PRELIMINARY

numa·logic

PC-700/-900/-1100 APL PROGRAMMING MANUAL

SETUP PROCEDURES FOR THE AST RESEARCH CC-232E CARD

Step 1 - Set rocker switches SW1, SW2 and SW3 as noted in table. (Use the tip of a ball point pen.)

Step 2 - Install the provided jumper plugs in the follwing 4 positions.

- Between pins S and T
- Between pins D and E
- Between pins N and P
- Between pins L and M

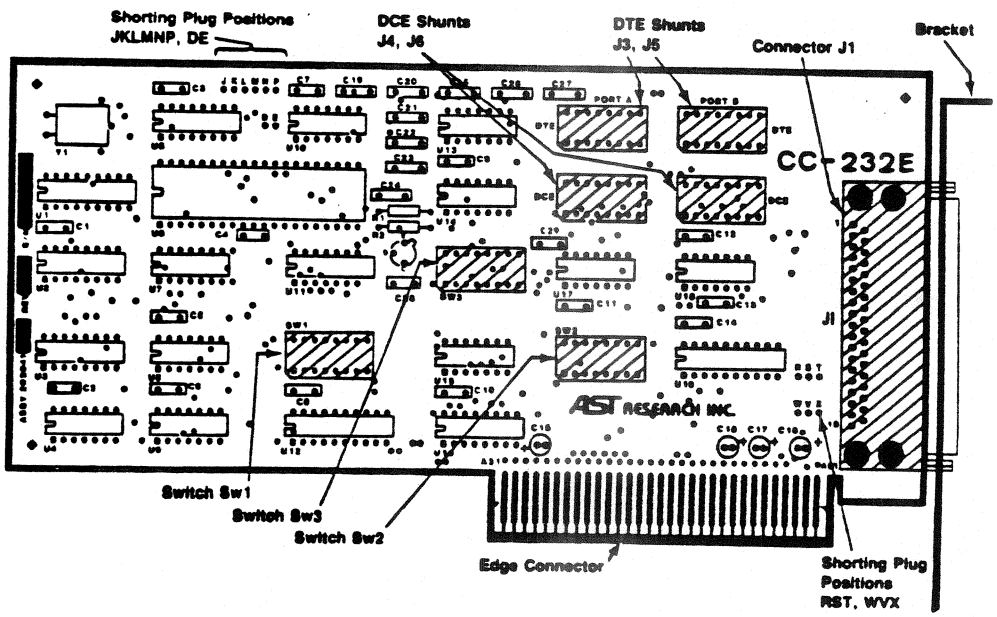
Step 3 - Verify that there is not a jumper plug between pins J and K.

The position of the jumper plug on pins W V X does not matter.

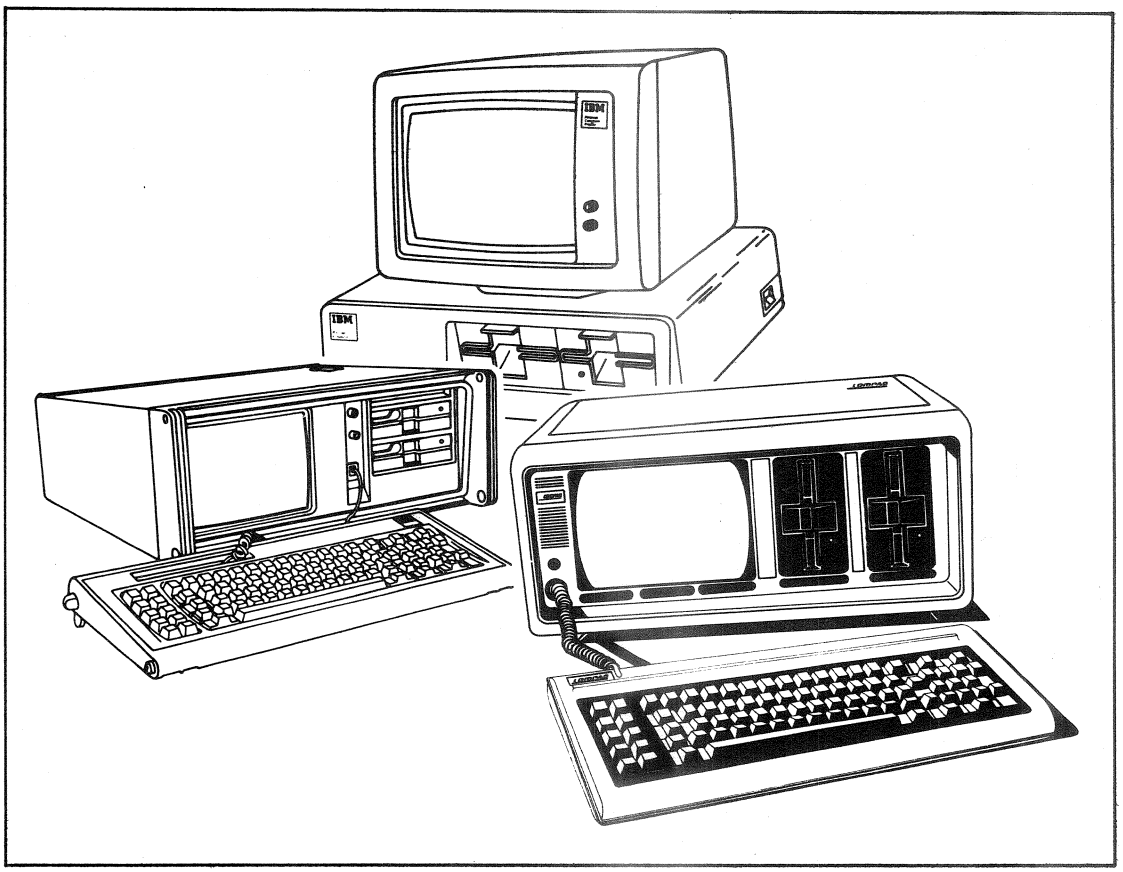
Step 4 - Verify that the DIP shunts are plugged into locations J3 and J5, not locations J4 and J6.

SWITCH POSITIONS

Switch SW1								
Position	1	2	3	4	5	6	7	8
Setting	Don't Care	Don't Care	On	On	On	On	Off	Off
Switch SW2								
Position	1	2	3	4	5	6	7	8
Setting	On	Off	Off	Off	Off	Off	On	Off
Switch SW3								
Position	1	2	3	4	5	6	7	8
Setting	Off	Off	On	Off	Off	Off	Off	Off



ADVANCED PROGRAM LOADER PROGRAMMING MANUAL



PC-700/-900/-1100 PROGRAMMABLE CONTROLLERS

Westinghouse Electric Corporation
Industry Electronics Division
1521 Avis Avenue
Madison Heights, MI 48071

June, 1984

NOTE TO READER:

This manual is a preliminary version of the final Advanced Program Loader Programming Manual (NLAM-B816), which is now in production. The preliminary is being made available on a temporary basis until the final manual is printed.

The first 5 Sections, along with Appendix A, stand by themselves and provide new information about the Advanced Program Loaders that can be used with the PC-700/-900/-1100 programmable controllers.

Sections 6 and 7 act as bridges between the CRT Program Loader Manual (BLAM-B56) and this preliminary Advanced Program Loader Manual. Operational characteristics, where different, are indicated. Where information is the same, specific references are made to the CRT Programming Manual.

For the time being, these 2 manuals must be used together.

Tables of contents are placed before each Section. The Sections in this manual are:

1. Introduction
2. General Description
3. Computer Modifications
4. Keyboards
5. Program Loader Startup
6. Modes of Operation
7. Advanced Program Loader Functions

A. COMPAQ Computer Modifications

Section 1

INTRODUCTION

1-1. APL EXPLAINED

One of the optional programming devices available for the NL-700/-900/-1100 programmable controllers is a portable/personal computer for which Westinghouse supplies specialized software. Currently 3 types of Advanced Program Loaders (APL) are compatible and acceptable. These are:

- NLPL-1581, which is an IBM Portable Computer
- NLPL-1580, which is a COMPAQ Portable Computer
- IBM Personal Computer

The 2 units with the NLPL Catalog Numbers can be ordered through Westinghouse. All 3 units may also be ordered directly from retail outlets. (See Figure 1-1.) For proper operation with the programmable controllers, all of the Loaders require the NLSW-781 Software Package be loaded in and active.

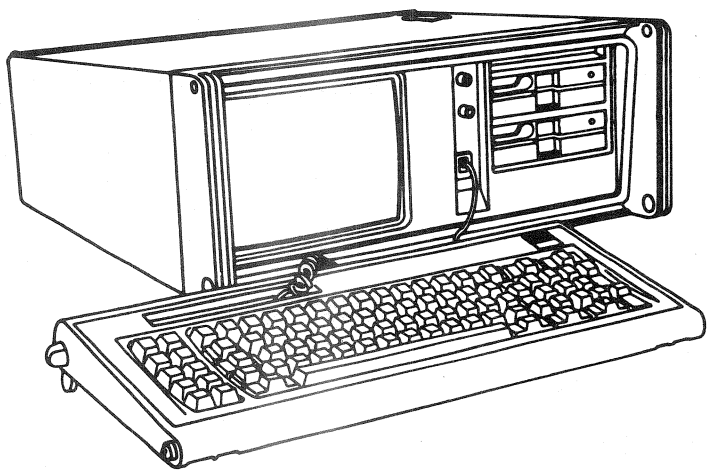


Figure 1-1. Portable Computer

More specific information about required standard and optional equipment, and about ordering, is given in Section 2. Note that regardless of the computer used, 512Kb of memory must be installed.

1-2. PURPOSE OF THE MANUAL

This manual is designed to be used to:

- Select proper equipment

- Start up the Loader
- Operate the Loader

The majority of discussions contained here are devoted to the actual use of the unit. Emphasis is placed on how to perform the basic tasks. (Refer to the individual programmable controller's Systems Manual for explanations of the programmable functions.)

In general, the tasks the Loader performs are:

- Entering a ladder program into the programmable controller
- Monitoring a ladder program contained in the controller
- Storing a ladder program on, and recalling from, a diskette
- Producing a hardcopy printout of the ladder program

1-3. RELATED DOCUMENTATION

In addition to the information presented here, there are other related documents which should be consulted. These are:

- PC-700/-900 Systems Manual (Catalog No. NLAM-B751). This is available from Westinghouse and is shipped as standard with each PC-700/-900 programmable controller.
- PC-1100 Systems Manual (Catalog No. NLAM-B788). This is available from Westinghouse and is shipped as standard with each PC-1100 programmable controller.
- IBM Guide to Operations (IBM No. 1502332). This is supplied with each Portable Computer but may be obtained separately.
- IBM Guide to Operations (IBM No. 1502232). This is supplied with each Personal Computer but may be obtained separately.
- COMPAQ Operations Guide (COMPAQ No. 100001-001). This is supplied with each COMPAQ Portable Computer.
- CC-232 User's Manual (Pub. 001129-01 A0). This is supplied with each AST Research, Inc. Advanced Communication Board.
- Installation Manual/User's Guide (No. 20065-Rev. 1.0). This is supplied with each Tecmar, Inc. Memory Expansion Board. (Note: If a different manufacturer is chosen, use the provided manual.)

1-4. IMPORTANT GENERAL CONSIDERATIONS

Selection, interconnection, and use of peripheral devices such as printers, other than those recommended by Westinghouse, are the sole responsibility of the customer.

CAUTION

The AC supply line HI/LO (L1/L2) wiring arrangement for the Advanced Program Loader and any other peripherals must be identical with the arrangements for the PC-700/-900/-1100 controllers. Also, a third-wire ground must be used. Severe injury or equipment damage could result due to non-identical arrangements.

Only the computers noted in Paragraph 1-1 are known to be completely compatible with the PC-700/-900/-1100 programmable controllers and the NLSW-781 Software Package. Other IBM "look-alikes" or alleged "IBM compatibles" have not been verified by Westinghouse. There is no guarantee that the Software Package will operate properly.

Westinghouse does offer certain support for computers purchased through Numa-Logic. Units purchased through other sources must be serviced and supported elsewhere.

Section 2

GENERAL DESCRIPTION

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Section 2

GENERAL DESCRIPTION

2-1. INTRODUCTION

Both the IBM and the COMPAQ guide to operations manuals contain extensive hardware descriptions for the units. Refer to them for information concerning AC line connections and the power-on switch location. This Section is intended only as a very brief description of the major external components of the Loader.

In addition to certain optional equipment noted in Section 3, it is necessary to use a computer that has dual floppy disc drives and 512Kb of memory. Units without these capabilities will not perform the Advanced Program Loader's function properly.

While the required optional equipment is installed in the Loader, the unit can still function as a personal computer, assuming the correct software is loaded into memory.

Refer to Appendix A for similar information about the COMPAQ unit.

2-2. DESCRIPTION

The major hardware features for an IBM Portable Computer are shown in Figure 2-1. Note that the display is an integral part of the system unit. The Personal Computer's display is separate. See Figure 2-2.

In all cases the Loader's keyboard, although detachable, remains connected to the system unit by means of a fixed cable.

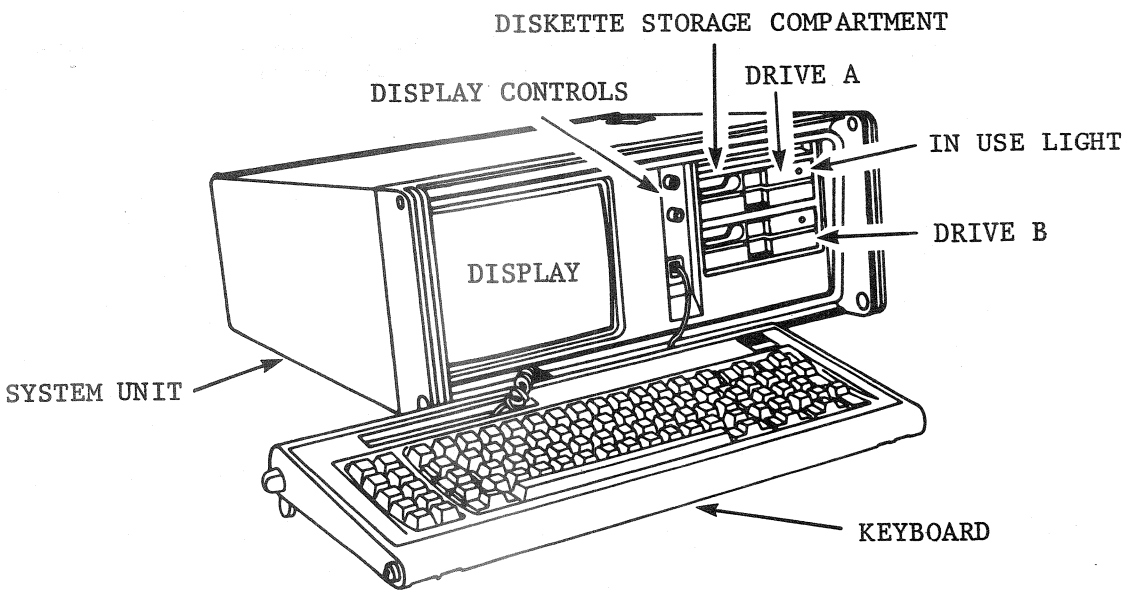

Figure 2-1. IBM Portable Computer

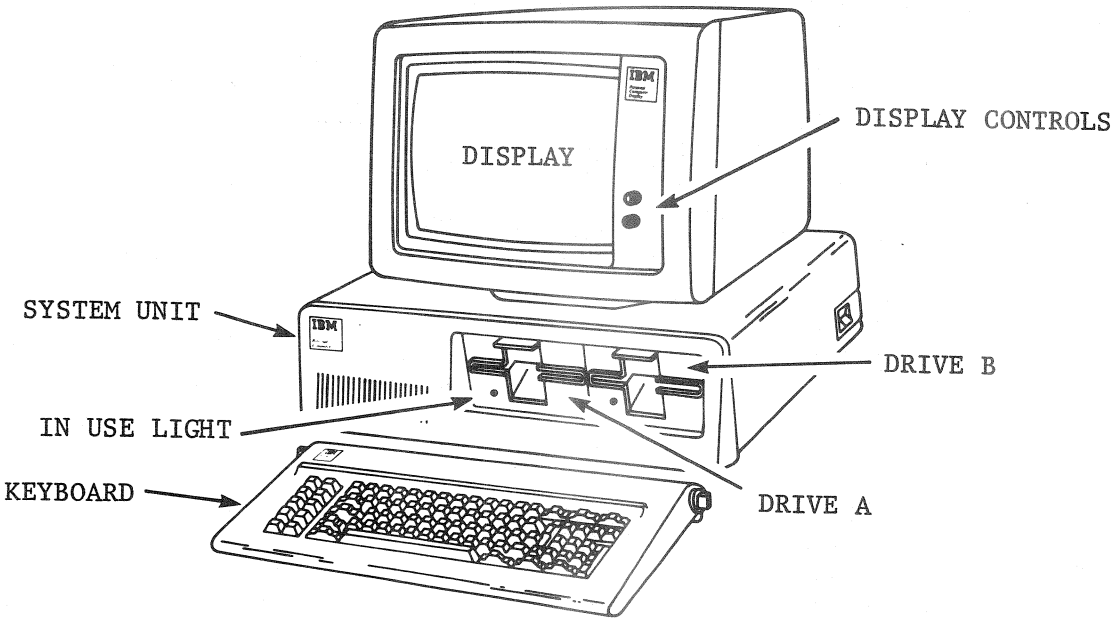

Figure 2-2. IBM Personal Computer

2-3. SPECIFICATIONS

A summary of the more important specifications for the IBM Portable Computer are listed in Table 2-1. Refer to Table 2-2 for the Personal Computer.

2-4. SOFTWARE

There are 2 different software requirements that must be satisfied before the computer can be used as an Advanced Program Loader. These are:

- Disk Operating System (DOS) 2.0
- NLSW-781 Programming Package APL Software Diskette

2-4-1. DOS 2.0

The Disk Operating System is supplied by IBM. It consists of a grouping of IBM programs that are used to perform the following programs:

- Formatting a diskette
- Producing a copy of a diskette
- Storing information on a diskette
- Retrieving information from a diskette
- Loading information into the computer from the Westinghouse APL Software Diskette

TABLE 2-1. IBM PORTABLE COMPUTER SPECIFICATIONS

System Unit
Dimensions (W D H) 20 x 17 x 8 in. (50.8 x 43 x 20.3 cm) Weight 30 lbs (13.6 kg) Supply Voltage 115/230 VAC, switchable 50/60 Hz, switchable Power Consumption 114 watts User Memory Size - 512Kb Access time - 200 nanoseconds Cycle time - 345 nanoseconds
Keyboard
Dimensions (W D H) 18 x 7.5 x 1.5 in. (45.7 x 19 x 3.8 cm) Weight 4 lb (1.8 kg)

TABLE 2-2. IBM PERSONAL COMPUTER SPECIFICATIONS

System Unit
(Dimensions (W D H) 20 x 16 x 5.5 in. (50.8 x 40.6 x 14 cm) Weight 28 lbs (12.7 kg) Supply Voltage 120 VAC 60 Hz Power Consumption 200 watts User Memory Size - 512Kb Access time - 250 nanoseconds Cycle time - 410 nanoseconds
Keyboard
Dimensions (W D H) 20 x 8 x 2 in. (50.8 x 20.3 x 5 cm) Weight 6 lb (2.7 kg)
Monochrome Display
Dimensions (W D H) 22.8 x 13.9 x 10 in. (60 x 35.3 x 25.4 cm) Weight 17.3 lbs (7.9 kg) Display 25 lines x 80 characters

2-4-2. NLSW-1581

The Advanced Program Loader Software Diskette consists of a group of programs written by Westinghouse to allow the computer to function with the PC-700/-900/-1100. This Diskette is loaded into the computer after the IBM DOS Diskette is loaded.

2-5. COLOR GRAPHICS

Color graphics are optionally available for the IBM portable/personal and the COMPAQ computers. However additional modules are required in the computer, as is special user-written programming. This features is especially valuable for process control applications.

Section 3

COMPUTER MODIFICATIONS

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Section 3

COMPUTER MODIFICATIONS

3-1. INTRODUCTION

None of the three types of recommended portable/personal computers noted in Section 1 can be immediately plugged in and operated as an Advanced Program Loader. In addition to the required software, it is necessary to install certain optional pieces of hardware.

Users may choose to assemble all of the hardware and install it themselves. Alternately, the IBM or COMPAQ Portable Computer can be ordered from Westinghouse with all of the required items installed. Use these Catalog Numbers:

- NLPL-1580 COMPAQ Portable Computer
- NLPL-1581 IBM Portable Computer

These Catalog Numbers include the following items:

- 1 DOS Operating System Diskette
- 1 Memory (256K bytes)
- 1 Memory Expansion Board (256K bytes)
- 1 Dual Floppy Disk Drive
- 1 Operations Guide
- 1 Advanced Communications Board (with dual RS-232-C ports using HDLC protocol)

(The only other essential item is a Communications Cable, which is ordered separately.)

The purpose of this Section is to assist the customer who obtains the computer from a retail outlet and must, therefore, assemble and install all of the required items. It also illustrates cabeling methods.

CAUTION

> Equipment damage can result when certain cables are connected or disconnected while AC line power is applied to the personal/portable computer. Be sure to disconnect the computer at the AC socket before connecting any cables.

3-2. MEMORY

The Advanced Program Loader must contain 512Kb of memory to function with the PC-700/-900/-1100 Processors. This capacity can be requested at the time or order. It may also be purchased and installed by the user at a later time. Since the "basic" computer capacities, along with memory increments, vary so much, no generalities are made here. All that can be said is that 512Kb are required. In many cases a "memory expansion board" with a 256Kb capacity can be installed, thereby meeting the requirement.

There are a number of manufacturers that make the memory expansion boards. As an aid, the following is known to function with the Loader:

Wave™ Memory Expansion Board
Tecmar, Inc.
6225 Cochran Road
Solon, Ohio 44139

3-3. COMMUNICATIONS

There are a number of items that provide communications with the PC-700/-900/-1100 Processors or with the NLP-786 Serial Printer. These are detailed here.

3-3-1. COMMUNICATIONS BOARD

The port provided by the unmodified Loader is not capable of providing communications with the programmable controller. It is necessary to install a communications board that supports an externally accessible 50-pin interface port. (Half of these pins connect with the PC-700/-900/-1100, and half with the optional Serial Printer, if used.)

The following is the required interface board:

CC-232 Programmable Advanced Communications Board
AST Research, Inc.
Irvine, CA 92714

This Board is supplied with a ribbon cable. Its use is not recommended since it is not industrially rated. Westinghouse makes a substitute cable available. (See Paragraph 3-3-2.)

3-3-2. COMMUNICATIONS CABLE (NLC-4PL)

Westinghouse offers the Communications Cable which is used to connect with the Loader. (See Figure 3-1.) The other end connects with:

- PROGRAM LOADER port on the PC-700
- COMMUNICATIONS INTERFACE PORT on the PC-900 and PC-1100

Use of this Cable is recommended since it is industrially rated.

3-3-3. COMMUNICATIONS ADAPTER PLUG (NLC-4CA)

Westinghouse offers the Communications Adapter Plug, which is required if the Communications Cable is used. Its function is to "split" the Communication Board's fixed 50-pin connector into two 25-pin ports, one male and one female. (See Figure 3-1.)

The PC-700/-900/-1100 connects with the Loader through SERIAL PORT B on the Plug. This is a synchronous port that may be configured in software for a variety of baud rates. During the system configuration phase of startup, the user should always select 9600 baud. (Other rates are for different Loader applications.)

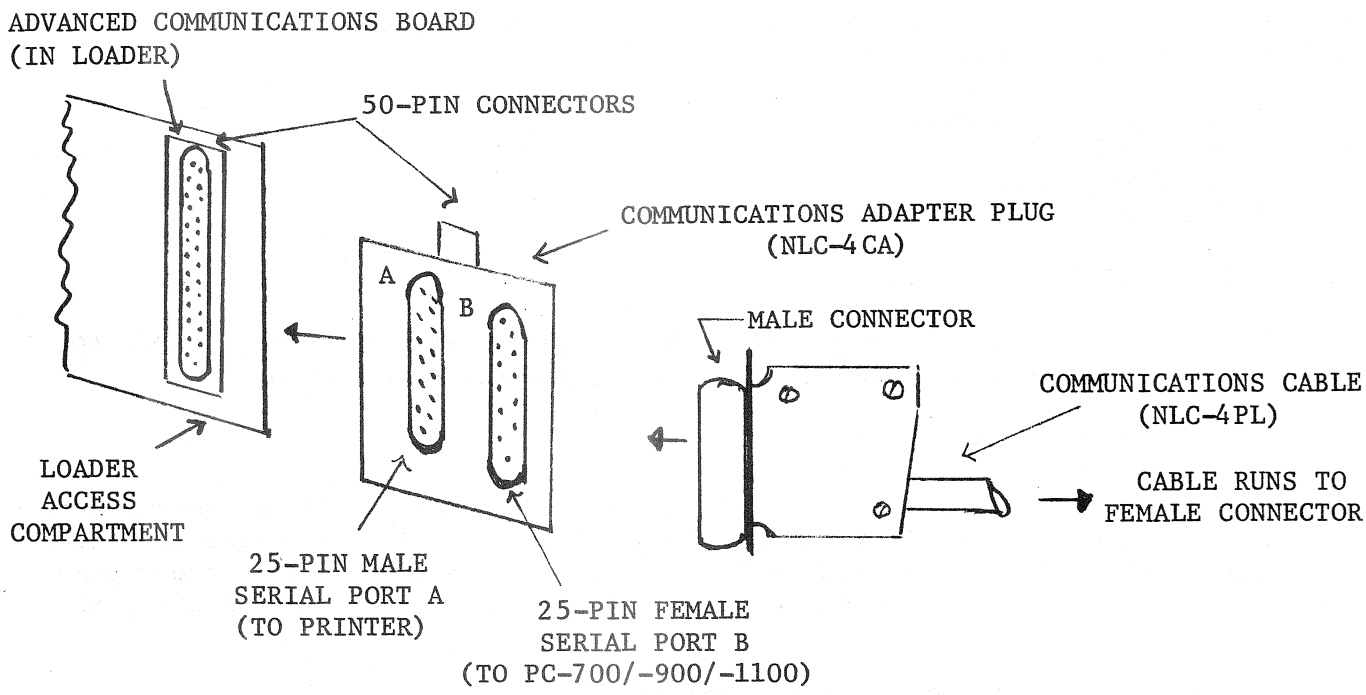


Figure 3-1. Recommended Connection Arrangement

3-3-4. AST RIBBON CABLE

Although it is possible to use the ribbon cable supplied by AST with the Advanced Communications Board, so much additional and optional equipment is required, the recommendations noted in Paragraph 3-3-2 and 3-3-3 are strongly suggested due to their simplicity.

3-4. SERIAL PRINTER (NLP-786)

Any printer that strictly follows the RS-232-C standard can be used with the Advanced Program Loader. The printer allows a hardcopy of the ladder program to be produced. Westinghouse makes available the NL-786 Serial Printer. This unit is a Centronics 150 Series model, which may also be bought from the manufacturer.

The Serial Printer connects with the Loader by means of the Communications Cable (NLC-4PL), noted earlier. (See Figure 3-2.) When used in this application, the male end is connected with the female communications port on the Serial Printer. The female end is mated with the SERIAL PORT A connector on the Loader. (In other words, the cable connectors are reversed in position.)

3-5. DISKETTES

Users will want to have a number of diskettes available to use during the development of a ladder program or for off-line storage. Always choose a high quality type since data retention and durability are critical. A quantity of 10 is sufficient.

Order double-sided, double-density, 5-1/4 in. diskettes.

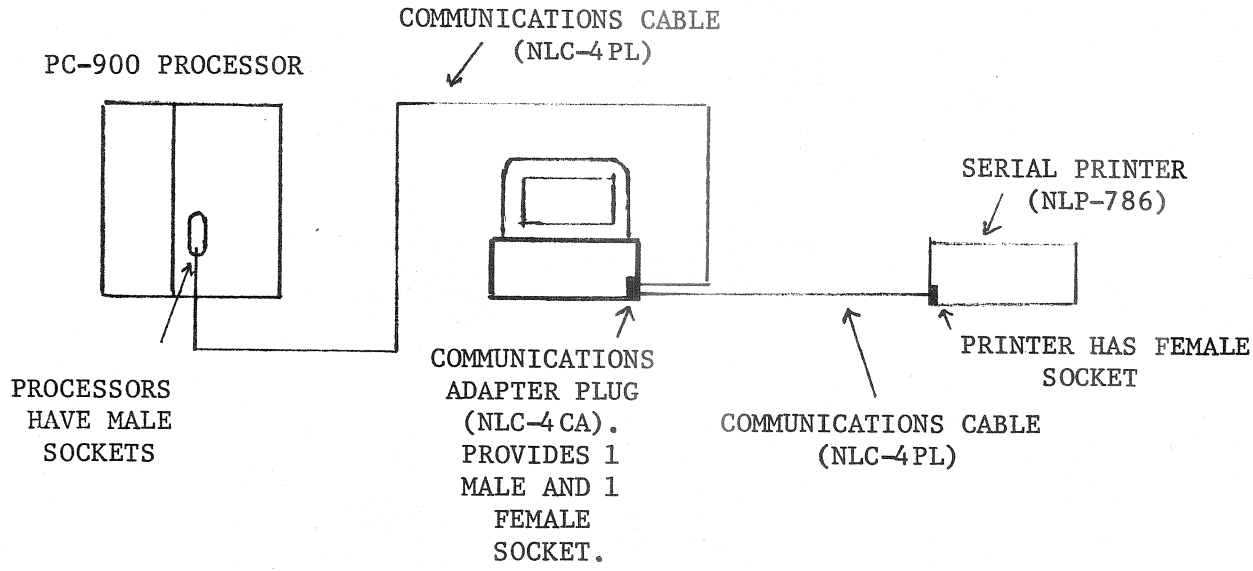


Figure 3-2. Communications Cable Connections

3-6. COMMUNICATION BOARD SETUP

The required Advanced Communication Board is "programmable," and, therefore, must be set up before actual installation. Refer to Figure 3-3 and locate SW1 thru SW3.

Follow these setup procedures:

Step 1 - Set rocker switches SW1 thru SW3 as noted in Table 3-1. (Use the tip of a ball point pen.)

Step 2 - Install the provided jumper plugs in the following 2 positions:

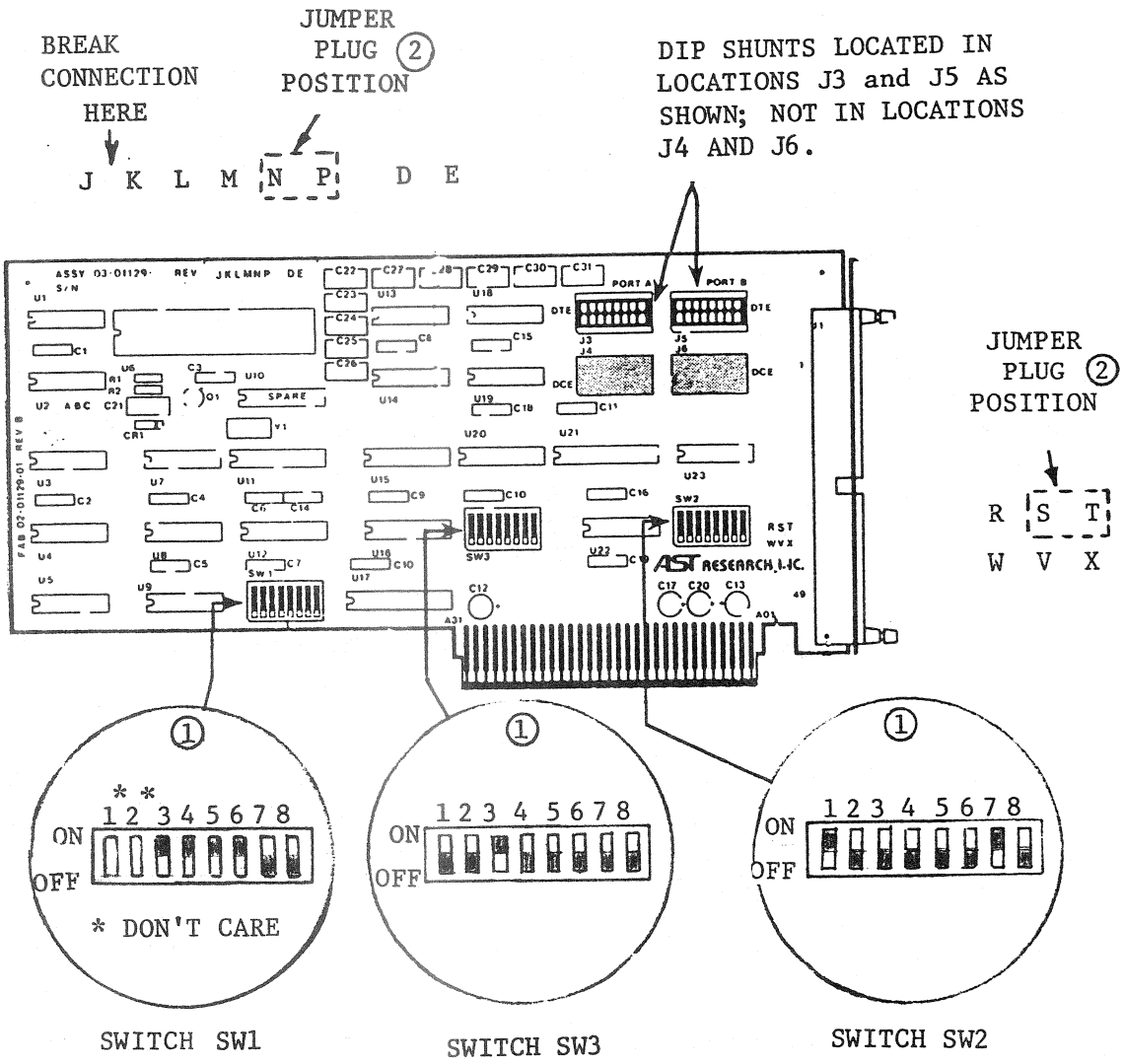
- Between pads S and T
- Between pads N and P

Step 3 - Verify that there is not a jumper between positions J and K.

Step 4 - Verify that the DIP Shunts are plugged into locations J3 and J5, not locations J4 and J6.

If some other communications board is chosen, refer to the accompanying documentation for specific setup information.

The Advanced Communication Board can be plugged into any of the expansion slots in the portable/personal computer. (See the operations manual for illustrations. Both IBM and COMPAQ place this information in a section called "Options.")



(1) See Table 3-1.

(2) These may be a jumper plug or a soldered connection.

Figure 3-3. AST Advanced Communication Board Setup

TABLE 3-1. SWITCH POSITIONS

Switch SW1								
Position	1	2	3	4	5	6	7	8
Setting	Don't Care	Don't Care	On	On	On	On	Off	Off
Switch SW2								
Position	1	2	3	4	5	6	7	8
Setting	On	Off	Off	Off	Off	Off	On	Off
Switch SW3								
Position	1	2	3	4	5	6	7	8
Setting	Off	Off	On	Off	Off	Off	Off	Off

3-7. CABLE, PLUG INSTALLATION

Once the Communication Board is properly installed, the 50-pin socket will be accessible from the outside of the computer. Place the Communications Adapter Plug (NLC-4CA) over this socket and seat it firmly. (See Figure 3-1.) Orient it so that the type can be read.

Next place the Communications Cable (NLC-4PL) onto the Plug's 25-pin connector marked SERIAL PORT B. Connect the other end with the PC-700/-900/-1100 processor.

3-8. PRINTER CONNECTION

Assuming that there is only one Communications Cable (NLC-4PL) available, disconnect it from the Processor and PORT B. Place the male end on the Serial Printer, and the female end on the SERIAL PORT A connector at the Loader. (See Figures 3-1 and 3-2.)

Section 4

ADVANCED PROGRAM LOADER AND NLPL-780 KEYBOARDS

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Section 4

ADVANCED PROGRAM LOADER AND NLPL-780 KEYBOARDS

4-1. INTRODUCTION

The CRT Program Loader (NLPL-780) keyboard was designed exclusively for use with a Numa-Logic programmable controller. Thus nearly all of the keys are dedicated and specialized keys. (See Figure 4-1.) The Advanced Program Loader (NLP-1580) contains a general purpose keyboard without keys dedicated to a programmable controller's functions. (See Figure 4-2.) This Section summarizes the differences between the two keyboards.

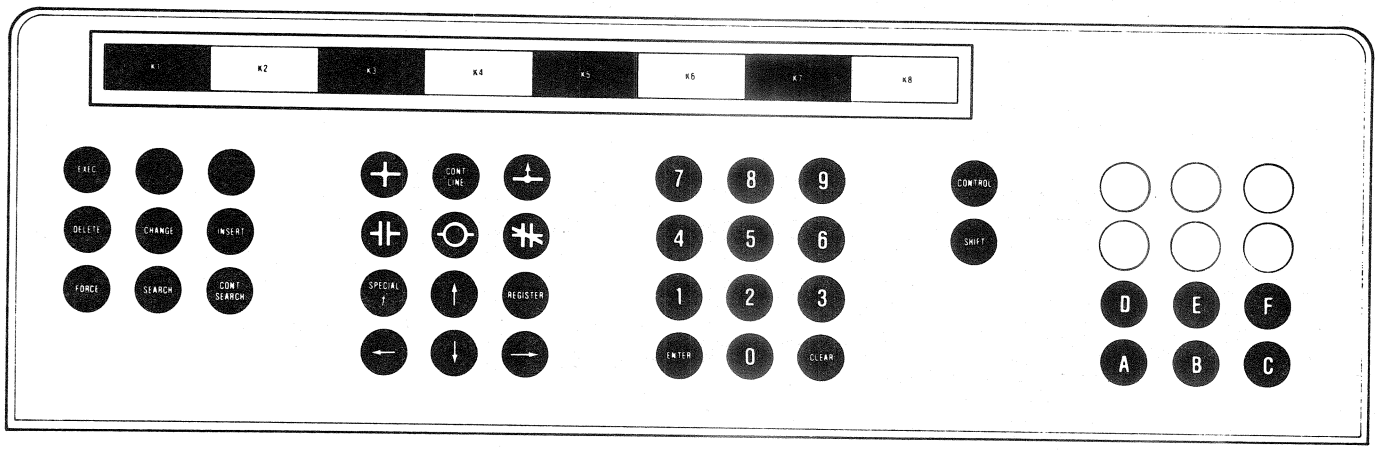

Figure 4-1. CRT Program Loader

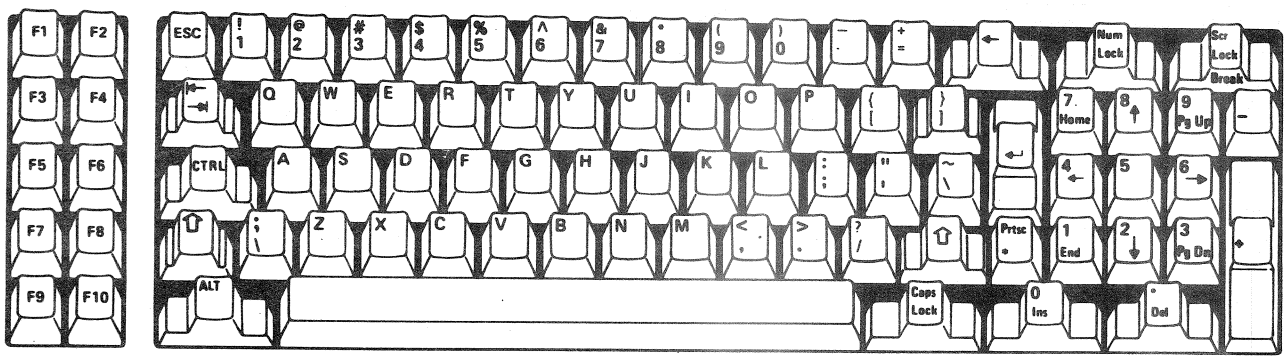

Figure 4-2. Advanced Program Loader Keyboard

4-2. KEYBOARD COMPARISONS

The keys with equivalent functions are cross-referenced in Table 4-1. Note the following:

TABLE 4-1. KEYBOARD CROSS-REFERENCES

CRT Program Loader	Advanced Program Loader ① ②	Function
EXEC	CTRL E	Enter the Executive Menu.
CONTROL EXEC	CTRL T	Toggle between Program and Monitor Modes.
DELETE	Del ③	Delete a Network in Program Mode.
DELETE	DELETE Fkey	Delete a register from the screen in Register operation of the Monitor Mode.
CHANGE	Ins Del	Change a network in Program Mode
	CHANGE Fkey	Change a register value in Register operation of the Monitor Mode.
INSERT	Ins	Insert a network in Program Mode.
FORCE	FORCE Fkey or CTRL F	Clear all forced conditions when in Monitor Mode.
SEARCH	CTRL S	Enter the Search Mode from either Program or Monitor Mode.
CONT SEARCH	CTRL Z	Continue search operation.
┼	X JUNCT Fkey	Program a junction.
CONT LINE	CONT LINE Fkey	Program a horizontal line across the screen.
┴	UP BRCH Fkey	Program an up branch.
┤ ├	NO Fkey	Program a normally open contact.
-( )-	-( )- COIL Fkey	Program a coil.
┤/├	NC Fkey	Program a normally closed contact.
SPECIAL F	SPCL FUNC Fkey	Display the 8F menu.

(Cont'd.)

CRT Program Loader	Advanced Program Loader ① ②	Function
REGISTER	REG Fkey Ctrl R	Enter the Register Mode.
← ↑ → ↓	← 4 ↑ 8 → 6 ↓ 2	Cursor movement.
0 thru 9	0 thru 9 ④	Numeric entry.
ENTER	↵	Complete key sequence.
CLEAR	←	Multi-function.
CONTROL	Ctrl	Used in combination with other keys to provide special functions.
SHIFT	⇧	Used in combination with other keys to provide special functions.
SHIFT CLEAR	Ctrl C	Clear the screen.
Search ↑	Pg Dn	Display the next rung.
Search ↓	Pg Up	Display the previous rung.
	Ctrl Q	Display the Help Screen.

① F key designates one of the function keys, F1 thru F10.

② The ↵ of the Personal Computer keyboard is referred to as the Enter key.

③ Where the Control key is used with other keys, depress and hold the Control key CTRL and then the associated key.

④ The numeric keys across the top of the keyboard are used to enter numbers associated with the ladder logic elements.

- Any of the keyboard functions of the Advanced Program Loader involving a control key necessitates depressing both the Control key and the associated key simultaneously. Thus to enter the Executive Mode, depress and hold the Control (CTRL) and then press the E key.

- Many of the keys described in the Table are also listed on the "Help Screen" display. The Help Screen display can be initiated by pressing and holding the Control (CTRL) key, and then pressing the Q key on the Loader.

- Both the NLPL-780 ENTER key and the Advanced Program Loader Enter key are sometimes required to complete a key sequence. A good example of this is when an F function key selection is made with the Advanced Program Loader and the F key label, F1 thru F10, will be flashing on the screen. The Enter key is required to complete the sequence.

Additional information on the use of the Keyboard of the Advanced Program Loader is listed in Section 6 where the various modes of operation are discussed.

Section 5

PROGRAM LOADER STARTUP

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Section 5

PROGRAM LOADER STARTUP

5-1. INTRODUCTION

The purpose of this Section is to assist the user to start up the Advanced Program Loader. In addition to detailing actual procedures, a certain amount of attention is given to the operating environment and to diskette care and use.

5-2. ENVIRONMENTAL CONSIDERATIONS

The Program Loader must be operated within the limits determined by its manufacturer. These are:

- Temperature: 60° to 90°F (16° to 32°C)
- Humidity: 8 to 80% R.H.

Note that these are more restrictive than the operating range specifications for the programmable controllers.

Additionally, it is critical not to subject the unit to:

- Caustic, dirty or corrosive atmospheric conditions
- Extreme electromagnetic radiation, such as can be found near welding or inductive heating type machines

5-3. DISKETTES

For individuals not familiar with personal computers, the following information is extremely important. Without a basic understanding of proper diskette-handling procedures, improper operation could result.

5-3-1. CARE

A diskette is permanently sealed in a black plastic cover which protects it, aids with keeping it clean, and allows it to spin freely. This cover should never be opened. (See Figure 5-1.)

Although the diskette is somewhat flexible, it should never be bent. Always try to hold the diskette with your right thumb at the corner over the label.

Never allow anything to touch the diskette's gray or brown surface which is visible through cutouts in the cover. An invisible scratch or even a fingerprint can cause errors when the data is read.

The following are general guidelines for diskette use:

- When they are not in use, store diskettes in the original paper envelope.

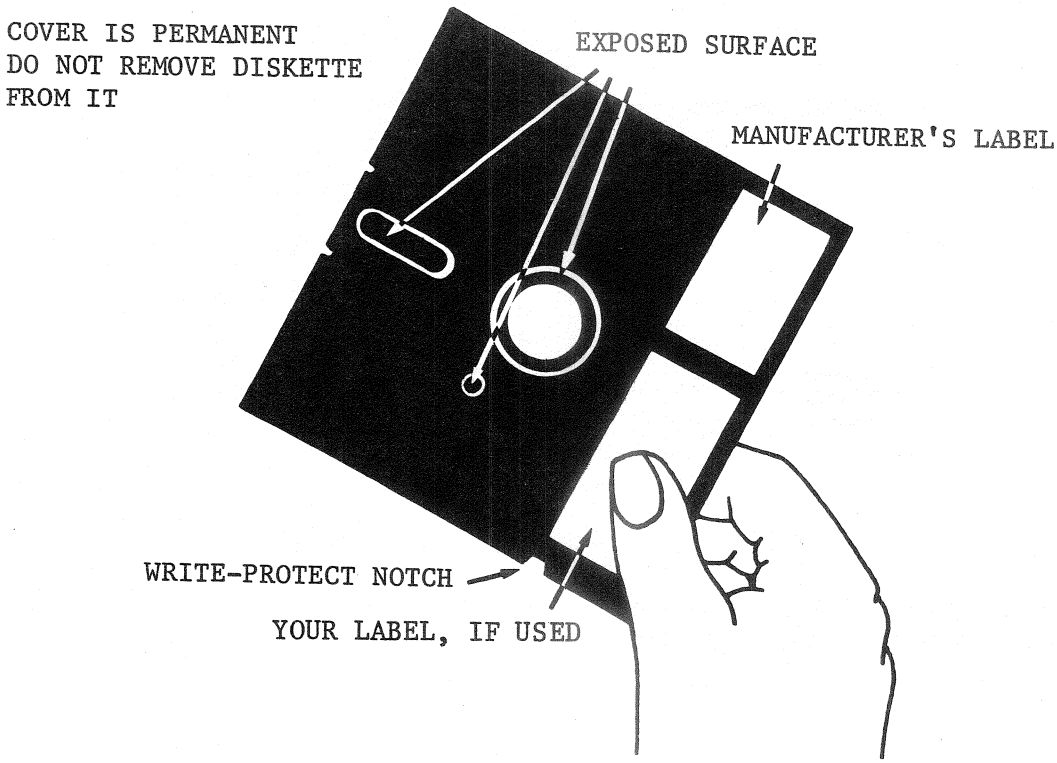

Figure 5-1. Common Diskette Features

- Store the diskettes in an upright position. Use the notebook pockets provided with the software packages.
- Do not place the diskettes on dirty or greasy surfaces, and do not allow dust to collect on them.
- When writing on the diskette's cover, use a felt tip pen, and do not press down hard.
- When applying additional labels, write on them before fixing them to the cover.
- Keep diskettes away from stray magnetic sources such as a TV set, telephones, dictation equipment, electronic calculators, electric motors, and magnets.
- Keep diskettes away from extremes of heat and cold, which could cause warping or improper operation. (The first sign of heat damage is a warped cover.)
- If the diskette is to be unused for several hours, open the drive door so that the drive head does not unnecessarily rest on the diskette's surface for long periods of time.

5-3-2. LOADING PROCEDURES

The following steps should be followed to properly insert a diskette into a drive.

Step 1 - Open the drive door by gently pulling at the spring-loaded tab on its face. (See Figure 5-2.)

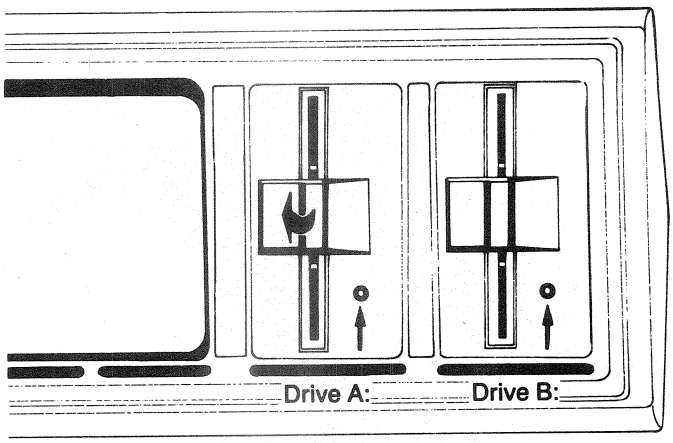

Figure 5-2. Opening Drive Doors

Step 2 - Pick up the diskette and hold it so that your right thumb covers the manufacturer's label. (See Figure 5-3.)

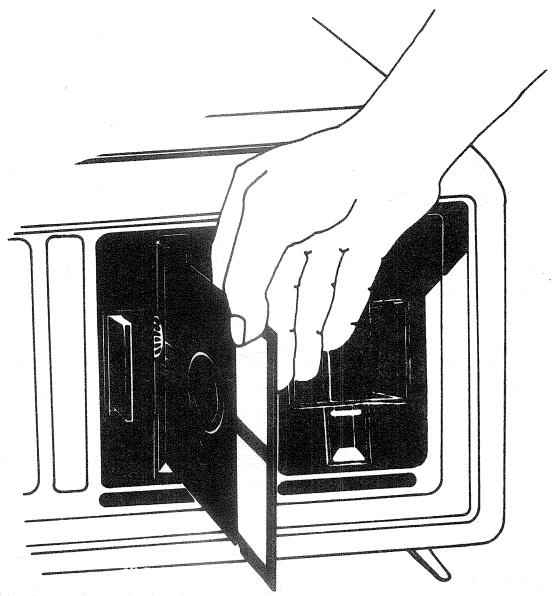

Figure 5-3. Proper Installation Method

Step 3 - Carefully begin to insert the diskette with the manufacturer's label upwards or to the left, depending on which unit is used. (The edge with the oval cutout enters the drive first.)

Step 4 - Gently push the diskette all the way into the drive. Do not force or bend it. If it is pushed too hard, it could be permanently damaged.

Step 5 - Carefully push the drive door's spring-loaded tab to the right. The door will close over the disk.

To remove the diskette, open the drive door, and carefully draw it straight out.

CAUTION

> Never remove a diskette while the drive's red IN USE light is on. This may damage the diskette, or destroy the data stored on it. (In most cases the diskette will be usable, but the data must be reloaded.)

5-4. BACKUP DISKETTES

When first receiving the Westinghouse Software Package, it is an excellent practice to make a second, backup copy of the NL-781 diskette. At the same time, make a copy of the DOS diskette. Also, after building the ladder program on diskette or in the PC-700/-900/-1100 Processor, a backup should be made. In this way, any accidental erasing or damaging of the original, master diskettes will not cause expensive reordering or programming delays.

Follow this procedure to produce a backup DOS diskette.

Step 1 - Remove the shipping cardboard from both drives, if this has not already been done.

Step 2 - Insert the DOS diskette into Drive A.

At this point there are 2 possibilities, depending whether AC power is on or off. If the computer is on, follow Steps 3A. (This is the most simple procedure.) If power is off, follow Step 3B.

Step 3A - With power already on and has been running, "boot" the DOS diskette into the computer. (To boot means to load a single portion of the DOS programs into the computer.) To do this, press sequentially and hold down these keys:

- Control (CTRL)
- Alternate (ALT)
- Delete (DEL)

Then release the keys. (See Figure 5-4.)

Step 3B - If power is off, turn it on.

(The computer automatically executes a power-on self-test for 30 to 90 seconds. If the test is passed, a one-second beep sounds. The drive then begins to load the DOS diskette. After loading is completed, the screen displays a prompt for a new date entry. If the screen is not displaying characters at this point, verify that the brightness control is turned fully clockwise.)

(If the power-on self-test fails, the display does not request a new date entry. A hardware problem exists. Consult the computer's operations guide for more information.)

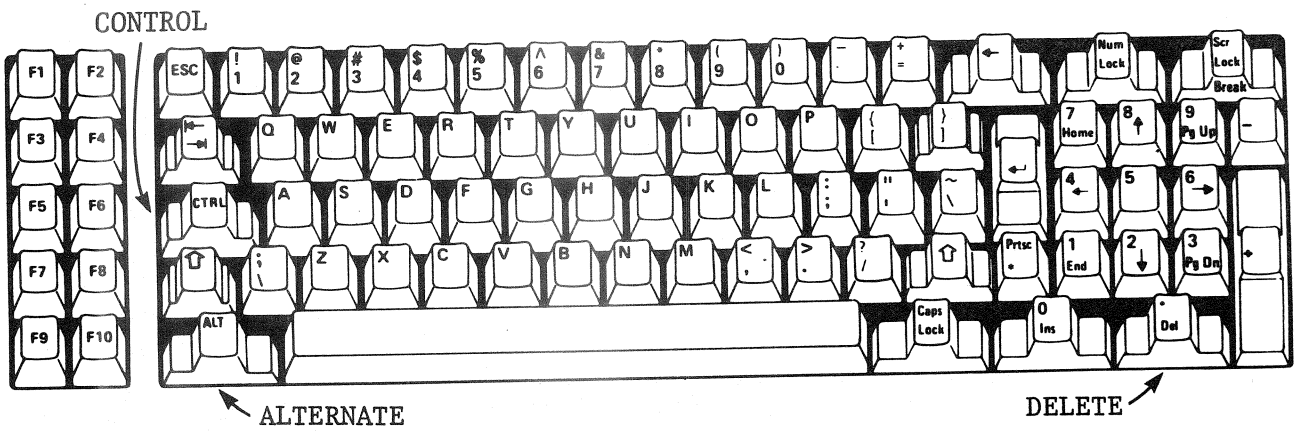

Figure 5-4. Startup Key Locations

Step 4 - Press the Enter key (↵) twice. (See Figure 5-4.) This causes the previous time and date on the DOS to be accepted. Of course the current date and time can be entered, if desired. When these entries are completed, the "A prompt" is displayed. It is called "A prompt, but is displayed as A .

The A prompt is a request for you to enter a special DOS command. These are more fully detailed in Paragraph 5-6.

Step 5 - Enter the following DOS command to access the DOS program used to copy a diskette:

```
diskcopya:b:
```

Step 6 - On the screen, verify the entry is properly made. Then press the Enter key (↵) to execute the command. In this case the diskcopy program will be accessed from the DOS diskette.

Step 7 - Insert the diskette to be copied in Disk Drive B and the blank, or "target," diskette in Drive A.

Step 8 - Press any key to initiate testing. When copying is successfully completed, the screen displays:

```
Copy another (Y/N)?
```

Step 9 - Depress the n key (no) to complete the operation.

(The screen reverts to the A prompt.)

The following steps are used to verify that the master diskette's contents were correctly copied onto the target diskette.

Step 10 - Insert the original, or master, DOS diskette into Disk Drive A and enter the following after the prompt:

diskcompa:b:Enter key (↵)

After the Enter key is depressed, the DOS program used to compare 2 diskettes is loaded into the computer.

Step 11 - Insert the diskette intended to be copied into Disk Drive B and the "target" diskette into Drive A.

Step 12 - Depress any key to initiate the comparison process.

When the comparison is successfully completed, the screen displays:

Diskettes compare ok

Once the copy and verification process is completed, return the master diskettes to the pockets at the rear of their respective notebook-type manuals, or store them in a safe place.

5-5. WRITE-PROTECT NOTCH

Once a backup diskette is produced, it can be protected from being accidentally written over or erased. Place an adhesive tab over the write-protect notch. (See Figure 5-1.) Adhesive tabs are usually shipped with the blank diskettes.

Do not place a write-protect tab on the original Westinghouse Software Diskette supplied with the NL-781 Package. If a new, merged Software Diskette (explained later) is being used, do not place a tab on it. The tab will prevent them from being merged.

5-6. PROGRAM LOADER STARTUP

This Paragraph lists the procedure for readying the portable/personal computer for use as an Advanced Program Loader.

Due to copyright restrictions, the Westinghouse Software Diskette (NL-781) cannot be factory-shipped with the DOS programs contained on it. Thus the user must perform an initial two-disk merging operation. However the user is free to combine the diskettes so that subsequent booting operation is greatly simplified. In fact, the Westinghouse Software Diskette contains an "auto boot" program that greatly simplifies all subsequent booting.

Paragraph 5-6-1 outlines the procedure to merge the diskettes. Although lengthy, it need be performed only once. Paragraph 5-6-2 outlines procedures for starting up the Advanced Program Loader once a merged Software Diskette is available. It is very brief and simple. Readers should not assume booting is difficult.

5-6-1. MERGING DISKETTES

In order to take advantage of the auto boot program, it is necessary to transfer the DOS files to the Westinghouse Software Diskette. This Paragraph outlines the steps that must be taken.

Keep in mind that there are two instances in which booting may be required:

- When the Loader has been turned off, but is now powered up
- When power had been applied, but now, for some reason, the Westinghouse Software Diskette needs to be reloaded into the personal computer.

These conditions affect Step 2 in the following procedure.

Step 1 - Insert the DOS diskette into Drive A.

Step 2A - If AC power is already on, load the DOS diskette into the computer. To do this, press sequentially and hold down these keys:

- Control (CTRL)
- Alternate (ALT)
- Delete (DEL)

Then release the keys.

Step 2B - If AC power is off, turn it on. The computer performs a number of self tests and then displays a date entry prompt.

Step 3 - Press the Enter key (↵) twice.

This causes the previous time and date on the DOS to be accepted. The A prompt is now displayed. (It appears as A>.) This prompt indicates that the DOS software is ready to accept specific commands.

Step 4 - Place the original, factory-shipped Westinghouse Software Diskette into Drive B.

Step 5 - Remove the DOS diskette from Drive A.

Step 6 - Install a third, temporary diskette in Drive A. This must be a blank diskette formatted according to DOS 2.0 or 2.1.

Refer to the computer's operations guide for information about formatting a diskette using DOS software.

Step 7 - In response to the A prompt, enter:

copy b:*.* a:

Step 8 - On the screen, verify the entry is properly made. Then press the Enter key (↵) to execute the command.

At this time the files on the Westinghouse Software Diskette are copied on the third diskette. After the copy operation is complete, go on to the next step.

Step 9 - Enter this command after the A prompt:

erase b:*.*Enter key (↵)

This command erases all of the files from the original Westinghouse Software Diskette on Drive B.

Step 10 - Remove the third, temporary diskette from Drive A, and lay it aside.

Step 11 - Place the original DOS diskette in Drive A.

Step 12 - After the A prompt, enter:

sys b:Enter key (↵)

Wait for the copy operation to be completed. (This command causes the "hidden system files" to be written onto the Westinghouse Software Diskette in Drive B.)

Step 13 - After the A prompt, enter

copy command.com b:Enter key (↵)

(This causes the "command file" to be written into the Diskette in Drive B.)

Step 14 - Remove the DOS diskette from Drive A.

Step 15 - Place the third, temporary diskette in Drive A.

Step 16 - After the A prompt, enter:

copy*.* b:Enter key (↵)

(This command causes all of the original files to be written back into the Westinghouse Software Diskette.)

Step 17 - Remove both diskettes from the drive and place the Westinghouse Software Diskette in Drive A.

Step 18 - Press sequentially and hold down these keys:

- CTRL
- ALT
- DEL

Release them.

This command initiates the auto boot process from the single, merged Diskette. Only this single Diskette need be used to boot up the Loader from this time on.

Step 19 - Mark the Software Diskette to indicate it is merged with auto boot capability.

CAUTION

Do not place a write-protect tab on the original Westinghouse Software Diskette, nor on the merged Diskette. Such Diskettes cannot boot up the Loader.

NOTE

The Westinghouse Software Diskette (NL-781) is "copy-protected." This means that only the original Diskette from Westinghouse may be used "to boot up" the Loader. Copies other than the merged Diskette cannot be used to perform the boot function.

Copies can be used to continue operation of the Loader once it is booted up, however. In this way the original Diskette can be protected from loss.

If a copy Diskette is used in an attempt to boot the Loader, the screen displays the message: Unauthorized Duplicate.

5-6-2. SIMPLIFIED ADVANCED PROGRAM LOADER STARTUP

Once a merged Software Diskette is available, follow these steps to boot up the Loader.

Step 1 - Place the Software Diskette in Drive A.

Step 2A - Turn AC power to the Loader on. Booting automatically commences.

Step 2B - If AC power is already on, as during Loader operations, press sequentially and hold down these keys:

- CTRL
- ALT
- DEL

Release the keys. Booting automatically occurs, unless a copy Diskette is being used to operate the Loader. In such a case, simply install the master merged Software Diskette. When the accessing of the merged diskette is complete, the Executive Mode menu will be displayed as shown in Figure 6-1.

Step 3 - For maximum protection, remove the original Software Diskette from Drive A and replace it with a copy.

Step 4 - Place a blank diskette in Drive B.

(This is used for the user's ladder program.)

Section 6

MODES OF OPERATION

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Section 6

MODES OF OPERATION

6-1. INTRODUCTION

The modes of operation of the Advanced Program Loader are nearly identical in structure to the operation of the same modes of the CRT Program Loader (NLP-780). Each of the modes is discussed in this Section as follows:

- Program/Edit mode (Par. 6-2)
- Monitor mode (Par. 6-3)
- Archive mode (Par. 6-4)
- Print mode (Par. 6-5)
- Executive Function mode (Par. 6-6)

The "Executive mode menu" is used to access all the other modes of operation. (See Figure 6-1.) The Executive mode menu appears on the screen when:

- The Westinghouse Software Diskette is first loaded into the Loader and executed
- The Software Diskette is being executed and the CTRL is pressed and held and then the E key is pressed

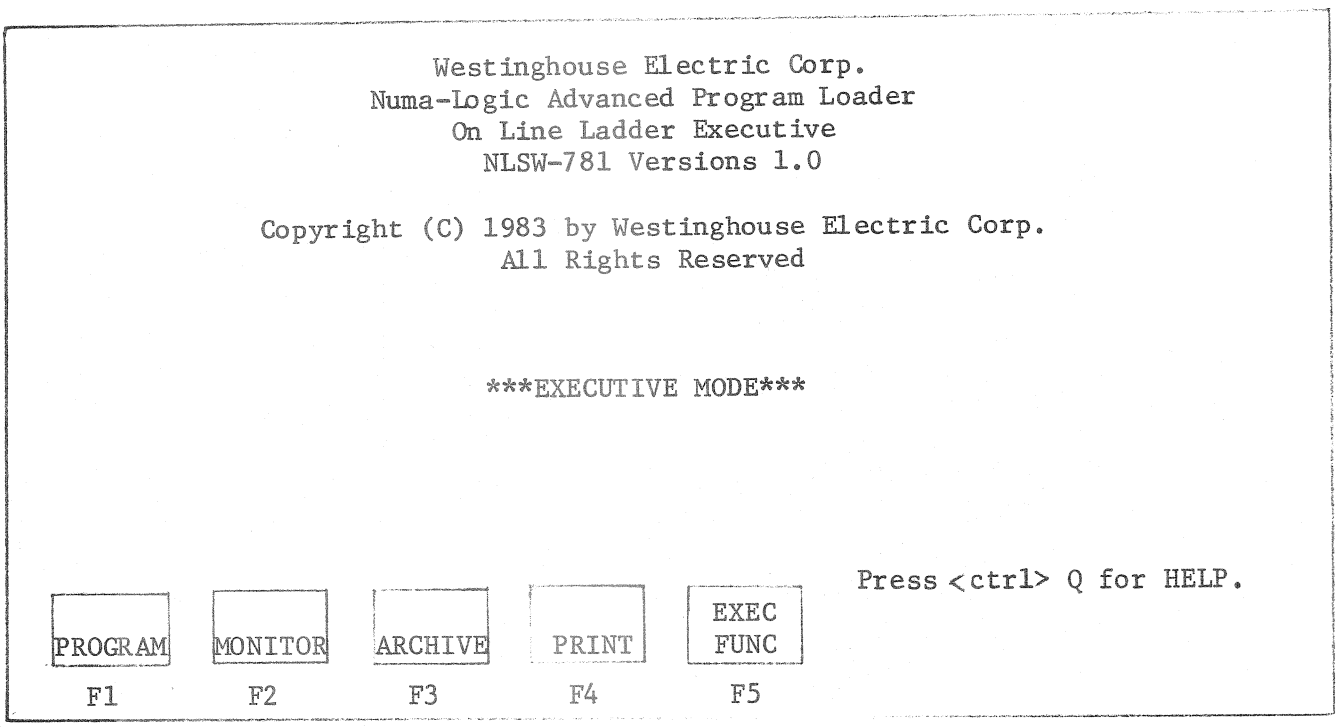

Figure 6-1. Executive Mode Menu

6-2. PROGRAM/EDIT MODE

The entry and editing of the ladder elements other than the special functions are nearly identical in structure to the Program/Edit mode of the CRT Program Loader. Figure 6-2 shows the screen displayed when the Program mode is first selected. Observe the screen and note the following:

- Function keys F1 thru F10 are used to enter the actual elements.
- The elements are displayed in the upper portion of the display.
- Special function elements are entered by first pressing the F10 key. This will be described in more detail later.

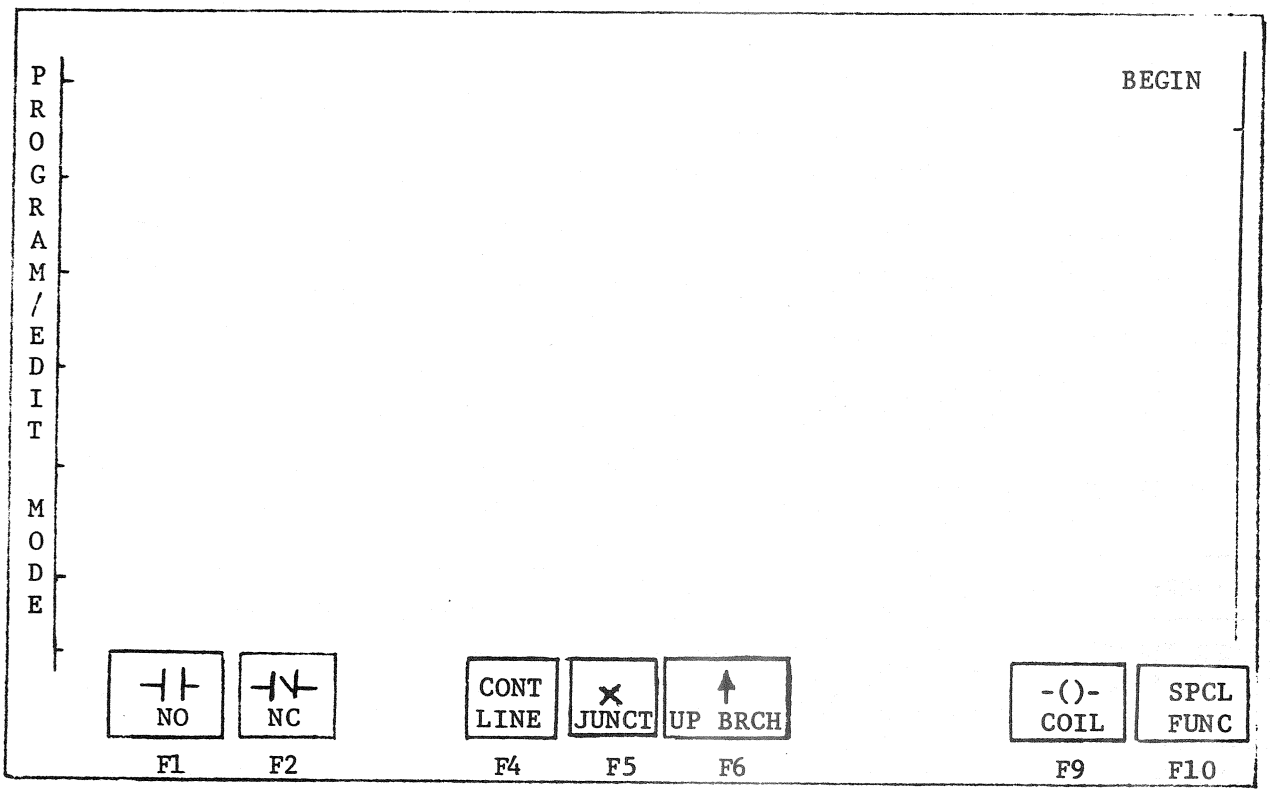

Figure 6-2. Initial Program Mode Screen

One difference in the entry of the elements, other than special functions, is that the Backspace key [←] of the Advanced Program Loader performs the CRT Program Loader's CLEAR key function in most cases. A listing and comparison of the various key functions for the CRT Loader and the Advanced Program Loader is contained in Table 3-1. See the instructions in the CRT Programming Manual starting on page 3-6 for details on entering elements.

6-2-1. SPECIAL FUNCTIONS

As mentioned earlier, special functions are handled differently by the Advanced Program Loader. First the special function menu must be accessed. This is performed by press-

ing the F10/SPCL FUNC key from the initial Program mode screen shown in Figure 6-2. When the F10/SPCL FUNC key is pressed, the first page of the special function menu is displayed. See Figure 6-3. Observe the Figure and note the following:

- F9/PAGE key can be pressed. Each time it is pressed, the screen displays the other special function page. Figure 6-4 shows page 2 of the special menu functions.
- The F10/EXIT function key can be pressed to return to the initial Program mode screen.
- The 2-character mnemonic of the desired special function can be entered followed by the Enter key (↵). For example, pressing the OM followed by the Enter key would initiate the programming of the OR Matrix special function.

After the 2-character code is entered, programming of the special function elements is the same as the CRT Program Loader, as described in the CRT Programming Manual starting on page 3-14.

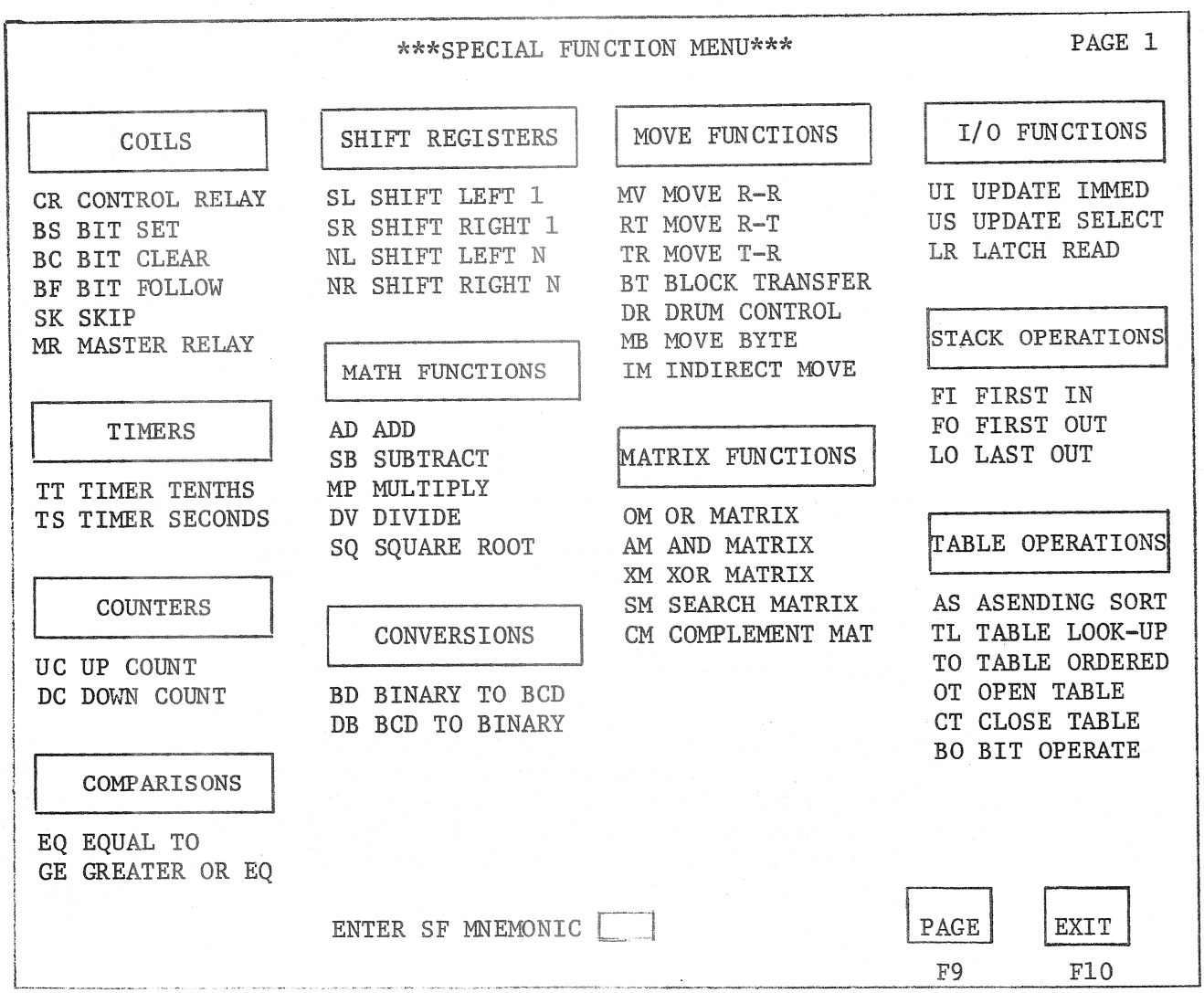

Figure 6-3. Page 1 of Special Function Menu

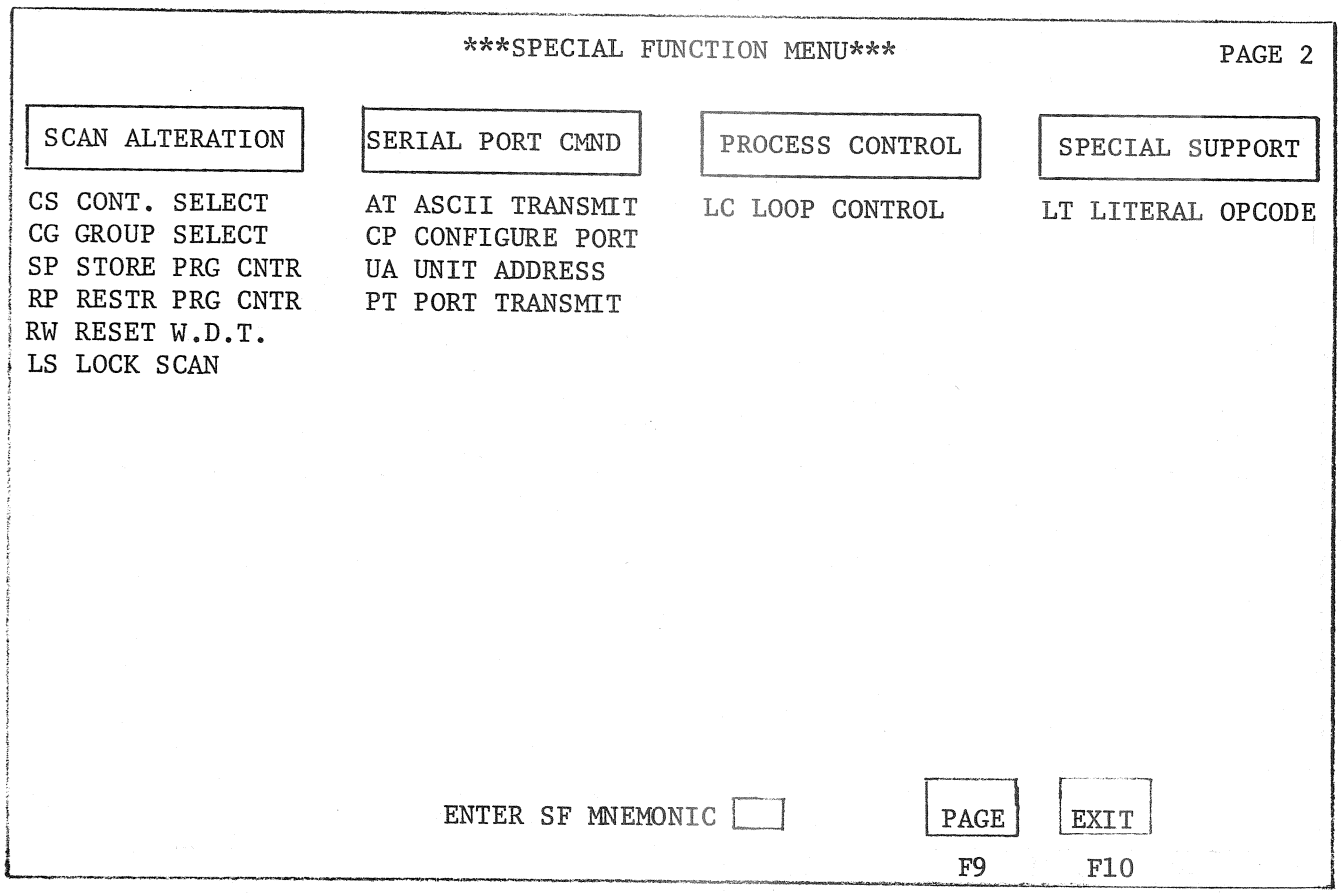

Figure 6-4. Page 2 of Special Function Menu

6-3. MONITOR MODE

The Monitor mode of the Advanced Program Loader is similar in structure to the Monitor mode of the CRT Loader. Figure 6-5 shows the initial Monitor mode screen. Observe the Figure and note the following similarities:

- F1 and F2 function keys are equivalent to the -| |- and -|\|- keys of the CRT Loader
- F3/REG function key is equivalent to the REGISTER key
- F5/FORCE function key is equivalent to the FORCE key
- F10/DELETE function key is equivalent to the DELETE key

The Monitor mode is described in the CRT Programming Manual beginning on page 3-27.

6-4. ARCHIVE MODE

The Archive mode of the Advanced Program Loader provides the ability to store ladder program information on:

- Floppy diskette or hard disk
- Magnetic tape

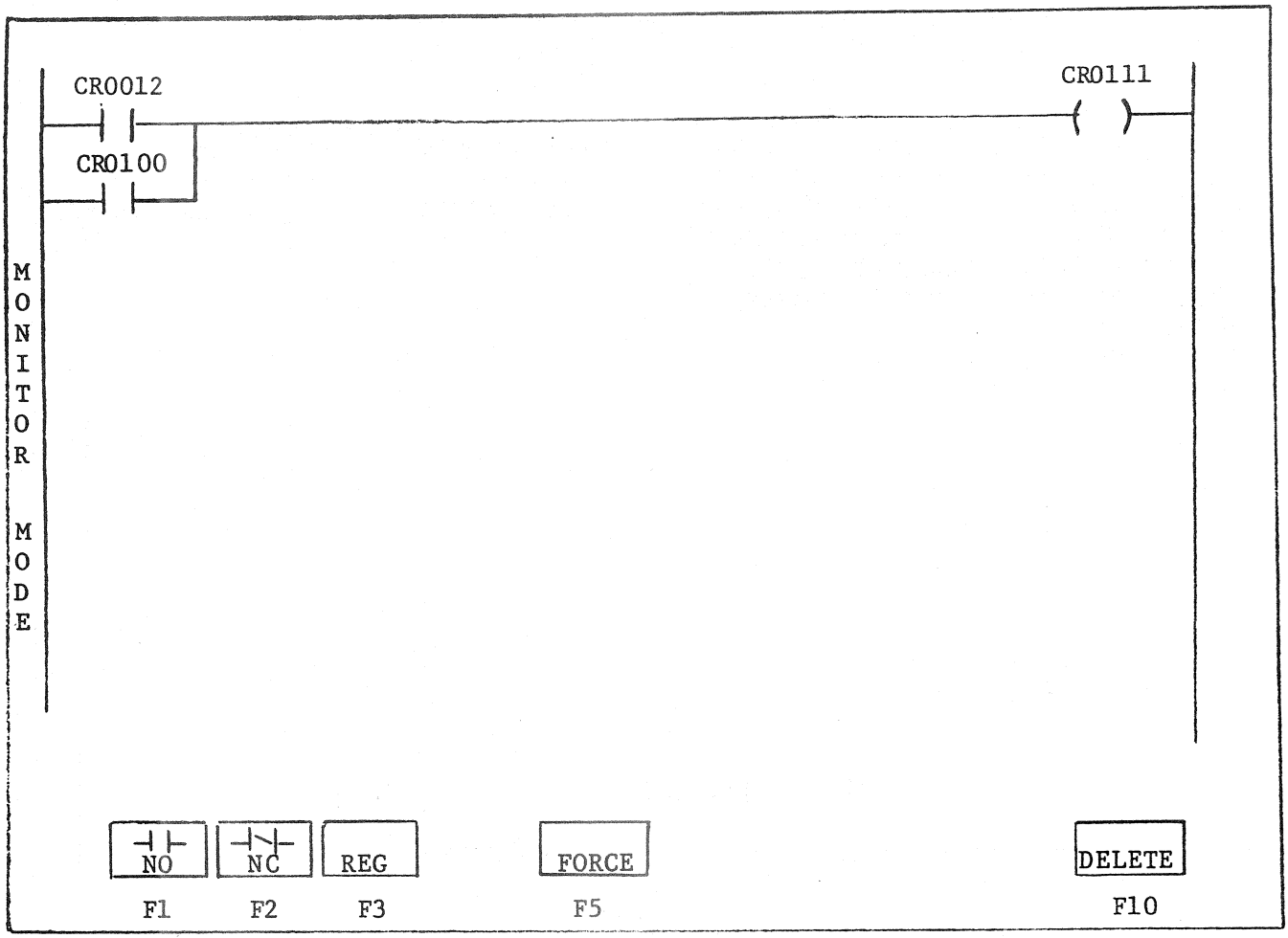

Figure 6-5. Typical Monitor Mode Screen

When the F3/ARCHIVE function key is depressed, the initial Archive mode screen, as shown in Figure 6-6, appears. Each of the operations is described separately in the following Paragraphs.

6-4-1. MAGNETIC/TAPE STORAGE

The tape storage operation provides a means for the user to:

- Record the ladder program and associated data on magnetic tape
- Reload the processor memory from the magnetic tape
- Verify the processor memory and magnetic tape contain the same data

When the Archive mode screen, as shown in Figure 6-6, is displayed, press the F1/TAPE STORAGE function key to initiate the tape storage screen, as shown in Figure 6-7. Observe the Figure and note the following:

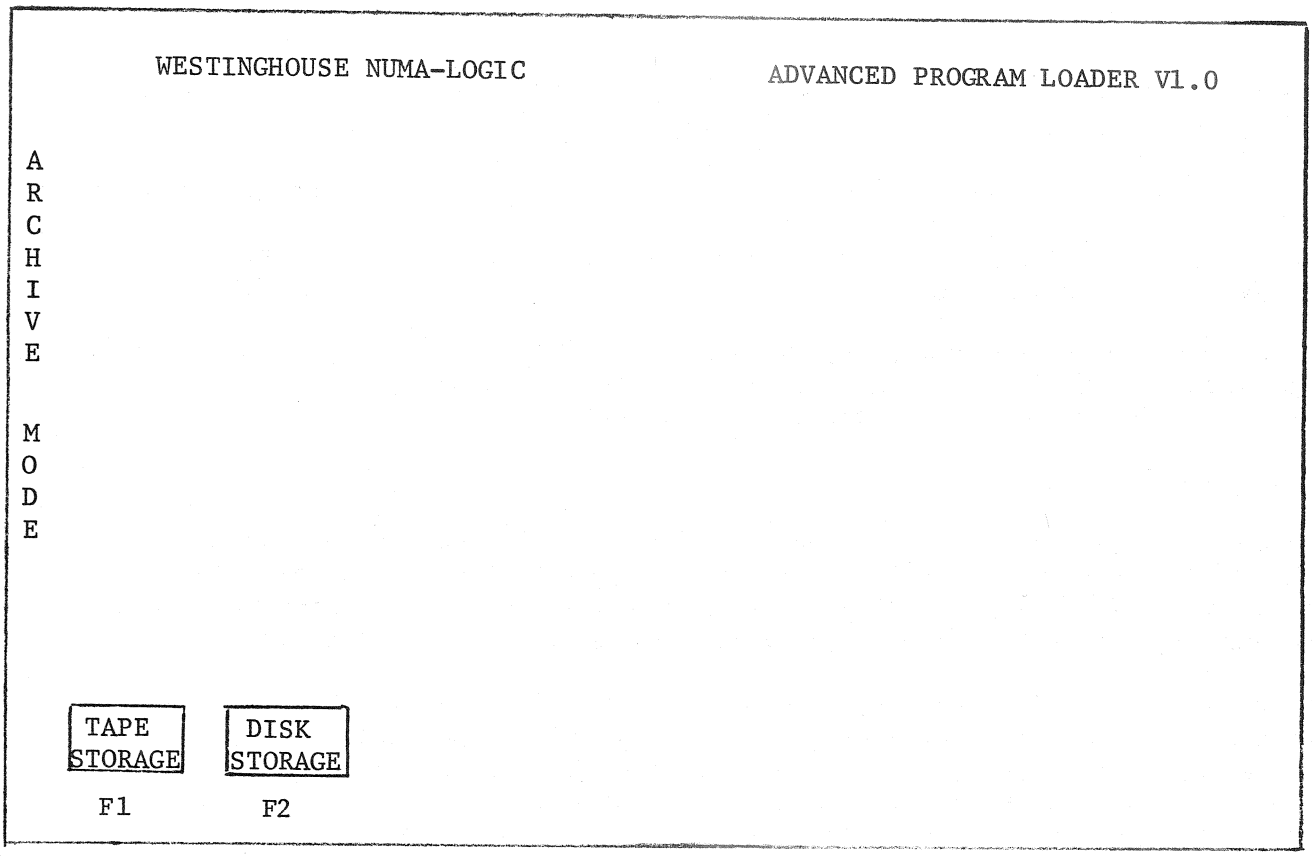

Figure 6-6. Archive Mode Menu

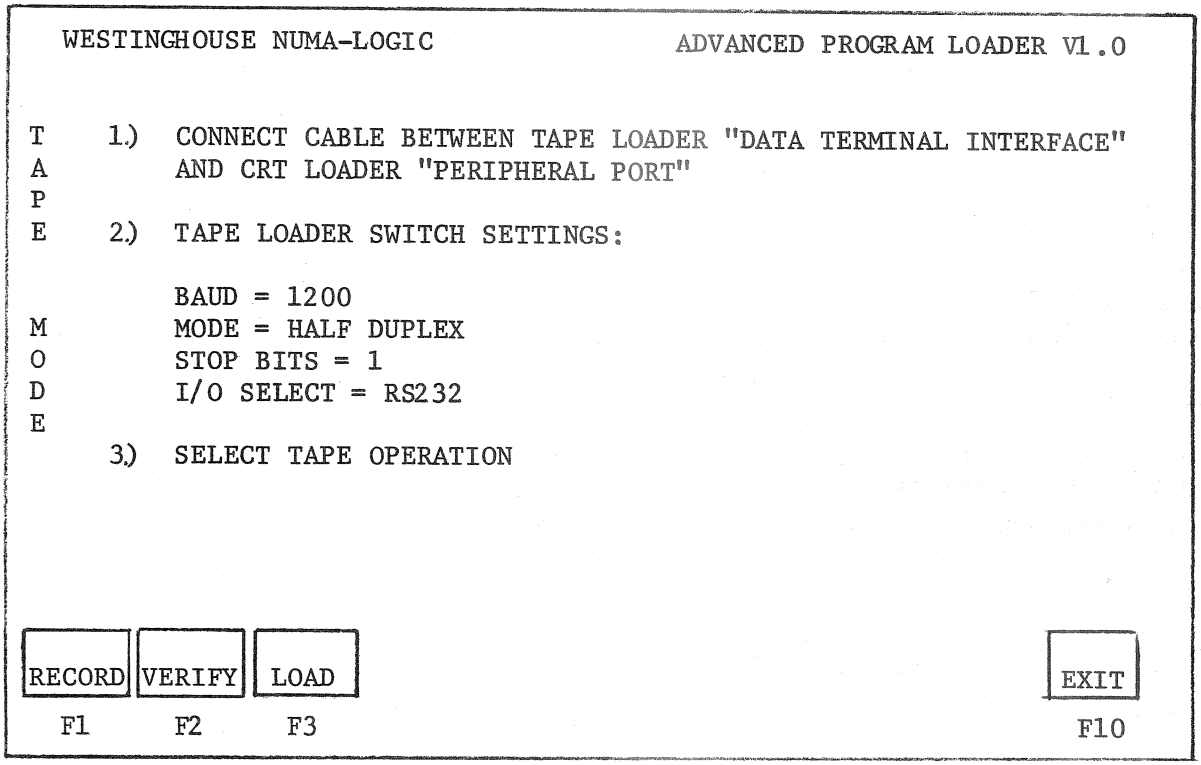

Figure 6-7. Tape Storage Screen

- Communications Cable (NLC-3PL) connects between the Tape Loader and Port A on the Communications Adapter Plug. (See Figure 3-1.)

- The Tape Loader Mode Switch is set to half-duplex rather than full-duplex.

- The F10/EXIT function key is used to return the operation to the initial menu of the Archive mode.

The balance of the magnetic tape operations is similar to the CRT Loader's Tape mode, as described in the CRT Programming Manual starting on page 3-28. The variations in operation are described in the following Paragraphs.

6-4-1-1. RECORD

The tape record operation of the Advanced Program Loader provides the ability to load a magnetic tape with the ladder program contained in the programmable controller. An additional step has been added to the Westinghouse Software Diskette's RECORD operation that is not present in the CRT Loader's RECORD operation.

If the PC is in a fault condition when the RECORD operation is selected, the user is presented with a choice of continuing and recording a possibly faulty program or discontinuing the operation. If the operator chooses to continue the record operation, it is similar to the procedure for the CRT Loader, as listed starting on page 3-30 of the CRT Programming Manual--with one exception. After the hardware has been prepared and a TAPE ID assigned, the user is presented with an additional prompt, as shown in Figure 6-8. This is an enhancement and allows the operator to specify the processor holding registers that he wishes to record with his program. The operator must perform one of the following operations:

- Press F1/HIGHEST REF function key followed by the Enter key to automatically select the highest reference number used by the ladder program.

- Press F2/REGS function key followed by the Enter key to select all registers.

- Enter the highest reference number desired followed by the Enter key.

When the holding register selection process has been completed, the record operation will automatically begin as with the CRT Loader. The Verify operation is automatically accessed when the record operation is finished.

6-4-1-2. VERIFY

The tape verify operation of the Advanced Program Loader is nearly identical to that of the CRT Loader. The F10/EXIT function key is functionally equivalent to the CLEAR key on the CRT Loader during a verify operation.

6-4-1-3. LOAD

The tape load operation of the Advanced Program Loader is nearly identical to that of the CRT Loader. The F10/EXIT function key is functionally equivalent to the CLEAR key on the CRT Loader during a load operation.

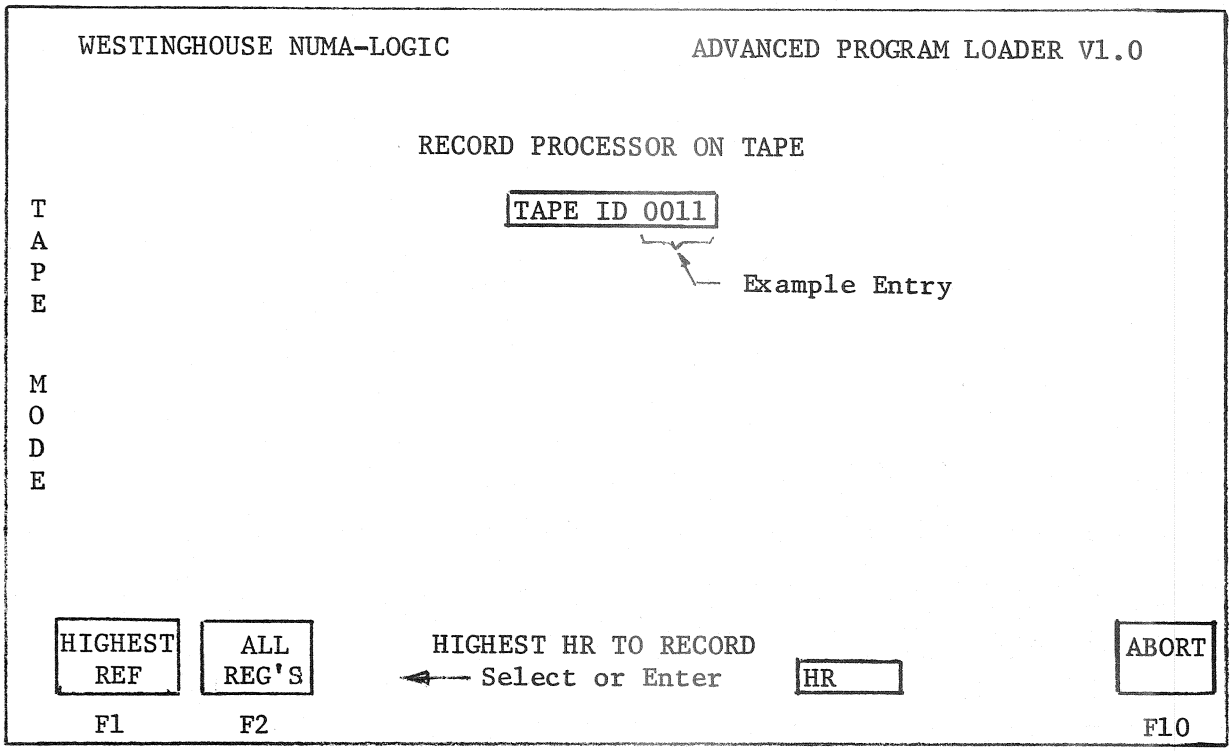

Figure 6-8. Record Holding Register Selection

6-4-2. DISK STORAGE

The disk storage operation of the Advanced Program Loader allows the ladder program to be loaded into and accessed from a diskette. The disk storage menu--accessed from the main menu of the Archive mode--is shown in Figure 6.9. The 6 selections are record, verify, load, utility, directory and erase. Each selection is described in the following paragraphs.

NOTE

File specification conforms to the syntax of IBM PC-DOS V. 2.XX. Refer to the DOS Manual for more information on the proper method(s) of specifying file names.

6-4-2-1. RECORD

The disk record operation of the Advanced Program Loader provides the ability to load a diskette with the ladder program contained in the programmable controller. Pressing the F1/RECORD key when the disk storage menu, shown in Figure 6-9, is displayed on the screen initiates an operator prompt to enter the filename. The filename can consist of any alphabetic and/or numeric characters chosen to identify a particular ladder program. A maximum of 41 characters can be included in a filename.

File specification follows the syntax set forth in the IBM PC-DOS version 2.XX Manual.

After the filename specification is keyed in followed by the Enter key (↵), the Advanced Program Loader automatically loads the ladder program contained in the programmable controller into the diskette contained in Disk Drive A.

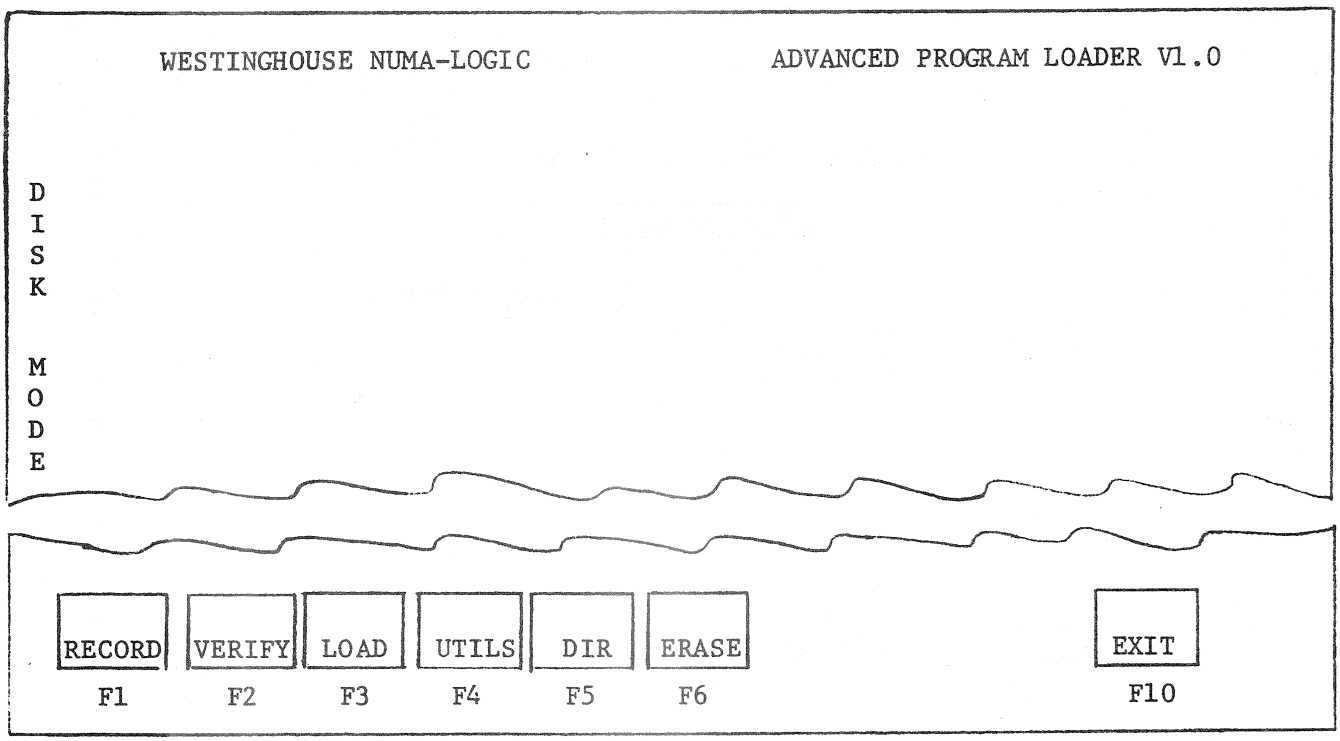

Figure 6-9. Disk Storage Menu

NOTE

Disk Drive A of the Advanced Program Loader is the default drive automatically selected. Another Disk Drive can be selected as described in the utility operation listed in Paragraph 6-4-2-4.

When the ladder program has been loaded onto the diskette, the Advanced Program Loader automatically accesses the verify operation.

6-4-2-2. VERIFY

The disk verify operation of the Advanced Program Loader compares the contents of a ladder program stored on a diskette with the ladder program contained in the programmable controller. Pressing the F2/VERIFY function key when the disk storage menu is displayed on the screen initiates a prompt for the operator to specify either:

- Ladder program, or
- Ladder program and registers

After a selection is made, the operator is prompted to enter the filename. (Filenames are discussed in Paragraph 6-4-2-1. The verify operation is initiated when the filename is keyed in followed by the Enter key (↵).

6-4-2-3. LOAD

The disk load operation of the Advanced Program Loader transfers a ladder program from a diskette to the memory of the programmable controller. Pressing the F3/LOAD key when the disk storage menu--shown in Figure 6-9--is displayed on the screen

initiates a prompt for the operator to enter the filename of the ladder program to be loaded. (Filenames are discussed in Paragraph 6-4-2-1.)

After the filename selection is made and the Enter key (↵) is pressed, the Advanced Program Loader initiates the loading process. After the loading is completed, the Advanced Program Loader automatically accesses the verify operation.

6-4-2-4. UTILITY

The disk utility operation of the Advanced Program Loader provides the following capabilities:

- Select Disk Drive other than Drive A. (Disk Drive A is considered the default drive.)
- Display the listing or "directory" of files contained on a diskette.
- Erase files contained on a diskette.
- Change the default directory.

The entry format for each of these Functions is listed on the screen when the F4/ UTILITY key is pressed followed by the Enter key. (See Figure 6-10.) The format for each of the disk utility operations is shown in the Figure. Key-in examples of the utility operations, entered in the lower portion of the screen, are contained in Table 6-1.

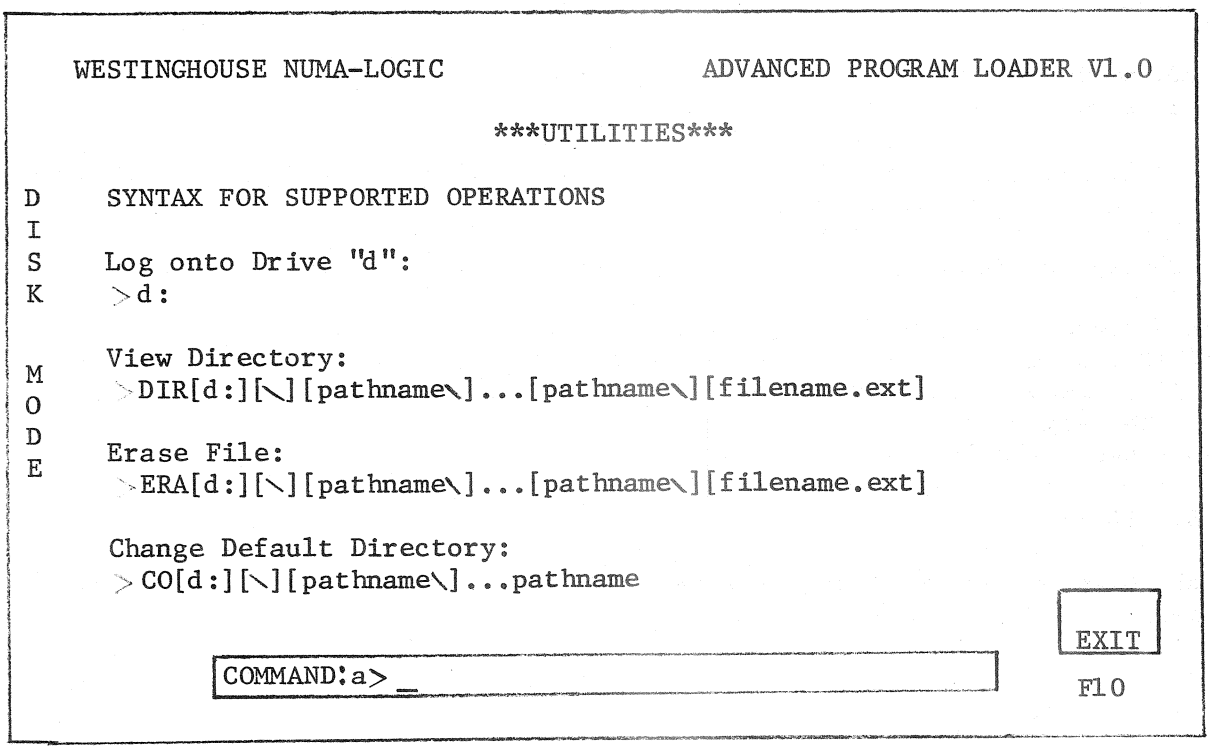

Figure 6-10. Disk Utility Menu

TABLE 6-1. DISK UTILITY KEY-IN EXAMPLES

Key-in [1]	Description
B: Enter key	Causes Disk Drive B to be the default drive.
DIR Enter key	Displays the directory of the files on the diskette contained in the current default Disk Drive.
ERA filename Enter key	Erases the file designated by filename.
[1] The prompt a> appears on the screen and is not entered by the operator.	

6-4-2-5. DIRECTORY

The disk directory operation of the Advanced Program Loader provides the following capabilities:

- View the contents of a diskette contained in the default Disk Drive or a selected Disk Drive.
- Interrogate the diskette contained in the default Disk Drive or specified Disk Drive for a specified file.
- Change the default Disk Drive to any available Disk Drive.

The entry format for each of these operations is listed on the screen displayed when the F5/DIR function key is pressed followed by the Enter key (↵). See Figure 6-11. The various entry formats for each of the directory operations are shown in the Figure. The key-ins for the directory operations are similar to the utility example key-ins shown in Table 6-1.

6-4-2-6. ERASE

The disk erase operation of the Advanced Program Loader provides the following capabilities:

- Erase a file contained on a diskette located in the default Disk Drive or another Disk Drive.
- Change the default Disk Drive to any available Disk Drive.

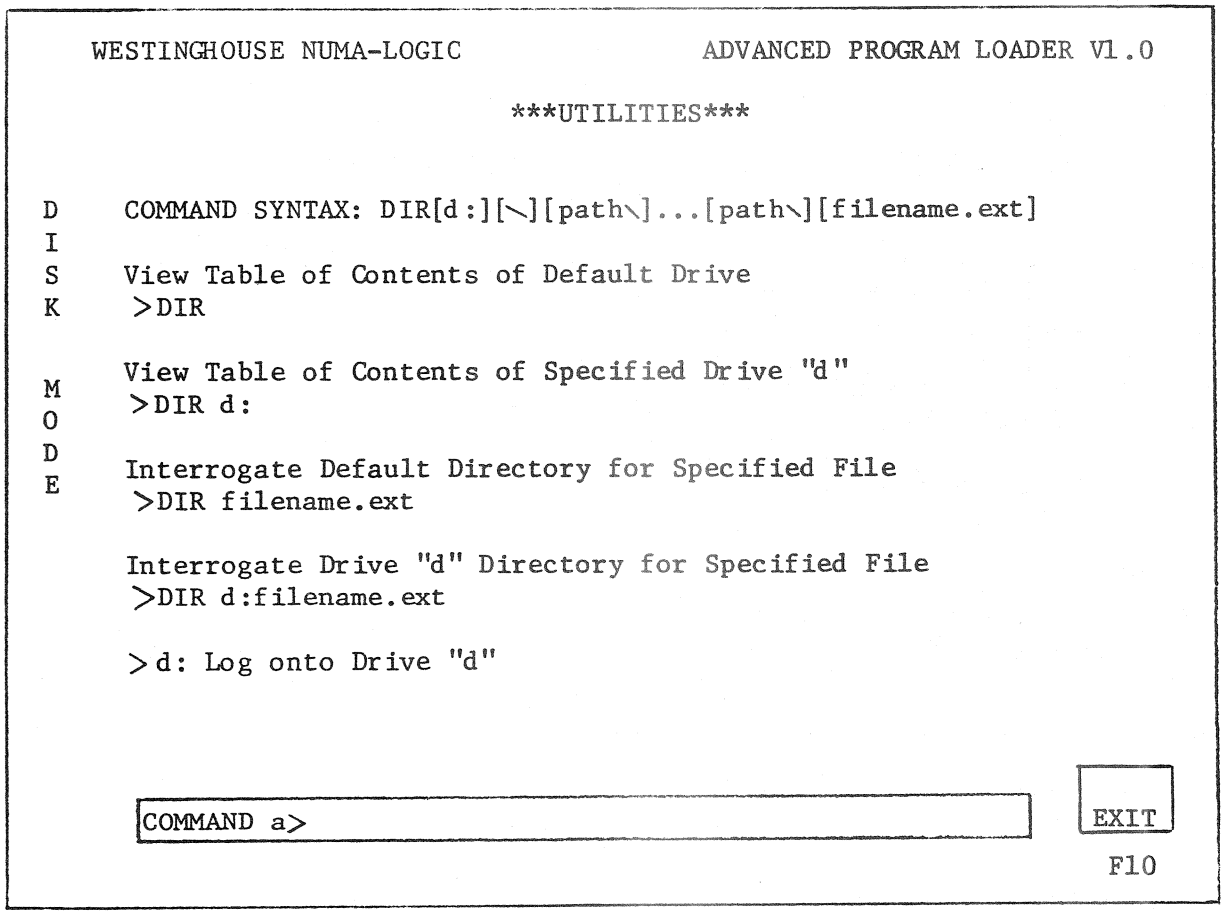

Figure 6-11. Disk Directory Menu

The entry format for each of these operations is listed on the screen displayed when the F6/ERASE function key is pressed followed by the Enter key (↵). See Figure 6-12. The key-ins for the erase operation are similar to the utility example key-ins listed in Table 6-1.

6-5. PRINT MODE

The Print mode of the Advanced Program Loader provides the ability to print ladder programs, registers, forced I/O, and ladder programs with coil cross-referencing. Also, the mode provides the ability to time the changes of state between:

- Selected contacts, or
- Changes in register contents

The Print mode of the Advanced Program Loader is very similar to the Print mode of the CRT Loader, as described in the CRT Programming Manual beginning on page 3-37. It is accessed by pressing the F5/EXEC FUNC function key when the Executive mode menu is being displayed.

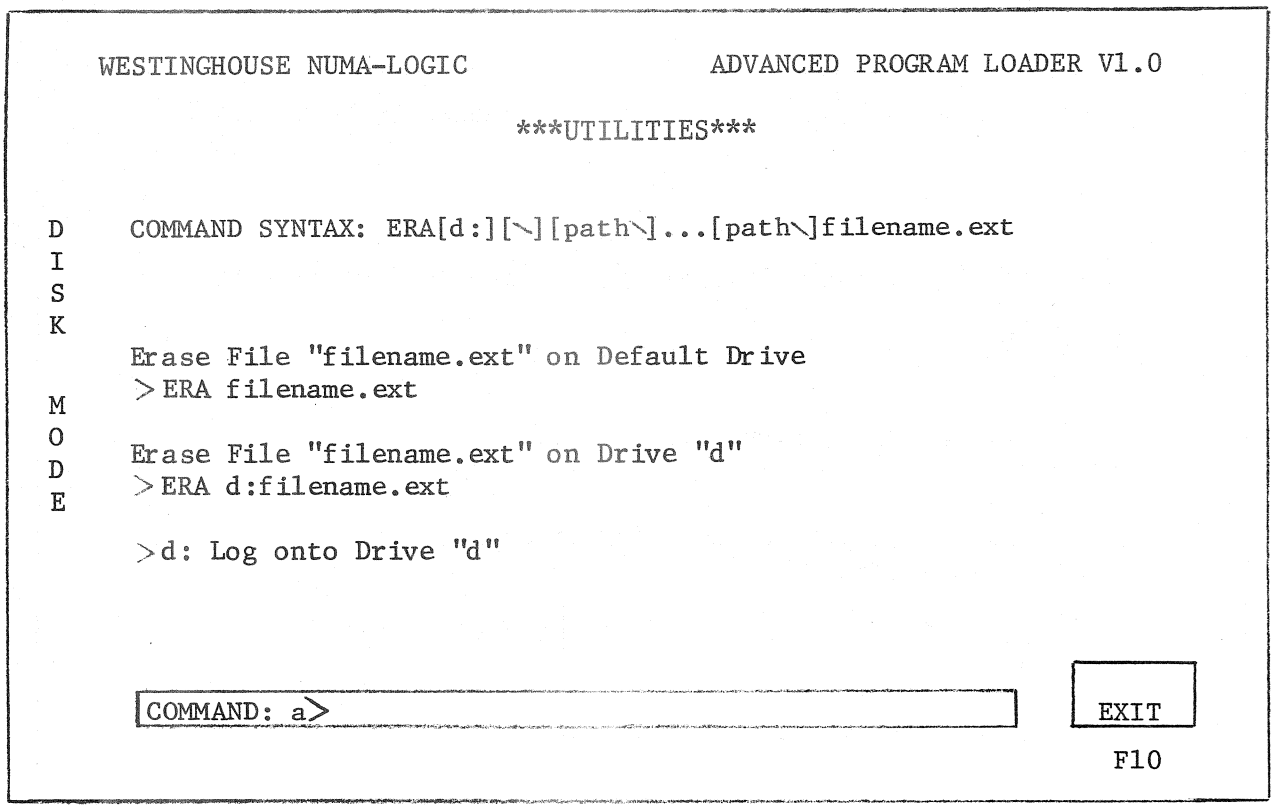

Figure 6-12. Disk Erase Menu

6-6. EXECUTIVE FUNCTION MODE

The Executive Function mode of the Advanced Program Loader provides the following functions:

- Configure the Communication Ports of the Advanced Program Loader (F1/CONFIG PORTS function key). See Figure 6-13.
- Display the status of the programmable controller on the screen (F4/PC STATUS function key).
- Test the programmable controller (F5/RETEST PC function key).
- Pack the registers (F6/PACK REGS function key).
- Erase the memory of the programmable controller (F9/ERASE PC MEM function key).

The Enter key (↵) must be pressed in each case after the desired function key to select the operation. Each of the Executive Function mode operations is described in the following Paragraphs.

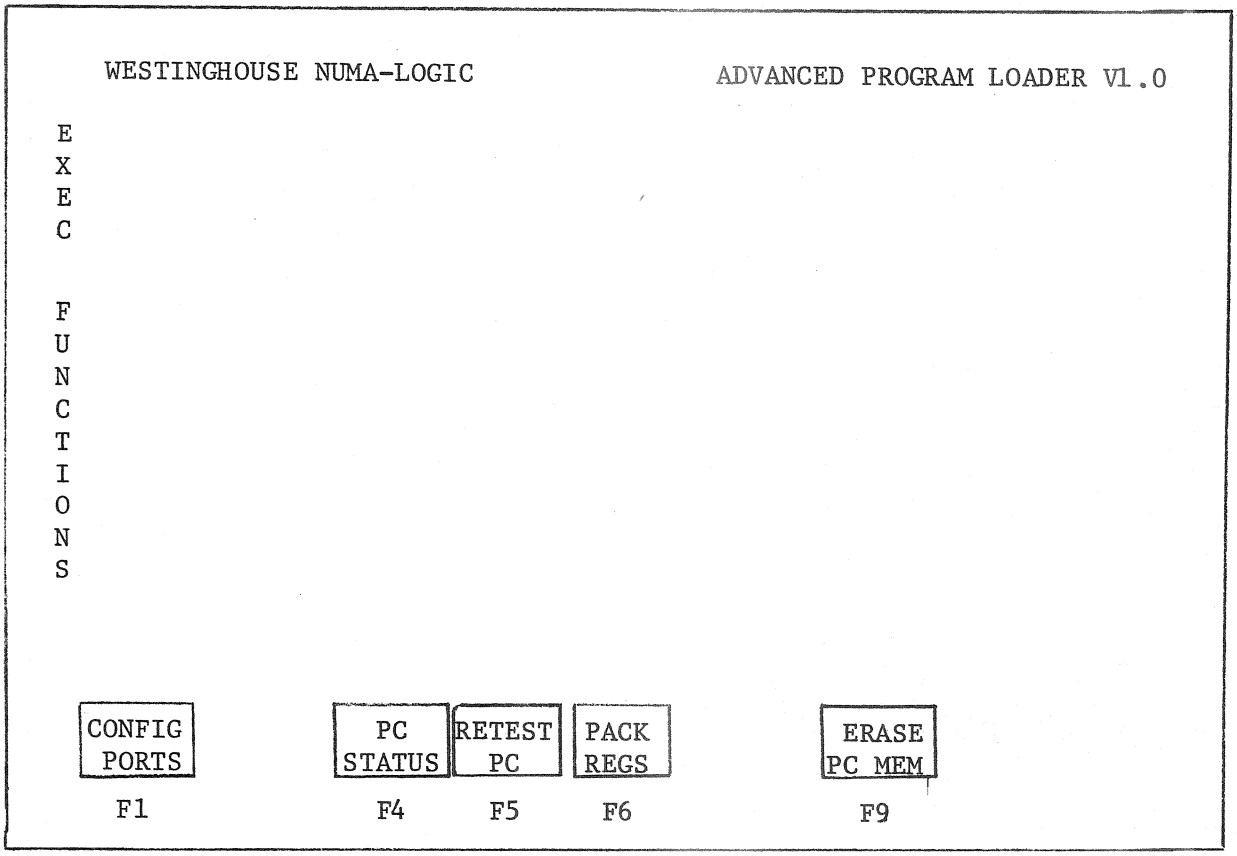

Figure 6-13. Executive Function Mode Menu

6-6-1. CONFIGURE PORTS

The configure ports operation allows the operator to configure the following characteristics for each of the communication ports:

- Baud rate
- Number of stop bits
- Number of data bits
- Parity

Also, the operator may specify:

- The printer port as either serial Port A of the Advanced Communication Card or the standard IBM parallel port (LPT1)
- The WESTNET II Data Highway local and target addresses

The configure ports operation is enabled from the Executive Function mode menu by pressing the F1/CONFIG PORTS function key. When the F1 key is pressed, the screen shown in Figure 6-14 is displayed. Observe the Figure and note the following:

- F1/PC PORT function is used to configure the programmable controller port (Port B, as shown in Figure 3-1).

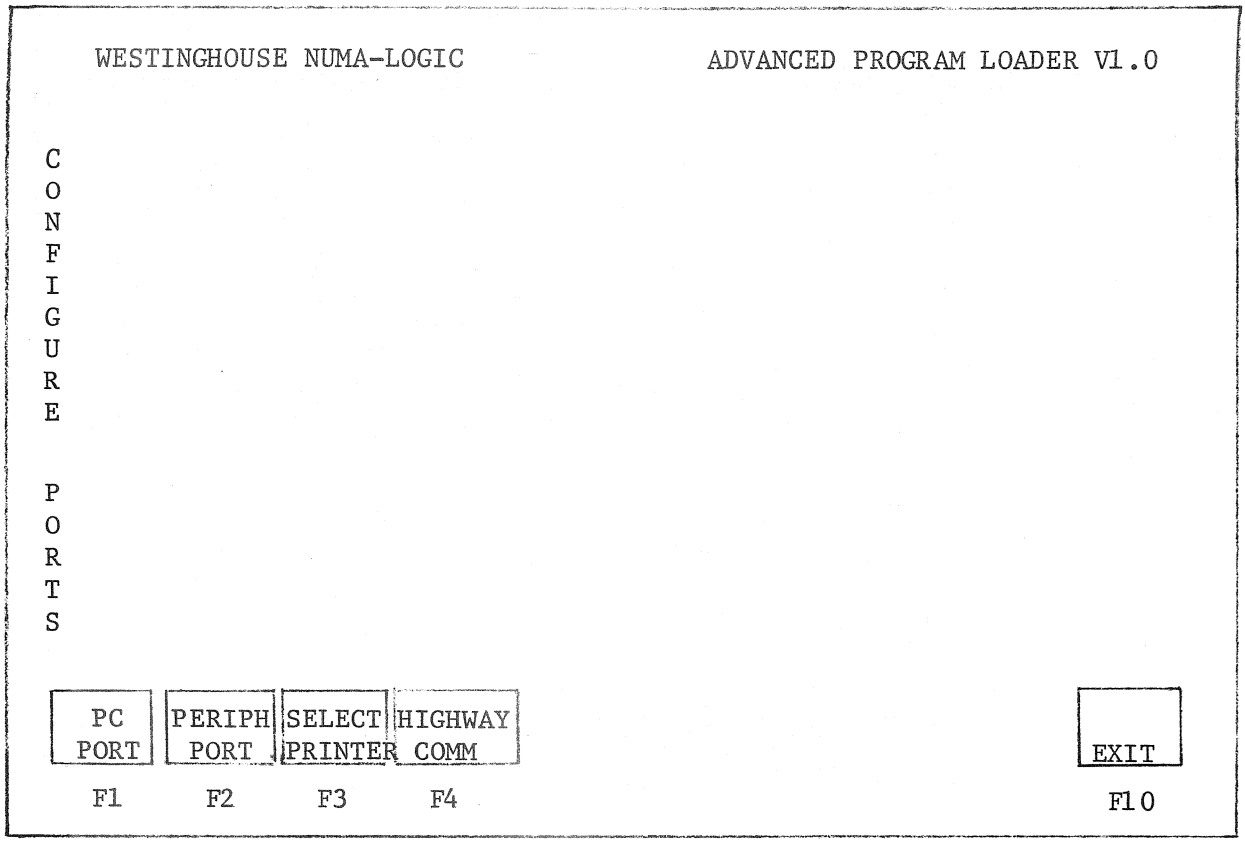

Figure 6-14. Configure Ports Menu

- F2/PERIPH PORT function key is used to configure the peripheral port (Port A, as shown in Figure 3-1).
- F3/SELECT PRINTER function key is used to select either the serial or parallel communications port. If the parallel port is selected, the standard IBM parallel printer--Epson FX180--can be used for ladder diagram printouts.
- F4/HIGHWAY COMM function key configures the WESTNET II Data Highway communications channel.

Each of the selections is discussed in the following Paragraphs.

6-6-1-1. PC AND PERIPHERAL PORTS

The programmable controller port and peripheral port configurations determine baud rates, stop bits, data bits and type of parity check for the ports. Pressing the F1/PC PORT, or F2/PERIPH PORT, function key causes the configure port menu to be displayed on the screen. See Figure 6-15. Observe the Figure and note the following:

- Default selections for the 4 configurable items are noted on the screen
- To select between items such as baud rate and stop bits, use the up [↑] and down [↓] keys which are part of the number keypad on the right portion of the Keyboard.

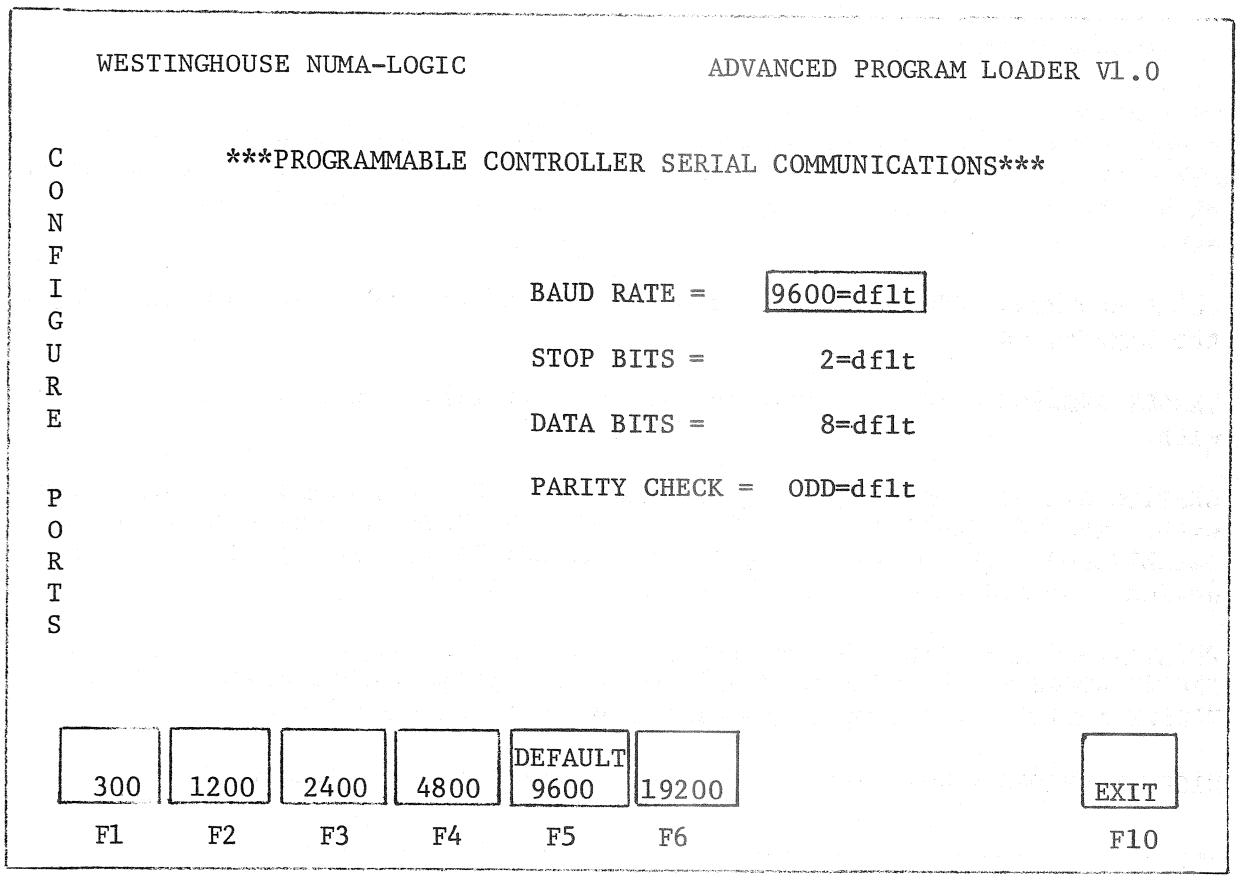

Figure 6-15. Configure Ports Menu

- The actual selections for baud rate, stop bits, data bits and parity check are also made using the function keys. For example, when the baud rate selection is being performed as shown in Figure 6-15, press the F2/2400 function key to select a baud rate of 2400.

- The configure port menus for the PC port and peripheral ports are identical except that the parity check default is ODD for the PC port and NONE for the peripheral port.

When the PC and/or peripheral port configurations have been completed, press the F10/EXIT function key to return to the main Executive Function menu.

6-6-1-2. SELECT PRINTER

The select printer operation allows the operator to select either:

- Serial Port A of the Advanced Communication Board. (See Paragraph 3-3-1.) The serial port is used with the Centronics 150 Series printer supplied by Westinghouse as Catalog No. NLP-786. (See Paragraph 3-4.)

- Parallel Port, standard with IBM Personal Computers. This port can be used with a standard IBM parallel printer or the Epson FX or MX series printers.

The serial port is the default selection.

6-6-1-3. HIGHWAY COMMUNICATION

The highway communication operation allows the Advanced Program Loader to communicate with the programmable controller through the WESTNET II Data Highway. Selecting the F4/HIGHWAY COMM function key from the configure ports menu initiates the operation and displays the screen shown in Figure 6-16. The 5 categories of items shown on the screen are:

- LOCAL ADDRESS - Address that the Advanced Program Loader is communicating to the highway on.
- TARGET ADDRESS - Address that the Advanced Program Loader is communicating with.
- SESSION STATUS - Address that the TARGET ADDRESS is currently communicating with. The SESSION STATUS matches the LOCAL ADDRESS if communications is established. If the target device is already communicating with another device, the address of this third device is displayed.
- PC STATUS - Mode and Override status of the programmable controller at the TARGET ADDRESS. Nothing is displayed if the programmable controller at the TARGET ADDRESS is currently communicating with another device.
- HIGHWAY ERRORS - Any Data Highway error messages are displayed below this title.

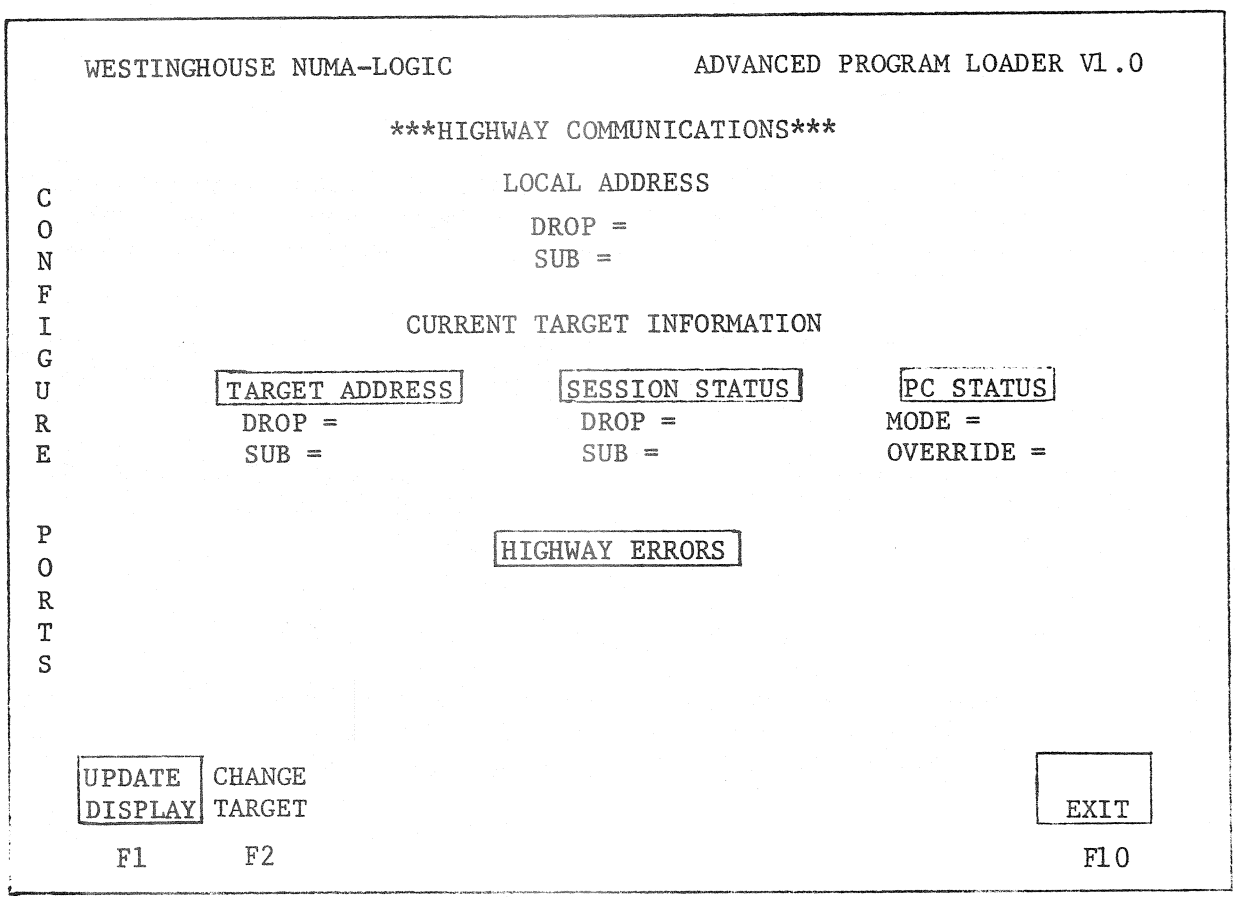

Figure 6-16. Highway Communications Menu

When the highway communications operation is initially accessed, three F keys are displayed: F1/UPDATE DISPLAY, F2/CHANGE TARGET, and F10/EXIT.

The F1/UPDATE DISPLAY function refreshes the screen and causes all current highway information to appear.

The F2/CHANGE TARGET operation allows the user to select the highway address that he desires to communicate with. When the CHANGE TARGET function key and Enter key are pressed, the user is prompted to specify the TARGET ADDRESS. The specification is done by highlighting the proper parameters and entering the desired values. Once the desired values have been entered, communications with the TARGET ADDRESS is attempted by pressing the EXECUTE CHANGE function key. Once the EXECUTE CHANGE function key is pressed, the screen is refreshed with the current highway data. If the ABORT function key is pressed, no changes are made.

Once communications are established with a TARGET ADDRESS, a choice of two additional function keys appears on the screen to change the mode of the target PC from the local address:

- OVERRIDE ON operation is equivalent to changing the keyswitch position of the target PC
- OVERRIDE OFF returns the control of the programmable controller to the keyswitch

After communications are established with a target programmable controller, the Advanced Program Loader operates as if it is plugged directly into the programmable controller.

6-6-2. PC STATUS

The PC status operation initiates a display of the current status of the programmable controller. Press the F4/PC STATUS function key when the Executive Function mode menu is active to display the PC status. An example of the status of a PC-900 is shown in Figure 6-17. Refer to the CRT Programming Manual for more information on PC status as described starting on page 3-58.

6-6-3. RETEST PC

The retest PC operation provides the operator with the ability to clear the fault registers and initiate a verification of the programmable controller. Press the F5/RETEST PC function key when the Executive Function mode menu is displayed to initiate the test. When the test is completed, DONE will be displayed on the CRT. If the verification fails, the screen indicates the type of failure.

6-6-4. PACK REGISTERS

The pack registers operation can be used to recover unused memory locations from the processor that may have previously been used by holding registers. For example, if a holding register is used in a special function, and the special function is deleted, the controller "thinks" that the register is still used. The pack registers function alleviates this problem. Press the F5/PACK REG function key when the Executive Function mode menu is displayed to perform the pack registers operation.

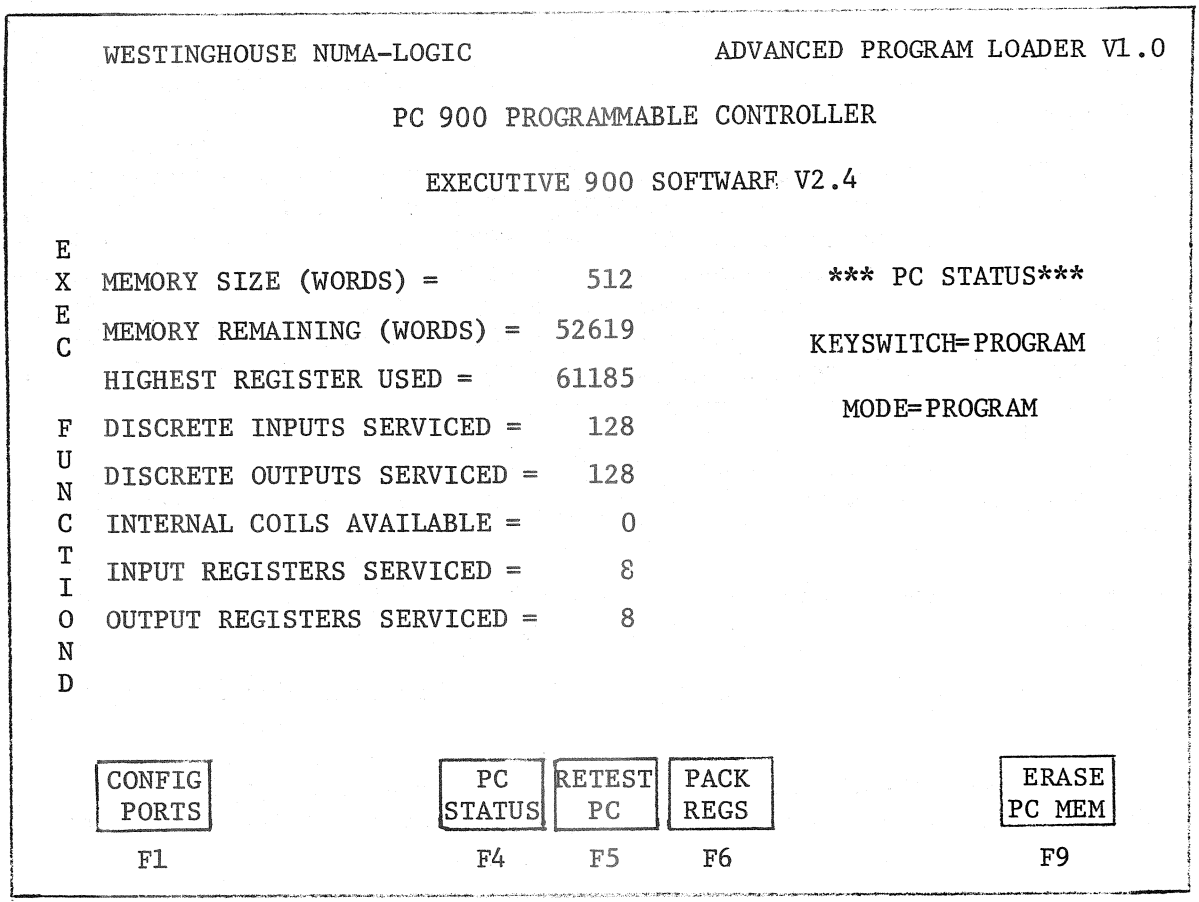

Figure 6-17. PC Status Display Example

6-6-5. ERASE MEMORY

The erase memory operation clears the ladder program of the programmable controller. Press the F9/ERASE PC MEM function key to automatically erase the ladder program from the programmable controller. The keyswitch of the programmable controller must be in the PROGRAM position or the operation will be aborted. If the programmable controller is in a fault mode, the operator will be requested to:

- Proceed and clear memory, or
- Abort the operation.

Section 7

ADVANCED PROGRAM LOADER FUNCTIONS

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Section 7

ADVANCED PROGRAM LOADER FUNCTIONS

7-1. INTRODUCTION

Functions are defined as operations of the Advanced Program Loader which can be initiated from either the Program or Monitor modes. The functions discussed in this Section are:

- Search function (Par. 7-2)
- Register function (Par. 7-3)

7-2. SEARCH FUNCTION

The search function of the Advanced Program Loader provides the ability to locate and display rungs of the ladder program containing the specified contacts, coils, registers, or forced conditions. The search function can be entered from either the Program or Monitor modes. Press and hold the CTRL key and then press the S key to enter the search function. The menu shown in Figure 7-1 is displayed.

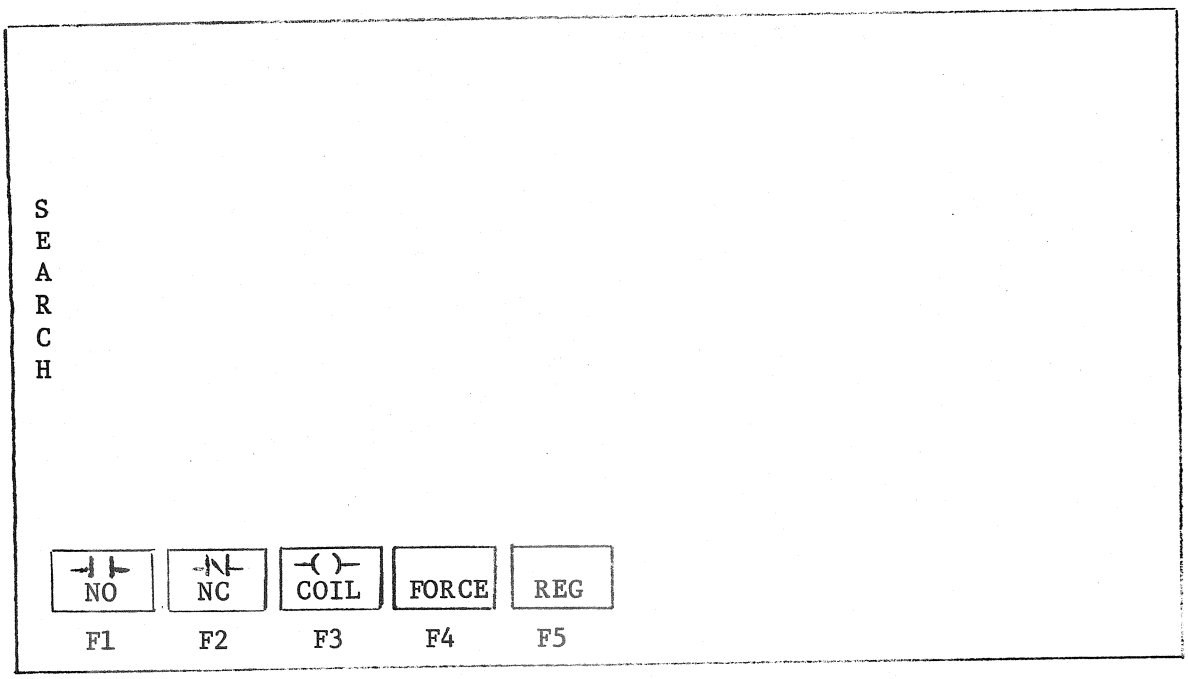


Figure 7-1. Search Menu

When the search menu is displayed, pressing the F1 thru F5 function keys initiates the display of submenus as follows:

- F1/NO contact function key, or F2/NC contact function key, causes the menu shown in Figure 7-2 to be displayed. Select the type of contact by pressing

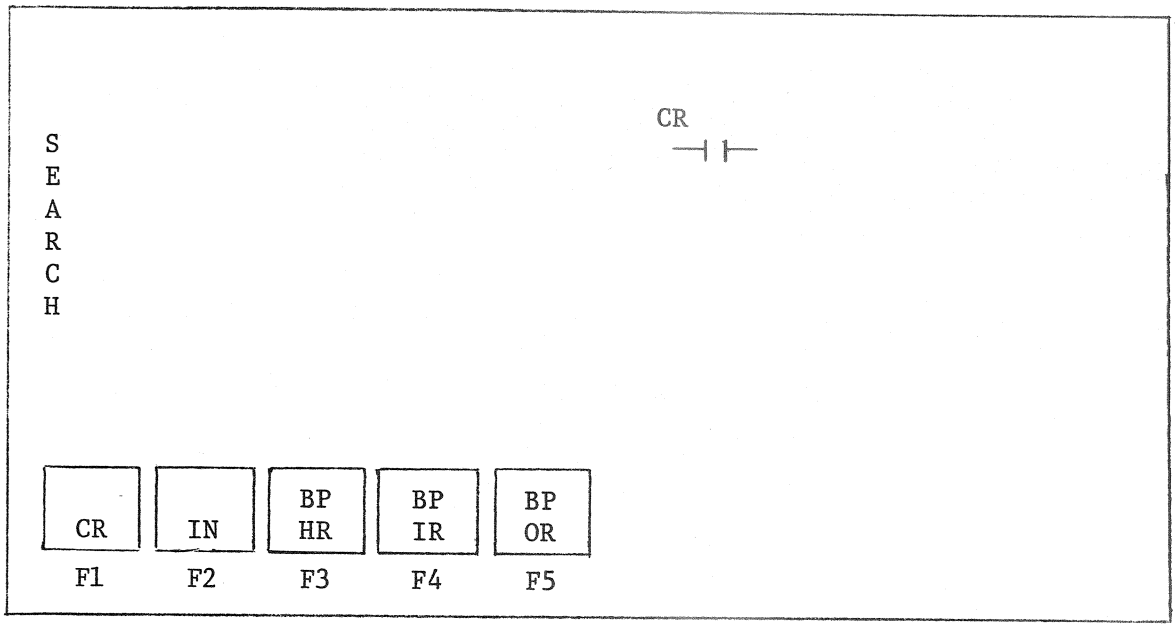


Figure 7-2. Search for Contacts Submenu

the F1 thru F5 function keys followed by the reference number. The search entry is completed by pressing the Enter key (↵).

- F3/COIL function key causes the menu shown in Figure 7-3 to be displayed. Select the type of contact by pressing the F1 thru F7 function key followed by the reference number. The search entry is completed by pressing the Enter key (↵).

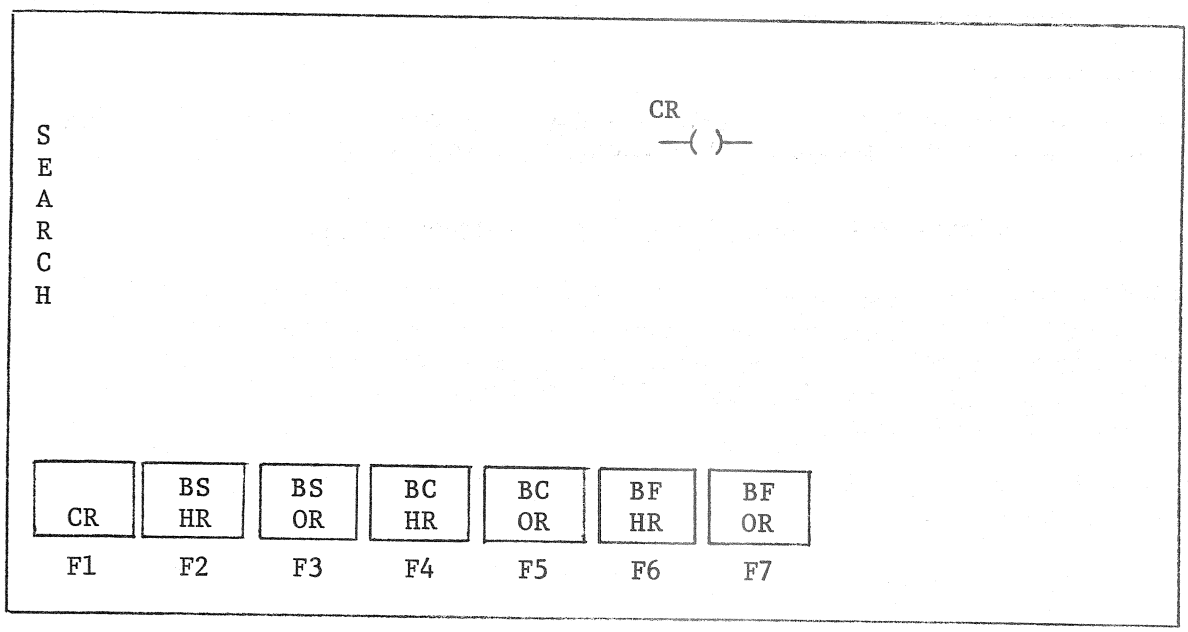
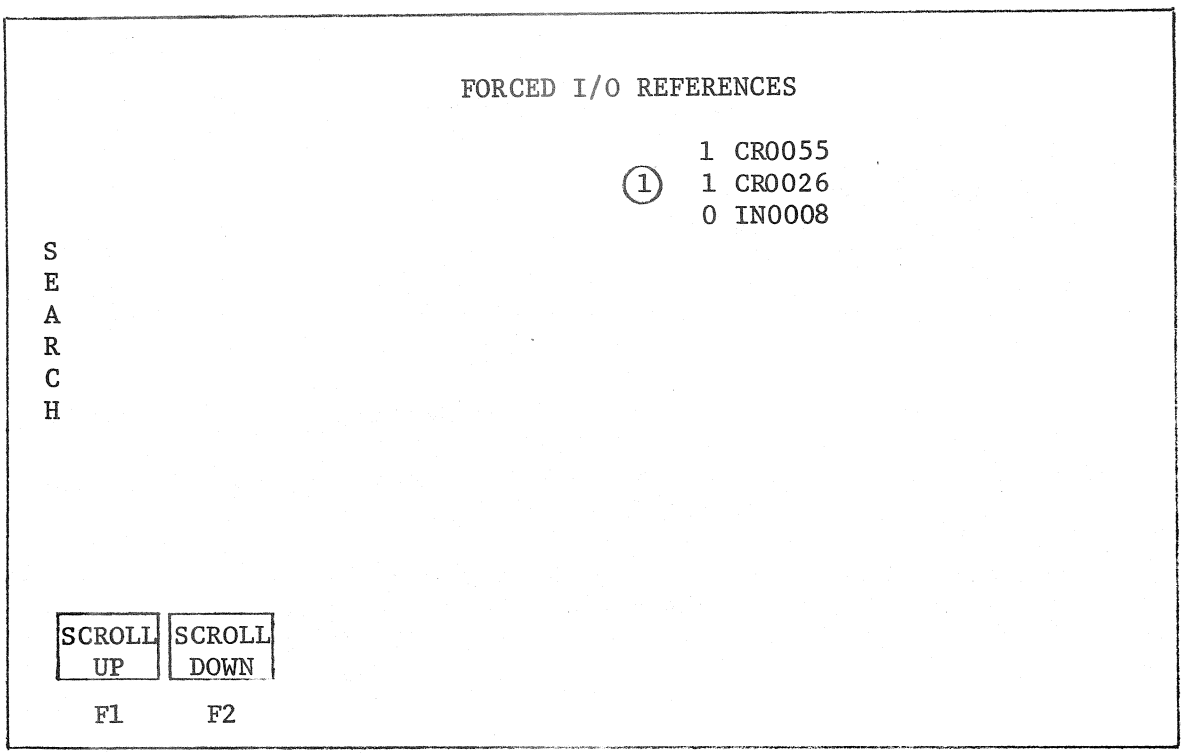


Figure 7-3. Search for Coil Submenu

- F4/FORCE causes the display of forced I/O references to be displayed. Any elements previously forced are displayed on the screen, as shown in the example of Figure 7-4. Up to 15 element reference numbers will be displayed. If more than 15 elements are forced, the F1/SCROLL UP and F2/SCROLL DOWN function keys can be used to observe all the elements. Elements are forced in the Loader's Monitor mode.



(1) A "1" to the left of the element reference number indicates the element is forced on. A "0" indicates the element is forced off.

Figure 7-4. Search for Force Submenu Example

- F5/REG causes the menu shown in Figure 7-5 to be displayed. Select the type of register by pressing the appropriate F1 thru F6 function key followed by the register number. The entered register type and reference number appear on the screen, as shown in Figure 7-5. The search entry is completed by pressing the Enter key (↵).

When a search is initiated, it begins at the start of the ladder program and searches for the element until:

- It displays the rung containing the element searched for, or
- The element is not in the ladder program. At this time the message NOT FOUND is displayed momentarily before automatically returning to the Program or Monitor mode.

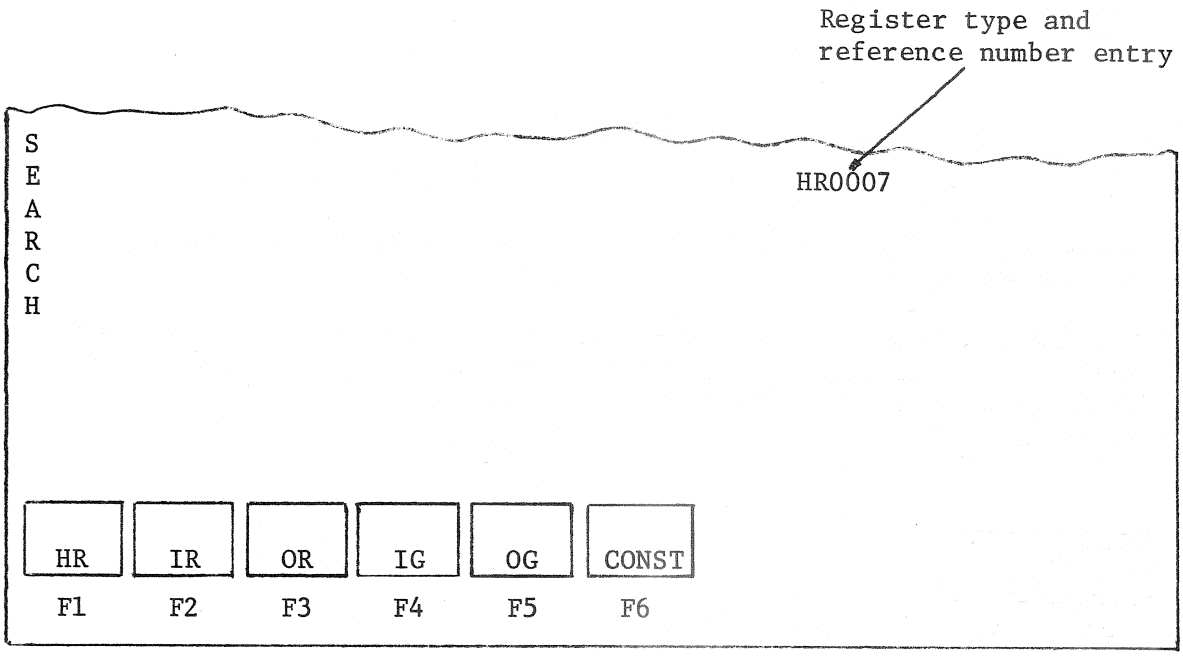


Figure 7-5. Search for Register Submenu

If the searched element is found, a search for the element in other rungs can be made by pressing and holding the CTRL key and then pressing the Z key. This is referred to as the continued search operation.

7-3. REGISTER FUNCTIONS

The register functions provide the ability to monitor and change the contents of the registers associated with the ladder program. The register function is initiated by:

- Pressing and holding the CTRL key and then pressing the R key when the Advanced Program Loader is in the Program or Monitor mode.
- Pressing the F3/REG function key when the main Monitor mode menu is being displayed.

The screen shown in Figure 7-6 is displayed when the register function is selected. The operator must first choose whether the register data will be displayed in:

- Decimal: Press F1 function key
- Binary: Press F2 function key
- Hexadecimal: Press F3 function key
- ASCII: Press F4 function key

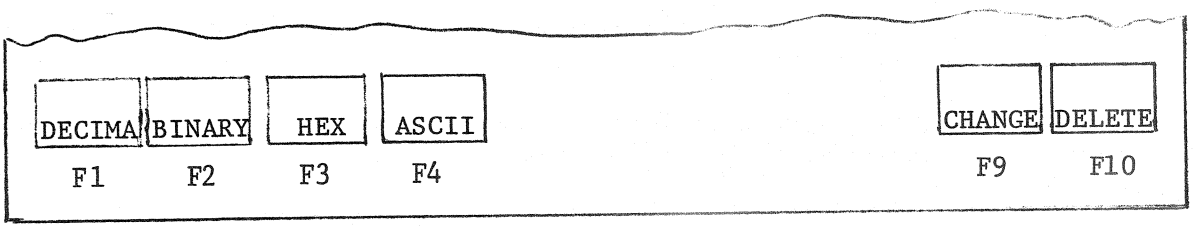


Figure 7-6. Numbering System Selection

When the numbering system selection has been made, the single or table selection screen will be displayed. See Figure 7-7. The operator selects either:

- F1/SINGLE REGISTER function key to select a single register to be displayed on the screen, or
- F2/TABLE function key to select a table of registers to be displayed on the screen. The table contains all possible registers of the type chosen, although only 21 will be displayed at one time.

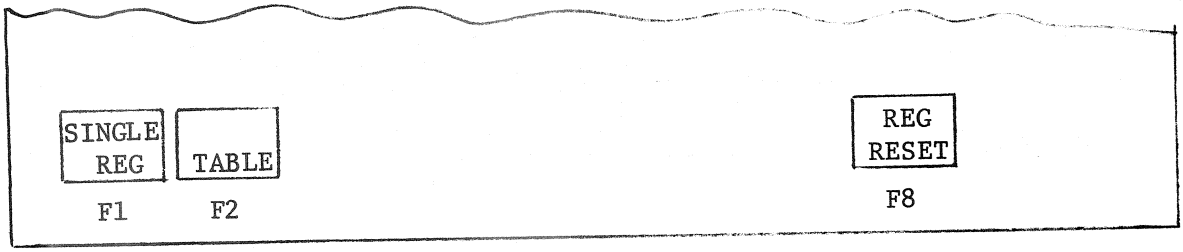


Figure 7-7. Single/Table Selection

Immediately after pressing the F1 or F2 key, the screen displays the register type submenu. (See Figure 7-8.) Next, the operator selects the function key F1 thru F6 to define the type of register which will be monitored. Finally, the reference number of the register is keyed in followed by the Enter key (↵). As soon as the Enter key is pressed, the contents of the register are displayed, as shown in Figure 7-8.

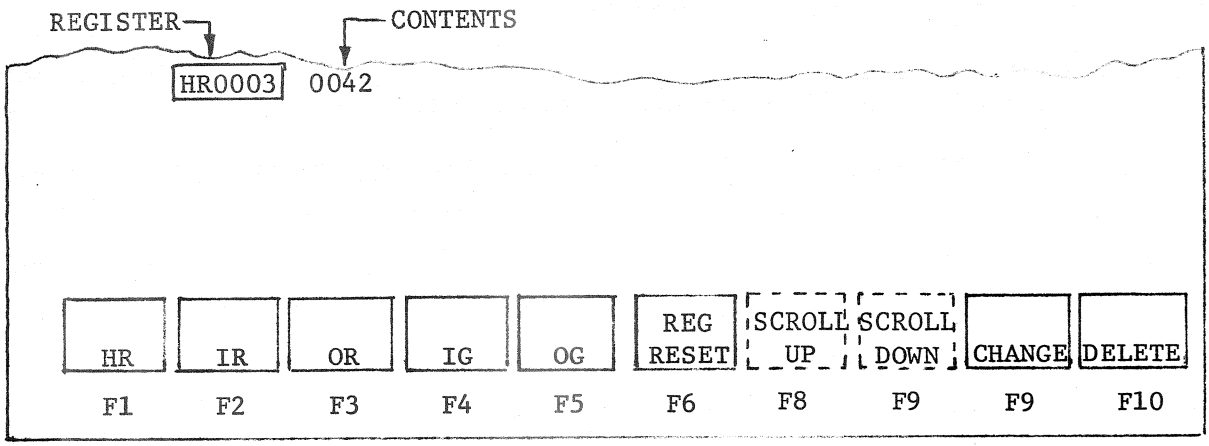


Figure 7-8. Register Type Submenu

The register can be changed or deleted as follows:

- Press F9/CHANGE function key followed by entering the new register contents. When completed, press the Enter key (↵).
- Press the F10/DELETE function key to remove the register from the screen before selecting a new register to monitor or modify.

If the table selection had been made instead of the single register selection, the screen would display the reference number and contents of up to 21 consecutive regis-

ters beginning with the register number entered by the operator. Also the F7/SCROLL UP and F8/SCROLL DOWN function keys can be used to display additional registers beyond the 21 appearing on the screen.

Appendix A

COMPAQ COMPUTER MODIFICATIONS

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Appendix A

COMPAQ COMPUTER MODIFICATIONS

A-1. INTRODUCTION

The information contained in Section 3, "Computer Modifications," applies to both the IBM and COMPAQ portable/personal computers. Thus there is no need to repeat topics such as standard and optional equipment, vendor addresses, cable connections, and communications setup. These are all common to both types of units.

There is, however, a need to detail Advanced Communications Board installation procedures in relation to the COMPAQ. (The COMPAQ Operations Guide does not discuss this area.) See Figure A-1.

The purpose of this Section is to explain how to install the Communications Board, or equivalent.

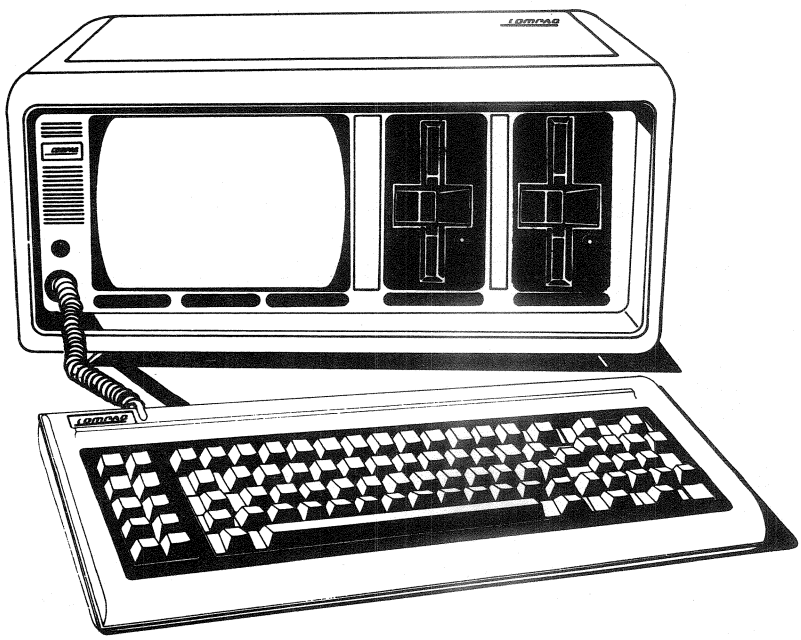

Figure A-1. COMPAQ Portable Computer

A-2. INSTALLATION

Follow these steps to install the Communications Board.

Step 1 - Turn the COMPAQ's AC power switch to the off position, and detach the AC supply cord from the unit.

Step 2 - Stand in front of the computer, and position your arms and hands over the rear top edge, as shown in Figure A-2.

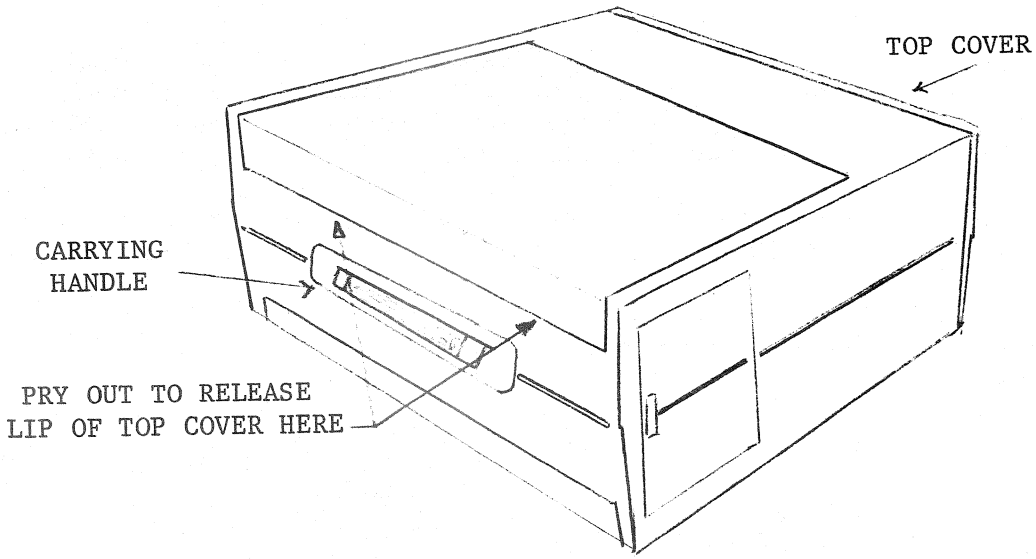

Figure A-2. COMPAQ Lid Removal

Step 3 - With your thumbs and palms, press the lid down. At the same time pry the lid outward with your fingertips.

Step 4 - Once loose, gently lift the top cover to gain access to the unit's Input/Output Compartment. Lay it aside.

Step 5 - Without removing them, loosen the 6 screws securing the Input/Output Compartment to allow removal of the cover.

Step 6 - Remove the screw that secures the expansion slot cover. Remove and discard this cover. Do this in either of the 2 unused slots. (See Figure A-3.)

Step 7 - Setup the AST Advanced Communications Board as described in Paragraph 3-6.

Step 8 - Install the Board in the desired slot. Be sure to seat it firmly in the connector.

Step 9 - Reinstall the screw removed in Step 6, above. This fits into a metal fitting on the Board and secures it. (See Figure A-4.)

Step 10 - Replace the Input/Output Compartment Cover, and tighten the screws securely.

Refer to Paragraph 3-8 for cable installation procedures.

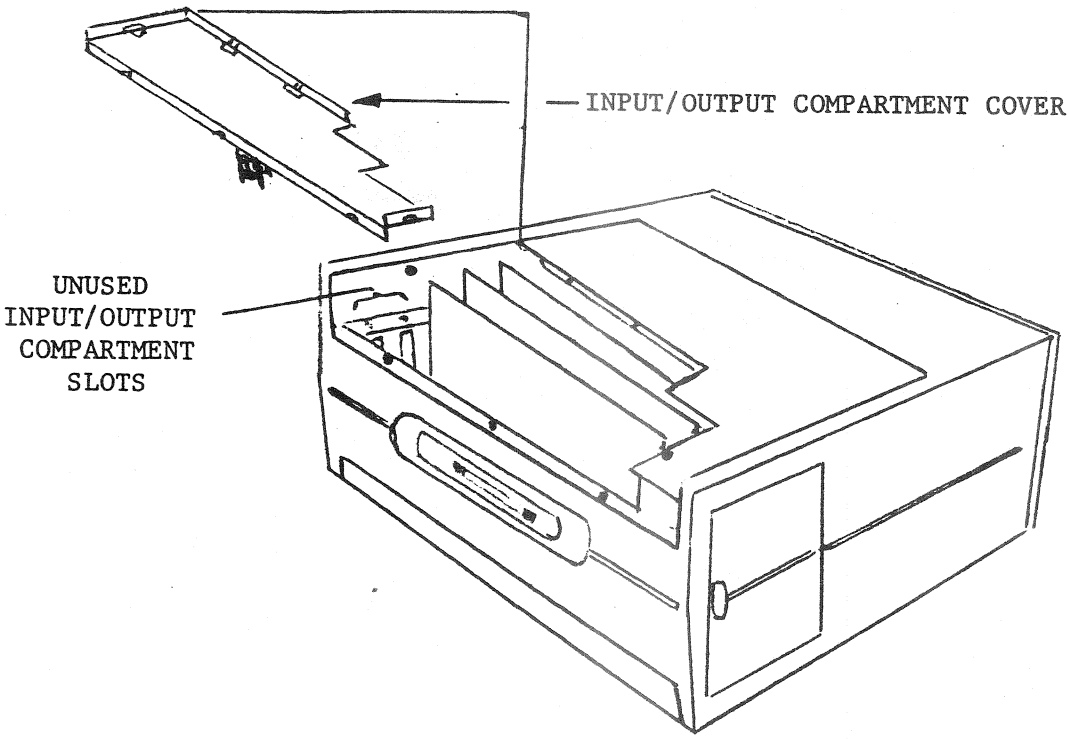

Figure A-3. Input/Output Compartment Cover

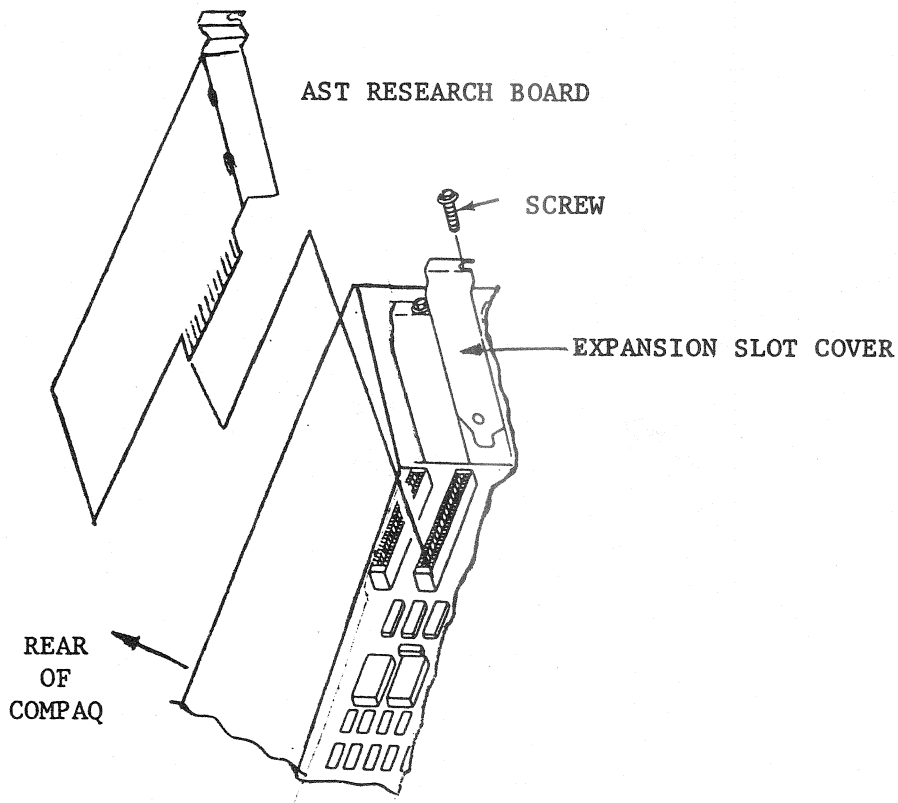

Figure A-4. Input/Output Compartment