←
CD	20	DTR	(Data Terminal Ready)	→
DA	24	TxC	(Transmit Signal Timing)	→
*	25	TI	(Test Indication)	→

*These signals are not defined in the EIA RS-232C Standard, but are used by some IBM modems.

If you operate the CC-432 in DTE mode, one end of the cable must have a DB25S (female) connector to connect to the CC-432 Advanced Communications Board, and the other end must be a DB25P (male) connector to mate with the modem (DCE) connector. The modem (DCE) is expected to provide transmit and receive clocks. The system speed will be determined by these signals, up to 9600 bps.

For DCE operation, the CC-432 provides the clocking. The speed will be determined by the baud rate jumper on the CC-432. (Do not set it higher than 9600 bps.) You will probably need a DB25S (female) connector on the end of the cable that attaches to the host system.

2.2 Installing the CC-432 Advanced Communications Board

It takes only a few minutes to remove the cover from the PC and install the CC-432 Advanced Communications Board into any one of the empty slots in your PC's system board. Refer to Appendix D for instructions on installing your board.

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SECTION 3

SOFTWARE CONFIGURATION

The AST-SNA package includes a configuration program
which allows you to tailor the operation of the package to
your individual requirements. This program generates a file
used to store the configuration parameters. If you do not need
to customize the configuration parameters, AST-SNA will use
a set of default paramerters (stored in a default configuration
file) when you begin operations as described in Section 4.

This section discusses custom configuration in detail and is
organized in the following manner:

- Preparing an operating diskette.

- Configuration program: first menu page.

- Configuration program: second menu page.

3.1 Preparing an Operating Diskette

Before beginning operation, you must create an operating
diskette from the AST-SNA master diskette.

STEP 1
Make a backup of your AST-SNA Master diskette. To do this,
see you Personal Computer *Disk Operating System Manual* for
instructions on formatting a blank diskette and backing up
diskettes.

The master diskette should contain the following files:

ASTKB.EXE (for international keyboard support)
SNA.COM
SNACFG.EXE
MAPDFT.AST
SNATERM.EXE
C432TEST.COM

STEP 2
During operation of AST-SNA, you will find it convenient to
have the Disk Operating System (DOS) system software on
the same diskette as the AST-SNA software. You may also
wish to copy some of the DOS utilities — such as CHKDSK
and MODE — onto the operating diskette.

For instructions on copying files and formatting a blank
diskette so that it includes DOS system software, refer to your
IBM Personal Computer Disk Operating System.

After you create the operating diskettes, store the AST-SNA
master diskette in a safe place.

3.2 The AST-SNA Configuration Program

To create (or modify) an AST-SNA configuration file designed
specifically for your PC, insert the operating diskette created
in Section 3.1 into drive A: and enter the following command:

A > SNACFG [filename] <Enter>

[filename] is the name of an existing configuration file.
You will not specify this parameter if you are
generating a configuration file for the first time. To
create files with alternate names, enter the desired
file name at the CONFIGURATION FILENAME
prompt (see Figure 3-1).

When this command is entered, the configuration program
begins execution and "reads-in" the named configuration file;
that is, the parameters of the configuration file become the
default settings on the menus.

If the specified configuration file does not exist—that is, if the
name has not been previously specified as a configuration
output file—the standard default settings of the configuration
parameters are used instead.

Two menu pages are displayed in this program:

- A menu of the parameter values (see Figure 3-1). This is the **main menu** or the **first menu page**.

- A second configuration parameter menu page allows you to redefine the selection of PC keys (into special 3278/79 keys). To reach the second menu page, press the <**PgDn**> key on the numeric keypad. To return to the first menu page at any time, press the <**PgUp**> key on the numeric keypad. (See Figure 3-2.)

You can terminate the configuration program in one of two ways:

- When you have entered the configuration parameters and you wish to save the configuration parameter file, return to the first menu page and press the <**Esc**> key.

- If you wish to abort the program and exit without saving changes to the file, you may do so at any time by returning to the first menu page and pressing the <**Ctrl**>-<**Break**> key sequence.

3.2.1 First Menu Page

Upon entering the SNACFG command, the screen shown in Figure 3-1 will be displayed.

```
            AST-SNA CONFIGURATOR        Version X.XX

     ↵ = [default], PgDn = define keyboard, Ctrl/Break = abort. . .

     CONFIGURATION FILENAME [CONFIG.DAT] :
     INTERFACE CARD ADDRESS [:300] : INTERRUPT REQUEST LINE [2] :
     NRZI [N] :
     DATA LINK ADDRESS [:00] :
     IDNUM [:00000] :
     TERMINAL'S LOCAL ADDRESS [02] :
     DISPLAY TYPE [M] :
     DISK PRINTER AVAILABLE [N] :


     PRINTER AVAILABLE [N] :

     INFORMATION: Configuration output file
     CHOICES: any legal DOS file name
```

Figure 3-1. Main Menu or First Menu Page.

The bottom line of the display shows the possible values for the currently selected parameter. The line above this gives a brief description of the current parameter.

In order to change the value of the selected parameter, simply type in the new value and move the cursor to the next parameter.

When you move the cursor, the value entered is validated, and the display is updated.

Positioning the Cursor

You can move the cursor from one parameter to another by using the Cursor Up, Cursor Down, Tab, and Enter keys. It can be positioned at the beginning of each field.

Pressing the Cursor Up key moves the cursor up the screen one line at a time. When you reach the top line and press the Cursor Up key, the cursor moves to the last line of the parameter list.

Pressing the Cursor Down, Tab, or Enter key moves the cursor down the screen one line at a time. When you reach the last line of the parameter list and press one of these three keys, the cursor moves to the first line of the parameter list.

Parameter Definitions

A description of the main menu's parameters follows.

NOTE

These parameters will require information from your host system programmer: NRZI; Line Bit Rate; Control Unit Number; Terminal Device Number; Disk Printer Device Number; Printer Device Number.

Configuration Filename

This parameter is used to name the configuration file that will be created when the program is written. The default name is "CONFIG.DAT", but any valid DOS file name can be used.

Interface Card Address and Interrupt Request Line

If the CC-432 Advanced Communications Board's switch settings have not been changed from the factory default configuration (see Section 2), then the default parameters, shown in brackets, can be used. Otherwise, enter the correct parameter values for the configuration. The entry for the Interface Card Address is a three-digit hexadecimal number; the value for the Interrupt Request Line is a single decimal digit.

NRZI

This is a data-encoding parameter which specifies the use of non-return-to-zero inverted. This is enabled by entering < Y >. Ask you host systems programmer if you should enable this parameter.

Data Link Address

The two-digit hexadecimal address assigned to your system which identifies the SNA station in the link layer. If you change this address, another must be entered here.

IDNUM

The five-digit hexadecimal station identification assigned to your system. If you change this address, it must be identified here.

IDBLK

The three-digit hexadecimal station identification code representing the SNA device type. The default "017" is the code for the basic 3274 control unit; however, this can be changed to either "018" to emulate a 3276 or "03D" for IBM PC 3270 emulation. If you do not know the correct value for this parameter, ask your host systems programmer.

Display Type

Affects the terminal emulation screen display. If color (C) is chosen, the monitor will use four colors to identify different types of display fields.

The monochrome display type (M) should be selected if you have a monochrome display or a non-color graphics monitor. If you have a color display, either setting can be selected.

Disk Printer Available

This determines whether the disk printer emulation is selected. The default is no (N). If (Y) is chosen, the following two prompts will be displayed.

The disk printer parameters provides AST-SNA with information to use in emulating a printer that outputs to a disk file. This type of printer emulation can be used independently of whether a printer is actually attached to your PC.

Disk Printer Device Number

This is used to determine the character sequences which will identify the printer emulation within AST-SNA to the host computer. The value for this parameter is entered as a one- or two-digit decimal number. If you do not know the correct value for this parameter, ask your host systems programmer. The disk printer device number cannot be the same as the terminal device number or the physical printer device number.

Disk Printer Filename

This is used to specify the default name of the output file for output to the printer emulation. (This output includes both that generated by the host and that resulting from screen print operations.) When AST-SNA begins execution, the output file is opened. If the file does not exist, AST-SNA attempts to create it.

Printer Available

This parameter specifies the type of *physical* printer available to this PC. If you have an Epson printer(*) and are using "narrow" (8 1/2 inch wide) paper but want to use 132-column mode, select the value "E" for PRINTER AVAILABLE.

If you are using wide paper in your Epson printer, select the value "P". If you are using narrow paper on the IBM Graphic printer, enter "G". Enter "S" to select a serial printer.

(*)A printer such as the following: Epson MX 80, MX 80FT, RX 80, FX 80, IBM Dot Matrix, IBM Graphics, MX 100, or FX 100.

If you specify an Epson or IBM Graphic printer for the PRINTER AVAILABLE parameter, the emulation package handles output to the printer in a special way. If the host writes a buffer to the printer in 132-column mode, the AST-SNA sends the printer a "print in compressed mode" character prior to any actual output, and prints the buffer in compressed mode.

A host write with any other column mode will result in normal width print characters. With the IBM Graphics printer, however, the character "|" will be printed as "]", "¢" as "[", and "⌐" as "∧".

The default for PRINTER AVAILABLE is "N". If any type of printer is specified, the following prompts will appear:

Printer Device Number:
This is used to determine the character sequences which will identify the printer emulation within AST-SNA to the host computer. The value for this parameter is entered as a one- or two-digit decimal number. If the correct value for this parameter is not known to you, ask your host systems programmer.

Printer Line Length:
This determines the maximum length of a line which AST-SNA will output to the printer. If an attempt is made to output lines longer than the specified length, the lines will be truncated on output. The value for this parameter is a two- or three-digit number.

Printer Port:
This entry tells AST-SNA how the printer is to be addressed within the PC. This is the LPTn (for a parallel or Epson printer) or COMn (for a serial printer) port number, as used by DOS in referring to the printer. The value for this parameter is a single decimal digit.

If "S" was selected at PRINTER AVAILABLE for a serial printer, the following parameters will also be displayed:

Printer Port Speed:

This sets the baud rate of the selected serial communication adapter. Choices are 110, 150, 300, 600, 1200, 2400, 4800 or 9600 baud.

Printer Port Parity:

The parity is either N (none), O (odd), or E (even). The default value is E.

Printer Port Data Bits:

Either 7 or 8 is selected. The deault value is 7.

Printer Port Stop Bits:

Either 1 or 2 is selected. If the baud rate selected above is 110, use 2; otherwise, use 1 (the default value).

Printer Port Uses CTS:

Y (the default) uses the Clear To Send, which allows output to the serial printer only when the clear to send condition has been met. N ignores this requirement, and implies the printer uses XON/XOFF protocol.

NOTE

If both a disk printer and a physical printer are enabled in your configuration, AST-SNA will initially assign the physical printer to your terminal emulation. To change this assignment, the operator at the PC press the IDENT key. The current printer assignment can be changed as often as you wish, providing that no print requests are currently in the queue.

3.2.2 Second Menu Page (Keyboard Mapping)

The second menu page is used entirely for defining the mapping of keys on the PC keyboard to special 3278/79 keys and is reached by pressing the <**PgDn**> key at the main

menu. Three columns of paired key names are used to define the mapping, with the name or description of a key from the PC keyboard on the left and the name of the corresponding 3278/79 key, if any, on the right. In some cases, a combination of keys on the PC keyboard is mapped into a single 3278/79 key.

```
AST-SNA KEYBOARD DEFINITIONS  = enter value, cursor keys = cursor movement
space bar = erase cell, PgUp = return to main menu, PgDn = 4port configuration
  →  |            TAB            |  ←        BACK TAB         ↵          ENTER
* (Prt Sc)        PRINT          HOME       HOME             UP         UP
LEFT              LEFT           RIGHT      RIGHT            DOWN       DOWN
INS               INSERT         DEL        DELETE         ← (BS)       RETURN
far rt—                          far rt +                   PgUp
PgDn
alt 1             PA1            alt 5      ERASE INPUT      alt 9      RESET
alt 2             PA2            alt 6      DUP              alt 0      IDENT
alt 3             PA3            alt 7      FIELD MARK       alt —      SYS REQ
alt 4             ERASE EOF      alt 8      DEV CNCL         alt =      CLEAR
F1                PF1            shift F1   PF11             alt F1     PF21
F2                PF2            shift F2   PF12             alt F2     PF22
F3                PF3            shift F3   PF13             alt F3     PF23
F4                PF4            shift F4   PF14             alt F4     PF24
F5                PF5            shift F5   PF15             alt F5
F6                PF6            shift F6   PF16             alt F6
F7                PF7            shift F7   PF17             alt F7
F8                PF8            shift F8   PF18             alt F8
F9                PF9            shift F9   PF19             alt F9
F10               PF10           shift F10  PF20             alt F10
Choices:ATTN |  BACK TAB  |  CLEAR  |  DELETE  |  DEV CNCL  |  DOWN  |  DUP  |  ENTER
ERASE EOF  |  ERASE INPUT  |  FIELD MARK  |  HOME  |  IDENT  |  INSERT  |  LEFT  |  RSTPRT
PA1..PA3  |  PF1..PF24  |  PRINT  |  RESET  |  RETURN  |  RIGHT  |  SYS REQ  |  TAB  |  UP
```

Figure 3-2. Second Menu Page.

The current keyboard mapping for your PC can be changed by positioning the cursor at the appropriate PC key or key combination and entering the desired 3278/79 key name. The bottom three lines of the screen are a list of valid 3278/79 key names. Pressing the space bar at a parameter clears the current assignment without making a new assignment.

SECTION 4

OPERATION

This section tells you how to begin using your PC as a SNA 3270 Information Display System. The section is organized in the following manner:

- Starting AST-SNA.

- Modifying the AUTOEXEC.BAT file.

- Operation and the hot-key function.

- Printer emulation.

- Connecting to the mainframe.

- The keyboard.

- Status line messages.

4.1 Starting AST-SNA

AST-SNA is used by invoking several programs found on the operating diskette you created earlier (see Section 3). The following programs are invoked as described:

- **SNA**: Equips the PC with the resident software needed to handle the SNA/SDLC communication protocol.

- **SNATERM**: Invoked on the PC to provide 3270 display emulation capabilities.

NOTE

SNA must be invoked before SNATERM in
order for AST-SNA to function properly.

The SNA and SNATERM commands may be entered with a
configuration file name, as in the following example:

SNATERM [filename]<Enter>

If no configuration file is entered, the default file (CONFIG.DAT)
is used.

In order to start AST-SNA, perform the following steps:

STEP 1
PC Preparation: Place your AST-SNA operating diskette in
drive A:, or issue the **cd** command to access the appropriate
hard disk directory. Enter the **SNA** and **SNATERM** commands
with the desired file name (if applicable).

You may modify your AUTOEXEC.BAT file so that SNA is
invoked during boot-up. (See Section 4.1.1.) If this is done,
SNATERM need only be invoked manually.

Upon entering SNA, the system will display the interface card
address number, the interrupt request line number, the line
speed, and the control unit number.

Upon entering SNATERM, the system will display the 3270
screen.

NOTE

If the communications line to the host has
not been established, the system will
display a message in the 25th status line
indicating this.

STEP 2
Establishing a Connection to the Mainframe: Dial-up can be performed at any time after the SNA command has been executed. Once the connection is established, the system message **[4]** is displayed.

The connection to the mainframe is discussed in detail in Sections 4-4, 4-5 and 4-6.

4.1.1 Editing The AUTOEXEC.BAT File

You may choose to edit the AUTOEXEC.BAT file on your operating diskette so that AST-SNA can be automatically executed during boot-up. This allocates the PC's memory for emulation and saves you a step. You may, however, choose not to enter the AST-SNA commands, and invoke the emulation manually.

The following steps describe how to modify your AUTOEXEC.BAT file and how to perform the boot-up process. In the description of these steps, it is assumed that your PC has at least two disk drives.

STEP 1
Place your bootable diskette containing the AST-SNA files in drive A: of your PC.

STEP 2
Enter the following command:

   A> **TYPE AUTOEXEC.BAT** < Enter >

The contents of your AUTOEXEC.BAT file will be listed on your screen.

STEP 3
Enter the following command:

   A> **COPY CON AUTOEXEC.BAT** < Enter >

The cursor will drop down one line.

STEP 4
Type in the contents of your current AUTOEXEC.BAT file, pressing <**Enter**> at the end of each line. At the end of the file, add the following command:

      SNA [filename]<**Enter**>

STEP 5
Check the file carefully to insure that all commands have been properly entered. After you have done this, press the following key sequence to close the file:

   A> <**Ctrl**>-<**Z**>-<**Enter**>

Your new AUTOEXEC.BAT file will be stored on the bootable diskette.

To boot-up your system using the modified AUTOEXEC.BAT file, perform the following steps:

STEP 1
Place your operating diskette, containing the modified AUTOEXEC.BAT file, in drive A: of your PC.

STEP 2
Boot the system by pressing the <**Ctrl**>-<**Alt**>-<**Del**> key sequence. When the PC has completed boot up, you may dial up the mainframe. Once the connection is established, your PC will be able to access the mainframe.

STEP 3
To begin emulation on your PC, enter the following command:

   SNATERM

4.2 Operation and the Hot-Key Function

AST-SNA allows you to operate the 3270 terminal emulation software in the background while executing DOS applications in the foreground. You can quickly switch between background and foreground by using the *hot-key* sequence.

After the commands to start 3270 SNA emulation have been entered, you may press the hot-key sequence, which consists of pressing both <**Shift**> keys simultaneously (<**Shift**>-<**Shift**>).

NOTE

The first time you issue the hot-key sequence, the SNATERM program is made resident in the PC's memory. Having the program resident means that when you hot key out of the host emulation back to DOS, all status and associated task information pertaining to the host job is maintained along with a virtual screen buffer in memory. If you hot key back again to the host emulation, the current task information is returned to the screen.

Pressing <**Ctrl**>-<**Alt**>-<**Del**> before initially pressing the hot key exits the terminal emulation and releases the SNATERM program's memory to DOS. The SNATERM command must then be re-entered to resume emulation.

NOTE

If you *need* to reboot the PC, first hot-key into emulation mode; then, press the <**Ctrl**>-<**Alt**>-<**Del**> sequence twice. If you press <**Ctrl**>-<**Alt**>-<**Del**> in DOS, the PC will ignore the command and sound the audible alarm.

Under certain circumstances, the hot-key sequence is ignored. For example, if the host system is communicating with the emulation software and cannot be interrupted, the hot-key sequence is rejected by the audible alarm and must be re-entered.

The following conditions apply to the hot-key:

- The SNATERM program takes about 45 KB of a
  PC's memory. If you press <Ctrl>-<Alt>-<Del>
  once without ever using the hot key, this memory is
  released to DOS, and the SNATERM program is not
  made resident.

- DOS should only be reloaded using proper software
  reset sequence procedures.

4.3 Printer Emulation

Two key sequences are defined to provide the PC with the
ability to enable or disable the use of a PC printer as a 3287
emulation printer. This allows the operator at the PC to alternate
the printer between network and host 3270 printing jobs.

The PC can enable or disable the PC printer for use as a
3287 emulation printer by the following keystroke sequences:

- <Ctrl>-<Alt>-<+> (Hold down Ctrl and Alt, then
  press the plus (+) key on the far right of the keyboard.)
  This sequence *enables* the printer as a 3287 printer.

- <Ctrl>-<Alt>-<-> (Hold down Ctrl and Alt, then
  press the minus (-) key on the far right of the
  keyboard.) This sequence *disables* the printer as a
  3287 printer and allows it to be used as a DOS
  printer.

NOTE

You cannot execute DOS print jobs while
3278 emulation is enabled.

4.4 Connecting to the Mainframe

Before you can log on, your PC system must be connected to the host. If the PC is on a nonswitched line, check the hardware components (modems, etc.) to make sure that they are all properly connected and operational. Refer to Section 1.4, "Physical Connections". If you are on a dial-up line, see Section 4.4.1 for details on setup.

Once the PC is physically connected to the host, it must be logically connected to the host as well. You will know that this connection has been made when you see a "B" next to the "[4]" on the bottom line of the PC screen. See Figure 4-1. If you don't see the "B", the commands have not been processed. Contact the network operator or the systems programmer at your installation.
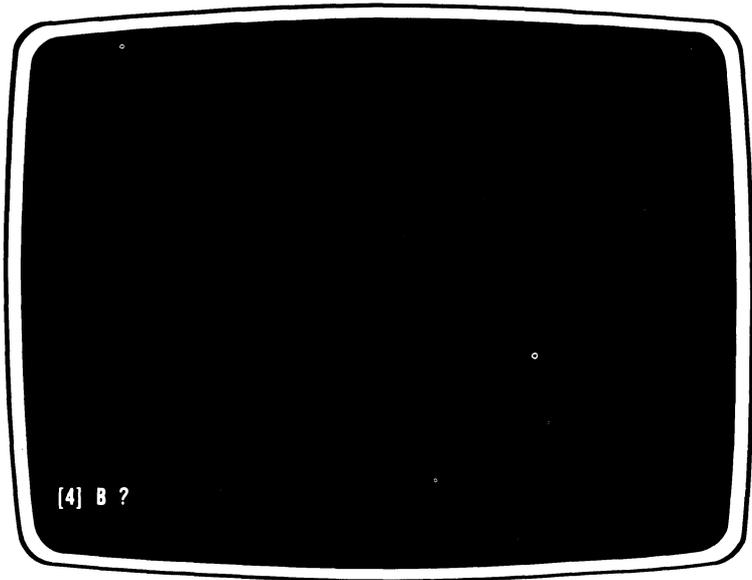
Figure 4-1. Initial Host Connection Screen.

4.4.1 Dial-up Lines

If you are on a switched line, the following procedures must be performed at the PC to establish a connection with the host.

1. Check that the modem is powered on.

2. Make sure that all of the physical connections are established and that the modem is in the "talk position."

3. Lift the handset, and listen for the dial tone.

4. Dial the phone number (designated by your installation).

5. Wait to hear the high-pitched answer tone, then switch to data mode, and hang up the phone.

You are now connected to the host system. Your PC is now able to communicate with the host. Continue with the log-on sequence or return to DOS.

4.5 Logging On

After completing the five steps outlined above and executing SNATERM, you may see a message on the screen. If so, all is well, and you may now type the log-on message and follow the procedures defined for your installation. Now you may enter your log-on sequence.

Once you have successfully logged on, the word JOB will appear on the status line. You can now begin to enter and modify data according to the procedures described in your system operating manual.

If the word JOB does not appear, an error message may appear either on the screen or on the status line to tell you why the word JOB does not appear and what to do next.

4.6 Logging Off

The following log-off procedure, like the log-on procedure, represents a typical log-off sequence. Your procedure may be different, so contact the individual responsible for defining your host system for the specific log-off sequence for your installation.

Once you have completed your data entry and are ready to disconnect from the host, type the specific logoff sequence defined by your installation.

4.7 The Keyboard

AST-SNA lets you use your PC keyboard like a 3278/79 keyboard. In order to do this, AST-SNA interprets certain keys and key combinations on your keyboard as having the same functions as the keys on a 3278/79 keyboard. *See Appendix A for a listing and brief explanation of these keys*.

Figure 4-2 shows you the 3278/79 87-key keyboard. You can see that most of the keys correspond exactly to those on your IBM PC keyboard.

Figure 4-2. 3278/79 Keyboard Implemented on the IBM PC.

75-Key Typewriter Keyboard or
87-Key Typewriter Keyboard

Unshifted PF1-PF10
Shift PF11-PF20
Alt PF21-PF24

Exit

PA1 PA2 PA3 ERASE EOF ERASE INPUT DUP FIELD MARK DEV CNCL RESET IDENT SYS REQ CLEAR

{ Top Row of Keyboard Only
{ With Alt Key Depressed

New Line

Enter

Unshifted Print

Figure 4-2 and Table 4-1 show you the keys that are found on the 3278/79 keyboard along with the default equivalent keys on the IBM PC keyboard. See Section 3.5 for a description of how the equivalent key assignments can be changed, if you don't want to use the defaults.

Table 4-1. 3278/79 Special Keys with IBM PC Equivalents.

3270 Key	IBM PC Key
(⌐↖) (Cursor Home)	Home
Enter	Enter
PA1	Alt 1
PA2	Alt 2
PA3	Alt 3
ERASE EOF	Alt 4
ERASE INPUT	Alt 5
DUP (Duplicate)	Alt 6
FIELD MARK	Alt 7
DEV CNCL	Alt 8
RESET	Alt 9
IDENT	Alt 0
SYS REQ	Alt -
CLEAR	Alt =
PF1 thru PF10	F1 thru F10

**Table 4-1. 3278/79 Special Keys with IBM PC Equivalents
(Continued).**

3270 Key	IBM PC Key
PF11 thru PF20	Shift F1 thru F10
PF21 thru PF24	Alt F1 thru F4
→| (Tab)	→| (Tab)
|← (Backtab)	|← (Backtab)
↑ (Cursor Up)	↑ (Cursor Up)
↓ (Cursor Down)	↓ (Cursor Down)
← (Cursor Left)	← (Cursor Left)
→ (Cursor Right)	→ (Cursor Right)
↵ (New Line)	⟵ (Backspace)
☐–☐ (Print)	* (on PrtSc key)
ⓐ(Insert Mode)	Ins
ⓐ(Delete)	Del
ATTN	Far rt -

NOTE

In the above table under the column
entitled "IBM PC Key," if one function is
designated by a key combination (e.g.,
"Alt 1"), this means that you must press
and hold the first key and then press the
second key. Also, keys "0" thru "9" and
"-" in this column refer to the keys along
the top of the PC keyboard, not those on
the numeric keypad.

4.8 Status Line

The 25th line of your display screen is used for operating and status messages. These messages give you specific information about your system's operation. The messages are grouped into four categories and are displayed in four different locations on the line as shown in Figure 4-3.
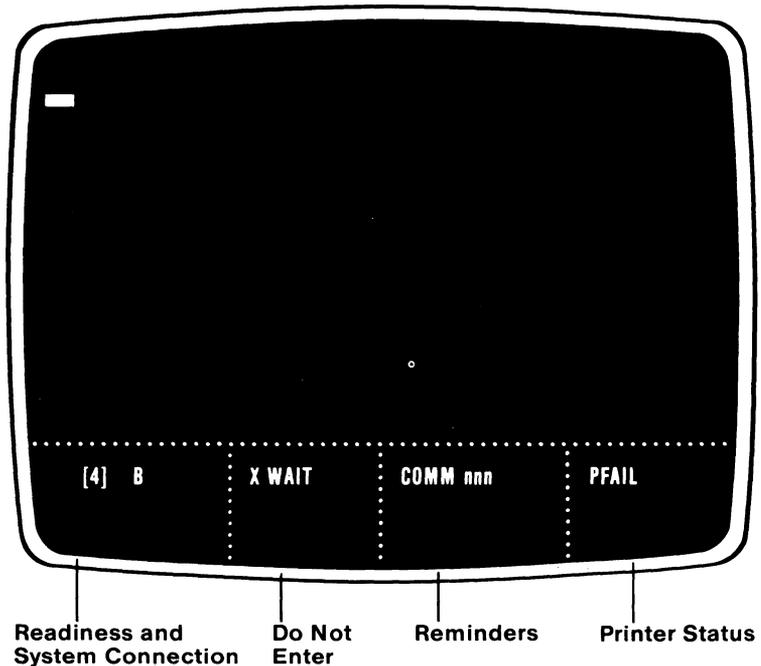
Figure 4-3. Status Line.

4.8.1 Readiness and System Connection

The Readiness and System Connection symbols let you know if your display station, control unit, or host system is ready. The following are the Readiness and System Connection symbols:

[4]

The "[4]" is displayed when your PC (emulating an IBM 3274 control unit) is ready for operation with a communication line connection established. This symbol must be visible before the "A" can be displayed next to it.

B

The Online "B" symbol is displayed when your display station is attached and on-line to the control unit using the SNA/SDLC protocol. This symbol will not appear initially until the host has performed a write-type operation to the terminal.

JOB

The word JOB is displayed when your display station is in communication with the host computer's application program.

4.8.2 "Do Not Enter" Messages

The symbol for the Do Not Enter messages is an X, and it is displayed when your system will not accept input from your keyboard. The words or symbols displayed to the right of the X define why your keyboard is disabled and what you can do, if anything, to restore your keyboard to input mode.

You can still press the keys on your keyboard. Although they are not physically locked, you will not see any characters displayed on the video screen, and no keyboard-entered data will be transmitted to the host.

X WAIT

Wait: the host needs additional time to perform your task.

X SYSTEM

System lock: the host disabled your keyboard after it processed your input. You may receive some type of message from the host system explaining why your keyboard was disabled. The host will restore your keyboard.

X ? +

What?: the display station did not accept all, or part, of your last operation. Press the RESET key, then try the operation again.

X <OP>

Go elsewhere: you tried to do something in a location that doesn't allow it. For example, you may have attempted to enter, change, or delete a character while the cursor is positioned in a protected field. Press the RESET key, then move your cursor to a different area, or perform a different action.

X OP>

Too much data: you tried to enter more data into a field than it could hold. Press the RESET key, then correct the entry.

X OP NUM

Numeric: you tried to enter a nonnumeric character into a field that allows only numeric entry. Press the RESET key, then enter numeric data.

X –S

Minus symbol: you keyed in a symbol that the control unit does not recognize. Press the RESET key.

X –f

Minus function: you tried to perform an operation that is not supported. Press the RESET key to restore your keyboard.

X –UNAUTH

Unauthorized print: you tried to print while the printer was powered down or assigned to PC DOS usage. Press the RESET key to restore your keyboard.

X COMM nnn

Communication check: there is a communication problem
somewhere between the host and AST-SNA program. Press
the RESET key, then continue. The three-digit number
defines the type of communication check.

X MCHK nnn

Machine check: this message is displayed when there is an
internal problem. The system returns to the DOS display.
Report the problem to AST Technical Support.

X PROG nnn

Program check: there is a programming error in the data
coming from the host. Press the RESET key, then continue.
The three-digit number defines the type of program check.

X PRT FAIL

Printer not working: your print request was aborted because
the printer attached to your display station is not working. It
may be unplugged, out of order, out of paper, assigned to PC
DOS, etc.

Press the DEV CNCL key to restore the keyboard. Once you
restore the keyboard, you can fix the printer problem.

The RESET key is ineffective when the X PRT FAIL message
is displayed.

X PRT VBUSY

Printer very busy: the printer assigned to your display station
is currently printing data from a host and cannot perform the
requested local print. You may press the DEV CNCL key to
cancel the job that you are currently printing. Refer to your
IBM 3274 manual for definitions of the error codes.

The RESET key is ineffective when X PRT VBUSY is displayed.

4.8.3 Reminders

The next category of messages is the reminders. These messages describe a condition that has occurred.

COMM nnn

Communication reminder: an error has been detected on the communication link connecting your system to the host. You may not be able to communicate with the host. The two- or three-digit number defines the error.

This message is displayed until AST-SNA ascertains that the link is working properly. See you IBM 3274 manual for common message definitions.

4.8.4 Printer Status Messages

The next category of messages is the Printer Status Messages. These messages let you know the progress of the print operation. In the following messages, "nn" defines whether a disk or a line printer is currently enabled. Check your PC's configuration to determine the association of this print parameter.

POFF nn

Printer is not enabled for host printing: invoke the printer for 3287 emulation. When enabled, you will see the PRT message.

PRT nn

Printer assigned: this message is displayed when an allocated printer is attached to a PC that is powered on and enabled for 3287 emulation. If the message is not displayed, the printer is either powered off, in some sort of error state (X PRT FAIL is displayed), is printing (PRTNG nn is displayed), or is enabled for DOS print jobs (POFF is displayed). If the latter is the case, enable 3287 emulation.

PRTNG nn

Printer printing: the printer is now printing your job.

PFAIL nn

Printer failure: the printer failed while printing your job. See the description of the X PRT FAIL message in Section 4.8.2 of this manual for more information and possible recovery.

SECTION 5

AST-SNA/CLUSTER OPTION

The AST-SNA/Cluster is an option for AST-SNA that allows the user to attach as many as four additional IBM PCs or ASCII terminals to emulate the capabilities of an IBM 3278 or 3279. *To obtain more detailed information about this product, contact the Sales Department at AST Research.*

The AST-SNA/Cluster option includes software and cluster communication board and supports the following additional features:

- 1920-character display screen (24 lines × 80 columns).

- Status indicators.

- Audible alarm.

- Basic 3270 attribute support.

- Printer support including upper- and lowercase characters and local printer capability.

The additional communication capabilities of this option include:

- Transfer rates of 110 to 9600 bits per second (bps).

- Full duplex asynchronous protocols.

Complete information, including configuration to tailor this package to your individual requirements, will be forwarded at the time of purchase of this option.

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SECTION 6

APPLICATIONS PROGRAM INTERFACE

The AST-SNA software can act as a standalone 3270 emulator
that can be invoked and exited freely; additionally, your
applications program can interface directly with the AST-SNA
software *kernel* module to allow you to use its operation and
control software facilities specifically for your requirements.

These software program control facilities are available to your
program though assembly language routines or *calls*, in much
the same way that the Disk Operating System (DOS) facilities
are available. A function identifier and parameters are placed
in registers and an interrupt instruction is executed to call the
kernel, which *returns* the result in a register. Your applications
program may be written in any language that can communicate
with assembly language routines such as BASIC or C.

This section provides the experienced assembly language
programmer with the information needed to take advantage of
these software facilities. This interfacing capability is referred
to as the Applications Program Interface (API).

6.1 Overview

The AST-SNA API provides a mechanism by which user
applications programs, such as AST-3270/FTS-R, can directly
access the communications capabilities of the AST-SNA
emulation software. The function calls provided give the
applications program access to the internal screen buffer for
each device maintained by the memory-resident protocol
emulation kernel, and also allow the applications program to
inform the kernel of changes in device state and events
requiring emulation processing.

The protocol emulation kernel can also inform the applications program of events which may require processing by the program. This is implemented by allowing the applications program to specify the address of an event processing routine. The specified routine is called by the emulation kernel when an event which may require application processing occurs, with parameters that identify the type of event.

The AST-SNA API is intended to be used only by sophisticated programmers with an extensive knowledge of assembly language. AST is nonetheless able to provide support for developers of applications programs designed to use the API.

6.2 Screen Representation

When using the AST-SNA API, applications programs are able to read and write data directly from the internal screen image buffers used by the protocol kernel code. There is one such buffer dedicated to each configured device included in the emulation.

A screen-image buffer is an array of 1920 characters, or 24 rows of 80 characters each. The first character in the buffer is that which appears in the upper-left corner of a 3278 screen. The character codes are taken from the extended ASCII defined for use of the IBM PC, with the exception of codes :C0 through :FF, which are used for attribute characters (the lower six bits of an attribute character have the standard 3270 interpretation).

Since EBCDIC character codes are used on the communications line, it is necessary to translate codes for receive and transmit data. The translation used is straightforward, mapping characters with the same appearance in the other code set.

6.3 Programming Information

In order to use the API, the protocol emulation kernel portion of the AST-SNA package must be loaded. When this is done, the kernel operates as an interrupt-driven background program in the PC, allowing other programs to be executed concurrently.

User programs access functions of the API through software interrupt :59. The specific function to be performed is determined by the contents of the AL register. Other parameters are also passed and returned in the registers, as detailed separately for terminal and printer devices (Sections 6.4 and 6.5). Only those registers listed as being used for returned parameters are modified by a function call.

The protocol emulation kernel keeps track of which configured devices are currently in use. Function calls are provided to allocate (change the state to "in use") and deallocate (change the state to "not in use") devices. The only function call which is valid for a device not currently in use is the call to allocate it.

Within the kernel, several data items are associated with each configured device. These include the screen-image buffer (as described in the preceding section), the current cursor position, and status information. Function calls are provided to find the address of the buffer, to read and write the cursor position value, and to read the status information.

Another function call is used to emulate the effect of a control key entry from a terminal device, or of a change in the availability of a printer device. This call allows applications programs to initiate host data transfers and to inform the kernel of external events which affect the operation of the protocol.

A function call is also provided to request termination of the protocol emulation kernel operation. When this function call is executed, it causes the communications line to be disconnected and all functions of the kernel to be suspended. Note that the protocol emulation kernel remains in memory after this call is executed, but is totally unusable.

Two other function calls are defined. These calls, which set the address of an event processing routine and unlock a device, are discussed later in this section.

6.4 Function Descriptions

This section contains detailed descriptions of the API function calls as they are used with terminal device emulations. Function calls as they are used with printer device emulations are discussed in Section 6.5. The functions listed below are designated by a hexidecimal number.

6.4.1 Allocate Device — :01

The Allocate Device function call is used to establish a linkage within the protocol emulation kernel between the applications program and one of the devices being emulated. Either a specific device number, or any available terminal device, can be allocated with this function.

Call: **AL** is :01 and **AH** specifies the device number or type to be allocated as illustrated below:

Bit 7:   Set if specific device.
Bit 6:   0
Bit 5:   Set if any available terminal.
Bits 4-0: Specific device number.

Return: **AL** is :00 and **AH** is the device number if the function is succesful. If the specified device is already allocated (or all terminal devices are allocated), AL returns :FF.

NOTE

This function call will produce an error message if the hot-key sequence has been used. Ignore this error message and continue.

6.4.2 Deallocate Device — :02

This function call is used to terminate an established linkage within the protocol emulation kernel between the applications program and one of the devices being emulated.

Call: **AL** is :02 and **AH** is the device number to be deallocated.

Return: **AL** is :00 if the function is successful. If the specified device has not been allocated, **AL** returns :FF.

6.4.3 Get Buffer Address — :03

This function call is used to find the address of the screen buffer associated with a device within the protocol emulation kernel. The returned buffer address can be used by the applications program to access data received from the host, and to store data to be transmitted to the host.

Call: **AL** is :03 and **AH** is the device number.

Return: **AL** is :00 and ES:DI points to the screen buffer for the specified device if the function is successful. If the specified device has not been configured, **AL** returns :FF.

6.4.4 Set Event Processing Routine — :04

This function call is used to set the address of an event processing routine within the applications program, or to clear a previously-specified event processing routine address.

Call: **AL** is :04, **AH** is the device number and ES:DI points to the applications program event processing routine.

Return: **AL** is :00 if the function is successful. If the specified device has not been allocated, **AL** returns :FF.

6.4.5 Get Cursor Position — :05

This function call is used to get the current cursor position within the screen buffer for a device.

Call: **AL** is :05 and **AH** is the device number.

Return: **AL** is :00 and DI is the offset of the current cursor position within the screen buffer if the function is successful. If the specified device has not been configured, **AL** returns :FF.

6.4.6 Set Cursor Position — :06

This function call is used to set the current cursor position within the screen buffer for a device.

Call: **AL** is :06, **AH** is the device number and DI is the offset of the current cursor position within the screen buffer.

Return: **AL** is :00 if the function is successful. If the specified device has not been configured, **AL** returns :FF.

6.4.7 Control Key Entry — :07

This function call is used to inform the protocol emulation kernel that a control key has been entered for a device. The control keys involved either affect other devices within the emulation or initiate data transfers to the host.

Call: **AL** is :07, **AH** is the device number and **BH** is the control key code, defined in the Table 6-1:

Table 6-1. Device Numbers and Control Key Codes.

AH	BH
:01	PF 13
:02	PF 14
:03	PF 15
:04	PF 16
:05	PF 17
:06	PF 18
:07	PF 19
:08	PF 20
:09	PF 21
:10	PF 22
:0B	PF 23
:0C	PF 24
:0D	RESET
:0E	PRINT
;0F	DEV CNCL
:14	IDENT
:15	ATTN
:16	Screen Buffer Modified
:26	Operator Identification Card Reader
:27	Magnetic Slot Reader
:2B	PA 3
:2C	PA 1
:2D	CLEAR
:2E	PA 2 (CNCL)
:30	TEST REQ / SYS REQ
:31	PF 1
:32	PF 2
:33	PF 3
:34	PF 4
:35	PF 5
:36	PF 6
:37	PF 7
:38	PF 8
:39	PF 9
:3A	PF 10
:3B	PF 11
:3C	PF 12
:3D	ENTER and & (Selector-Light Pen Attention)
:3E	Selector-Light Pen Attention space null)

Return: **AL** is :00 if the function is successful. If the specified device has not been configured, or the key code is not recognized **AL** returns :FF.

6.4.8 Get Device Status — :08

This function call is used to read current status information for a device within the protocol emulation kernel.

Call: **AL** is :08 and **AH** is the device number.

Return: **AL** is :00 if the function is successful, in which case the other register contents are as described below. **AL** is :FF if the specified device has not been configured.

When the successful return is taken, **BH** returns apair of codes for the current protocol state of the device. The first code occupies the top four bits of the register, and gives the current connection state for the device. The values for this field are as follows:

0:      No host connection.
1:      Host connection established.
2:      Host connection online.

The second code occupies the lowest two bits of the register, and gives the current "do not enter" state for the device. The values defined for this field are:

0:      Normal ready state.
1:      Transmission (X WAIT) state.
2:      System (X SYSTEM) state.

BL returns a set of flags indicating actions requested by the host:

Bit 7:   Unsolicited command received.
Bit 6:   Buffer written.
Bits 5-3: Unused.
Bit 2:   Sound audible alarm.
Bit 1:   Restore keyboard.
Bit 0:   Clear screen.

The first flag in this list is used to inform the applications program of a host attempt to execute an unsolicited command. Handling of this flag is described in Section 3.3. The remaining flags are derived from the write control character value sent by the host with a command which writes to the screen buffer. These are reset within the kernel after they are reported to the applications program, so any required action should be taken immediately upon finding any of these flags set.

CH is a code for the current protocol error state, defined as follows:

:00   None.
:01   Host program error.
:02   Communication line error.
:03   Emulation kernel error.

If an error condition is indicated by the returned value in **CH**, a specific error number is returned in **CL**. For host program errors, the value returned in **CL** is the binary value of the last two decimal digits of the corresponding program check condition recognized by a 3274 control unit. For communication line errors, it is the binary value of the last two decimal digits of the equivalent communication check condition. For emulation kernel errors, the value is an indication of a specific problem within the emulation kernel code. Any errors of this type should be reported to AST Technical Support immediately.

DH is a code for the status of the printer assigned to the device. The value returned is defined as follows:

:00   No printer assigned.
:01   Printer powered down.
:02   Printer error.
:03   Printer available.
:04   Printer printing.
:05   Printer busy.
:06   Printer very busy.

DL returns the device number of the assigned printer, or :FF if no printer is assigned.

6.4.9 Terminate Operation — :09

This function call is used to terminate the operation of the emulation kernel code. No other function calls to the protocol kernel can be executed after the successful completion of this function call.

Call: **AL** is :09.

Return: **AL** is :00 if the function is successful. If any of the devices being emulated are allocated at the time the function call is made, the function fails and AL returns :FF.

6.4.10 Unlock Device — :0A

This function call is used to unlock a device so that an unsolicited host command can be executed.

Call: **AL** is :0A and **AH** is the device number.

Return: **AL** is :00 if the function is successful. If the specified device has not been configured, **AL** returns :FF.

6.5 Printer Device Functions

This section describes the differences in the API function calls when used for printer device emulations. It should be referred to in conjunction with the preceding subsection for a complete description of how the calls operate for printer devices.

6.5.1 Allocate Device — :01

This function call is used to establish a linkage within the protocol emulation kernel between the applications program and one of the devices being emulated. Either a specific device number, or any available printer device, can be allocated with this function.

> Call: **AL** is :01 and **AH** specifies the device number or type of device to be allocated:
>
> Bit 7:   Set if specific device.
> Bit 6:   Set if any available printer.
> Bit 5:   0.
> Bits 4-0: Specific device number.

> Return: **AL** is :01 and **AH** is the device number if the function is successful. If the specified device is already allocated (or all printer devices are allocated), **AL** returns :FF.

6.5.2 Deallocate Device — :02

This function call operates the same as for terminal devices.

6.5.3 Get Buffer Address — :03

This function call operates the same as for terminal devices.

6.5.4 Set Event Processing Routine — :04

This function call operates the same as for terminal devices.

6.5.5 Get Cursor Position — :05

This function call operates the same as for terminal devices.

6.5.6 Set Cursor Position — :06

This function call operates the same as for terminal devices.

6.5.7 Control Key Entry — :07

This function call is used to inform the protocol emulation kernel of changes in printer status.

> Call: **AL** is :07, **AH** is the device number and **BH** is the control key code, defined as follows:
>
> > :10   Printer Busy
> > :11   Printer Done
> > :12   Printer Powered-Off
> > :13   Printer Operator Intervention Required
>
> Return: **AL** is :00 if the function is successful. If the specified device has not been configured, or the key code is not recognized **AL** returns :FF.

6.5.8 Get Device Status — :08

This function call is used to read current status information for a device within the protocol emulation kernel.

> Call: **AL** is :08 and **AH** is the device number.
>
> Return: **AL** is :00 if the function is successful, in which case the other register contents are as described below. **AL** is :FF if the specified device has not been configured.

When the successful return is taken, **BH** returns a code for the current protocol state of the device in the top four bits of the register. The values for this field are as follows:

0:      No host connection.
1:      Host connection established.
2:      Host connection online.

The low four bits of the register are unused.

BL returns a set of flags indicating actions requested by the host:

Bit 7:   On: SNA character stream format.
          Off: Data stream capability format.
Bit 6:   Buffer written.
Bits 5-4: Printout format mode.
Bit 3:   Start printer.
Bits 2-0: Unused.

These flags are derived from the write control character value sent by the host with a command which writes to the screen buffer. These are reset within the kernel after they are reported to the applications program, so any required action should be taken immediately upon finding any of these flags set.

CH is a code for the current protocol error state, defined as follows:

:00   None.
:01   Host program error.
:02   Communication line error.
:03   Emulation kernel error.

If an error condition is indicated by the returned value in **CH**, a specific error number is returned in **CL**. For host program errors, the value

returned in **CL** is the binary value of the last two decimal digits of the corresponding program check condition recognized by a 3274 control unit. For communication line errors, it is the binary value of the last two decimal digits of the equivalent communication check condition. For emulation kernel errors, the value is an indication of a specific problem within the emulation kernel code. Any errors of this type should be reported to AST Technical Support immediately.

DL returns the number of the device currently requesting output to the printer, or :FF if either no output is being requested or the host is requesting output (see the Start Printer bit in **BL**.

6.5.9 Terminate Operation — :09

This function call operates the same as for terminal devices.

6.5.10 Unlock Device — :10

This function call operates the same as for terminal devices.

6.6 Status Handling

Applications programs can either use polling to detect changes in device status or request that a software interrupt be provided whenever a change in status occurs. If polling is used, the program must assure that it is done often enough so that required responses to status changes are not excessively delayed.

In order to use the software interrupt technique, the applications program must specify the address of an event processing routine (function code :04). The emulation kernel code will then notify the applications program when a status change occurs. This technique avoids the overhead of unnecessarily polling the status, and is recommended.

When a software interrupt is generated for a status change, the new status information is passed to the event processing routine in the registers. The format is the same as the return from a call to get the device status (function code :08), with the device number in AL. Certain flags in the status, which reflect host actions (returned in BL), are reset after being reported. These flags should therefore be saved if action is required beyond that performed by the event processing routine.

A limited amount of storage (about 64 bytes) is available on the stack used by the emulation kernel when the event processing routine is called. None of the registers need to be saved by the routine, although the SP and SS registers must be restored to their original values before returning to the emulation kernel. The event processing routine must exit with a far return to the kernel when it completes its processing.

All protocol processing is temporarily suspended when an event processing routine is called. Protocol errors can result if the routine delays returning from the call for more than about one second. In order to avoid any problems of this type, the routine can simply save the status information in most cases, and set a flag to indicate that an event has occurred. The flag can then be checked periodically as part of the normal processing in the applications program.

Applications programs should use the status information to determine when the device buffer can be validly accessed. The precise status to look for depends on the host programming, but in general the buffer should not be accessed while the "do not enter" state for the device (returned in the low four bits of BH) is nonzero (corresponding to a locked keyboard on a 3270 terminal).

The host programming can perform actions which require synchronization between the applications program and the kernel, in order to avoid the loss of data entered into the screen-image buffer for a device by the applications program. In particular, unsolicited host commands (those occurring when the "do not enter" state for a device is zero, corresponding to an unlocked keyboard on a 3270 terminal) require such synchronization.

When an operation of this type occurs, the kernel informs the applications program by setting a flag in the status information for the device involved. The kernel delays completion of the operation until the applications program acknowledges that it is ready by executing a function call to allow the completion of the operation (function code :0A). This acknowledgement should not be delayed for more than one second.

Once the applications program acknowledges the unsolicited host command, it must not modify the device buffer until processing of the command is completed. This is indicated by a change in the device status which turns off the unsolicited command flag bit. When this occurs, the applications program can again modify the buffer without loss of data.

A related issue is the use of the control key entry function to report that the screen buffer for a device has been modified. The function call to report that the buffer has been modified (function code :07, control code :16) should be executed the first time the device buffer is modified after it has been written by the host.

SECTION 7
TROUBLESHOOTING

This section tells you how to find and solve the most common problems that can prevent AST-SNA from functioning properly.

7.1 Finding the Problem

The following major problem areas can cause AST-SNA to function incorrectly:

1. The modem, including: the modem cable, the modem at the PC, and the modem at the host system.

2. Software parameters in AST-SNA or the host system communications software.

3. The phone lines (or other communication lines).

4. PC system hardware conflicts, including the CC-432 Advanced Communications Board configuration.

Modem and software parameter problems are the most common.

7.1.1 Modems

Be sure to use **synchronous**, modems with this terminal emulation software package: asynchronous modems (such as Hayes) will **not** work. A minimum of 12 signals (for DTE and DCE operation) are to pass through the modem cable to the CC-432 Advanced Communications Board on pins 1 through 8, 15, 17, and 20.

Most modems also have internal switches and jumpers that you may have to set: consult the manufacturer's instructions for correct configuration, and the suitability of specific modems and transmission rates for your local telephone system. If you suspect that your modem is limiting your communications capability, your modem supplier is the best source of information and technical assistance.

7.1.2 Software Parameters

Your PC software parameters must match the host system parameters. Your AST-SNA documentation gives the applicable parameters in detail.

7.1.3 Phone Lines

You must tell the phone company (or companies) the type of modem you attach to your phone system. If you want to communicate through a PBX-type phone system (used in many offices), you will need an "exclusion key" or a separate, direct outside line. Your local phone company and PBX supplier can help you to determine your needs. Be sure that the modem is compatible with your phone system: some modems require a special phone jack to insure proper function (signal strength and data integrity).

7.1.4 PC System Hardware

Improper PC system configuration (including the CC-432 Advanced Communications Board) can prevent AST-SNA from functioning correctly. The IBM Personal Computer *Technical Reference Manual* and *Guide to Operations* tell you how to configure your PC correctly. Section 2 of this manual tells you how to configure your CC-432 Advanced Communications Board for your application.

7.2 Product Repair Procedure

If your AST Research product ever requires repair, contact your dealer first. The dealer from whom you originally purchased the product can usually service the product. If you must return a hardware product to the factory for service, follow these guidelines to ensure rapid, accurate turnaround:

1. *Call AST Research Technical Support for a Return Authorization Number (RAN):* A technician will discuss the problem with you; if factory service is required, the technician will give you a Return Authorization Number (RAN). Always refer to the RAN when you return anything for service. AST Research will return anything without a RAN to the sender.

2. *If the product is covered under an AST Research warranty:* There is no charge for parts or labor involved in the repair. Please include a copy of your original purchase receipt as the proof of date of purchase for all warranty repairs.

   If the product is not covered under an AST Research warranty: Contact your dealer or AST Research Technical Support for further information.

3. *Parts not covered under the warranty:* Dealer- or user-installed parts (such as RAM chips) are not covered under the terms of the warranty. Dealer-installed parts are warranted by the dealer; parts that you install are covered only by the parts suppliers' warranties. If we find that your dealer- or user-installed parts are defective, we can identify which parts are defective, but we will not replace parts unless you specifically authorize us to do so in writing when you send the board to us. The parts charges and any applicable labor charges will be billed COD.

4. *Describe the problem and return any related accessories:* Please include a brief but explicit written description of the problem when you return your AST product to the factory for repair. Also return any accessories that might relate to the problem. For example, if the the parallel port does not function correctly, be sure to return the parallel port adapter cable with the board.

5. *Be sure to provide a return shipping address that UPS can deliver to and include your RAN:* UPS cannot normally deliver to post office boxes. Reference the RAN issued to you by AST Technical Support on all correspondence. Securely package all materials to prevent shipping damage. Shipping charges must be prepaid; CODs will not be accepted. Ship the materials to the following address:

    AST Research, Inc.
    Customer Service—RAN xxxx
    2722 Michelson Drive
    Irvine, CA 92715

    where *xxxx* is your assigned Return Authorization Number.

6. Once your product is repaired, we will return it to you by UPS or UPS Blue Label service, whichever is appropriate for your geographical location. We will return items covered by warranty at our expense. Shipping costs and repair expenses for items not covered by warranty will be billed COD. If you prefer overnight service (UPS Red Label), the shipping charges will be billed COD. If you want us to ship Federal Express, please give us your Federal Express account number for billing purposes.

APPENDIX A

3278/79 KEY FUNCTIONS

The explanation of the keys is divided into types based on the function that each key performs. Some keys perform cursor control functions, some perform editing functions, and others, called PF keys, have their function determined by an application program. Section 4 of this manual identifies the 3278/3279 keys and the corresponding IBM PC keys.

The Editing Keys

ERASE EOF

If the screen is formatted, the ERASE EOF (Erase to End of Field) key erases all characters from and including the cursor position to the end of that particular input field. If the screen is unformatted, all characters from the cursor to the end of the screen are erased.

The ERASE EOF key lets you delete a field in the event that you entered the information incorrectly. If you notice that the input is wrong, you can use the Backtab key to get to the beginning of that entry field and then press ERASE EOF (the cursor does not move out of its location). At that point, you can enter the correct data.

ERASE INPUT

If the screen is formatted and you press the ERASE INPUT key, all input fields are erased from the screen. The headings remain on the screen, but all of the locations where you entered data are erased. The cursor then moves to the first unprotected field on the screen. If there are no input fields on the screen, ERASE INPUT doesn't erase anything; the cursor is moved to the first position of line 1.

When you press the ERASE INPUT key while you are in an unformatted screen, the input characters are erased and the cursor moves to the first location in line 1.

The ERASE INPUT key can be used if you notice that you have entered a lot of incorrect fields. You can blank all of the fields, then begin entering the correct data from the beginning of the screen.

FIELD MARK

The FIELD MARK key inserts a field mark character (;) into the cursor position. The application program determines how to use this character.

RESET

Pressing the RESET key lets you recover from certain error conditions. When the alarm sounds and your keyboard is locked, pressing RESET lets you unlock your keyboard and resume entering data. It is also used to turn off the insert mode function.

🔒 (Lock)

The Lock key is similar to the Shift Lock key on a typewriter. When you press the Lock key, all keys pressed are entered and displayed in uppercase. The Lock key works only with the alphabetic character keys. You must press the Shift key when you want to key in the upper half of the other keys.

The Lock key remains in effect until you press it again to clear it. When the Lock key is in effect and you press the Shift key, the characters are displayed in lowercase.
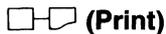
▢┼▽ (Print)

Pressing the Print key takes the information from your screen and prints it on your assigned printer. If for some reason your printer cannot perform the print function, a message will appear in the Operator Information Area on the screen and tell you why the printer function is disabled. See Section 4.2.4, "Printer Status Messages", for more details.

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IDENT

Pressing the IDENT key changes the assigned printer for your terminal, if more than one printer assignment is possible. This key can only be used while you have no queued print requests.

â (Insert Mode)

Pressing the Insert Mode key puts your keyboard into insert mode. When you are in insert mode, you can enter characters into an existing input field, and the existing data moves one space to the right for each character that you enter.

If you want to turn off the insert mode function, press the RESET key.

ẵ (Delete)

When you press the Delete key while in an input field, the character that is highlighted by the cursor is deleted. All of the characters of that field on that same line to the right of the deleted character shift one position to the left each time the Delete key is pressed.

The Function Keys

The Function keys are the Program Function (PF) keys, the ATTN key, the CLEAR key, the Program Attention (PA) keys, and the Enter key. These keys are grouped together in this section because each of them causes some type of transmission to the host which will cause your keyboard to lock. You should also see the X WAIT message be displayed in the status line. With these keys, you will usually receive something back from the host that will display on your screen—maybe a formatted screen.

Because the specific function of some of these keys is determined by the application program at the mainframe to which you are connected, it is difficult to let you know the

exact way in which those keys will be used. This manual tells you, where possible, how they are generally used, but you should refer to your host application program documentation on the specific use of the keys.

PF1 Through PF24

There are 24 possible PF keys. The exact functions performed by each of these keys is determined by the application program, so refer to the documentation on the specific application.

While the PF keys are being used, the X WAIT message is displayed in the Operator Information Area and your keyboard is disabled. This message is normally turned off once the data is transmitted, but this depends on the host application. Refer to the documentation on the specific application.

CLEAR

Pressing the CLEAR key erases all of the character locations on the screen, except line 25. It also creates an unformatted screen display and puts the cursor in the first position of line 1 on the screen. Refer to the documentation on the specific application.

PA1 through PA3

The PA1 through PA3 keys are the Program Attention keys. They are set up to either signal the program or communicate with it. The use of these keys will vary depending upon what use has been defined for them by the application program.

While the PA keys are being used, the X WAIT message is displayed in the Operator Information Area and your keyboard is disabled. This message is normally turned off once the data is transmitted, but this depends on the host application. Refer to the documentation on the specific application.

Enter

The Enter key signals that you completed your entry and are now ready to send all of the new information from the screen to the host system. While this signal and information are being transmitted, the X WAIT message is displayed in the Operator Information Area and your keyboard is disabled. This message is normally turned off once the data is transmitted, but this depends on the host application. Refer to the documentation on the specific application.

The following keys—the SYS REQ, the DUP, and the DEV CNCL keys—perform the functions described below.

SYS REQ

The SYS REQ (System Request) key is a Function key that initiates a Test Request Read operation. Usage of data that is read from the terminal when this key is pressed depends on the host access method.

DUP

The DUP (Duplicate) key inserts the DUP character (*) into the cursor position. The application program determines how to use this character.

DEV CNCL

The DEV CNCL (Device Cancel) key lets you cancel an outstanding print request when an X PRT BUSY or X PRT VBUSY message is displayed in the Operator Information Area.

Positioning the Cursor

The cursor is the special moveable symbol on the screen that helps guide you through the display. The cursor that you see on your screen is a blinking underscore. You can easily move the cursor up and down, or across the screen. You can insert data at the cursor position. If your system is set up for it, the cursor can move automatically from one entry field to the next.

The current location is the position of the cursor. In other words, you enter or modify data at the position on the screen that the cursor occupies. As you enter characters, the cursor automatically moves to the next character position.

Line 25 is the bottom line on the screen where you see the operating and status messages displayed. You cannot move the cursor to this line.

You can move the cursor around the screen using the Cursor Up, Cursor Down, Cursor Right, Cursor Left, Tab, Backtab, Cursor Home, and New Line keys. Section 4 shows you where these keys are located on your PC keyboard. The Cursor Up, Cursor Down, Cursor Right, and Cursor Left keys let you position the cursor on protected fields.

↑ (Cursor Up)

Pressing the Cursor Up key moves the cursor up the screen one character position at a time. When you reach the top line of the screen and press the Cursor Up key, the cursor moves to the same column in line 24. If you hold the key down, the cursor moves automatically up the screen until you release the key.

↓ (Cursor Down)

Pressing the Cursor Down key moves the cursor down the screen one character position at a time. If you are on line 24 and press the Cursor Down key, the cursor moves to the same column in line 1. If you hold the Cursor Down key down, the cursor moves continuously down the screen, then to the top and down the screen again until you release the key.

→ (Cursor Right)

Pressing the Cursor Right key moves the cursor one position to the right on the screen. When you come to the end of the line, the cursor moves to the first position on the next line

down. If you hold the Cursor Right key down, the cursor moves across the line to the rightmost position on the line, then to the first position in the next line down, then across to the rightmost position, and so on until you release the key.

← (Cursor Left)

Pressing the Cursor Left key moves the cursor one position to the left on the screen. When you press the Cursor Left key from the first position of the line, the cursor moves up to the last position of the previous line. If you hold the Cursor Left key down, the cursor moves left to the leftmost position, then to the rightmost position of the previous line, and so on until you release the key.

⌐↖ (Cursor Home)

Pressing the Cursor Home key moves your cursor to the first location of the first input field on the screen. If there are no input fields or if the screen is unformatted, pressing the Cursor Home key relocates the cursor to the first position in line 1.

↵ (New Line)

Pressing the New Line key is similar to pressing the Carriage Return on a typewriter. When you press the New Line key, your cursor moves to one of several locations on the screen depending on whether the screen is formatted or unformatted.

If the screen is unformatted, pressing the New Line key moves the cursor to the first location on the next line.

If the screen is formatted, the cursor is moved to one of the following locations:

- The first character position of the first unprotected field in the next line.

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- The first character location in the next line. If there are no protected fields or characters in the first location of the next line, the cursor is positioned there.

- The first character position on the first available line. When the next line contains all protected fields, the cursor must skip to the first unprotected position.

If all of the character locations on the screen are protected, the cursor is moved to the first position on line 1.

→ | (Tab)

The Tab key moves your cursor forward to the first character position of the next input field.

When the screen is unformatted, the Tab key moves the cursor to the first position of line 1.

| ← (Backtab)

Pressing the Backtab key moves your cursor backward to the first position of the current input field.

If your cursor is currently in the first character location of the input field, pressing the Backtab key moves your cursor to the first character location of the previous input field.

When the screen is unformatted or there are no input fields, the Backtab key moves your cursor to the first position in line 1.

APPENDIX B

VIDEO DISPLAY SCREEN

This appendix describes the video display screen. AST-SNA lets your PC screen look like an IBM 3278. Figure B-1 shows an example of a formatted video display screen. The host application controls what the display image looks like, and the cursor movement depends on what comes from the host.

Formatted/unformatted

The video display and its controller can display information in two modes, formatted and unformatted.

A formatted screen consists of one or more fields as defined by the host application. Typically, the screen is formatted into fields that contain text (a prompt) and fields that are blank. The text fields are used to convey information to you. The blank fields are normally used to enter information which is transmitted back to the host application.

The unformatted screen is one that contains no defined fields. When the 3278 starts up, the screen is unformatted. Most host applications usually send formatted screen images to a 3278.

Figure B-1 shows an example of a formatted 3270 video display screen. This particular screen is set up with certain locations that describe a field and ask you for input. Once you enter the information, you move the cursor to the next input field and then enter the requested information.
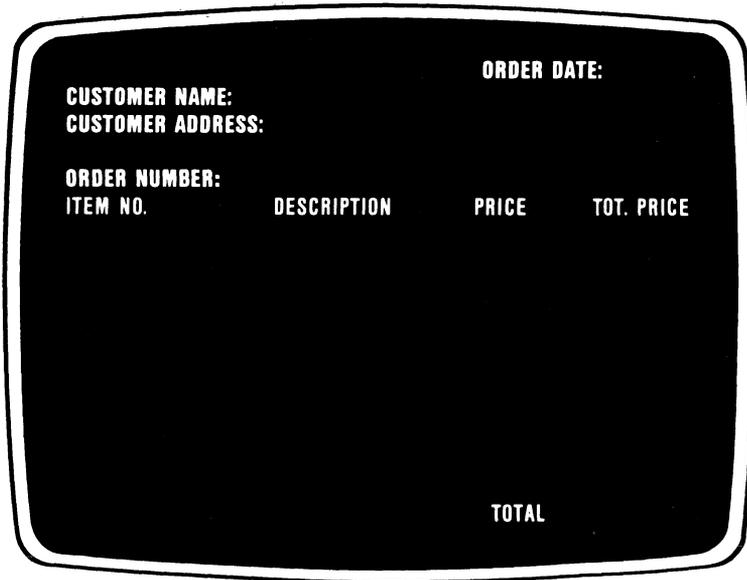
Figure B-1. Example of Formatted Video Display Screen.

Protected/unprotected

The formatted screen is composed of fields that are either protected or unprotected. The information in a protected field cannot be modified. If you look at Figure B-1, you can see that there are a number of prompts on the screen. For example, the upper right corner of the screen shows the words "ORDER DATE:". This prompt asks you to enter the date that the order is placed. You cannot change or delete the words "ORDER DATE:" because this is a protected field. In fact, all of the fields that you see in Figure B-1 are protected. You cannot make changes to those prompts from your keyboard.

The unprotected fields are the areas on the screen into which you can enter or change data. The unprotected field is often called an input field. An example of an unprotected field is the blank space next to the protected field "ORDER DATE:" in Figure B-1 which allows a date to be entered.

Intensity

Notice in Figure B-1 that some of the fields appear brighter than others. This is called intensity and can be used to distinguish fields from each other. There are three types of intensity: normal, high, and blank. The normal intensity is the usual screen display. High intensity is much brighter and stands out more. Blank intensity does not show up on the screen and can be used to enter data that should remain secret; for example, your password.

Input Fields

There are two types of input fields, alphameric and numeric. An alphameric field lets you enter any of the letters, numbers, or special characters on the keyboard into an input field, such as the customer address.

A numeric field restricts your entry to the digits 0 through 9 and some other special symbols. A numeric field would be used for input that requires only numbers; for example, the price of an item or an order number. Take a look at Figure B-1. There is a prompt called "ORDER NUMBER:". This field has been set up so that you can enter only numerics. If you try to enter any character other than the digits 0 through 9 or the special characters, your keyboard will lock, you may hear an alarm, and data will not appear on the screen. If this happens, press the RESET key, then reenter the correct data.

Moving to Another Field

Tab

Pressing the Tab key is one method of moving to the next field. When you reach the end of an input field, press the Tab key, and your cursor is positioned at the first character of the next input field.

Backtab

The Backtab key reverses the direction of the Tab key. If you want to move to a position prior to the present position (either on the same line or further up the screen), press the Backtab key, and the cursor will move to the first input character position of the previous field.

New Line

When you press the New Line key, your cursor moves to the first unprotected field in the next line or following lines. If there are no unprotected fields, the cursor moves to the top of the screen and is positioned in the first position in column 1. The New Line key will not let you tab through the screen. Even if there is more than one unprotected field on a line, the cursor will move to the next line, skipping over the additional unprotected fields.

Auto Tab (Auto Skip)

The Auto Tab feature is actually a field type that automatically moves the cursor to the next input field. Once you have finished entering the data into a field that has been marked as Auto Tab, the cursor will move to the first character of the next input field. This feature is normally used when the input field will always contain a certain number of characters. A date or an order number are examples of the types of fields that would take advantage of the Auto Tab feature.

Sending Data to the Host

Enter

When you finish entering data into all of the fields and are ready to send the data to the host system, just press the Enter key and only the data contained in the fields that you have entered is sent to the host.

PA and PF Keys

The Program Attention (PA) and Program Function (PF) keys, which are defined in Appendix A, cause control information to be transmitted to the host, which results in your keyboard locking. The specific function of these keys is determined by the application program at the mainframe to which you are connected. Refer to the documentation on the host application program to which you are connected for specific use of these keys.

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APPENDIX C

INTERNATIONAL KEYBOARD SUPPORT

AST-SNA can be easily customized to suit various character sets for different countries. ASTKB.EXE and MAPDFT.AST are included on the AST-SNA master diskette for use with International Keyboard Support.

MAPDFT.AST is a character-mapping file that is read by AST-SNA to associate ECBDIC codes from the host with PC symbols presented on your PC's screen.

ASTKB.EXE is a program which is invoked to set-up alternate character-mapping files (xxxxxx.AST). One function of this program is to allow you to set up a character-mapping file for a country by merely entering the country's code. These files can be customized using the other functions of the program.

ASTKB.EXE can be invoked to create or modify as many alternate character-mapping files as you choose. AST-SNA, however, will only read the file named MAPDFT.AST. When you desire to use an alternate file, rename the MAPDFT.AST file; then, rename your alternate file to MAPDFT.AST.

To execute ASTKB.EXE, enter the following command:

A> **ASTKB [filename]** <**Enter**>

where [filename] is the full name of the character-mapping file you wish to create or modify. If you do not specify the file name, AST-SNA will assume that you wish to modify the existing MAPDFT.AST file.

Upon invoking the program, the following screen will be displayed:

```
          AST-SNA/BSC ASCII/EBCDIC MAPPING TABLE CONFIGURATION PROGRAM
                    (C) AST Research, Inc.    1985 ver X.XX




You are now building/modifying the file: mapdft.ast
Please press ENTER key to continue
```
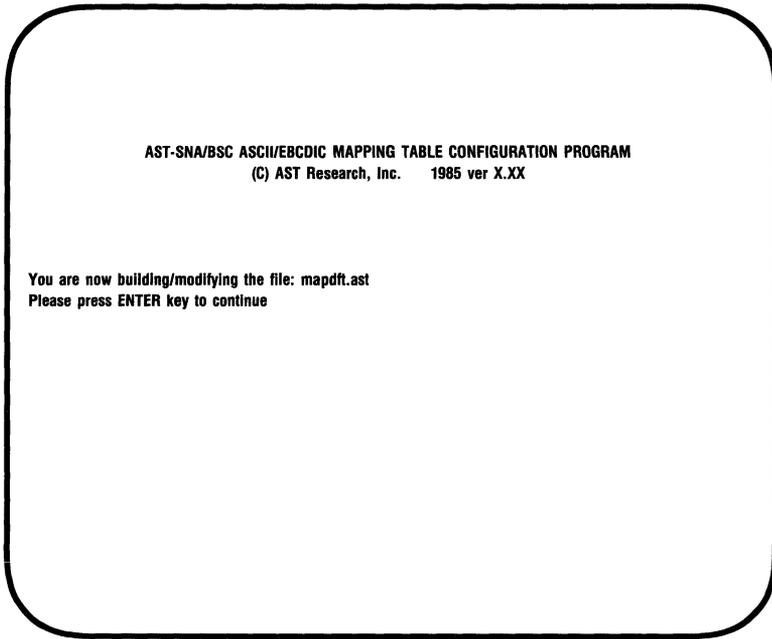
Figure C-1. Initial ASTKB.EXE Screen.

At this point, either press <**Enter**> to continue or press the
<**Alt**>-<**Break**> key sequence to return to DOS. Upon
pressing <**Enter**>, the following screen will be displayed:

```
          AST-SNA/BSC ASCII/EBCDIC MAPPING TABLE CONFIGURATION PROGRAM
                   (C) AST Research, Inc.  1985 ver X.XX


   0 — To save the constructed file and exit to DOS
        (Use Ctrl-Break to exit without saving the file)
   1 — To build a default ASCII-EBCDIC mapping by country code
   2 — To customize ASCII to EBCDIC mapping
   3 — To customize EBCDIC to ASCII mapping
   4 — To re-assign a PC key to desired ASCII code
   5 — To undo whatever has been done by action (4)
   6 — To display current mapping



   Please choose a action number and ENTER  →
```

Figure C-2. ASTKB.EXE Main Menu.

Follow the on-screen prompts to perform the desired task.
The program may be terminated at any point by pressing the
<**Alt**>-<**Break**> key sequence.

Briefly, you have the following options at the Main Menu:

OPTION 1: This allows you to select an international keyboard
    mapping by entering the corresponding number.

OPTIONS 2-4: These options allow you to modify the standard
    keyboard mappings. *Do not* attempt these options unless
    you are familiar with the technical aspects of keyboard
    mapping.

OPTION 5: This option allows you to erase changes made by
    option 4, thus returning the PC keys to their original
    ASCII codes.

OPTION 6: Displays the current mapping, including any
    changes you have made since entering this program.

APPENDIX D

CC-432 ADVANCED COMMUNICATIONS BOARD INSTALLATION

Your CC-432 Advanced Communications Board is part of a complete AST Research hardware/software package. If you intend to communicate with a host computer via a modem/phone line link, it is probably ready to use in its factory default configuration. Otherwise, you must configure the AST Research CC-432 Advanced Communication board to select its IBM PC I/O addresses, interrupt line, baud rate, and to configure its communications port as DCE or DTE (default is DTE). Refer to Section 2 for instructions on configuration.

In *DTE mode*, the CC-432 expects to be connected to a synchronous modem that provides clocking signals as well as data. In *DCE mode*, the on-board modem eliminator is enabled. For some applications where the PC is in the same room as the host computer, the on-board CC-432 modem eliminator can replace a separate modem eliminator. The CC-432 modem eliminator does not replace the RS-232 interface that is required for communicating with the PC.

NOTE

When you install your AST Research communications package and CC-432 Advanced Communications Board in your PC, be sure that you know which IRQ lines and I/O addresses are used by each of the devices in your system (you can obtain this information from the device suppliers, user's manuals and your dealer). Resolving device conflicts before installation will save time and frustration later on.

D.1 I/O Address and Function Selection

To avoid conflict with existing IBM PC peripheral boards, use an address range that is not used by any of the peripherals in your PC. Positions 1 and 2 on DIP switch S1 select the I/O address range for the CC-432 (Table D-1).

Table D-1. CC-432 I/O Address Select.

S1 Position 1 2	Hexadecimal I/O Addresses
ON ON	300-30F
OFF ON	320-32F
ON OFF	340-34F
OFF OFF	360-36F

NOTE

The hard disk in the IBM PC-XT uses I/O addresses 320-32F; do not use this setting if you have a PC-XT.
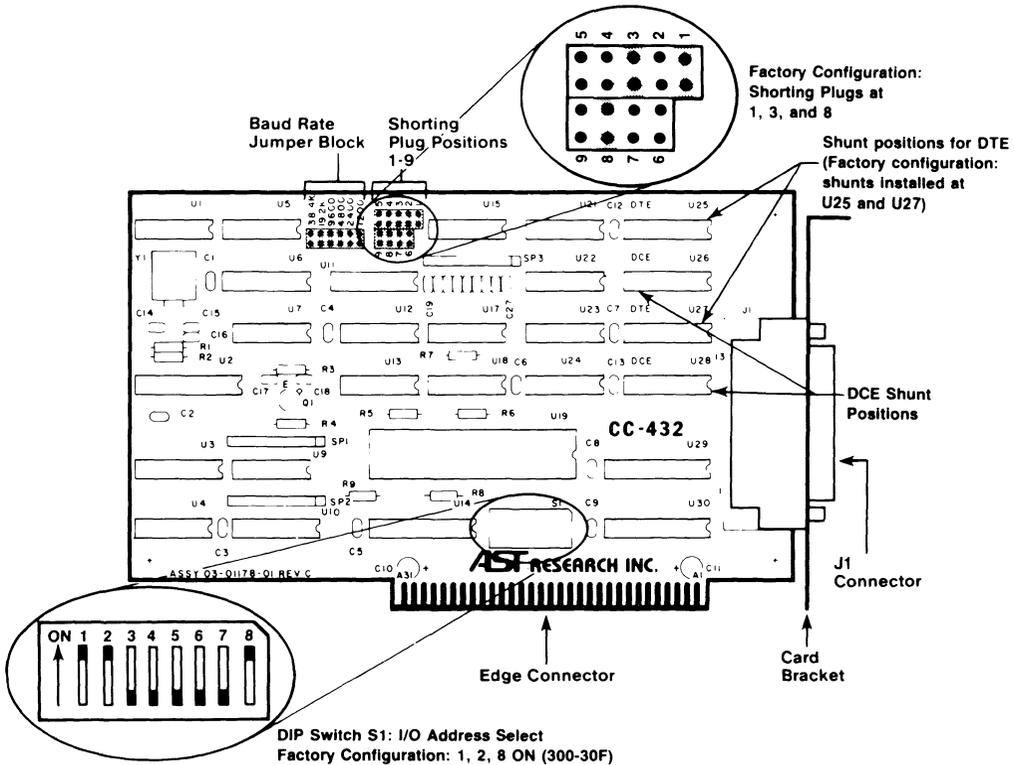
Figure D-1. CC-432 Advanced Communications Board Layout.

D.2 Interrupt Line Selection

Positions 3 through 8 on DIP switch S1 select an Interrupt Request (IRQ) line for the CC-432. Table D-2 lists the IRQ line selected by each of these five positions. An ON condition selects the interrupt line, and only **one** IRQ position can be ON at any time.

Table D-2. Interrupt Line Selection.

S1 Position	Interrupt Line
8	IRQ2
7	IRQ3
6	IRQ4
5	IRQ5
4	IRQ6
3	IRQ7

NOTE

AST Research communications packages normally use IRQ2. For all applications, make sure that the selected IRQ line is not used by another system device. Only **one** IRQ position on the CC-432 can be ON at any time. The standard IBM assigned IRQ applications are listed at the end of this Appendix.

D.3 Installation

This section describes how to install your AST Research CC-432 Advanced Communications Board.

The CC-432 Advanced Communications Board can be inserted in any of the full-length expansion slot receptacles on the PC system board.

CAUTION

Be sure that the power is off and that the power cord is removed from the PC before installing or removing any equipment.

Also be sure that you have set the switch, shunts, and shorting plugs for your applications before you install the CC-432 Advanced Communications Board into the computer.

You will need a flathead screwdriver or a hex wrench in order to install the CC-432 Advanced Communications Board.

STEP 1
Remove the PC cover: Use a flathead screwdriver or hex wrench to remove the mounting screws from your PC (see your PC's manual for the location of the cover mounting screws).

IBM PC and PC-XT: Once you have removed the mounting screws, pull the PC cover off as shown in Figure D-2.
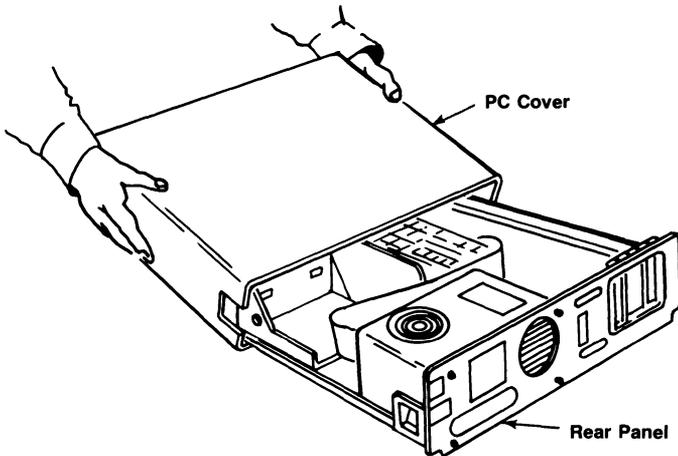
Figure D-2. Removing the PC Cover.

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PC-AT: Unlock the key clock at the front of the PC-AT by turning the key counterclockwise. Remove the back panel (which is attached to the PC-AT with plastic fastener strips) from the rear of the PC-AT. Use a flathead screwdriver or hex wrench to remove the mounting screws. Slide the cover toward the front until it comes off, as shown in Figure D-3.
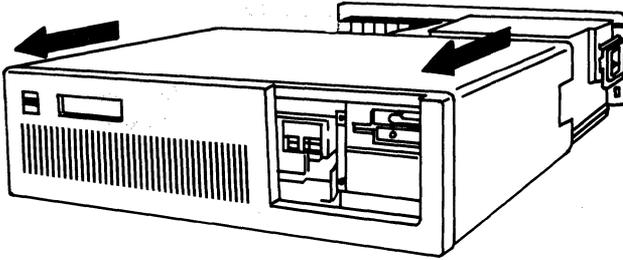
Figure D-3. Removing PC-AT Cover.

Portable PC: Remove the keyboard and unplug the keyboard cable from the Portable PC. Use a flathead screwdriver or hex wrench to remove the mounting system unit cover towards the rear until it comes off, as shown in Figure D-4.
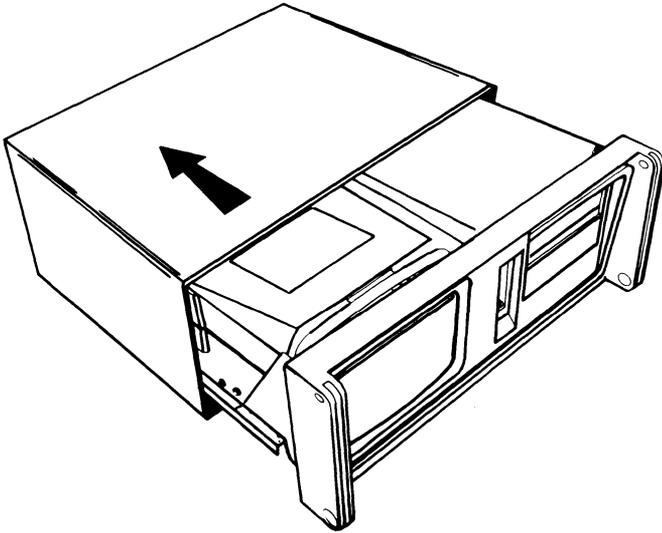
Figure D-4. Removing the Portable PC Cover.

STEP 2

Portable PC only: Disconnect the internal keyboard-cable connector and remove the metal shield screws as shown in Figure D-5. If you do not have a Portable PC, move on to STEP 3.
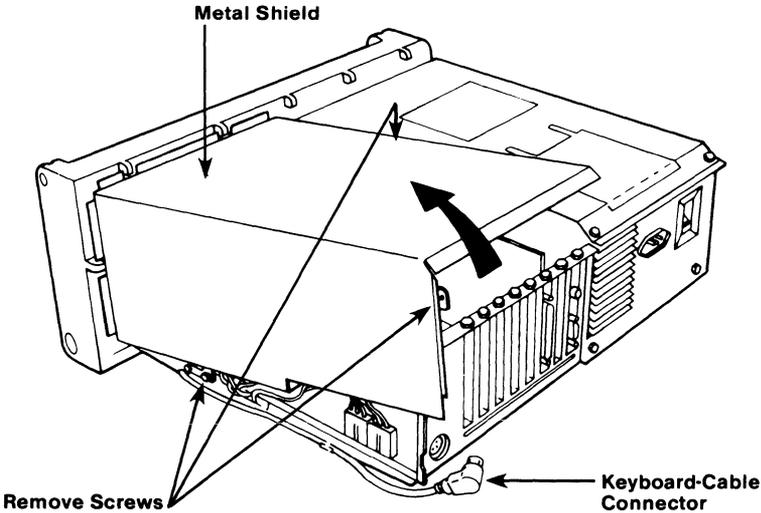
Figure D-5. Removing the Keyboard Cable and Metal Shield from the Portable PC.

STEP 3

Remove expansion slot cover: Select an unused expansion slot, and locate the metal bracket that covers the cutout in the back panel of the PC chassis for the slot that you have selected. Remove and save the bracket retaining screw using a small flathead screwdriver. Remove the expansion slot cover.

STEP 4
Install the board: Line up your CC-432 Advanced Communications Board and position its front bottom corner in the card guide channel. Lower the board until its edge connector is resting on the expansion slot receptacle. Using evenly distributed pressure, press the board straight down until it seats in the expansion slot. See Figure D-6.

CC-432 Board
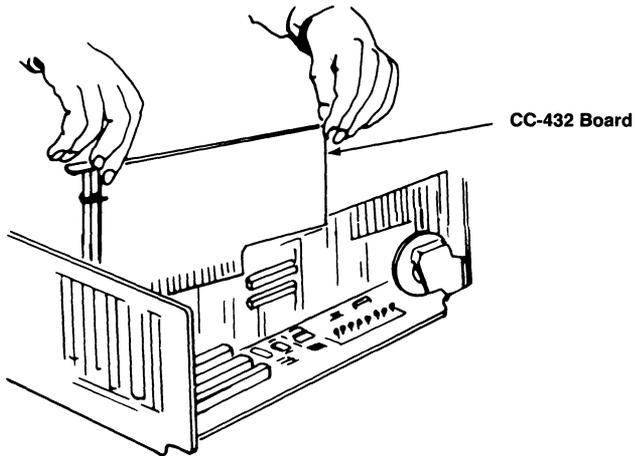
Figure D-6. Installing the CC-432 Advanced Communications Board.

STEP 5
Secure the borad to the rear of the PC chassis: Use the screw you removed from the expansion slot cover in STEP 2.

STEP 6
Replace the PC cover as described below:

PC and PC-XT: Carefully slide the cover from the front until it stops securely against the rear panel. Reinstall the cover mounting screws you removed earlier.

PC-AT: Carefully slide the cover from the front until it stops securely against the rear panel. Reinstall the cover mounting screws you removed earlier. Press the back panel so that the plastic fastener strips secure it in place.

Portable PC: Replace the metal shield to its original position over the right half of the chassis and reinstall the shield screws. Carefully slide the cover from the rear until it stops securely against the front panel. Replace the cover mounting screws.

STEP 7
Power up your PC.

When you use the CC-432 Advanced Communications Board in DTE mode, the cable should only be as long as necessary to reach a modem positioned next to your PC. When you use the CC-432 Advanced Communications Board in DCE mode, limit the cable length to a maximum of 50 feet. Some installations require a shielded cable for reliable operation.

The following common problem areas can cause your AST-SNA package to not function correctly:

- The modem, including: the modem cable, the modem at the PC, and the modem at the host system.

- AST-SNA software configuration parameters or the host system communications software.

- The phone lines (or other communication lines).

- PC system hardware conflicts with the CC-432 Advanced Communications Board configuration.

Modem (especially the cable and the modem at the PC) and software parameter problems are the most common.

APPENDIX E

HOST CONSIDERATIONS

E.1 NCP Configuration

The Network Control Program (NCP) is the software that resides in the IBM 370x and, together with the hardware, makes up the front end processor. The NCP performs many functions in an SNA/SDLC environment. Some of the functions of the NCP include the following:

- Handles data link protocols.

- Performs data link error recovery.

- Routes data through the network.

- Blocks and segments data.

- Interfaces non-SNA devices to the network.

E.1.1 NCP Configuration Parameters

When you perform an NCP generation, several parameters must be set, as in the following examples.

```
LINE    [,CLOCKING = EXT]
        [,NRZI = {NO/YES}]

PU      [,ADDR = nn]
        [,MAXDATA = 265]
        [,MAXOUT = 7]
        [,MAXLU = nn]
        [,PUTYPE = 2]

LU      [,LOCADDR = nn]
        [,BATCH = NO]
```

AST-SNA requires the following parameters with the
LINE macro:

```
LINE      [,SPEED = nn]
          [,CLOCKING = EXT]
          [,CONFIG = {SW/NONSW}]
          [,NRZI = {NO/YES}]
          [,POLLED = YES]
```

where:

[,SPEED = nn]   indicates that you can select
                                 your own speed based on the
                                 type of modem you are using.
                                 AST-SNA allows for a maximum
                                 of 9600 bps, so your parameter
                                 must specify 9600 or less.

[,CLOCKING = EXT]   specifies that the modem must
                                 provide the clocking.

[,CONFIG = SW]   indicates that the physical
                                 SDLC link is a switched line.

[,CONFIG = NONSW]   indicates that the physical
                                 SDLC link is a nonswitched
                                 line.

[,NRZI = NO]   specifies that the terminal
                                 equipment at the ends of the
                                 SDLC link must operate in a
                                 non-return to zero (NRZ) mode.

[,NRZI = YES]   specifies that the terminal
                                 equipment at the ends of the
                                 SDLC link must operate in a
                                 non-return to zero inverted
                                 (NRZI) mode.

It is essential that all terminal equipment on the same SDLC link operate in the same mode. In other words, both sides must be defined as NRZI = NO or NRZI = YES. This mode must be the same as the NRZI mode specified during the installation configuration. This parameter is dependent on the communication hardware in the remote system.

[,POLLED = YES] indicates that all of the SDLC devices on the line are polled.

The **PU** macro describes a physical unit (PU). AST-SNA emulates one 3270 PU; therefore, one PU macro is required in the generation. The description includes the address, the maximum amount of data the PU can receive, etc. You must use the parameters listed below with AST-SNA.

```
PU      [,ADDR = nn]
        [,MAXDATA = 265]
        [,MAXOUT = 7]
        [,MAXLU = nn]
        [,PUTYPE = 2]
```

where:

[,ADDR = nn] indicates the SDLC link station address in hexadecimal. This address may be any hex value between X'01' and X'FE', inclusive. This address must be the same as the data link address specified during AST-SNA installation configuration.

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[IDBLK = nnn]

indicates the first part of the Exchange ID (XID). This value is expressed by a three hex digit identification code representing the SNA device type and must match the IDBLK specified during the AST/SNA configuration process.

[IDNUM = nnnnn]

indicates the second part of the Exchange ID (XID). This value is expressed by any five hex digits but must match the Station ID specified during the AST/SNA local configuration process.

[,MAXDATA = 265]

indicates the maximum SDLC frame size in bytes. This includes the transmission header and the request/ response header. You can specify a smaller frame size, but specifying 265 will give you better performance.

[,MAXOUT = 7]

indicates the maximum number of SDLC frames that can be transmitted by the NCP before receiving a data link response. Seven is the maximum number that you can specify, and 7 will give you maximum performance. You can, however, specify less than 7.

[,MAXLU = nn]   indicates the maximum
                              number of logical units
                              defined for the physical
                              unit. Each CRT represents
                              one logical unit, and each
                              printer represents one
                              logical unit. So, if you have
                              one of each, you would
                              specify MAXLU = 2.

[,PUTYPE = 2]   indicates that the physical
                              unit type is 2. All of the 3270
                              products are physical unit
                              type 2 (cluster controllers).

The **LU** macro defines an SNA Logical Unit (LU). Each
device supported on the cluster is represented by an LU.
AST-SNA supports multiple LUs. You must define one LU
for each CRT and printer supported.

The LU macro requires the following parameters:

LU   [,LOCADDR = nn]
          [,BATCH = NO]

where:

[,LOCADDR = nn]   indicates that the local address
                              of the logical unit is nn. The
                              address must be the same as
                              the TERMINAL'S LOCAL
                              ADDRESS.

[,BATCH = NO]   indicates the processing priority.
                              Specifying NO indicates a high
                              priority. You can specify
                              BATCH = YES, but the
                              performance will be lowered.

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Figures E-1 and E-2 illustrate the relationship between AST-SNA PC configuration data and NCP/VTAM system generation macro:

```
                    AST-SNA CONFIGURATION VERSION x.xx

    ⏎ = [default], PgDn = define keyboard, Ctrl/Break = abort, ESC = write file
    CONFIGURATION FILENAME [CONFIG.DAT] :
    INTERFACE CARD ADDRESS [:300] :
    INTERRUPT REQUEST LINE [2] :
    NRZI [N] :
    DATA LINK ADDRESS [:B0] :
    IDNUM [:00136] :
    IDBLK [:017] :
    TERMINAL'S LOCAL ADDRESS [02] :
    DISPLAY TYPE [C] :
    DISK PRINTER AVAILABLE [N] :

    PRINTER AVAILABLE [E] :
    PRINTER'S LOCAL ADDRESS [03] :
    PRINT LINE LENGTH [80] :
    PRINTER PORT (LPT) [1] :

    INFORMATION: Configuration output file
    CHOICES: any legal DOS file name
```

Figure E-1. First Menu Page of AST-SNA Configuration.

```
MY3274PU        PU
                ADDR = B0,
                DISCNT = NO,
                IDBLK = 017,
                IDNUM = 00136,
                IRETRY = YES,
                MAXDATA = 265,
                MAXOUT = 7,
                PASSLIM = 7,
                PUTYPE = 2,
                VPACING = 0


MY3278LU        LU
                DLOGMOD = D4C32782,
                LOCADDR = 02
                PACING = 0


MY3287T3        LU
                LOCADDR = 03,
                BATCH = YES,
                DLOGMOD = DSC2K
```

Figure E-2. NCP/VTAM'S PU, LU Generation Macro.

E.2 CICS Configuration

IBM's Customer Information Control System (CICS) is a Data Base/Data Communications (DB/DC) system that helps the application programmer develop teleprocessing-oriented applications by isolating the application programs from the access methods.

CICS and Information Management System (IMS), another DB/DC system, use high-level SNA protocols to implement more sophisticated error recovery. SNA is concerned with end-to-end error reporting and recovery. CICS and IMS use these end-to-end response protocols to ensure not only that data is delivered to its network destination, but that the data was processed at the destination without error or exception conditions.

SNA supports protocols that delimit groups of logically-related data and allows restarts based on these groupings. Sets of data that must be processed as a unit can be specified through SNA protocols (chaining), and logical conversations can be defined (bracket protocol). SNA expands the scope of error recovery, and CICS and IMS use these new tools to enhance error recovery.

E.2.1 CICS Configuration Parameters

The DFHTCT TYPE = TERMINAL macro describes a terminal communication session to CICS. There are different parameters depending on the type of device. The device may be a CRT, a 3287 printer, or an SCS printer. The parameters for these devices are described below.

Uppercase letters or special symbols other than brackets, braces, or ellipses should be entered exactly as shown (using upper-or lowercase letters). Square brackets, not part of the input, represent an optional term. Lowercase letters represent user-defined parameters. Pressing < Enter> is not necessary unless explicitly stated.

The DFHTCT TYPE macro for a **CRT** requires that the following parameters are set. Other parameters may be required when performing the generation, but the following are the only parameters that affect AST-SNA.

```
DFHTCT   TYPE = TERMINAL
         ,TRMTYPE = LUTYPE2
         [,DEFSCRN = (24,80)]
         [,BUFFER = 1536]
         [,RUSIZE = 256]
         [,CLASS = {CONV/VIDEO}]
         [,CHNASSY = YES]
         [,TRMSTAT = TRANSCEIVE]
         [,FEATURE = AUDALARM]
         [,ACCMETH = VTAM]
```

where:

TYPE = TERMINAL	indicates that a terminal is being defined for the region.
,TRMTYPE = LUTYPE2	indicates that the terminal is a type 2 logical unit.
[,DEFSCRN = (24,80)]	indicates that the screen size is 24 lines by 80 columns.
[,BUFFER = 1536]	indicates that the receive buffer for the logical unit is 1536 bytes.
[,RUSIZE = 256]	indicates that the maximum size of the request unit is 256 bytes.
[,CLASS = CONV]	indicates that the device classification is conversational.
[,CLASS = VIDEO]	indicates that the device classification is display.
[,CHNASSY = YES]	indicates that for each READ issued, a screen of data containing all of the elements of a chain will be received from the logical unit.
[,TRMSTAT = TRANSCEIVE]	indicates that messages are automatically transmitted to the terminal by the user.
[,FEATURE = AUDALARM]	indicates the audible alarm feature.
[,ACCMETH = VTAM]	indicates that VTAM is the access method that is used for this TCTTE.

The DFHTCT TYPE macro for the **3287 Printer** requires that the following parameters are set. Other parameters may be required when performing the generation, but the following are the only parameters that affect AST-SNA.

```
DFHTCT  TYPE = TERMINAL
        TRMTYPE = LUTYPE3
        [,TRMMODE = 2]
        [,CLASS = {CONV/VIDEO}]
        [,BUFFER = 256]
        [,RUSIZE = 256]
        [,CHNASSY = YES]
        [,TRMSTAT = TRANSCEIVE]
        [,ACCMETH = VTAM]
```

where:

TYPE = TERMINAL	indicates that a terminal is being defined for the region.
TRMTYPE = LUTYPE3	indicates that the terminal is a type 3 logical unit.
[,TRMMODE = 2]	specifies a printer with a buffer size of 24 by 80.
[,CLASS = CONV]	indicates that the device classification is conversational.
[,CLASS = VIDEO]	indicates that the device classification is display.
[,BUFFER = 256]	indicates that the receive buffer for the logical unit is 256 bytes.
[,RUSIZE = 256]	indicates that the maximum size of the request unit is 256 bytes.

[,CHNASSY = YES]   indicates that for each READ issued, a screen of data containing all of the elements of a chain will be received from the logical unit.

[,TRMSTAT = TRANSCEIVE] indicates that messages are automatically transmitted to the terminal by the user.

[,ACCMETH = VTAM]   indicates that VTAM is the access method that is used for this TCTTE.

The DFHTCT TYPE macro for the **SNA Character String (SCS) printer** requires that the following parameters are set. Other parameters may be required when performing the generation, but the following are the only parameters that affect AST-SNA.

```
DFHTCT   TYPE = TERMINAL
         ,TRMTYPE = SCSPRT
         ,BUFFER = 256
         ,RUSIZE = 256
         ,CHNASSY = YES
         ,TRMSTAT = TRANSCEIVE
         ,ACCMETH = VTAM
         ,HF = YES
         ,VF = YES
         ,FF = YES
```

where:

,TYPE = TERMINAL   indicates that a terminal is being defined for the region.

,TRMTYPE = SCSPRT   indicates that the terminal is an SCS printer.

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,BUFFER = 256   indicates that the receive buffer
                                 for the SCS printer is 256 bytes.

,RUSIZE = 256   indicates that the maximum
                                 size of the request unit is
                                 256 bytes.

,CHNASSY = YES   indicates that for each READ
                                 issued, a screen of data
                                 containing all of the elements
                                 of a chain will be received from
                                 the logical unit.

,TRMSTAT = TRANSCEIVE   indicates that messages are
                                 automatically transmitted to the
                                 terminal by the user.

,ACCMETH = VTAM   indicates that VTAM is the
                                 access method that is used for
                                 this TCTTE.

,HF = YES   indicates that the horizontal
                                 forms feature is supported.

,VF = YES   indicates that the vertical forms
                                 feature is supported.

,FF = YES   indicates that the forms feed
                                 (FF) SCS control character is
                                 supported.

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APPENDIX F

GLOSSARY

This glossary defines the terms and acronyms used in this manual.

alphameric field. A field in the video display screen that lets you enter an alphabetic, numeric, or special character.

attribute. A control character that defines characteristics of fields for 3270 formatted screens.

coaxial cable. A physical medium used to attach IBM 3270 display stations and printers to IBM 3270 control units.

control unit. A device that controls the operations of a number of attached peripheral devices. An IBM 3270 control unit may be referred to as a 3271, 3272, 3274, 3275, or 3276.

cursor. The sometimes blinking rectangular character on the screen. The cursor highlights your current location on the screen. When you press one of the data keys, the cursor moves to the next input location.

dial-up line. A communication line that requires a physical connection, usually a phone call, to establish the transmission link. The link is valid only until the connection is broken, when either end hangs up or disconnects.

display station. Usually an IBM 3270 CRT with attached keyboard.

field. A group of consecutive characters that make up an item of information.

format. The arrangement of the data on the video screen. The format includes prompting labels as well as fields in which data may be entered.

half-duplex. A mode of data transmission in which the data can flow in two directions but only one direction at a time.

host. A processor that can support and run application programs. In an SNA environment, the host will contain software that can perform network control functions.

input field. A field that is set up to allow entry of data. You can also change, delete, or add data in an input field.

intensity. The degree of brightness of the images on the screen. Intensity can be high, normal, or blank.

leased line. A fixed communication link that is reserved for one or more users and is always available for transmission.

logical unit. A port through which end users access the SNA network.

modem. A device that converts analog signals to digital signals and vice versa between processors and/or terminals for transmission across the communication line.

numeric field.A field that lets you enter only numeric digits, and sometimes special and alphabetic characters.

prompt. A message field generated by the host application that gives you instructions about the type of information required in the input field. In the following example, "NAME:" is the prompt; "JOHN SMITH" is the contents of the input field.

     Example: NAME: JOHN SMITH

protected field. A field that has been set up so that data cannot be entered, modified, or erased. A prompt is usually a protected field.

remote. A device that is located at some distance (usually greater than 200 feet) from the host and uses communication links.

status line The 25th line on the screen which contains the operating and status information.

unprotected field. Also called an input field, a field that lets you enter, modify, or erase data.

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FCC WARNING

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to a computer that complies with Class B limits. Operation with non-certified peripherals is likely to result in interference to radio and TV reception. When connecting to a peripheral device, a shielded I/O cable is required to ensure compliance with FCC Rules.

Instructions to User

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

- Reorient the receiving antenna.

- Relocate the computer with respect to the receiver.

- Move the computer away from the receiver.

- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

- Ensure that board slot covers are in place when no board is installed.

- Ensure that all brackets are fastened securely to the PC chassis.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission (FCC) helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

AST RESEARCH, INC.　　**Product Comment Form**

AST-SNA User's Manual
000101-001 E

We appreciate your comments regarding any problems or
suggestions related to AST Research products. Please use
this form to communicate any observations that you have
concerning the improvement of either the product itself or
the product documentation provided in this manual.

Submitter Information

Submitter's name:

Address:

Product/Manual Comments and Suggestions

Please mail this form to:

AST Research, Inc.
Attn: Product Marketing
2121 Alton Ave.
Irvine, CA 92714

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