Allen-Bradley

BASIC Development Software

(Catalog Numbers 1747-PBASE)

Programming Manual

Rockwell Automation

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell International Corporation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Rockwell Automation publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Chapter 3

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The DOS Directory Shell

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- who should use this manual
- the purpose of this manual
- how to use this manual
- terms and abbreviations
- conventions used in this manual
- Rockwell Automation support

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Allen-Bradley small logic controllers.

You should have a basic understanding of SLC 500™ products, PLC products, and 1771 and 1746 I/O products. You should understand programmable controllers and be able to interpret the ladder logic instructions required to control your application. If you do not, contact your local Rockwell Automation representative for information on available training courses before using this product.

Purpose of this Manual

This manual is a programming guide when using the BASIC Development Software, 1747-PBASE.

Chapter	Title	Contents
	Preface	Describes the purpose, background, and scope of this manual. Also lists related publications.
1	Installing the Software	Described how to install the BASIC Development Software onto your personal computer.
2	Getting Familiar with Your Development Software	Describes the basic concepts of the BASIC Development Software, including how the help system works, using the pull-down menus, and creating a simple first program.
3	Configuring Your Software	Provides information on a number of configuration options including mouse, display, printer, memory, function keys, and Terminal mode.
4	Editing a Program	Covers all editing techniques, including searches, moving blocks of text, text formatting, and advanced editing features.
5	Manipulating Files	Provides information on file management, from simple loads, saves, and merges, to creating your own User Menus.
6	Writing Programs Using the BASIC Development Language	Begins with an overview of the BASIC language, macros, and program organization. A second sample program is written, translated and downloaded.
7	Printing Your Program	Covers all aspects of printer setup and printing.
8	Translating Your Program	Prepares your BASIC development program for downloading to the BASIC or BASIC-T module.
9	Communicating with the BASIC or BASIC-T Module	Provides information on changing to Terminal mode, downloading to and uploading from the module, and debugging your BASIC program.
Appendix A	BASIC Macro Library	Lists the programming macros available through the BASIC Development Software.
Appendix B	The DOS Directory Shell	Explains how to display a DOS directory tree and directory from which you can execute a large number of DOS commands.

Related Documentation

The following documents contain additional information regarding Rockwell Automation products. To obtain a copy, contact your local Rockwell Automation office or distributor.

For	Read this document	Publication Number
A BASIC and BASIC-T manual that provides information on installing and using the 1746-BAS and 1746-BAS-T modules.	SLC 500™ BASIC and BASIC-T Modules User Manual	1746-UM004A-US-P
A reference manual that explains the BASIC language as used with the BASIC and BASIC-T modules.	BASIC Language Reference Manual	1746-RM001A-US-P
A user manual that provides information on installing and using the 1771-DB/B module.	BASIC Module User Manual	1771-6.5.113
An overview of the SLC 500 family of products	SLC 500™ System Overview	1747-SO001A-US-P
A description of how to install and use a Modular SLC 500 Processor	Modular Hardware Style Installation and Operation Manual	1747-6.2
A reference manual that contains status file data and instruction set information for SLC 500 processors	SLC 500™ and MicroLogix™ 1000 Instruction Set Reference Manual	1747-6.15
A description of how to install and use a module that acts as a bridge between DH485 networks and devices requiring DF1 protocol.	DH-485/RS-232C Interface Module User's Manual	1747-6.12
In-depth information on grounding and wiring Allen-Bradley programmable controllers	Allen-Bradley Programmable Controller Grounding and Wiring Guidelines	1770-4.1
A glossary of industrial automation terms and abbreviations	Allen-Bradley Industrial Automation Glossary	AG-7.1
An article on wire sizes and types for grounding electrical equipment	National Electric Code	Published by the National Fire Protection Association of Boston, MA

Terms and Abbreviations

The following terms and abbreviations are specific to this product. For a complete listing of Allen-Bradley terminology, refer to the Allen-Bradley Industrial Automation Glossary, publication number ICCG-7.1.

- A-Stack error — occurs when too many expressions are PUSHed onto the argument stack or when you attempt to POP data that does not exist
- BASIC development language — enhanced BASIC language that comes with the BASIC Development Software (catalog number 1747-PBASE) and provides programming support for the BASIC and BASIC-T modules.
- DH485 — network communication protocol
- dialog box — a box that appears on the screen of the BASIC Development Software displaying available options for a selected menu item
- EMS — refers to the expanded memory that may be installed on your personal computer. The BASIC Development Software uses *expanded* memory not *extended* memory.
- EPROM — Erasable Programmable Read Only Memory
- file — a BASIC program file
- filename extension — the characters to the right of the filename and period.
- Hypertext help — a context-sensitive help system that allows access to help from practically any point in the BASIC Development Software.
- keystroke macros — a recorded series of keystrokes invoked by one keystroke to reduce the number of keystrokes needed to perform a function
- memory module — BASIC or BASIC-T modules EEPROM or UVPROM
- MTOP — system control value that holds the last valid memory address
- program port — the port used to program the module. Either PRT1 or port DH485 can be used as the program port.
- programming macros — commands available through the BASIC Development Software designed to streamline programming
- QuickStroke — refers to a key or pair of keys that are pressed rapidly to perform a function or access a menu. These keys are shown within braces **[ ]**, for example, **[Alt-F10]**.
- RAM — Random Access Memory
- ROM — Read Only Memory, refers to the optional memory module memory space (EEPROM or UVPROM)
- RS-232/423 — serial communication interface
- RS-422 — differential communication interface
- RS-485 — network communication interface
- SLC 500 — SLC 500 fixed and modular controller

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- Text in **`this font`** indicates words or phrases you should type.
- Key names match the names shown and appear in bold, capital letters within brackets (for example, **`[ENTER]`**).
- The progression to arrive at a screen through a menu path is shown as follows:

`Path: Toplevel menu → Edit mode → File → load file in cur.win.`

- The progression to arrive at a screen through a QuickStroke is shown as follows:

`QuickStroke: <SHIFT-F5>`

Rockwell Automation Support

Rockwell Automation offers support services worldwide, with over 75 Sales/ Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Rockwell Automation representatives in every major country in the world.

Local Product Support

Contact your local Rockwell Automation representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

Technical Product Assistance

If you need to contact Rockwell Automation for technical assistance, please review the information in the appropriate chapter first. Then call your local Rockwell Automation representative.

Your Questions or Comments on this Manual

If you find a problem with this manual, please notify us of it on the enclosed Publication Problem Report.

If you have any suggestions for how this manual could be made more useful to you, please contact us at the address below:

Rockwell Automation
Control and Information Group
Technical Communication, Dept. A602V
P.O. Box 2086
Milwaukee, WI 53201-2086

Installing the Software

This chapter begins with a general description of your BASIC Development Software and then steps you through installing the software on your personal computer. Major topics include:

- a general description of the BASIC Development Software
- the necessary hardware for installation
- the BASIC Development Software disk sets
- how to install your software
- how to back up your disks

What Your Software Does

This section provides a general outline of what the BASIC Development Software can do. Standard features of the BASIC Development Software include:

- communication terminal capabilities
- debugger feature to troubleshoot software that is executing on the BASIC or BASIC-T module
- translator utility to convert BASIC Development Software programs for downloading to the module
- windows that allow you to edit up to 100 files (or different parts of the same files) simultaneously
- adjacent window function for easy movement between split windows
- pull-down menu system and QuickStroke shortcuts
- dynamic display function key labels with **[Shift] [Ctrl]** and **[Alt]** keys
- user-definable keystroke macros that allow you to replace a series of commonly used keystrokes with a single keystroke
- undo up to 65,535 operations and then redo the last undo
- line, stream, and columnar block operations, including inter-window copy, move, and cut-and-paste capability
- search and replace multi-file search across directories or files
- DOS shell and DOS directory shell with multi-directory display
- Hypertext help that provides a context-sensitive on-line help system, available at all times
- automatic extension that allows specific default setups for editing, translating, and compiling
- language support (auto-indent, construct matching) for BASIC

- linedraw facility that lets you program graphic screens that translate into BASIC and can be executed from the module
- simple text formatting features including intelligent word wrap and reformat, indent and outdent
- mouse support to speed menu selections
- pop-up programmer's calculator with hex, decimal, octal and binary operations, a simulated printing tape, and the ability to paste the result into a program
- pop-up ASCII table with hexadecimal and decimal equivalents
- full EMS support where large files may be edited completely in EMS memory
- swap out memory to EMS memory or disk when running other programs or large compiles
- user menus that you can create for rapidly selecting your most frequently edited files, or for selecting frequently used programs installed in your personal computer
- user-configurable default switch set-ups for search and replace, and multi-file search functions
- multiple default directories based on file extensions (.bas files in one directory; .bdl files in another)

The BASIC Development Software requires an MS-DOS compatible personal computer with at least 640K byte available RAM installed and at least 2M byte of available disk space on the hard drive. Your personal computer must be operating with a DOS version between 3.1 and 6.22.

Hardware Requirements

Your BASIC Development Software supports almost all video cards and video modes. EGA 43 line and VGA 50 line modes are built in. Other video modes can be configured using the command line. Refer to Chapter 3 for additional information on configuring video modes.

The software supports Microsoft, MOUSE SYSTEMS, LOGITECH or any compatible mouse. It also supports the Expanded Memory Specification 4.0 and above.

Hardware for Interfacing Your Personal Computer with the BASIC or BASIC-T Module

A minimum of one communication port must be available on your personal computer. You need one of the following combinations of accessories to interface your personal computer with the module.

To interface the communication port (COM1 or COM2) on your personal computer with port DH485 on the module, use an Allen-Bradley 1747-PIC Interface/Converter:

- for direct connection to port DH485 on the module
- plus an Allen-Bradley 1747-AIC Isolated Link Coupler to interface your personal computer with a DH485 network on which the module resides

To interface the communication port (COM1 through COM8) on your personal computer with the port PRT1 on the module, use a 9-pin female to 25-pin male for the 1771-DB/B null modem cable or a 9-pin female to 9-pin female D-shell for the 1746-BAS or 1746-BAS-T null modem cable.

To communicate with the module without using one of the communication ports on your personal computer, use an Allen-Bradley 1784-KR DH485 Interface Card and 1747-AIC Link Coupler for direct connection to port DH485 on the module.

For cable details and jumper settings associated with these different configurations, refer to the *SLC 500 BASIC and BASIC-T User Manual* (publication number 1746-UM004A-US-P).

You should have two 3.5 inch disks or three 5.25 inch disks.

Table 1.1 Disk Contents

Disk Number	Contents 3.5 inch disks	Contents 5.25 inch disks
1	INSTALL.EXE IDENTIFY.TXT MACROS.EXE HELP.EXE	INSTALL.EXE IDENTIFY.TXT HELP.EXE
2	IDENTIFY.TXT BASICEX.EXE TRANS.EXE MISC.EXE	IDENTIFY.TXT MACROS.EXE
3	none	IDENTIFY.TXT BASICEX.EXE TRANS.EXE MISC.EXE

Installation Procedure

Before installing your BASIC Development Software, the autoexec.bat file in your personal computer should be modified to include the \ABBASIC\BDS directory in its path command. This allows the BASIC Development Software to be initiated from any directory in the hard disk.

Use some form of file editing (most DOS systems come with an editing program called EDLIN) to add this statement to the path line in the autoexec.bat file on your personal computer. You may need to refer to the DOS manual for your personal computer for detailed information on structuring and editing this file. An example of a typical path statement with this directory added would be as follows:

```
PATH=C:\;C:\DOS;C:\MOUSE;C:\ABBASIC\BDS;
```

IMPORTANT When modifying your path command in the autoexec.bat file, *do not* remove any other directories from the existing path. Add **`C:\ABBASIC\BDS;`** to the end of the current path line. This assumes you are installing your BASIC Development Software on the hard drive called C:. If you are installing on a different hard drive, substitute the letter of that drive for the C: above.

Check your config.sys file to be sure it establishes a minimum of 20 files and 20 buffers. In most DOS systems, this file can be read by typing **`TYPE CONFIG.SYS`**. If necessary, edit this file to include the lines:

```
FILES=20
BUFFERS=20
```

IMPORTANT The number of files and buffers required is a *minimum* of 20. If the current number is greater than 20, do not reduce this number to 20. Doing so may cause some other software installed on your personal computer to become inoperable.

An automated installation program is provided to ease installation. The installation program automatically creates sub-directories and copies files from the disks to the hard disk.

IMPORTANT The installation procedure may be aborted at any time by pressing and holding the [Ctrl] key and then pressing [c]. *This leaves the installation incomplete and the software inoperable.*

To run the installation program:

1. Insert Disk 1 into the disk drive.
2. Type: **`A:INSTALL`** and press **`[Enter]`**.

IMPORTANT Substitute the letter of the drive you are using, if it is not drive A.

Follow the instructions displayed.

Two megabytes of free disk space is required to install this software. If you choose a drive with less than that amount of available memory, the following message is displayed:

```
There is not enough room on you disk drive. The minimum number of
free bytes must be 2000000.

WARNING: Software was not properly installed.
C:\>
```

This indicates that the installation procedure has been aborted. If you still wish to use this drive, you must free some space by deleting any unnecessary files you have on that disk and then try the installation again.

You may also choose a different drive. If the drive you choose has sufficient memory, the installation procedure continues. You are prompted to approve or alter the directory in which the software is to be installed:

```
Specify main directory in which to install files.
C:\ABBASIC
```

Press **[Enter]** to accept the directory name or type a new directory name and press **[Enter]**.

IMPORTANT If you alter a directory or sub-directory name, be sure to change the autoexec.bat file appropriately, as described in the beginning of the installation procedure section.

When you are finished loading the disks, you are reminded to modify your config.sys and autoexec.bat files as described in the previous section.

Directory Structure

The default directory structure after installation is as follows:

- \ABBASIC – main directory
- \ABBASIC\BAS – sub-directory to store the user BASIC source programs. This is your working directory.
- \ABBASIC\BDS – sub-directory that stores the BASIC Development Software files
- \ABBASIC\BDS\HELP – sub-directory that stores the help files

Change to your working directory before invoking PBASE. Additional working directories can be created anywhere on your hard disk.

You can change the sub-directory names after the installation process if the default names are not acceptable. The HELP sub-directory must reside directly under the BDS sub-directory or its equivalent. Do not rename the HELP sub-directory.

IMPORTANT If you alter a directory or sub-directory name, be sure to change the autoexec.bat file appropriately, as described in the beginning of the installation procedure section.

Rockwell Automation grants you a license to install and use this software on a single personal computer, and to make one copy for backup purposes only. You are not licensed to install this software on more than one personal computer or to distribute it in any way. See the outside of the software package for licensing information.

Backing-up Your Software

ATTENTION

This software is protected under the copyright laws of the United States. Unauthorized reproduction of copyrighted software violates U.S. copyright laws. Criminal penalties may include fines or imprisonment.

You need as many blank, double-sided, double density disks for backup as you received for the original software installation (two-3.5 inch or three 5.25 inch disks).

Your blank disks need not be formatted. Refer to your DOS manual for more information.

Getting Familiar with Your Development Software

This chapter is intended to give you an overview of the BASIC development software so that you can understand the software's general structure. The topics in this chapter include:

Starting Your Software

- software start-up
- toplevel menu
- main menu
- program editing and exiting

After installation, follow these steps to start your software.

1. Reboot your personal computer. This is necessary to activate any changes made to the autoexec.bat and config.sys files.
2. If your mouse driver is not automatically installed by your autoexec.bat file, execute whatever command is necessary to install it prior to starting the BASIC development software.
3. Change to your working directory. If you accepted the default directory assignments during software installation (refer to Chapter 1), the BAS subdirectory was created for use as a working directory. To change to this directory, type: **`> CD\ABBASIC\BAS`** at the DOS prompt and press the **`[Enter]`** or **`[Return]`** key (indicated throughout this manual by **`[Enter]`**). The > moves to the end of the line: **`CD\ABBASIC\BAS.`**
4. Type: **`> PBASE`** at the DOS prompt and press **`[Enter]`**. The software determines your monitor type and displays the Toplevel menu.

IMPORTANT If your personal computer does not recognize the command PBASE, the path command in your autoexec.bat file may not have been modified correctly.

If you have a mouse and it is not working, you can still proceed by using the arrow keys. You may want to go back and check to make sure your mouse driver was installed either through the autoexec.bat file or through commands you entered.

IMPORTANT There are additional mouse setup options listed in the Setup and Configuration menu. These include a mouse ON/OFF option. Refer to Chapter 3 for additional information on the Setup and Configuration menu.

Toplevel Menu

The Toplevel menu allows you to create and edit your BASIC program.

Table 2.1 Toplevel Menu Selections

Selection	Description
Select a project file	allows you to select a project file through your own custom menu. Selecting a project file is also available from the Other menu, and is described in Chapter 5.
Edit mode	allows you to enter Edit mode and open a new file window or enter the presently active window. All main menu functions are available in this mode.
Translate/compile	allows you to immediately translate/compile a selected file, provided you have correctly set up the filename extension and compiler program. Translate/compile is also available from the Other menu and is described in Chapter 8.
teRminal [232]	switches your personal computer to Terminal mode so you can establish communications with the BASIC or BASIC-T module or other port device you have configured. Terminal mode is also available from the Other menu and is described in Chapter 9.
User-defined program	allows you to temporarily leave the BASIC development software and execute a program at the DOS level of your personal computer. Select the program from a menu that you have created. User Defined Program is also available from the Other menu and is described in Chapter 5.
Configuration menu	displays a menu of set up features for mouse, display, printer, editing, etc. Chapter 3 describes this menu.
shell to DOS	temporarily exits the BASIC development software and takes you back to DOS where you can run programs or execute DOS commands. You can return by typing exit at the DOS prompt. Shell to DOS is also available from the Other menu.
Quit	exit your PBASE software and return to DOS

Main Menu

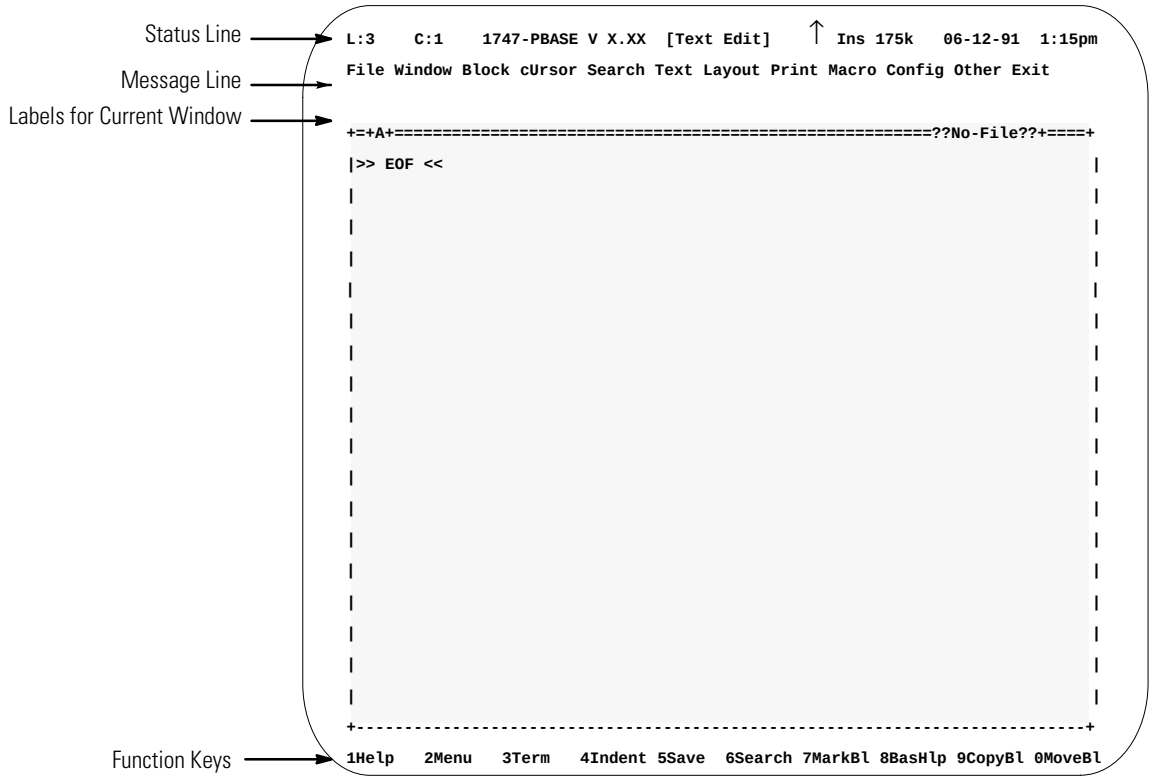
The Main menu appears once you enter Edit mode through the Toplevel menu.

1. From the Toplevel menu, move the cursor or the mouse to select the **`Edit mode`** option. You can also type in **`[E]`** since that is the highlighted letter on this menu item.
2. If cursoring, press **`[Enter]`** after highlighting Edit mode. If using a mouse, click the left mouse button when the mouse cursor is positioned over **`Edit mode`** option.

   The Main menu screen appears as shown below. You are now in Edit mode and can write or edit a program.

   Near the top left of the Main menu is the letter **`A`**; and near the top right is **`?No-File?.`** These are labels for the current window, which opened when you selected Edit mode. They tell you that you are looking at window A, which contains no file at this time.

Figure 2.1 Window A



Status Line

The status line is the first line at the top of the Main menu screen. Following is a description of the status line in the previous figure:

Table 2.2 Status Line Indicators

Indication	Description
L:3	indicates that your cursor is in the third line of the active window
C:1	indicates that your cursor is in the first column of the active window
1747-PBASE	indicates that you are working with the BASIC development software
[TEXT EDIT]	indicates that you are in Text Editing mode
R	does not appear in this example, but would appear if you were creating a keystroke macro (described in Chapter 4) to indicate when you are recording
↑	indicates that the **[caps lock]** key on your keyboard is on.
Ins	toggles between this and **Or** to indicate whether you are in Insert or Overstrike mode of text editing.
175K	indicates the amount of currently available RAM memory for your personal computer
06-12-91	the current date from your personal computer's clock
1:15pm	the current time from your personal computer's clock

Message Line

The message line is the third line on the main menu screen, just below the pull-down menus. The software displays normal operating messages, instructions, or error messages on this line as dictated by your selections and actions.

Function Keys

The function keys are listed along the bottom of the screen (1 through 10).

For additional function keys press and hold the **[Shift]**, the **[Alt]** or the **[Ctrl]** keys prior to pressing the function keys. For example, press **[F2]** to move your cursor up to the main menu. Press **[Shift-F2]** to print the date and time in the active window. Press **[Alt-F2]** to bring up the calculator. Press **[Ctrl-F2]** to move to the next error if an error file was loaded for examination.

The function key menu changes as you select different menus, or after you select a specific function key. This way, the most commonly used features can be accessed by pressing a function key. For example, pressing **[F8]** to bring up help on the module causes a new function key menu to appear.

Using Help Outside a Program

1. Press **[F1]**, or click the left mouse button when the cursor is on **1 Help** at the bottom left corner of the screen. Help is context-sensitive, meaning that a help screen appropriate for the current subject appears. If you are not working on any specific subject at the time, **1747-PBASE REFERENCE GUIDE - TABLE OF CONTENTS** appears.
2. Move the cursor or arrow keys to **B. Editor Quick Reference** and press **[Enter]** or the left mouse button. You should now be looking at **1747–PBASE QUICK REFERENCE.** Help screens may range from a couple sentences to several paragraphs.
3. Scroll through this help screen by using the up/down, right/left cursor (arrow) keys or the page-up/page-down keys. To the far right of the help screen is a column with arrows at the top and bottom. Place your mouse cursor on the upper or lower arrow, and click the left mouse button to scroll through the help screen. Notice that many of the help screens include words or items that are highlighted (or in a different color if you have a color monitor). These items are related topics for which additional help information is available.
4. Place the cursor on **goto Line number** and press **[Enter]** or the left mouse button. The help screen for **goto Line number** appears with more related topics you can select from this screen.

5. Press the **[Backspace]** key or move the mouse cursor to **Back-track<BackSpace>** and click the left mouse button. This steps you back through the help screens you have accessed and eventually brings you back to **1747-PBASE REFERENCE GUIDE - TABLE OF CONTENTS**. From there you can select other topics that may be of benefit. There is also a comprehensive Help Index that can be selected.
6. Press the **[ESC]** key or move the mouse cursor to **Done<ESC>** and click the left mouse button to exit any help screen at any time. The main menu screen reappears.

Using Help Within a Program

1. Type a command such as **GOTO** after the main menu screen reappears. (GOTO has an entire section of Hypertext help available.)
2. Press **[F8]** or move the mouse cursor to **8 BasHlp** at the bottom of the screen to bring up help on the module and BASIC language.
3. Press the **[ESC]** key or move the mouse cursor to **Done<ESC>** and click the left mouse button to exit help on **GOTO.**
4. Move the cursor up or down so that it is no longer on the same line as the **GOTO** statement.
5. Press **[F8]** or move the mouse cursor to **8 BasHlp** and click the left mouse button. If you are not on a word, the **BASIC Language Reference Manual - TABLE OF CONTENTS** appears. From this table of contents, you can access a broad range of help screens on the modules, including hardware setup, and programming information.
6. Press the **[ESC]** key or move the mouse cursor to **Done<ESC>** and click the left mouse button to exit help. The main menu reappears.

Typical Pull-down Menu

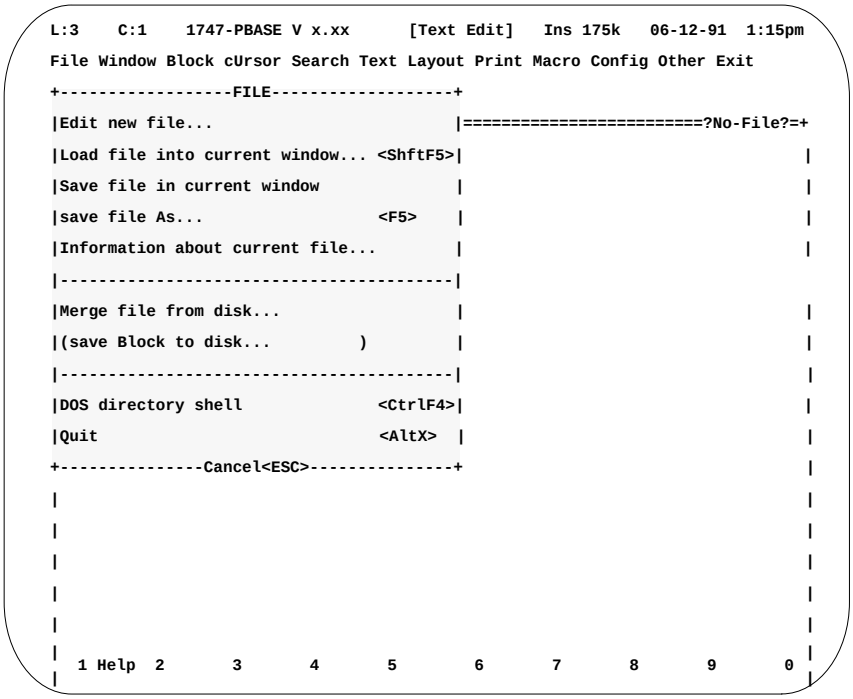
PBASE uses a pull-down menu to allow access to the options you need.

For example, the File menu is available once you enter Edit mode through the Toplevel menu.

```
Path: Toplevel menu → Edit mode → File
QuickStroke: available for individual items within the File menu
```

If using a mouse, move the cursor over to the File menu at the top left and click the left mouse button to pull-down the File menu. If you do not have a mouse, press **[F2]** on your keyboard to get you up to the pull-down menus. Cursor to the right or left to highlight **File** and press **[Enter]**. The **FILE** dialog box appears:

Figure 2.2 File Dialog Box



The **FILE** dialog box lists all the available options. Use your up and down arrow keys to move to the option you want. Press **[Enter]** to select your option. If you wish to leave the dialog box without selecting anything, press **Cancel <ESC>.**

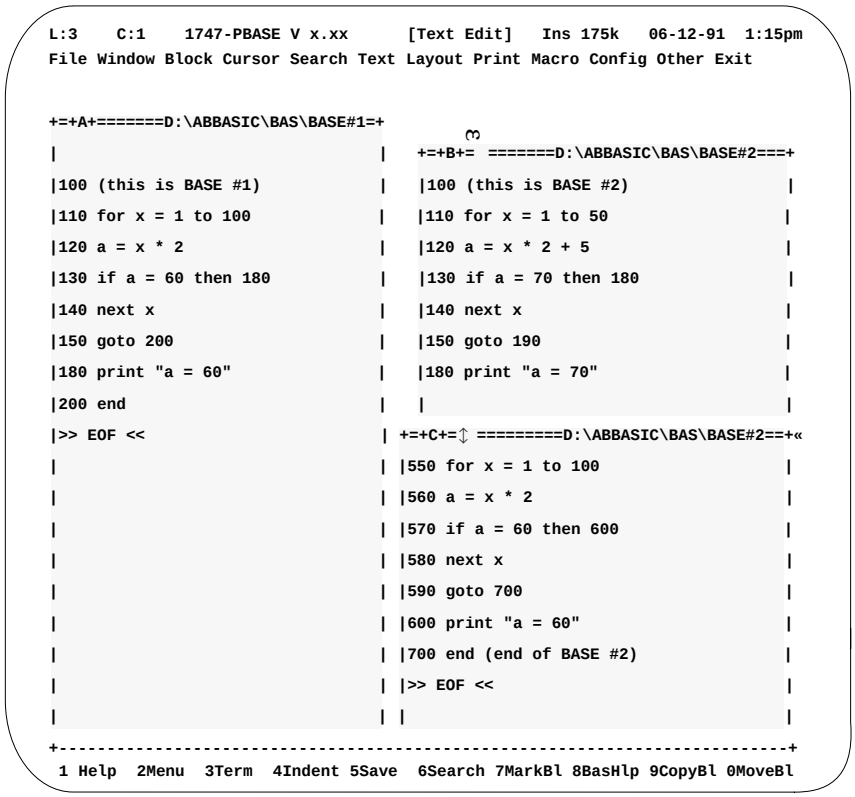
Some of the options have a QuickStroke assignment listed on the right. For example, pressing **[Shift F5]** instead of pulling down the File menu would load a file into the current window.

Navigating Within Windows

Windows are labeled alphabetically in their top left corner. Your BASIC Development Software can open up to 100 windows simultaneously. Each may contain a separate file, or they can be linked together and contain different parts of the same large file. You can open and close these windows independently of each other.

The following screen shows an example with 3 windows opened simultaneously. Window A contains a file called BASE#1 while windows B and C both contain a file called BASE#2. In this case, B and C are linked together; you are actually looking at different parts of the same file.

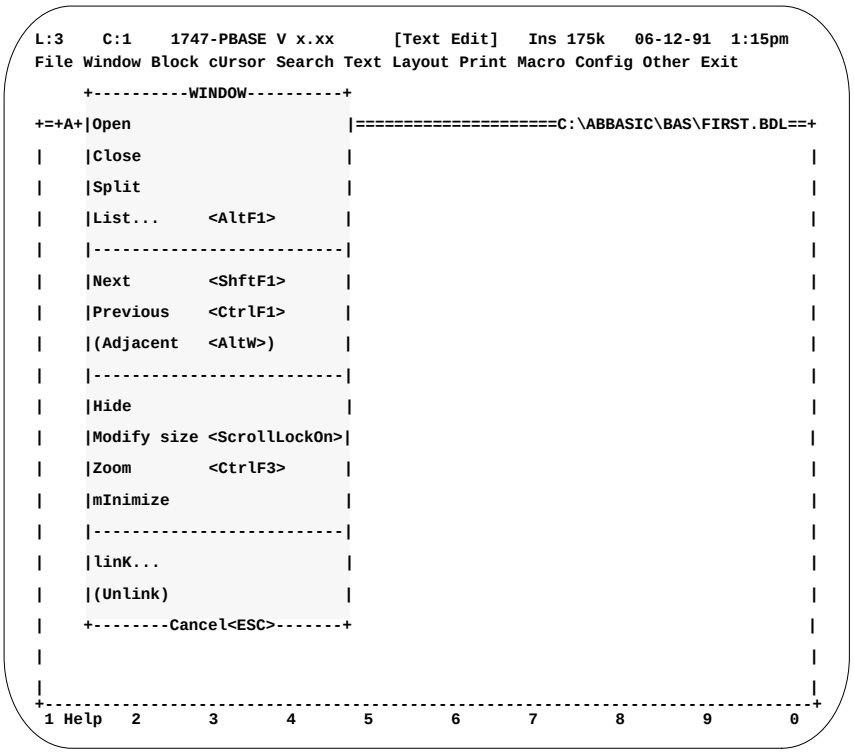
Figure 2.3 Window Labels



A more complete explanation of the options available through the Window menu is in Chapter 4. At this point, we simply want you to understand the concept behind the windows feature. To accomplish that, make a few adjustments to the current window:

1. If using a mouse, move the cursor over to the Window menu (near the top left) and click the left mouse button. If you do not have a mouse, press **[F2]** on your keyboard to access the pull-down menus. Cursor to the right or left to highlight the Window menu and press **[Enter]**.

Figure 2.4 Adjusting the Current Window



2. Cursor down, or move your mouse to select **Modify size** on the Window menu. When it is highlighted, press **[Enter]** or click the left mouse button.

   The border of the A window changes to highlighted (or a different color), indicating it is ready to have its size or position modified. Instructions appear on the message line directly above the A window.

3. Press and hold **[Shift]** and **[left arrow]**. The A window shrinks to the left. If you let go of **[left arrow]** and press **[up arrow]**, the screen shrinks upwards.

4. Let go of **[Shift]**, and press **[right arrow]**. You are now positioning the A window.

5. Press **[ESC]** when you are finished adjusting the size and shape of the A window.

6. Pull down the Window menu again. Cursor down to select **Zoom** on the Window menu. **Zoom** causes the A window to return to full size.

Editing a BASIC Program

The BASIC Development Language (BDL) streamlines BASIC programming by providing a number of screen editing features, open-format line entry, and macros. Macros are commands that represent a more complex series of BASIC commands.

After you finish writing your program in the BASIC development language, you must translate/compile it into the BASIC language that the BASIC or BASIC-T module understands. This creates a BAS file, which you can then download to the module.

Translating and downloading are described in the following sections and in Chapters 8 and 9.

General Editing

In the last section you positioned and sized the A window. Now you edit a BASIC program.

1. If using a mouse, move the cursor over to the File menu at the top left and click the left mouse button to pull down the File menu. If you do not have a mouse, press **[F2]** on your keyboard to move the cursor to the pull-down menus. Cursor to the right or left to highlight **File** and press **[Enter]**.
2. Cursor down, or move your mouse to select **save file As** on the File menu. When it is highlighted, press **[Enter]** or click the left mouse button. You also could have pressed **A** since it is the highlighted letter corresponding to this menu item.

   The **SAVE FILE AS** dialog box appears on the screen. On the first line, it indicates that the file in the current window is named **?No-File?**.
3. Type: **FIRST.BDL**
4. Press **[Enter]** or move the mouse cursor to **OK<ENTER>,** and click the left mouse button.

   The **SAVE FILE AS** dialog box disappears and **"C:\ABBASIC\BAS\FIRST.BDL Saved"** appears in the message line (third line from the top). Your message will be different if your software is not installed on the C: drive, or if you are using different directory names.

   You have just saved a file containing the **GOTO** statement under the name **FIRST** with the file extension of **BDL. BDL** stands for BASIC development language, and entering the file extension .BDL enables the software to identify the correct compiler for translating your program into the BASIC language. Filename extensions are described in Chapter 3.

5. Use the previously saved program:

   `FIRST.BDL`

6. Move the cursor to the top left corner of the window.

7. Type in the following program:

```
{THIS IS A FIRST PROGRAM}
REM FIRST PROGRAM
FOR X=1 TO 100
 A=X*2
 PRINT A
 NEXT X
END
```

   Notice that there are no line numbers entered here. Also notice that when you type in the lines within the for/next loop, they are indented. This is because the BASIC development software recognizes that you are entering a BASIC development language program (since your filename extension is BDL) and the default parameters are set for smart indenting. There are a number of other related parameters for BDL files discussed in Chapter 3.

Saving Your Program

Path: Edit mode → File → save file as
Path: Edit mode → File → save file as → save file in current window
QuickStroke: [F5]

We recommend that you periodically save sizeable programs as you work on them to avoid losing large quantities of work in the event of a system error or power failure.

The BASIC development software has an autosave feature that offers two methods for automatically saving files as you work on them. It also has a backup feature with several methods for making backup files. These features are described in Chapter 3.

1. If using a mouse, move the cursor over to the File menu at the top left and click the left mouse button. If you do not have a mouse, press [**F2**] to move the cursor to the pull-down menus. Cursor to the right or left to highlight the File menu and press **[Enter]**.

2. Move the cursor to **Save file in current window** and press **[RETURN]** or click the left mouse button.

   Since you have previously named and saved the file in the current window and selected **Save file in current window**, the software assumes you are saving it under its existing name. A message appears in the message line indicating that the save was completed.

Translating Your Program

Path: Toplevel menu → Translate/compile
Path: Toplevel menu → Edit mode → Other → Translate/compile
QuickStroke: [CTRL F8]

1. If using a mouse, move the cursor over to the Other menu and click the left mouse button. If you do not have a mouse, press **[F2]** to get to the pull-down menus. Cursor to the right or left to highlight the Other menu and press **[Enter]**.
2. Move the cursor to Translate/compile and press **[Enter]** or click the left mouse button. A dialog box appears asking you to select a translator/compiler. At this point, there is only one available that recognizes the .BDL extension under which you saved your file.
3. Move the cursor to select **1747-PBASE Translator** and press **[Enter]** or the left mouse button.

If you did not make any errors in entering this program, the translation occurs successfully. If you had errors, an error message appears in the message line, and the cursor moves to the location of the error in the program.

After successfully translating a .BDL file, a new file is created using the same name but with the .BAS extension. The .BAS file contains the BASIC language version of your program, including line numbers. In our case, there is now a file named FIRST.BDL and a file named FIRST.BAS.

IMPORTANT Translation is required only if your file was written using the BASIC Development Language (BDL). If you wrote the file using the BASIC language as described in the *BASIC Language Reference Manual* (publication number 1746-RM001A-US-P) or the *SLC 500™ BASIC and BASIC-T Module User Manual* (publication number 1746-UM004A-US-P), translation is not necessary.

Physically Connecting to Your BASIC or BASIC-T Module

At this point you could download the FIRST.BAS program to the module and execute it on the module. To do so requires that you connect the module to one of your personal computer's serial ports (COM1 through COM8). If you have the Allen-Bradley 1784-KR card installed in your personal computer, you could connect to this instead of a serial port.

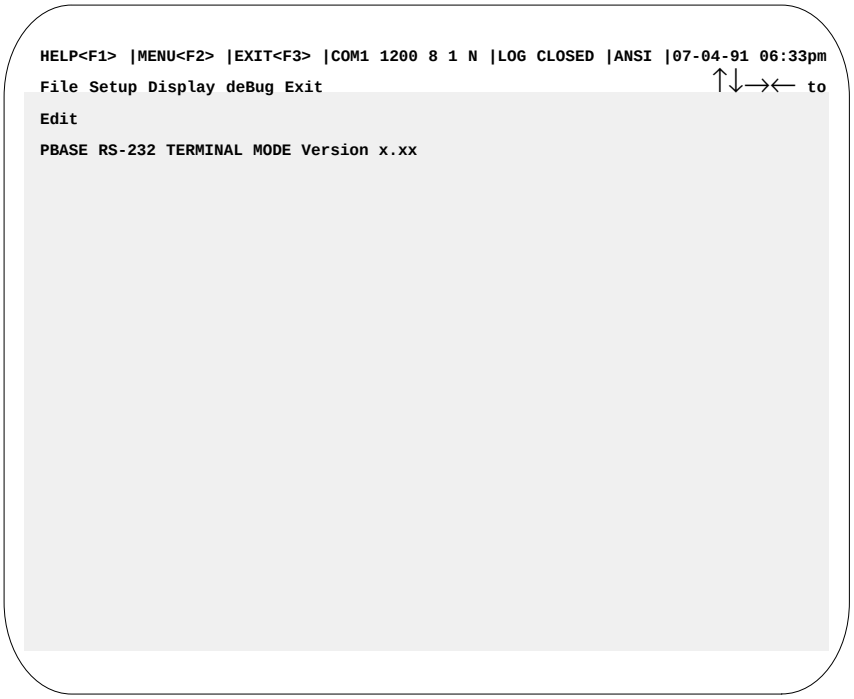
You may need to refer to Chapter 3 for details on terminal selection, and Chapter 9 for details on Terminal mode setup. Refer to the *SLC 500™ BASIC and BASIC-T Modules User Manual* (publication number 1746-UM004A-US-P) for details on making hardware connections.

Changing to Terminal Mode

Path: Toplevel menu → teRminal [232]
Path: Toplevel menu → Edit mode → Other → teRminal [232]
QuickStroke: [F3]

1. If using a mouse, move the cursor over to the Other menu and click the left mouse button. If you do not have a mouse, press **[F2]**. Cursor to the right or left to highlight the Other menu and press **[Enter]**.
2. Move the cursor to **teRminal [RS-232]** and press **[RETURN]** or click the left mouse button. The Main menu screen is replaced by the Terminal Mode screen, as follows:

Figure 2.5 Terminal Mode Screen



The **[RS-232]** that follows the terminal selection indicates that the BASIC development software is currently configured for RS-232 communications. Depending on your system, you may have configured it for DH485 communications [DH485] instead.

3. Press **[Enter]** and the prompt symbol > should appear indicating that you have established communications with the module. If you do not see the prompt symbol, you have not established communications with the module. Verify your terminal selection (Chapter 3), the communications setup (Chapter 9), and jumper settings on the module and cabling (*SLC 500™ BASIC and BASIC-T Modules User Manual*, publication number 1746-UM004A-US-P).

Downloading Your Program

Path: Toplevel menu → teRminal [232] → File → Download from host to module
Path: Toplevel menu → Edit mode → Other → teRminal [232] → File → Download from host to module
QuickStroke: [PgDn]

1. If using a mouse, move the cursor over to **File** on the Terminal mode screen and click the left mouse button. If you do not have a mouse, press **[F2]**. Cursor to the right or left to highlight the File menu and press **[Enter]**.
2. Move the cursor to **Download from host to module** and press **[Enter]** or click the left mouse button. A dialog box appears asking you to enter a filename for downloading.
3. Pressing **[Enter]** causes the translated version (FIRST.BAS) of the file you are actively working on (FIRST.BDL) to be downloaded to the module.

IMPORTANT Only files with the .BAS extension can be downloaded to the module.

Exiting a BASIC Program

To exit a program:

1. Press **[F3]** to exit terminal mode. This returns you to the main menu screen in Edit mode.
2. If using a mouse, move the mouse cursor over to **Exit** on the second line of the screen, and click the left mouse button. You can also press **[F2]** on your keyboard to access the pull-down menus and cursor left or right to highlight **Exit** and press **[Enter]**. This returns you to the Toplevel menu.
3. From the Toplevel menu, move the mouse cursor down to **Quit** and click the left mouse button. You can also cursor up or down to highlight **Quit** and press **[Enter]**. This quits the BASIC development software and returns you to the DOS level.

Configuring Your Software

This chapter describes how to configure your software. Major topics include:

- edit options
- display options
- mouse and keyboard options
- filename extensions
- printer options
- memory options
- file backup, temporary file, and autosave
- search and replace defaults
- Terminal Emulation mode selection
- save configuration and exit

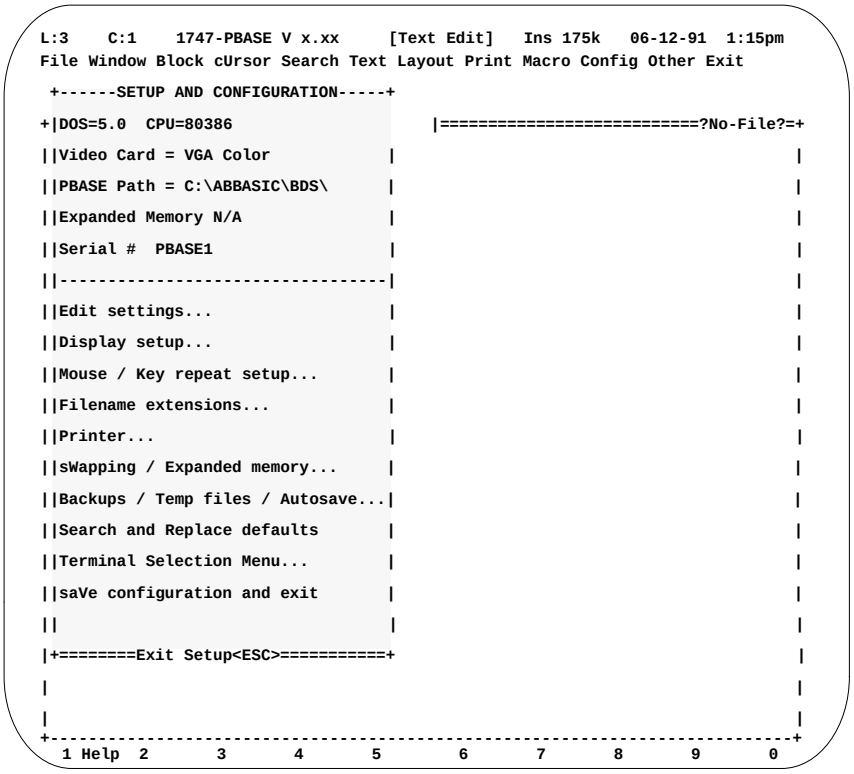
Setup and Configuration Menu

The Setup and Configuration menu can be selected from the Toplevel menu or the Main menu.

Path: Toplevel Menu → Configuration Menu
Path: Main Menu → Config

To access the Setup and Configuration menu from the Toplevel menu, for example, move the cursor using your mouse to the **Configuration menu** option and click the left mouse button. If you do not have a mouse, cursor up or down to highlight the **Configuration menu** option and press **[Enter]**.

Figure 3.1 Configuration Menu



Command Line Switches

The BASIC Development Software allows you to configure almost all of its options via the Configuration menu. However, if you need to force a configuration setting or change a setting temporarily, a command line switch can be used.

The following command line switches are available for use when starting the BASIC Development Software. To use any of them type **PBASE** followed by the desired switch or switches. (A space between **PBASE** and the / is optional; however, if using more than one switch, each must be separated by a space.)

Table 3.1 Command Line Switches

Switch	Equals	Summary
/MN	Mouse disable	The BASIC Development Software auto-detects the presence of a mouse driver. The BASIC Development Software requires DOS version 3.1 or higher.
/MY	Mouse enable	
/KN	Don't change keyspeed	Some personal computers with special ANSI.SYS replacement files encounter problems when attempting to alter the keyspeed or keyboard repeat speed. If you experience keyboard problems, try the /KN switch. (/KY is the default.) If this fixes your problem, be sure to go into the Configuration menu and select saVe configuration and exit. This saves /KN as the default and you do not need to use either of these command line switches again. To restore the previous settings, start the software using the /KY command line switch and again save the configuration.
/KY	Change keyspeed	
/KR	1784-KR card is installed	If you choose to use this card, first verify that its driver resides in the main subdirectory of the BASIC Development Software (ABBASIC\BDS unless you renamed it during installation). Then you must use this command line switch every time you run the BASIC Development Software.
/EN	Don't try to use enhanced keyboard	Some personal computers and some special memory resident programs do not work when the BASIC Development Software tries to use the enhanced keyboard functions. If you experience keyboard problems, try the /EN switch.
/NR	No restore	Disables the Restore feature of the BASIC Development Software. Use this if you have the Restore feature turned ON (via the Setup and Configuration menu), and would like to run the BASIC Development Software without restoring the previous status of the editor.
/B	Black and white	Forces the software to display screens in black and white instead of color.
/Xn	Sets screen length to n	The /X and /Y switches are used to override automatic detection of screen size and redefine the size. This is to accommodate custom video modes on some of the SUPER or ENHANCED EGA/VGA (and other) boards. The values you enter for n must be legal for your particular custom video mode. Use of either of these switches disables the Video Mode options when display setup is selected from the configuration menu.

Table 3.1 Command Line Switches

Switch	Equals	Summary
/Yn	Sets screen width to n	
/V	No snow suppression on CGA monitor	Do not wait for retrace on CGA video I/O. This disables snow suppression on CGA monitors.
/EMSOFF	Don't use expanded memory	Do not use Expanded Memory. This disables any expanded memory options available through the configuration menu.

Loading Files from the Command Line

Files to be loaded may be specified on the command line with the **PBASE** command. If more than one file is specified (separated by a space), then windows are created for each additional file. DOS wild card characters (* and ?) are allowed.

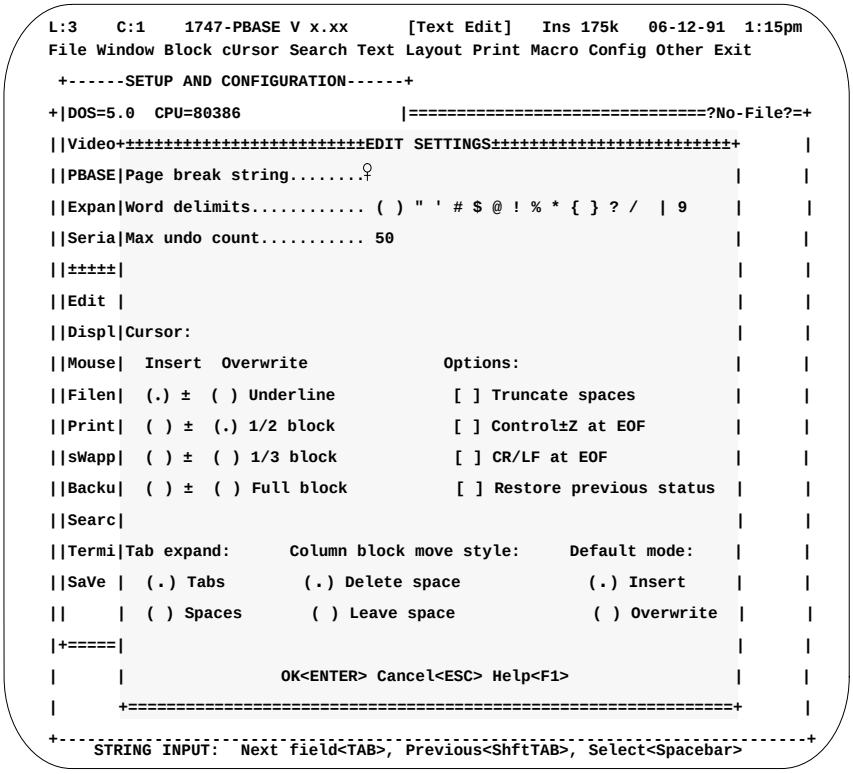
Examples:
PBASE *.BAS opens windows as required to load all .BAS files in the current directory.
PBASE TEST.BDL TEST.BAS opens a window for TEST.BDL and then opens a window for TEST.BAS.

Configuring Your Edit Options

Path: Toplevel Menu → Configuration menu → Setup and Configuration menu → Edit settings
Path: Main Menu → Config → Setup and Configuration menu → Edit settings

Selecting **Edit settings** from the Setup and Configuration menu causes the following dialog box to appear:

Figure 3.2 Edit Settings Dialog Box



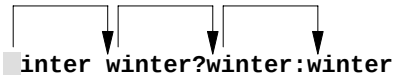
The **EDIT SETTINGS** dialog box allows you to configure several miscellaneous editor parameters which affect the operation and use of your BASIC Development Software. Press **[Tab]** to move to the next option.

- **Page break string** — allows the configuration of a user-definable page break string of up to 10 characters. The BASIC Development Software treats this string as a page break when it is encountered in a file. The default page break string is a single form-feed character (ASCII 12), typically entered by typing [**Ctrl–L**]. Refer to the help screens for more details.

- **Word delimits** — allows you to enter a string of characters that define the word delimits. The default word delimits string is **()”’,#$@!%*{}?/ |9** where striking the space bar enters the **[space]** character and **|9** enters the **[Tab]** character.

  The characters chosen as word delimiters typically are those that follow the end of a word. When you move the cursor one word to the left **[Ctrl - left arrow]** or one word to the right **[Ctrl - right arrow]**, the cursor stops at the next character to the right of a word delimiter. If two or more word delimiters appear together, the cursor stops at the next character to the right of the furthest right delimiter.

In the example below, the delimiter string is **[space] ? :** . The cursor stops at each **w** since a word delimiter is encountered:



- **Max undo count** — allows you to configure the amount of undo steps for each window. The maximum count is 65535. Setting this option to 0 turns undo off. The default count is set to 50. The larger this number, the less memory is available for editing.

- **Insert/Overwrite** — allows you to choose between four different cursor sizes. You can configure different sizes for the insert and overwrite cursors to make it easy to determine which mode you are in. Move your mouse cursor to select the desired cursor size and click the left mouse button. If you do not have a mouse, press **[Tab]** to access this field, use the up or down arrow keys to position the cursor on the desired field, and then press **[Tab]** again to select the item and move on to the Options field.

- **Options** — To select these miscellaneous edit options, move your mouse cursor to the desired field and then click the left mouse button. If you do not have a mouse, press **[Tab]** to access this field, use the up or down arrow keys to position the cursor, and press **[Space bar]** to select the desired items.
  - **Truncate spaces** — This option tells 1747-PBASE whether or not to truncate spaces that trail lines of text. This truncation only occurs when loading a file.
  - **Ctrl-Z at EOF** — Some programs require a **[Ctrl-Z]** (ASCII 26) at the end of a text file. Selecting this option toggles this feature on and off.
  - **CR/LF at EOF** — This option determines whether or not a Carriage Return/Line Feed pair is placed at the end of the file. This is the normal termination for DOS files.
  - **Restore previous status** — allows you to toggle the Restore feature ON and OFF. With Restore on, the entire STATUS of the editor is saved when you exit the BASIC Development Software. This includes loaded files, windows, cursor positions, marked blocks, and history lists for virtually every prompt.

IMPORTANT If a file to be loaded is specified from the command line, the restore feature is not invoked. Restore may also be suppressed by using the /NR option on the DOS command line when initiating the BASIC Development Software.

- **`Tab expand`** — allows you to configure how 1747-PBASE handles tab characters and the **`[Tab]`** key. When **`Tabs`** is selected, pressing **`[Tab]`** causes a tab character to be inserted and moves the cursor to the next tab stop. When **`Spaces`** is selected, pressing **`[Tab]`** causes spaces (ASCII 32) to be inserted to the next tab stop.

IMPORTANT If **`Tabs`** is selected, tab spacing can be changed at any time in the future. If **`Spaces`** is selected, tab spacing for the file cannot be changed by entering a new tab setting on the Layout menu.

- **`Column block move style`** — allows you to either leave the space intact or delete the space where the marked columnar block originated. Refer to the help screen for an example.

- **`Default mode`** — allows you to configure whether 1747-PBASE is in the Insert or Overwrite mode when it is first invoked. When you are in Edit mode, you can toggle this mode by pressing **`[Insert]`**.

IMPORTANT The word wrap function should turned off when editing .BAS and .BDL files. You can use the word wrap function for general word processing applications.

Configuring Display Setup

`Path: Toplevel Menu → Configuration menu → Setup and Configuration menu → Display setup`
`Path: Main Menu → Config → Setup and Configuration menu → Display setup`

Selecting the **`Display setup`** option from the Setup and Configuration menu allows you to set the video mode at 25 lines or 43/50 lines. Selecting 43/50 lines allows you to view more of your program on the screen, but the text size is considerably smaller. Refer to the help screens for details.

Configuring Mouse and Keyboard Options

`Path: Toplevel Menu → Configuration menu → Setup and Configuration menu → Mouse / Key repeat setup`
`Path: Main Menu → Config → Setup and Configuration menu → Mouse / Key repeat setup`

Selecting the **`Mouse / Key repeat setup`** option from the Setup and Configuration menu allows you to enable/disable a mouse, adjust the sensitivity of the mouse, and turn the mouse cursor off when the keyboard is used. It also allows you to set the keyboard repeat speed (delay between keystrokes when a key is held down) and the keyboard repeat delay (delay before repeating begins when a key is held down). Refer to the help screen for details.

Configuring Your Filename Extensions

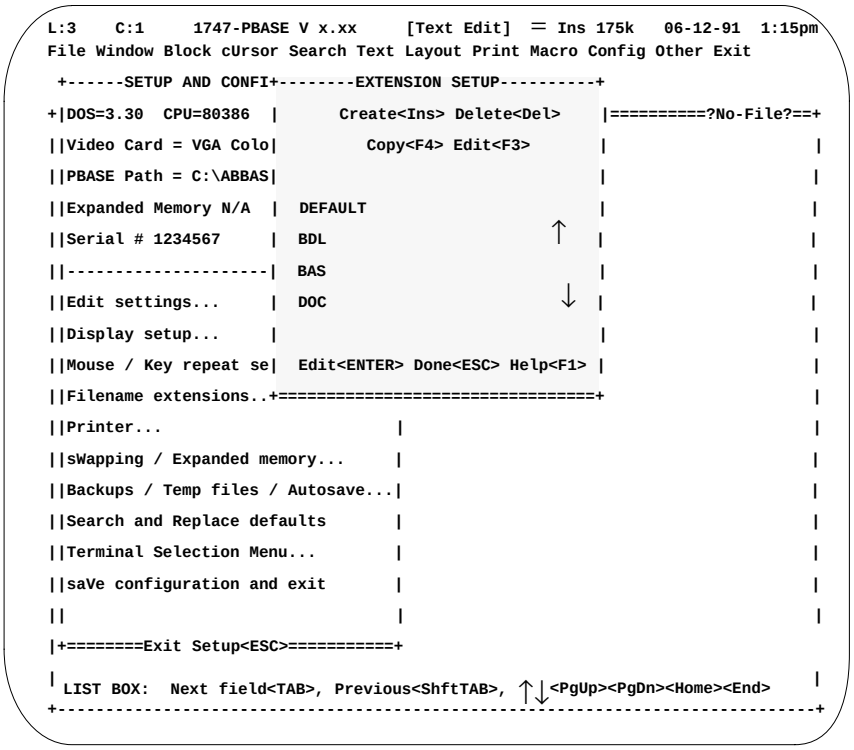
Path: Toplevel Menu → Configuration menu → Setup and Configuration menu → Filename extensions
Path: Main Menu → Config → Setup and Configuration menu → Filename extensions

To configure your filename extensions:

1. Select **Filename extensions** from the Setup and Configuration menu. You get a list of the filename extensions that are currently recognized by the BASIC Development Software. You can add (Create) or remove (Delete) extensions from this list as needed.

   Effect on Programming: Upon loading a file, the software searches this list for the extension of the file being loaded.

Figure 3.3 Extension Setup

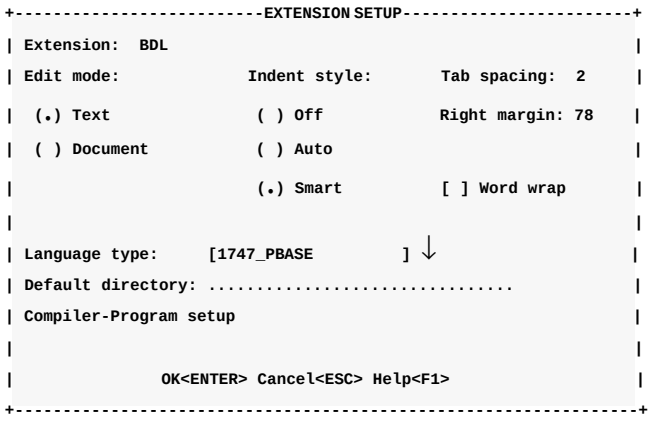


2. Press **[Tab]** to move to the next option. Press **[Enter]** to make selection.
3. Highlight the filename extension you wish to edit (BDL in this case) from the extension setup list and select **Edit<F3>.** You get the **EXTENSION SETUP** dialog box for the BDL extension. There you can see that the Edit mode for BDL files is text, the Indent style is smart, the Tab spacing is 2, the Right margin is 78 and Word wrap is off.

   Effect on Programming: If, for example, you select a program called FIRST.BDL to be loaded into an edit window, the software searches the filename extension list, and finds BDL. It refers to the parameters entered in the **EXTENSION SETUP** dialog box for BDL as the file is loaded. When you edit

this file, the indents, tabs, margins, and word wraps are guided by these settings.

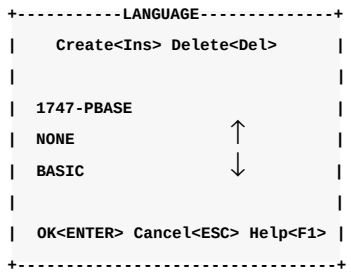
Figure 3.4 Extension Dialog Box



4. Move the cursor down to highlight Language type for the .BDL extension. (Use your mouse or press **[Tab]** to move the cursor.) Press **[down arrow]** to bring up the Language list box. Note that **1747-PBASE** was selected from this list for the .BDL extension.

   Effect on Programming: While you edit programs, the software notes the **Language type** from the extension setup table and interacts accordingly. Refer to the help screen on Language Specific Support for details.

Figure 3.5 Language Dialog Box



5. Press [ESC] to exit the Language list box and return to the **EXTENSION SETUP** dialog box. The next parameter, **Default directory**, is used to define DOS directory paths for loading and saving files. You can enter a disk drive and/or directory and sub–directory path here. Refer to the help screen on the Default directory for details.

   Effect on Programming: When you enter a filename to be loaded into a window, you can enter a DOS path along with the filename. If you do not, the currently active directory will be searched for that filename. If it is not found, then the default directory entered is searched.

   When you save a file from an open window, you can also enter a DOS path along with the filename. If you do not, the file is saved in the default directory entered here.

6. Move the cursor down by pressing **[Tab]** to highlight **Compiler–Program setup** for the .BDL extension, and press **[Enter]**. The Compiler/Program setup list box appears from which the desired compiler can be selected. In this case, the .BDL extension has only one compiler to select from: the 1747-PBASE Translator.

   Effect on Programming: When you attempt to translate/compile a file, the software again refers to the extension setup table. There it finds that files with .BDL as their filename extension use the compiler program called the 1747-PBASE Translator. This compiler is used during translate/compile.

Figure 3.6 Compiler Setup Dialog Box

```
+-----COMPILER/PROGRAM SETUP------+
|    Create<Ins> Delete<Del>      |
|      Copy<F4> Edit<F3>          |
|                                 |
|  1747±PBASE Translator          |
|                                 |
|                                 |
|                                 |
|  Edit<ENTER> Done<ESC> Help<F1> |
+---------------------------------+
```

7. Press **[Enter]**. The **COMPILER/PROGRAM SETUP** dialog box appears. You can define a number of compiler-specific parameters here. Refer to Chapter 8 for details on the parameters in this dialog box.

   Effect on Programming: Compiling is controlled by the settings in the **COMPILER/PROGRAM SETUP** dialog box. Parameters there determine, among other things, whether the file is saved first, whether the screen is cleared, whether compiler errors are processed, and how memory is allocated during the compile.

Figure 3.7 Compiler/Program Setup Variables

```
+--------------------COMPILER/PROGRAM SETUP-----------------------+
| Description:  1747±PBASE Translator                             |
| Command line: BTRAN <FILE> /I\ABBASIC\BAS.................      |
| Program type: [1747-PBASE         ]                             |
| Memory requited in k bytes(0=all):  0                           |
|                                                                 |
| Swap method:                    Options:                        |
|  (•) Use default             [ ] Clear screen                   |
|  ( ) No swap                 [X] Save all files                 |
|  ( ) To disk only            [ ] Reload file                    |
|  ( ) To EMS only             [ ] Do NOT process compiler errors |
|  ( ) To EMS then to disk                                        |
|                                                                 |
|                     OK<ENTER> Cancel<ESC> Help<F1>              |
+=================================================================+
```

Configuring Your Printer Options

Path: Toplevel Menu → Configuration menu → Printer
Path: Main Menu → Config → Printer

When you select the **Printer** option from the Setup and Configuration menu, you get a list of common printers. You can select a printer from this list or you can select **Create<Ins>** to add a printer if it is not listed. By selecting **Edit<F3>** , you can modify the parameters for a listed printer or a printer you have added.

Refer to Chapter 7 for information on printing and printer configuration.

Configuring Your Memory Options

Path: Toplevel Menu → Configuration menu → sWapping/Expanded memory
Path: Main Menu → Config → sWapping/Expanded memory

When you select the **sWapping/Expanded memory** option from the Setup and Configuration menu, you get a screen with several memory-related parameters. These allow you to optimize the use of conventional memory (the first 640K of RAM memory), expanded memory, and disk space in your personal computer.

IMPORTANT The BASIC Development Software uses expanded memory, not extended memory. Most 80386-based personal computers come with software (typically called EMM for Expanded Memory Manager) that allows you to designate some of your memory as expanded memory. Some 80386 and most 80286, 8088, 8086-based personal computers need a special board for expanded memory. Refer to the hardware and DOS documentation provided with your computer.

During editing or file manipulation, it is common for the conventional memory of your personal computer to fill completely. When this happens, the BASIC Development Software may attempt to move portions of a file into expanded memory or onto a disk drive. This memory swapping is done with no effect on you as a user.

You should find out how much expanded memory (EMS) your personal computer has before setting values to any of these parameters. As you become more proficient in using this software and begin using shell to DOS or user-defined program features, you should determine the maximum program size that you expect to use and allocate memory accordingly.

IMPORTANT Verify your personal computer's expanded memory size before selecting your memory option. If sufficient memory is not available, a system error may occur.

The memory swapping parameters here are similar to those in the compiler setup screen that you access when setting up a compiler for a specific filename extension (Chapter 8). Be aware that any memory swapping method selected for a compiler overrides the method selected here when that compiler is used. Refer to the help screens for details.

Backup Files, Temporary Files, and Autosave

Path: Toplevel Menu → Configuration menu → Backups/Temp files/Autosave
Path: Main Menu → Config → Backups/Temp files/Autosave

When you select the **Backups/Temp files/Autosave** option from the Setup and Configuration menu, you get a dialog box with several parameters for backing up files, making temporary files, and saving open files.

Backup Files

Backup files are a previously saved versions of files you have edited. They can be restored in the event of damage or undesired changes to the original file. You have several options for backup method and backup frequency.

Temporary Files

Temporary files are those created during memory swapping, or when you use the DOS shell. Though you have limited access to these files, and they are typically erased when you quit the BASIC Development Software, you can select a specific directory where they are to be stored. You can also use the Temporary file directory to send files to a RAM disk if you have that utility on your personal computer.

IMPORTANT If no directory paths are entered for the temporary files, they are saved to the active disk drive and directory. This may cause problems if, for example, you use the DOS Shell from the BASIC Development Software, log on to a floppy disk drive, and then exit back to the software. Temporary files are written to that floppy disk and an error occurs if the floppy disk runs out of space. To avoid this, you may want to enter the name of the directory in which your software was installed, such as C:\ABBASIC\BDS.

Autosave

The autosave feature causes files to be saved automatically after a specified period of time or a specified period of keyboard inactivity. This prevents you from losing too much of your work should there be a power failure or system error.

For details and descriptions of these parameters, refer to the help screens.

Search and Replace Defaults

Path: Toplevel Menu → Configuration menu → Search and Replace defaults
Path: Main Menu → Config → Search and Replace defaults

When you select the **Search and Replace defaults** option from the Setup and Configuration menu, you get a list box with three types of searches. When you highlight one of these and select it, you get a dialog box with parameters for that specific type of search.

These parameters are the defaults that define how the search is conducted. When the actual search is performed in Edit mode, a nearly identical screen appears, with the search parameters as you entered them. They can be altered at the time of the search, and remain altered until you quit; however, they revert back to the default values entered here the next time you run the BASIC Development Software.

User-defined keystroke macros can be created to select desired search and replace settings. Keystroke macros are described in Chapter 4.

For details and descriptions of these parameters, refer to the help screens.

Terminal Emulation Mode Selection

Path: Toplevel Menu → Configuration menu → Terminal Selection Menu
Path: Main Menu → Config → Terminal Selection Menu

The **Terminal Selection Menu** option from the Setup and Configuration menu allows you to select the Terminal Emulation mode desired for communicating with your BASIC or BASIC-T module. The following three Terminal modes are available:

- RS-232 Terminal Mode — allows you to communicate to the RS-232 program port (Prt1) of the module
- DH485 Terminal Mode — allows you to communicate to the DH485 port of the module
- General Purpose Communications Terminal Mode — allows you to use your personal computer as a general purpose communications terminal. In this mode, your personal computer can be used as an ASCII terminal that supports phone/modem dialing. This mode should *not* be used for communication to the module.

Refer to the *SLC 500™ BASIC and BASIC-T Modules User Manual* (publication number 1746-UM004A-US-P), for information on connecting and communicating with the module or other port device through the Terminal mode.

Save Configuration and Exit

Path: Toplevel Menu → Configuration menu → saVe configuration and exit
Path: Main Menu → Config → saVe configuration and exit

Some configuration changes are saved immediately at the time you assign them, while others are not saved until you select the **saVe configuration and exit** option from the Setup and Configuration menu. At that time, you are prompted to save the configuration if changes have been made and were not saved previously.

If you elect to exit without saving configuration changes, those that were changed immediately remain changed. Only changes that are not saved until exiting are abandoned.

IMPORTANT A file called DEFAULTS.BAT is included with the BASIC Development Software package to restore the default values. It will restore all values as if you had just installed the software in your personal computer. This file is executed by typing **DEFAULTS** (while in the directory in which DEFAULTS.BAT is stored) prior to running the BASIC Development Software.

ATTENTION

Executing the file DEFAULTS.BAT deletes all changes you made to any of the BASIC Development Software parameters and replaces them with the original default values. Do not execute DEFAULTS.BAT from the DOS shell.

Editing a Program

This chapter is designed to help you understand the file editing features available with your BASIC Development Software. It provides a general description of the features so you can apply them as needed when you begin writing your own programs. major topics include:

- simple editing techniques
- search operations
- block operations
- text formatting
- advanced editing features

Using Simple Editing Techniques

When you select **`Edit mode`** from the Toplevel menu, the main menu appears and a window opens. This window, the A window, is immediately available for file editing, or an existing file can be opened and loaded into it. At that point, your keyboard provides you with some simple editing techniques.

IMPORTANT If using the keys on the numeric keypad of your personal computer, make sure you have turned your **`[NumLock]`** off.

The following keys perform as described while editing text:

Table 4.1 Key Functions

Keys	Function
`[right arrow]`	Moves the cursor across the screen to the right.
`[left arrow]`	Moves the cursor across the screen to the left.
`[up arrow]`	Moves the cursor up the screen.
`[down arrow]`	Moves the cursor down the screen.
`[Ctrl-right arrow]`	Moves the cursor one word to the right.
`[Ctrl-left arrow]`	Moves the cursor one word to the left.
`[Home]`	Moves the cursor to the beginning of a line.
`[End]`	Moves the cursor to the end of a line.
`[PageUp]`	Scrolls the screen up by one full screen.
`[PageDown]`	Scrolls the screen down by one full screen.
`[Ctrl-PageUp]`	Scrolls the screen to the top of the page.
`[Ctrl-PageDown]`	Scrolls the screen to the top of the next page.
`[Ctrl-Home]`	Scrolls the screen to the top of the file.
`[Ctrl-End]`	Scrolls the screen to the end of the file.

Table 4.1 Key Functions

Keys	Function
[Delete]	Deletes the character directly under the cursor.
[Backspace]	Deletes the character to the left of the cursor.
[Insert]	Toggles between Insert mode (new text is inserted to the left of the cursor) and the Overstrike mode (new text overwrites the character under the cursor).

Another technique for moving through a program is to select a line number. You can select **goto Line number** when you pull down the cUrsor menu.

Path: Toplevel Menu → Edit Mode → cUrsor → goto Line number
QuickStroke: [Alt F8]

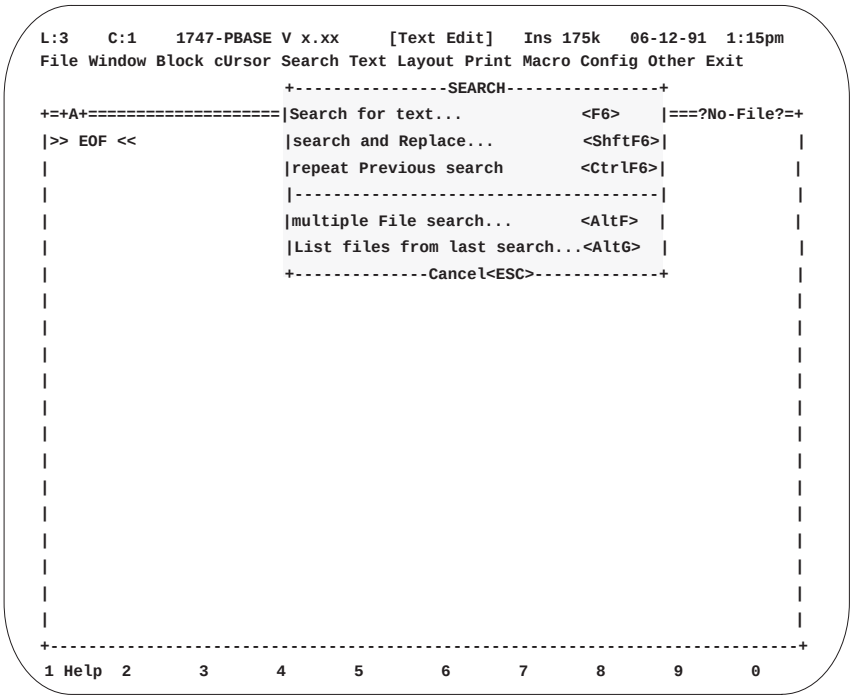
There are a number of other QuickStrokes and simple editing techniques available. They are listed in Hypertext help when you select Quick Reference from the help index or table of contents.

Searching Operations

The Search menu provides methods of searching for various expressions. This description is limited to a general explanation of the selections within that menu. For a detailed explanation on implementing menu selections, refer to the network of help screens. Refer to Chapter 2 for details on using Help.

Path: Toplevel menu → Edit mode → Search
Quickstroke: available for individual items within the Search menu.

Figure 4.1 Search Menu



The Search menu is divided into two sections. The first section provides search options used to search the current file that is loaded into the edit window. The second section provides options used to search multiple files in the specified search path, regardless of whether or not the file has been loaded into an edit window.

The following is a list of the options available from the Search menu and a brief explanation of their function. Remember that Hypertext help is available to assist you should you need more details:

- **`Search for text`** — allows you to search within a window, in the forward or reverse direction, in a number of different search modes, for several different expressions, literals, or phrases. For a complete description and examples of this search option, refer to the help screen.

- **`search and Replace`** — allows you to replace the searched item with a selected item. This is the same as **`Search for text`**, except that it allows for replacement of the searched characters during the search.

- **`repeat Previous search`** — repeats the last **`Search for text`** or **`search and Replace`**

- **`multiple File search`** — searches any or all files on any disk drive for any specified string with a number of different search options. Where the search was successful, files appear in a list box from which a file can be selected and loaded into a window.

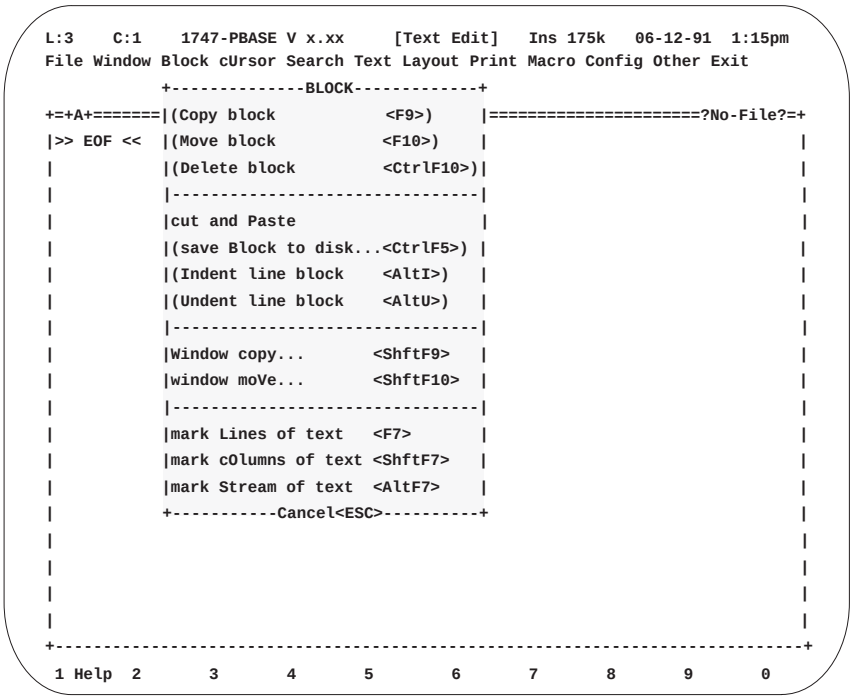
- **`List files from last search`** — lists the files found in the last **`multiple File search`**.

Using Block Operations

The Block menu provides many features for use with word processing software to increase speed and accuracy when editing BASIC programs.

`Path: Toplevel menu → Edit mode → Block`
`QuickStroke: available for individual items within the Block menu.`

Figure 4.2 Block Menu



Before you can manipulate a block (copy, move, delete, etc.), you must first define the block using one of the three marking options on the Block menu.

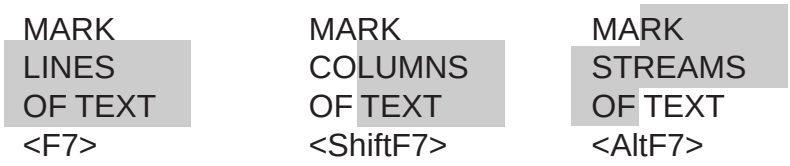
IMPORTANT If you are unable to change any characters in a file, that file has probably been locked. Files can be locked (made read-only) or unlocked through the File menu. Move the cursor to the Information About Current File option and press **[Enter]** or the left mouse button. Below the description of the current file are the unlock and lock options. Press **[Tab]** and/or the arrow keys to select either of these options and press **[Enter]** or the left mouse button.

The following is a list of the options available from the Block menu and an explanation of their function. Remember that Hypertext help is available with more details:

Table 4.2 Block Defining Options

Option	QuickStroke	Description
mark Lines of text	**[F7]**	allows you to mark specific lines in a file beginning or ending with the line where the cursor is positioned prior to selecting this menu item. If using a mouse, click the left mouse button to define this cursor position in the file.
mark cOlumns of text	**[Shift-F7]**	allows you to mark specific columns in a file beginning or ending with the column where the cursor is positioned prior to selecting this menu item. If using a mouse, click the left mouse button to define this cursor position in the file. With this option, you can fan out to control the column and row width being selected.
mark Stream of text	**[Alt-F7]**	allows you to mark a stream of text in a file beginning or ending with the character where the cursor is positioned prior to selecting this menu item. If using a mouse, click the left mouse button to define this cursor position in the file. This option is similar to marking lines of text except that it allows you to take portions of a line.
End block	**[F7]**	only appears while you are in the process of marking text. Select it after you have marked all that you want of the block.
turn marking oFf	**[Ctrl-F9]**	only appears after you have marked text. It allows you to remove all block marking in the file in the active window.

Figure 4.3 Marking Examples



Once you have defined a block, you can perform the following actions on it.

Table 4.3 Block Menu Actions

Option	QuickStroke	Description
Copy block	**[F9]**	allows you to copy a block to the current cursor position in a window.
Move block	**[F10]**	allows you to move a block to the current cursor position within a window.
Delete block	**[Ctrl-F10]**	allows you to delete the block within the currently active window.
cut and Paste		allows you to move, copy, or append a block to a hidden buffer for insertion elsewhere in any active window. Only one block can be in the hidden buffer at a time.
save Block to disk	**[Ctrl-F5]**	allows you to save a block to a disk as a separate file.
Indent line block	**[Alt-I]**	moves a block one tab stop to the right. This can be used only on blocks made by marking lines of text.

Table 4.3 Block Menu Actions

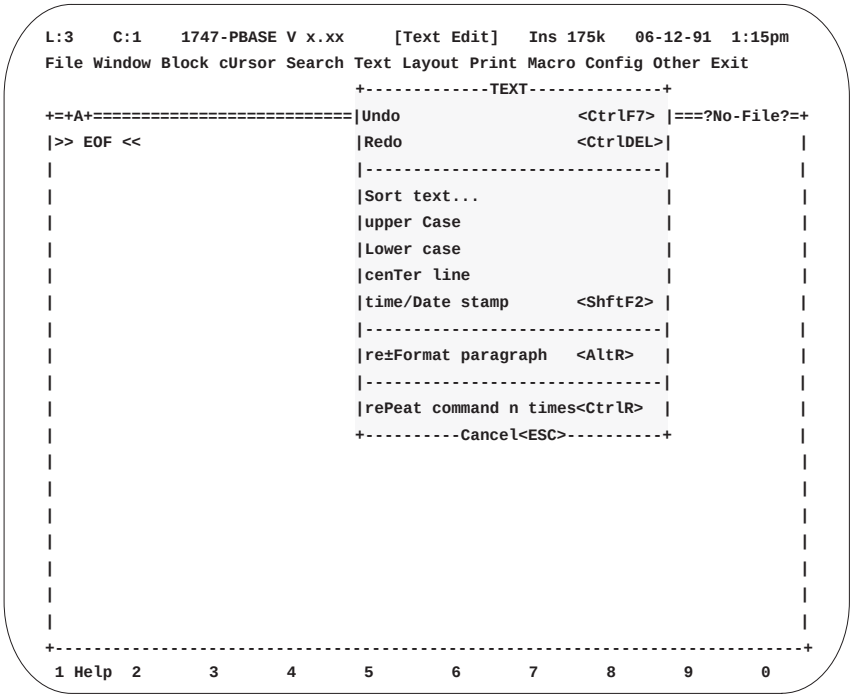
Option	QuickStroke	Description
`Undent line block`	`[Alt-I]`	moves a block one tab stop to the left. This can be used only on blocks made by marking lines of text.
`Window copy`	`[Shift-F9]`	allows you to copy any block to the currently active window.
`window moVe`	`[Shift-F10]`	allows you to move any block to the currently active window.

Text Formatting, Undo, and Redo

The Text menu supports text entry and formatting with a number of timesaving features. This menu also includes an undo and redo, allowing you to step back through any unwanted work.

`Path: Toplevel menu → Edit mode → Text`
`QuickStroke: available for individual items within the Text menu`

Figure 4.4 Text Menu



IMPORTANT If you are unable to change any characters in a file, that file has probably been locked. Files can be locked (made read-only) or unlocked through the File menu. Move the cursor to the Information About Current File option and press **`[Enter]`** or the left mouse button. Below the description of the current file are the unlock and lock options. Press **`[Tab]`** and/or the arrow keys to select either of these options and press **`[Enter]`** or the left mouse button.

The following is a list of the options available from the text menu and a brief explanation of their function. Remember that Hypertext help is available with more details.

Table 4.4 Text Menu Options

Option	QuickStroke	Description
`Undo`	`[Ctrl-F7]`	allows you to undo your last editing actions, excluding file saves and file loading. The amount of undo stops can be set from 0 to 65535 through the Setup and Configuration menu.
`Redo`	`[Ctrl-Delete]`	allows you to reverse your last undo.
`Sort text`		allows you to sort the lines of your file into ascending or descending, alphabetical or numerical order. You can control which column of characters is to be sorted, and you can confine the sorting to a specific area you have defined with a block.
`upper Case`		allows you to change a word, line, or block to all upper-case letters.
`Lower Case`		allows you to change a word, line, or block to all lower-case letters.
`cenTer line`		Centers the currently selected line between column 1 and the right margin.
`time/Date stamp`	`[Shift-F2]`	causes the current date and time to be inserted at the cursor location.
`re-Format paragraph`	`[Alt-R]`	places text into a paragraph that extends from the left margin to the right margin and wraps lines as needed. This feature is generally used when paragraphs of text are involved.
`rePeat command n times`	`[Ctrl-R]`	allows you to type in a number of repetitions followed by the key you want to repeat. For example, selecting rePeat command n times and then typing 74x results in seventy-four x's being inserted at the current cursor location. Typing 20 followed by the delete key causes the next twenty characters to be deleted.

Advanced Editing Techniques

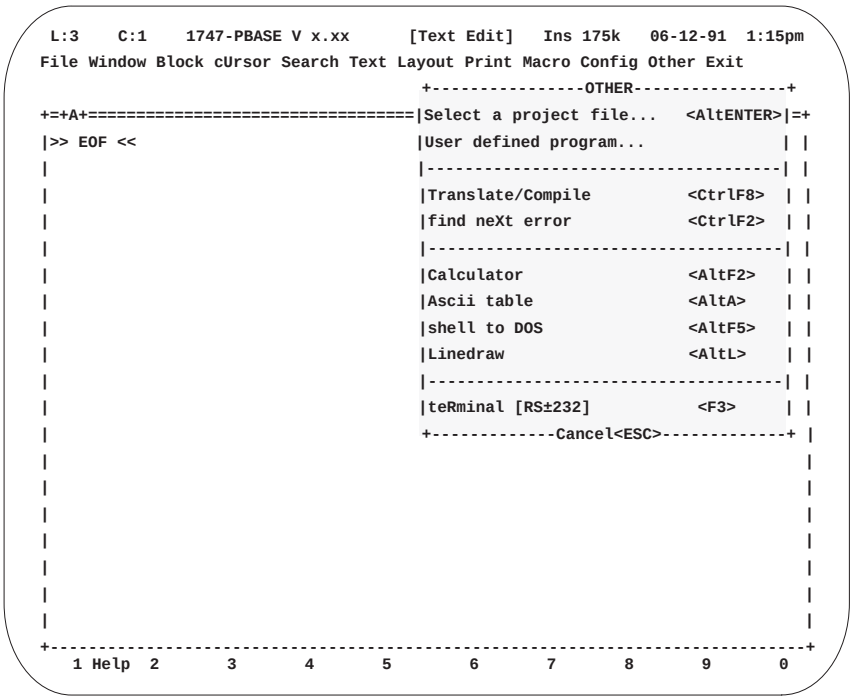
This section deals with the more sophisticated editing techniques available with the BASIC Development Software. These topics include:

- lines
- calculator
- ASCII Table
- windows
- keystroke macros
- cursor markers

The Other menu provides access to the first three of the advanced features described in this section.

Path: Toplevel menu → Edit mode → Other
QuickStroke: available for individual items within the other menu.

Figure 4.5 Other Menu



Drawing Lines

Path: Toplevel Menu → Edit mode → Other → Linedraw
QuickStroke: Toplevel Menu → Edit mode → [Alt-L]

The linedraw feature, available through the Other menu, is useful in creating boxes, bar graphs, and tables. When used in a print statement, these lines translate for use in any BASIC program executed through the BASIC module.

Linedraw allows you to draw single or double lines and boxes in a window. The lines are saved with the file and translated into BASIC code if you are using the 1747-PBASE Translator. Be aware that some printers may require special line characters to be defined in order to print the lines.

Hypertext help is available with more details on this feature.

Your BASIC Development Software comes with an example line-drawing program that uses this feature with programming macros. You can load this program into a window and review it as an example. It is called LINEDRAW.BDL and resides in the BAS sub-directory.

Using the Calculator

Path: Toplevel Menu → Edit mode → Other → Calculator
QuickStroke: Toplevel Menu → Edit mode → [Alt-F2]

The calculator feature, available through the Other menu, is useful for doing quick math operations right on your personal computer where the result can be pasted into the active file.

The calculator works with decimal, hexadecimal, octal, or binary formats. It can perform addition, subtraction, multiplication, and division. It can also perform logical AND, OR and exclusive OR functions. The calculator has a tape output so you can review your entries, and a paste option that pastes the calculation result at the last cursor location in the active window.

Hypertext help is available with more details on this feature.

The ASCII Table

Path: Toplevel menu → Edit mode → Other → ASCII table
QuickStroke: Toplevel menu → Edit mode → [Alt-A]

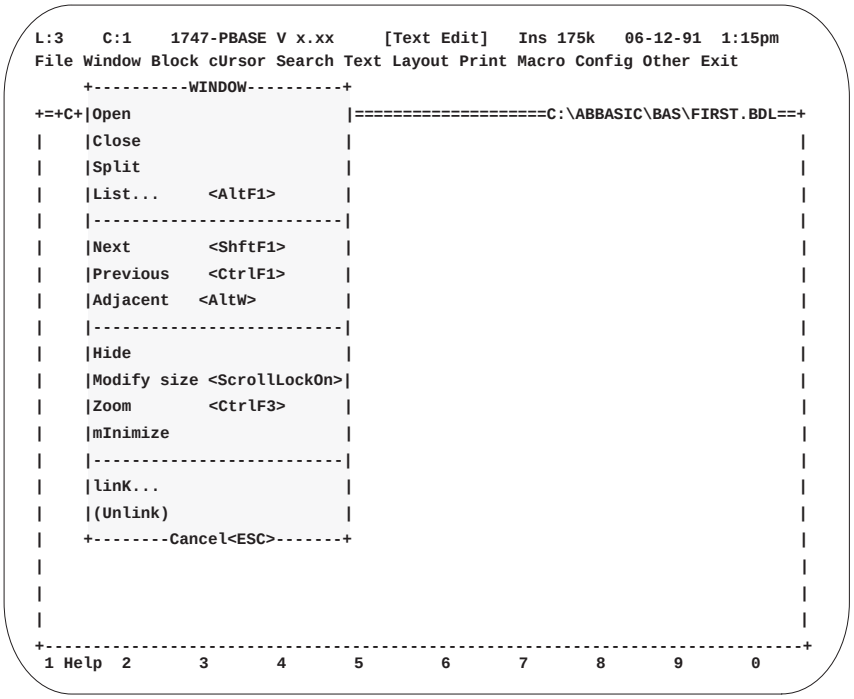
The ASCII table is a view-only, three-page ASCII table with character, decimal, and hexadecimal columns.

Using Windows

Path: Toplevel menu → Edit mode → Window
QuickStroke: available for individual items within the Window menu

Windows are labeled alphabetically in their top left corner. The software can open up to 100 windows simultaneously. Each may contain a separate file, or they can be linked together and contain different parts of the same large file. You can open and close these windows independently of one another.

Figure 4.6 Window Menu



The best way to understand and become proficient at using the window features is to apply them as you edit files. Hypertext help is available to assist you. The window menu items are explained briefly in the following table.

Table 4.5 Window Menu Options

Option	QuickStroke	Description
Open		opens a new window. A new file may or may not be loaded at the same time.
Close		closes the current window. If the file in that window has been edited but not saved, you are prompted to save or abandon the changes.
Split		splits the current window horizontally or vertically. A new file can be loaded in the process. If not, the existing file is duplicated in the split window and linked to the original.
List	**[Alt-F1]**	lists the open windows by window letter, filename, status, and path. Windows can be selected, deleted, hidden, saved, and previewed through this list.
Next	**[Shift-F1]**	alphabetically selects the next window, unless it is hidden.
Previous	**[Ctrl-F1]**	alphabetically selects the previous window, unless it is hidden.
Adjacent	**[Alt-W]**	prompts for a direction to activate an adjacent window.

Table 4.5 Window Menu Options

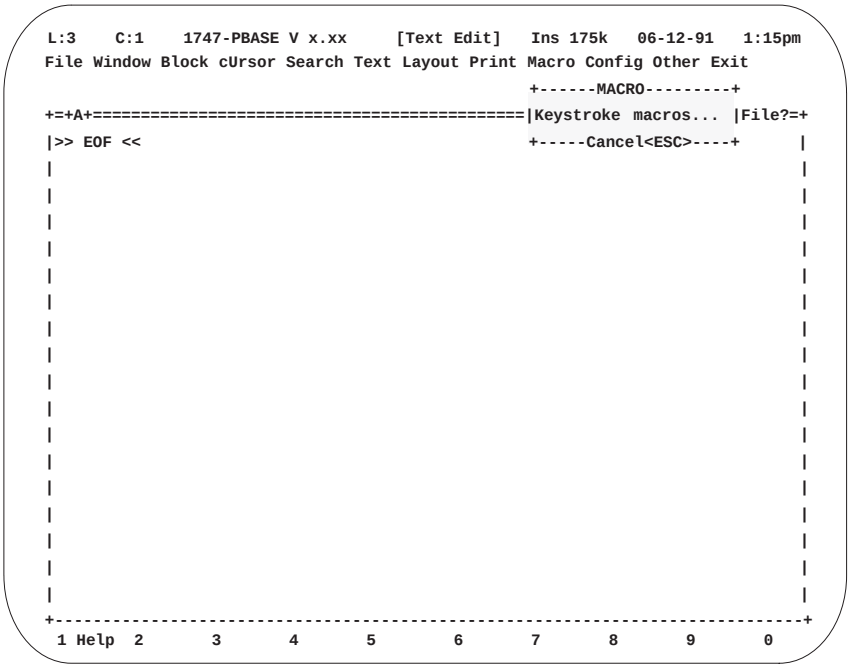
Option	QuickStroke	Description
Hide		hides a specific window. To bring it back, select List from the Window menu, select the hidden window on the **WINDOW LIST** dialog box, and then press **[Enter]** or select **OK<ENTER>**.
Modify size	**[Scroll Lock On]**	moves or resizes a window.
Zoom	**[CTRL-F3]**	increases a window to full size. Zooming the same window a second time returns it to its original size.
mInimize		reduces a window to a single line icon.
InK		allows you to view and/or edit different sections of the same file by placing those sections in different windows. This is useful for large files and when doing block editing.
Unlink		unlinks a previously linked window.

Using Keystroke Macros

Keystroke macros allow you to record a series of key presses that accomplish a specific task. The recorded keystrokes are then saved as a keystroke macro that can be played back with a single QuickStroke.

Path: Toplevel menu → Edit mode → Macro

Figure 4.7 Macro Menu



Keystroke macros make your work easier and faster by allowing you to cut down on repetitive actions. For example, suppose that every time you create a program file, you enter the same information in a header. You can create a file that contains this information and splice it into each new program file. To do this, you create a file containing the header information, save it to disk under the name **`header`**, and then use the **`Merge file from disk`** option from the File menu.

This makes things faster, but you still have to go through the steps of getting the file and merging it into your program. Creating a keystroke macro would allow you to complete the merge process with one keystroke.

IMPORTANT When recording keystrokes to create a keystroke macro, do not use the mouse to select menu items or to position the cursor. Use the actual keystrokes, including the function keys and the appropriate letter keys to select menu item.

IMPORTANT When recording keystrokes, avoid using the cursor keys to select menu items or filenames. If you record cursoring down to select the sixth file in the list, and that list increases or decreases in number, you will probably end up selecting the wrong file.

Follow the step by step procedure below to create a keystroke macro to consolidate the file merging in the above example. Remember that Hypertext help is available to assist you.

1. Press **`[Alt-F10]`** to begin keystroke recording.

   Notice the blinking reverse R character in the status line at the top of the screen. The R stands for recording and alerts you that all keystrokes are being recorded until you press **`[Alt-F10]`** again.

2. Press the keys that you would use to accomplish the file splicing:
   - **`[F2]`** brings up the Main menu
   - **`[F]`** selects the File menu
   - **`[M]`** selects **`Merge file from disk`**
   - **`[type in the name of the file to load]`**
   - **`[Enter]`**

3. Press **`[Alt-F10]`** again to stop keystroke recording. Once recording is terminated, you asked if you want to save the keystroke macro. Select the **`Yes`** option. The **`EDITING KEYSTROKE MACRO`** dialog box appears. You are prompted to enter a description, QuickStroke key assignment, and mode specification for the keystroke macro.

4. Type in **`Company header`**, the description for this keystroke macro. DO NOT press **`[Enter]`**. Doing so will save the macro without a QuickStroke assignment. If you press **`[Enter]`** by mistake, you can return to the **`EDITING KEYSTROKE MACRO`** dialog box by pressing **`[F3]`**.

5. Move the mouse cursor to the QuickStroke assignment field and click the left mouse button. If you do not have a mouse, press **[Tab]** to move the cursor to the QuickStroke assignment field and then press **[Space bar]**. The **EDIT QUICKSTROKE** dialog box appears.
6. Press **[Alt-B]**, the QuickStroke for this macro. Legal QuickStroke key assignments are described in Valid QuickStroke Key Assignments on page 4-15.
7. Press **[Tab]** to move down to the Mode field. This is described in Editing Keystroke Macros.
8. Press **[Enter]** to leave the Mode field unchanged and return to the keystroke **MACRO MANAGER** dialog box. There you see Company header added to the list of keystroke macros with **[Alt-B]**, the QuickStroke that activates it, on the right.

   From this point on in the current editing session, whenever you press **[Alt-B]**, the header is entered at the current cursor location.

Changing Recorded Keystrokes

Before leaving the keystroke **MACRO MANAGER** dialog box, you may want to make a change to the recorded keystrokes. For example, you find that the company header is always left-highlighted after the file-merge operation you defined with the {Alt-B] QuickStroke. Since it is necessary to turn this block marking off before any other block editing can be done, you can add the necessary keystrokes to the macro.

1. From the keystroke **MACRO MANAGER** dialog box, highlight the **Company header** keystroke macro, and press **[F3]** to edit it.
2. On the **EDITING KEYSTROKE MACRO** dialog box, select **Edit keystrokes** with the mouse and press the left mouse button. If you do not have a mouse, press **[Tab]** to move the cursor to highlight **Edit keystrokes**, and then press the space bar or down arrow.
3. Move the cursor down the list of keystrokes to the line *immediately preceding* where you wish to insert keystrokes.
4. Press
   - **[INS-F2]** to insert the keystroke to access the pull-down menus.
   - **[INS-B]** to insert the keystroke to access the block menu.
   - **[INS-F]** to insert the keystroke to turn the block marking off.
5. Press **[Enter]**, indicating that you are done editing keystrokes.
6. Press **[Enter]**, indicating that you are done editing the keystroke macro.
7. Press **[Enter]**, indicating that you are done with the keystroke **MACRO MANAGER**.

The whole process of splicing header information into any new file has now been reduced to one keystroke, **[Alt-B]**, and has been saved permanently to the active disk drive.

Editing Keystroke Macros

You have just recorded, saved, renamed, and edited a keystroke macro using a step-by-step approach. This sub-section is intended to provide an overview of all of the options available to create, delete, copy, edit, or play back a keystroke macro from the **MACRO MANAGER** dialog box.

Table 4.6 Macro Manager Options

Option	QuickStroke	Description
Create	**[INS]**	creates a new keystroke macro. Selecting create brings up the **EDITING KEYSTROKE MACRO** dialog box. There are four fields in this dialog box. • Description – enter up to 25 characters • QuickStroke assignment – press **[Tab]** to get to this field, followed by the space bar to allow you to edit it. Enter the keystroke that will trigger the macro. • Mode – Press **[Tab]** to get to this field, followed by the space bar or down arrow to display the options you may select. Mode selection determines whether the keystroke macro can be invoked from Edit or Terminal modes.(1) • Edit Keystroke – Press **[Tab]** to get to this field, followed by the space bar or down arrow to display a list of the actual keystrokes programmed for the selected macro. You can cursor up or down the list and then add **[INS]**, delete **[DEL]**, or change **[F3]**, the keys as needed.
Delete	**[DEL]**	erases a keystroke macro that was previously saved.
Copy	**[F4]**	duplicates a keystroke macro. You are prompted for a descriptive name for the duplicate. Then you are prompted to replace or reassign the QuickStroke key.
Edit	**[F3]**	allows you to edit the existing keystroke macro. Selecting this brings up the **EDITING KEYSTROKE MACRO** dialog box.
Playback	**[Enter]**	executes the highlighted keystroke macro immediately and returns to the Edit mode. You can use this to execute any keystroke macro on the list, including those that have not been assigned a QuickStroke.
Done	**[Esc]**	exits the keystroke **MACRO MANAGER** dialog box and returns to the Edit mode.

(1) In some cases, it may be useful to assign keystroke macros for use in Terminal mode. They could be written to send commands like RUN, CONT, NEW, or LIST to the BASIC or BASIC-T modules.

Valid QuickStroke Key Assignments

You can use any keystrokes that begin with **[Alt]** provided that the combination is not already in use. A message appears prompting you to enter a different combination if the one you selected is already in use. The QuickStroke key assignments are listed when you select Quick reference in Hypertext help.

In addition to the **[Alt]** keystrokes, you may be able to assign additional special function keys, depending on you personal computer's keyboard. For example, on AT or PS/2 style keyboards, the **[F11]**, **[F12]**, and **[center]** keys can be assigned as QuickStroke keys.

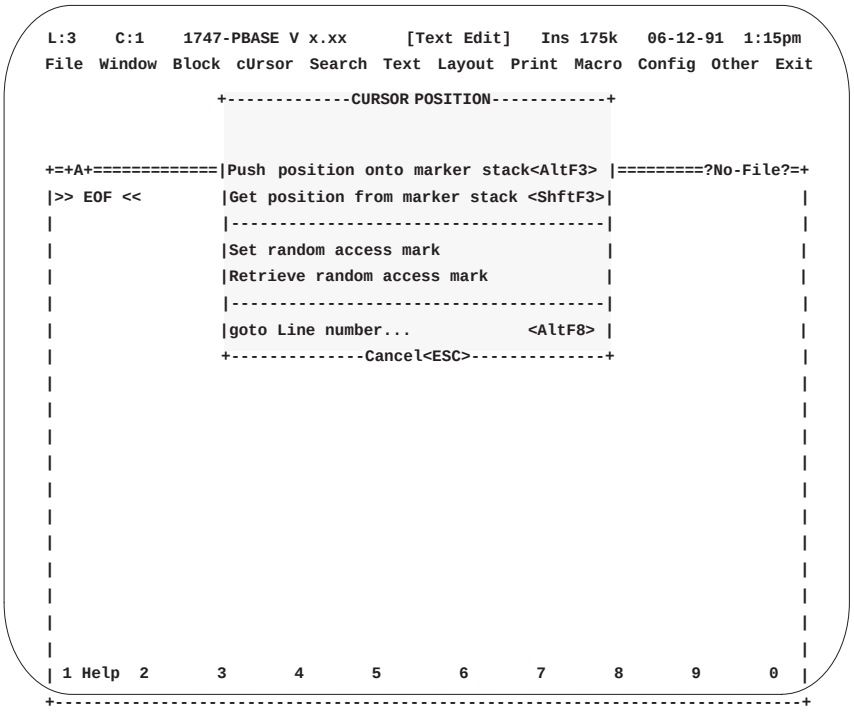
Using Cursor Markers

The Cursor menu provides several options for marking and retrieving the cursor position while writing programs.

If you are editing a very large file and need to frequently access a different section, you can set a cursor position marker at a key location and then instantly move to that position marker at any time with a single keystroke. The markers can be stacked up to 10 deep so that you can access up to 10 positions in the reverse order that they were stored. You can also set several random access marks throughout a file for random access according to a marker number.

Path: Toplevel → Edit mode → cUrsor
QuickStroke: available for individual items within the Cursor menu

Figure 4.8 Cursor Menu



The following table briefly describes the options available from the Cursor menu. Remember that Hypertext help is available with more details.

Table 4.7 Cursor Menu Options

Option	QuickStroke	Description
Push position onto marker stack	**[Alt-F3]**	stores up to 10 cursor positions in a marker stack. They are stored in the order they are saved each time this menu option is selected.
Get position from marker stack	**[Shift-F3]**	retrieves a stored cursor position from the marker stack and causes the cursor to move to that position. Positions are retrieved in the reverse order that they were saved.
Set random access mark		stores up to 10 cursor position for random retrieval within each window. These are not the same cursor positions as those in the marker stack. They are stored with a marker number from 0 through 9 and prompted when this menu option is selected.
Retrieve random access mark		retrieves the selected, stored cursor position and causes the cursor to move to that position. You are prompted for marker number 0 through 9 when this menu option is selected.
goto Line number	**[Alt-F8]**	prompts for a line number and then positions the cursor at that line in the file. The number you enter is *not* a BASIC program line number; rather, it is the absolute line number from the top of the file.

Manipulating Files

The goal of this chapter is to familiarize you with the manipulation features of your BASIC Development Software, including:

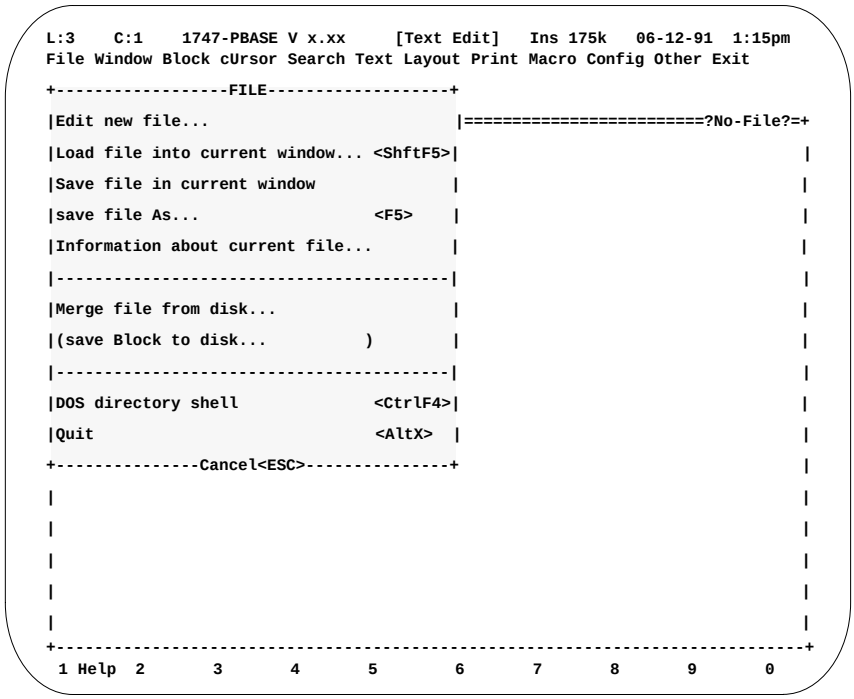
- the File menu
- project file selection
- user-defined programs

The File Menu

The first pulldown menu to the left of the main menu is the File menu. This menu is the most commonly used feature for file manipulation.

Path: Toplevel menu → Edit mode → File
QuickStroke: available for individual items within the File menu

Figure 5.1 File Menu



The following table provides a brief explanation of the options available from the File menu.

Table 5.1 File Menu Options

Option	QuickStroke	Description
Edit new file		creates a new window where a new or existing file is loaded. A dialog box appears from which you can either type in the filename or select it from a directory list. The directory list has the flexibility to list files from any directory on any disk drive in your system. There are also sort options for the directory list that allow you to list files by extension, name, size, date, and time.
Load file into current window	**[Shift-F5]**	loads a file into the existing window and replaces any file currently in the window. If the current file has been changed and not saved, you are first prompted to save or abandon the changes. Then a dialog box appears from which you can select a new file to load.
Save file in current window		save the files in the currently active window. It saves the file under its original name and replaces any previously saved version.
save file As	**[F5]**	saves the files in the currently active window under a different name. You can type a new name with extension in the dialog box that appears, or you can select an existing name from the directory list in the dialog box. If you select the name of an existing file, you are asked if you want to overwrite that file before the save takes place.
Information about current file		gives you the current filename, location, and amount of disk space used. From the dialog box displayed, you can also change the filename or lock the file so it cannot be modified.
Merge file from disk		merges another file into the file you are editing at the current cursor location. A dialog box appears from which you can select the file you wish to merge.
save Block to disk		saves a block to a disk as a separate file. A block is a portion of a program you have marked to be copied moved, or deleted, etc. See Using Block Operations on page 4-3 for details on selecting a block.
DOS directory shell	**[Ctrl-F4]**	displays DOS directories and directory trees from which you can select files. See Appendix B for more information on the DOS directory shell.
Quit	**[Alt-X]**	takes you out of the BASIC Development Software. IF any open files have been changed and not saved, you will be prompted to save or abandon the changes.

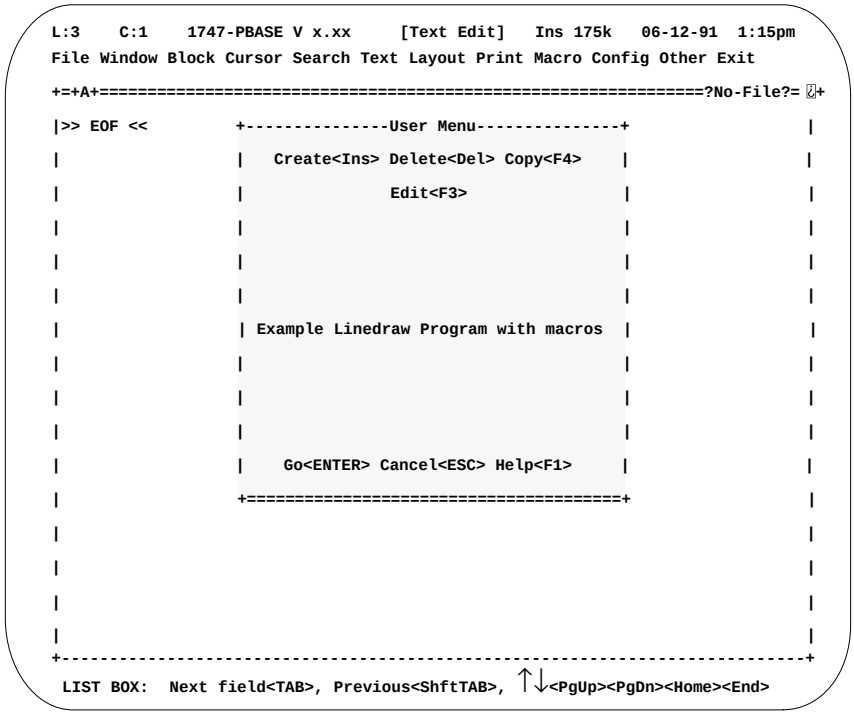
Selecting Project Files

The Select a project file option creates a personalized menu of frequently used files. It helps with organization and saves file loading time. This option can be accessed from either the Toplevel menu or the Other menu (under the Main menu).

User Menu

Path: Toplevel menu → Select a project file
Path: Toplevel menu → Edit mode → Other → Select a project file
QuickStroke: Toplevel menu → Edit mode → [Alt-ENTER]

Figure 5.2 User Menu



Behind the user menu is the A window and above it is the Main menu, indicating that you are now in Edit mode.

Use the up or down arrow keys or click you mouse on the vertical scroll bar to highlight different files. When you reach the file you wish to load, press **[Enter]** or click your mouse on the **Go<ENTER>** option. The file is loaded into the next available window. A new window is created, if necessary.

When you load a file into the User menu, you must create a descriptive name for the file under which the file will be listed on the user menu. The actual filename does not change.

For example, you have two BASIC files called FURN1.BDL and FURN2.BDL, used to control heat-treating furnaces. If you add them to the user menu, you can load them quickly using the Select a project file option. Also, you can create a descriptive name so that others using the software will recognize them. The FURN1.BDL file could be listed as “FURNACE CONTROL PROGRAM, MAIN FURNACE, SOUTH WALL”. The FURN2.BDL file could be listed as “FURNACE CONTROL PROGRAM, BACKUP FURNACE, WEST WALL”.

To load files into the User menu:

1. Select the **Create<Ins>** option from the user menu.
2. Enter a descriptive filename to the right of the Name option.
3. Enter the actual filename to the right of the select a Filename option.
4. Select the **OK<ENTER>** option when you are finished.

   Notice that the descriptive name now appears on the User menu.

Besides inserting a file on the User menu, you also have the option to edit, delete, or copy an existing file on the User menu.

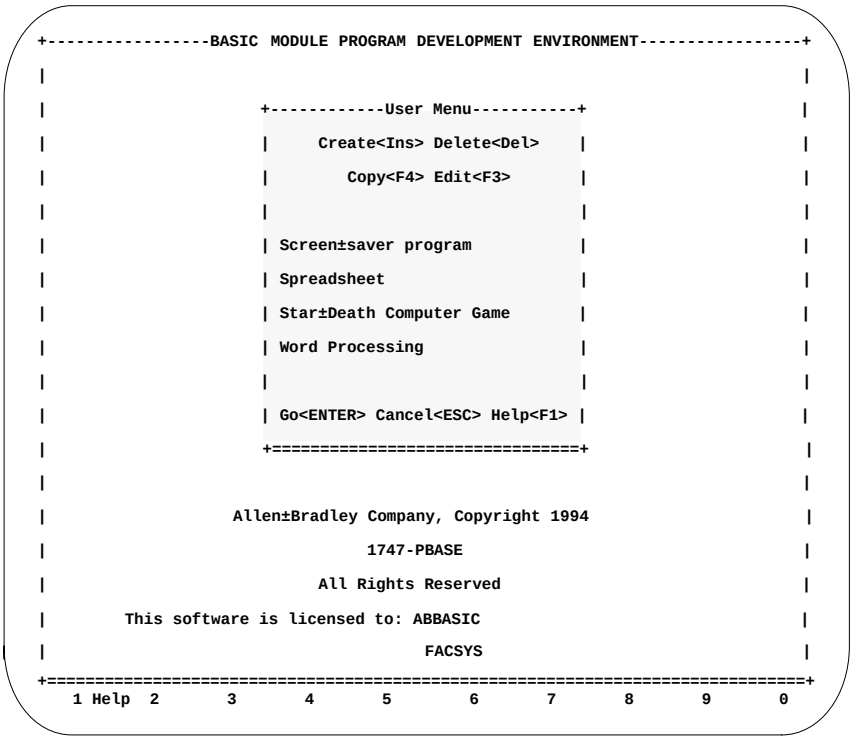
User-defined Programs

The User-defined program option on the Toplevel menu allows you to drop out of the BASIC Development Software to execute other programs on your personal computer. User-defined programs may be your word processing program, a file or disk management program, or a spreadsheet.

User-defined programs appear on a User menu, just like the project files discussed in the previous section. However, this is an entirely different User menu and the programs on it are generally independent programs, executable at the DOS level of your personal computer.

Path: Toplevel menu → User defined program
Path: Main menu → Edit mode → Other → User defined program

Figure 5.3 User-defined Programs User Menu



Programs are entered onto the User menu in a similar manner as the previous User menu, except that there are memory and directory issues to clarify.

Name Selection

When you enter a program into the User menu, you must create a descriptive name for the program, under which the program will be listed in the User menu. The actual filename for the file does not change.

To create a descriptive name for the file:

1. Select the **Create<Ins>** option from the User menu.
2. Enter a descriptive name, up to 120 characters, as you would like it to appear on the User menu.

Selecting a Filename

For the user-defined program feature to work correctly, you must enter the actual filename of the program as it appears in you personal computer's directory. Typically, you have to enter more than just the filename here. Unless the file resides in the current working directory, you have to provide a complete DOS path for the program.

To select the actual filename:

1. Highlight the select a Filename option and press **[Enter]** or click the left mouse button.

   A dialog box appears, giving you the option to view a directory listing of you personal computer. Use this directory listing to move through your directories and disk drives until you find the actual name that you want to enter into the User menu.
2. Highlight the program that you want and press **[Enter]** or select it with the mouse.

   The filename, along with its complete DOS path, is entered for the selected program.

After selecting the actual filename, move down to the Swap method option.

Swap Method Selection

The **Swap method** option in this dialog box refers to how memory is allocated when executing a user-defined program while still retaining the active files and current screens being used in the BASIC Development Software.

The following table contains a brief explanation of the options available under the Swap method option.

Table 5.2 Swap Method Options

Option	Description
No swap	when executing a user-defined program, no additional memory is freed up by swapping BASIC Development Software out to disk or EMS. EMS refers to your computer's expanded memory, if it has any.
To disk only	when executing a user-defined program, additional memory is freed up by swapping BASIC Development Software out to disk.
To EMS only	when executing a user-defined program, additional memory is freed up by swapping BASIC Development Software out to EMS.
To EMS then to disk	when executing a user-defined program, additional memory is freed up by swapping BASIC Development Software out to EMS first and then to disk.
Use default method	the swap method used is the same as selected for Shelling to DOS

IMPORTANT You may select a user-defined program that was executed with no problems before, and find that it is now too large for you personal computer's RAM memory. This is because the program now has to share RAM memory with the BASIC Development Software.

For large RAM memory-consuming files, you generally have to select the To EMS or To disk only options when adding those files to the User menu.

To select the swap method:

1. Highlight **`Swap method`**.
2. Select the desired Swap method.

After selecting the **`Swap method`**, move to **`Memory required`**.

Memory Required Selection

The **`Memory required`** option in this dialog box refers to how much memory is required to run your user-defined program. The BASIC Development Software checks its available memory before attempting to run the user-defined program. If the amount of available memory is greater than the amount specified by this option, then the BASIC Development Software will not swap itself out to EMS or disk.

To select **`Memory required`**:

1. Highlight **`Memory required`**.
2. Enter the amount of memory required for your user-defined program.

After selecting the amount of memory required, move down to **`Options`**.

Use COMMAND.COM Option

The **Use COMMAND.COM** option allows you to use internal DOS commands like DIR, DEL, COPY, etc. from the User-defined Programs menu.

To select **Use COMMAND.COM**:

1. Highlight **Use COMMAND.COM**.
2. Use the space bar to toggle your selection.
   - [X] = Yes
   - [Y] = No

After selecting **Options**, move to Starting directory.

Starting Directory

If you failed to define a complete directory path to the filename you entered above, you may do so here. For example, you could enter C:\WORD if the word processing filename you selected resided in the C: drive of your personal computer in the Word directory on that drive. Refer to you DOS manual for details on defining directories and directory paths.

Writing Programs Using the BASIC Development Language

This chapter is designed to help you write programs using the BASIC development language. It begins with an overview of the language. Other topics include:

- translator directives
- keystroke and programming macros
- program integration from separate files
- second program creation

Overview of the Language

The *BASIC Language Reference Manual* (publication number 1746-RM001A-US-P) and the *SLC 500™ BASIC and BASIC-T Modules User Manual* (publication number 1746-UM004A-US-P) define the syntax that provides the core of the BASIC development language. This core is then enhanced by the addition of translator directives and programming macros, all structured to a simple, open format that requires no line numbers. Descriptive label references are used as destinations for transferring control, instead of line numbers.

As an example, a BASIC development language program for printing the date is shown below. It uses a translator directive and a programming macro, and translates to about nine lines in BASIC. That means if you were *not* using the BASIC development language, instead of typing the three lines on the left, you would have to type in the eleven lines on the right.

```
REM EXAMPLE PROGRAM
{$I INCLUDE.BDL}
PRINT_DATE()
```

```
  0 REM ...
 10 REM EXAMPLE PROGRAM
 20 PUSH A
 30 CALL 44
 40 POP A
 50 P. A,"/",
 60 POP A
 70 P. A,"/",
 80 POP A
 90 P. A," ",
100 POP A
```

The initial statement **{$I INCLUDE.BDL}** is called a translator directive. There are several translator directives described in the next section of this chapter; however, this particular one has to be included in the beginning of your BASIC development language programs if you want to use any of the BASIC programming macros. It directs the 1747-PBASE Translator to a file called INCLUDE.BDL at the time the file is translated. This file contains the programming macros described in Appendix A of this manual.

IMPORTANT If you are using the 1771-DB/B, you must also include the line: **{$I INCLUDBB.BDL}**.

The command **PRINT_DATE()** is one of those BASIC programming macros from the INCLUDE.BDL file. A programming macro is like a BASIC subroutine that has already been created for you. If you look through appendix A, you see that there are close to 100 macros, including many with single or multiple variables.

To summarize, the core of the BASIC development language is the BASIC language. The BASIC development language enhances the BASIC language by offering translator directives and programming macros in an open format that does not require line numbering.

Translator Directives

When you write a program using the BASIC development language, it eventually must be translated to the BASIC language for downloading to the BASIC or BASIC-T module. Translation is performed by the 1747-PBASE Translator software.

This translation software is driven by translator directives that are included in a program. These directives result in the simplified, open format of the BASIC development language being translated to the commands and format of the BASIC language. The following is a list of BASIC translator directives:

Comment
(Remark)

Any text located within { } curly brackets are program comments which *are not* included in the translated program. Remarks (which are not translator directives, mentioned here for comparison only) *are* included in the translated program. Both of these can be used as an aid in debugging as well as program documentation. Memory limitations of the BASIC or BASIC-T module may dictate that you use more comments and fewer remarks.

Syntax:{ }

Syntax: REM

Example:

Before translation:	After translation:
`{This is a comment}`	`0 REM ...`
`REM THIS IS A REMARK`	`10 REM THIS IS A REMARK`

IMPORTANT If a dollar sign immediately follows the left curly bracket, it is not interpreted as a comment. Comments are also not allowed inside of comments.

Examples of illegal comments:

```
{$ comment}
{{comment}}
```

IMPORTANT Remarks (line zero) will be created by the 1747–PBASE Translator for each .BDL program that is translated (indicated in this manual by: 0 **`REM ...)`**. This remark contains the translator's filename (BTRAN), followed by its revision number, path and name of the program being translated, and date and time.

For example, upon translating the FIRST program of chapter 2 you would get something like:

```
0 REM BTRAN V X.XX C:\ABBASIC\BAS\FIRST.BDL, 06-12-91 06:35pm
```

Include

The Include directive tells the translator to load another source code file into the current program. This method of file inclusion allows you to frequently used routines in many different programs without re-entering any code or having to edit line numbers. The included file can contain any combination of program statements and translator directives.

Syntax: **`{$I [filename.ext]}`**

Example:

Before translation:	After translation:
`REM INCLUDE EXAMPLE`	`0 REM ...`
`{$I FIRST.BDL}`	`10 REM INCLUDE EXAMPLE`
	`20 FOR X=1 TO 100`
	`30 A=X*2`
	`40 P. A`
	`50 NEXT X`
	`60 END`

For this example, we have included the file FIRST.BDL. Its name was entered in an include directive, and the entire program appeared after translation.

During translation, the translator first looks to see if there is a DOS path specified with the include directive to indicate where the file FIRST.BDL can be found. For example, you could use:

`{$I A:\FIRST.BDL}` if the file FIRST.BDL is on the A: disk drive,
or
`{$I C:\ABBASIC\BDS\FIRST.BDL}` if the file FIRST.BDL is in the BDS subdirectory of the BASIC Development Software.

If no DOS path is specified with the include directive, then the translator looks to see if a DOS path is specified in the translator's command line. This is described in Chapter 8.

If there is no DOS path specified in either the include directive or the translator's command line, then the translator searches the current working directory for the file FIRST.BDL.

In either of these three cases, if the file is not found, then **`Error 25: File not found`** appears in the message line during translation.

IMPORTANT The file INCLUDE.BDL comes as part of the BASIC Development Software package. It contains the BASIC programming macros and the information necessary to translate them. Therefore, the statement **`{$I INCLUDE.BDL}`** should appear at the beginning of any program in which you intend to use the programming macros.

Label

Labels are used instead of line numbers to reference a target location in a program. A symbolic label is used anywhere you would have used a program line number in BASIC to reference a branch or jump location. This makes programs easier to read and understand, and there is no need to renumber the program after changes are made.

The label name is a string of up to 30 ASCII characters. The character set is defined to be [0..9, A..Z, a..z,_]. The label name cannot contain any tabs or spaces and must begin with a letter.

Syntax: **{$L [labelname]}**

Example:

Before translation:

```
REM LABEL EXAMPLE
IF A>C THEN GOTO GET_C_VALUE
A=55
{$L GET_C_VALUE}
C=107
```

After translation:

```
 0 REM ...
10 REM LABEL EXAMPLE
20 IF A>C THEN GOTO 40
30 A=55
40 C=107
```

Text

The Text directive allows you to include commands like RUN and LIST in your program. When translated, these commands are *not* given line numbers; but they are included in the output file. As the file is downloaded to the BASIC or BASIC-T module, these directives are executed as soon as they are encountered.

Syntax: **{$T [command for module]}**

Example:

Before translation:

```
REM TEXT COMMAND EXAMPLE
{$I INCLUDE.BDL}
FOREGROUND_BLACK()
BACKGROUND_RED()
CLS()
A=55
C=107
{$T RUN}
```

After translation:

```
 0 REM ...
10 REM TEXT COMMAND EXAMPLE
20 PRINT CHR(27),“[30m”,
30 PRINT CHR(27),“[41m”,
40 PRINT CHR(27),“[2J”,
50 A=55
60 C=107
RUN
```

In the above example, immediately after the file is downloaded, the RUN command is encountered and executed.

Line Number

The Line Number directive allows you to specify a starting line number to be used by the translator when it assigns line numbers to each program line. The line number can be any number between the values of 1 and 65535.

Line Number directives can be placed anywhere in the program. The line following the directive begins with the new number.

Syntax: **{$N [linenumber]}**

Example:

Before translation:

```
REM LINE NUMBERING
{$N 500}
IF A>C THEN GOTO GET_C_VALUE
A=55
{$L GET_C_VALUE}
{$N 800}
C=107
```

After translation:

```
  0 REM ...
 10 REM LINE NUMBERING
500 IF A>C THEN GOTO 800
510 A=55
800 C=107
```

Increment

The Increment directive allows you to specify a numeric value to be used as an increment between line numbers. The translator uses this increment when it assigns line numbers during translation. The number must be between the values of 1 and 100.

This directive can be used throughout the program as often as needed. The line number immediately following this directive is numbered according to the previous increment. Any lines after that are numbered according to the new increment.

Syntax: **{$S [number]}**

Example:

Before translation:

```
REM INCREMENT LINES BY 5'S
{$S 5}
IF A>C THEN GOTO GET_C_VALUE
A=55
REM INCREMENT LINES BY 10'S
{$S 10}
{$L GET_C_VALUE}
C=107
END
```

After translation:

```
 0 REM ...
10 REM INCREMENT LINES BY 5'S
20 IF A>C THEN GOTO 35
25 A=55
30 REM INCREMENT LINES By 10'S
35 C=107
45 END
```

Breakpoint

The Breakpoint directive inserts a STOP statement into the program when it is translated. The STOP statement is inserted only if the Debug directive is turned on {$D+}. When downloaded to the module and executed, program execution halts when the STOP is encountered. Entering the command CONT (for CONTinue) resumes execution from where it stopped.

Breakpoints can be used as debugging aids or to allow you to display or modify variables.

Syntax: **{$B}**

Example:
Refer to the example for Debug.

Debug on
Debug off

When the Debug directive is programmed on {$D+}, STOP statements are inserted at all the Breakpoints {$B} during program translation. {$D+} inserted anywhere in the program turns Debug on until {$D–} is encountered. The default is for Debug to be turned off {$D–}.

IMPORTANT The Debug directive is not related to the Terminal mode debugger in any way. In fact, if you use theTerminal mode debugger (described in Chapter 9), you should *not* use the Debug directive or the Breakpoint directive. The Debug and Breakpoint directives are useful for debugging programs from Terminal mode without using the Terminal mode debugger.

Syntax:**{$D+} to turn debug on**
{$D–} to turn debug off

Example:
Before translation:

```
REM  DEBUGGING
{$B}
{$D+}
IF A>C THEN GOTO GET_C_VALUE
{$B}
A=55
{$L GET_C_VALUE}
{$B}
C=107
```

After translation:

```
 0 REM ...
10 REM DEBUGGING
20 IF A>C THEN GOTO 50
30 STOP
40 A=55
50 STOP
60 C=107
```

In the preceding example, the first breakpoint is not translated to a STOP. This is because Debug has not been turned on at that point.

Macros

There are three types of macros used with the BASIC Development Software. They are:

- keystroke macros — temporarily or permanently record a series of keystrokes and replace them with a single keystroke. Keystroke macros are described in Chapter 4.
- programming macros — streamline programming and make your programs more readable and understandable. The BASIC Development Software comes with a file called INCLUDE.BDL, which contains close to 100 programming macros. These programming macros are listed and described in detail in Appendix A. The 1771-DB/B backplane calls are in the INCLUDBB.BDL file. These backplane calls are listed and described in detail in Appendix A.

  Beginning a program with the statement **{$I INCLUDE.BDL}** allows you to use any of them by simply typing in its macro call, such as **foreground_green()**. When your program is translated, the 1747–PBASE Translator goes to the INCLUDE.BDL file to find the BASIC subroutine that corresponds to that macro call.
- user-created programming macros — support your programming needs. While the programming macros described above already exist in the BASIC Development Software, these are created by you. They are created using a $MACRO translator directive described in the next section.

Creating Your Own Programming Macro

The Macro directive is a translator directive that allows the user to define BASIC statements as a macro that can be used in the program.

A programming macro must be defined before it can be called, or else a syntax error results. The maximum number and size of macros defined in a source file is limited only by the amount of memory available on your personal computer at translation time. Programming macros *cannot be nested*.

Labels can be defined and used within a macro; however, these labels can be referenced only from within the body of the macro. The translator assigns a unique line number for each label in the macro when the program is translated.

The macro call is a string of up to 30 ASCII characters. The character set is defined to be [0..9, A..Z, a..z,_]. The macro call cannot contain any tabs or spaces, and must begin with a letter.

Syntax:**{$MACRO [macrocall(%1,%2...%n)]}**
{$ENDM}

The variables %1, %2... above refer to parameter values that are passed to the programming macro. The maximum number of passed parameters, %n, is limited to 20. The **{$ENDM}** directive marks the end of the macro definition.

Example:

A programming macro is written to set the wall clock's day, month, and year. The macro is named Setdate and is defined by the BASIC lines between **{$MACRO...}** and **{$ENDM}**. After the programming macro is defined, it can be called again any number of times, anywhere in that program, by simply programming the name Setdate.

Example:

Before translation:

```
REM CREATE PROGRAM MACRO
{$MACRO Setdate(%1, %2, %3)}
PUSH %1
PUSH %2
PUSH %3
CALL 41
{$ENDM}
D=16
M=06
Y=90
Setdate(D,M,Y)
```

After translation:

```
 0 REM ...
10 REM CREATE PROGRAM MACRO
20 D=16
30 M=06
40 Y=90
50 PUSH D
60 PUSH M
70 PUSH Y
80 CALL 41
```

If you have a large number of your own programming macros or a number of them that you use frequently, you may wish to create a file containing only those macros. You could then include that file in all of your programs. For example, if you made a programming macro file named **mine.bdl**, you could then begin all of your programs with the command **{$I Mine.bdl}.** This would include that file during translation and allow you to use your programming macros throughout the program.

Bringing in Programs from Separate Files

Depending on the circumstances, you may want to access other programs from your program, or you may wish to copy other programs directly into your program. There are several methods for accomplishing this.

When choosing between accessing a program as a subprogram or inserting it into your main program, consider the following:

- the size of the program you wish to access or insert
- the frequency with which you need to execute it from your main program
- whether it is or may be used as a subprogram for other programs
- whether inserting it makes your main program unmanageably large

IMPORTANT If you are unable to merge or edit files, those files have probably been locked. Files can be locked (made read-only) or unlocked through the **Information about current file** option from the File menu.

Subprogram CALL 70, CALL 71

In a main program, the BASIC commands CALL 70 and CALL 71 cause execution to branch to a subprogram. The subprogram must have been previously stored in the memory module of the BASIC or BASIC-T module. Execution can be returned to the main program with a CALL 72. Refer to the *BASIC Language Reference Manual* (publication number 1746-RM001A-US-P) or the *SLC 500™ BASIC and BASIC-T Module User Manual* (publication number 1746-UM004A-US-P).

IMPORTANT The BASIC and BASIC-T modules do not distinguish between subprogram variables and main program variables. If a variable used in the main program is changed in a subprogram, the main program is affected.

Programming Macros

Appendix A describes the programming macros contained in the BASIC Development Software. Programming macros are BASIC subroutines that can be used through the BASIC development language. You can also create your own programming macros using the $Macro translator directive described in this chapter.

Merging a Program File

There are two ways to merge program files: the **`$Include`** translator directive and the **`Merge file from disk`** option available from the File menu. **`$Include`** can be used only with BASIC development language programs and is described in this chapter in the translator directives section.

`Merge file from disk` can be used with any program file. It prompts you for a filename and then merges that file into your program at the current cursor location.

IMPORTANT If you merge two .BAS files with any identical line numbers, the duplicate line numbers remain until you download the file to the module. At that time, if there is more than one line of the same number, the last line downloaded replaces any preceding lines with that number. This is not a problem with .BDL files, since line numbering is not allowed.

Creating a Second Program

In Chapter 2, you created a simple program. Following is a more complex program to illustrate many of the programming features described. It includes using programming macros, labels, and line-draw.

After you type in this BASIC development language program, translating, downloading, and executing it on your BASIC or BASIC-T module is briefly described.

Saving a file with a .BDL extension before you begin working on it causes the attributes for that extension to be used while you edit. Features such as indent style, tab spacing, right margin, word wrap, and language type are established for you.

Entering the Program

1. Pull down the File menu.
2. Select **save file As.** The **SAVE FILE AS** dialog box appears on the screen.
3. Type: **SECOND.BDL**
4. Press [Enter], or move the mouse cursor to **OK<ENTER>** and click the left mouse button. The **SAVE FILE AS** dialog box disappears, and the message **C:\ABBASIC\BAS\SECOND.BDL Saved** appears in the message line.
5. Type the first two lines of the Second program:

   ```
   REM SECOND PROGRAM
   {will print screen below, then check operator number}
   ```

   Note that they are comments because they are enclosed in **{ }**. Remember, comments are not translated. If you want these lines in the translated BASIC file, use **REM** instead of **{ }**. We have indented all comments in this example by five spaces to make them stand out.
6. Type **{$I Include.bdl}**

   {$I Include.bdl}** is not a comment because the **{** is followed immediately by a **$. **$I** is the include translator directive requesting that a separate file (**Include.bdl** in this case) be included during translation. Include.bdl is the file available with the BASIC Development Software that contains programming macros. As you become more familiar with the BASIC Development Software, you may wish to create your own file, **mine.bdl** for example, that contains your own programming macros. You could then include it during translation by beginning your program with the command **{$I Mine.bdl}**.

7. Type the screen setup comment and the screen commands that follow it. Note that these commands are programming macros. See Appendix A of this manual.

```
{screen setup}
background_Black( )
High_Intensity ( )
foreground_Yellow ( )
cls ( )
```

8. Type the print statements comment and the first print command. Print commands can be abbreviated as **P.** or the full command **PRINT** can be entered. A print command on a line by itself results in a blank line being printed.

```
{print statements}
print
```

   You are now ready to enter the print commands that cause a boxed-in message to appear on the screen when this program is run. Since you are using the line-draw feature here, it is best to first enter the text and then draw the lines in afterwards. Line drawing is performed in Overstrike mode only, so be sure that you have spaces and not text wherever you expect to draw a line.

9. Type the print statements as shown except for the lines. Leave spaces where you expect to draw a line.

```
P.tab(10),"                                        "
P.tab(10),"                  WARNING               "
P.tab(10),"     Use of this machine is restricted  "
P.tab(10),"                                        "
```

10. When you are ready to draw the box, pull down the Other menu and select **Linedraw.**

11. Position the cursor to a corner of the box by using the arrow keys. Line drawing does not begin until you hold [**Shift**] while moving with the arrow keys. Press [**F2**] to go into Double line mode. Press it again to go into Erase mode (to erase lines), and press it again to go back to Single line mode.

12. Press and hold [**Shift**] while you move with the arrow keys to create the box. Note that when you make a corner or intersection, the correct line characters are exchanged for the straight line. If you make a mistake, press [**F2**] to get to Erase mode; and then move over the unwanted line with the arrow keys while holding [**Shift]**.

13. When you have completed the box, press [**ESC**] to exit Line-draw mode.

14. Continue typing in the rest of the program as shown:

```
hit_any_key( )
{pause and wait for keystroke}
cls ( )
{$L loop1}
Print “Enter your Operator Number”
{pause and wait for input}
get_key (op)
{check for input of 49 or 50 which are ASCII decimal for
1 or 2 }
if op=49 then goto op1setup
if op=50 then goto op2setup
{print error and loop back for another entry}
cls ( )
print “Invalid Entry . . Operator number not recognized”
goto loop1
{$L op1setup}
get_time (d1,m1,y1)
{setup for operator #1}
goto acknowledge
{$L op2setup}
get_time (d2,m2,y2)
{setup for operator #2}
{$L acknowledge}
cls ( )
cursor_down(11)
print_time ( )
print “Operator #”,op-48.” acknowledged”
end
```

Translating

Since this example is written using the BASIC development language, it must be translated to the BASIC Language prior to downloading to the module. Do this by selecting Translate/Compile from the Other menu, and then selecting 1747-PBASE Translator. The program on the following page is the previous program after it is translated.

Figure 6.1 Second Program, After Translation (SECOND.BAS)

```
0    REM . . .
10   REM SECOND PROGRAM
20   P. CHR(27),"[40M",
30   P. CHR(27),"[1M",
40   P. CHR(27),"[33M",
50   P. CHR(27),"[2J",
60   P.
70   P. TAB(10),"                                          "
80   P. TAB(10),"                 WARNING                  "
90   P. TAB(10),"  Use of this machine is restricted       "
100  P. TAB(10),"                                          "
110  P.
120  P. "Hit any key to continue . . .",
130  If (EOF) THEN GOTO 130
140  PUSH A
150  A=GET
160  POP A
170  P.
180  P. CHR(27),"[2J",
190  P. "Enter your Operator Number"
200  IF (EOF) THEN GOTO 200
210  OP=GET
220  IF OP=49 THEN GOTO 270
230  IF OP=50 THEN GOTO 320
240  P. CHR(27), "[2J",
250  P. "Invalid Entry . .  Operator number not recognized"
260  GOTO 190
270  CALL 46
280  POP D1
290  POP M1
300  POP Y1
310  GOTO 360
320  CALL 46
330  POP D2
340  POP M2
350  POP Y2
360  P. CHR(27),"[2J",
370  P. CHR(27),"[11B",
380  PUSH A
390  CALL 46
400  POP A
410  P. A,":",
420  POP A
430  P. A,":",
440  POP A
450  P. A," ",
460  POP A
470  P. "Operator #", OP-48," acknowledged"
480  END
```

If you do not have any errors, the message BASIC translator Version x.xx appears in the message line after the translation is complete. If you have errors, correct them and translate the program again. For details on translating programs and finding translation errors refer to Chapter 8.

Downloading

Downloading a file requires that you connect your personal computer to the module using the configurations described in the *SLC 500 BASIC and BASIC-T Modules User Manual* (publication number 1746-UM004A-US-P). Module jumpers should be set to support that configuration per the *SLC 500™ BASIC and BASIC-T Modules User Manual* (publication number 1746-UM004A-US-P).

Before downloading, you also must select the correct terminal type through the Configuration menu (described in Chapter 3) and set up the terminal through the Setup menu (available when in Terminal mode). For complete details on terminal setup and downloading, refer to Chapter 9.

Assuming this is done and your configuration is correct, use the following steps to download a file:

1. Select **`Terminal`** mode from either the Other menu or from the Toplevel menu.
2. Select the File menu while inTerminal mode.
3. Select **`Download from host to module`**.
4. If **`second.bdl`** was the last file you translated, its translated version (**`second.bas`**) is the default file for the download and you need only press **`[Enter]`**. Otherwise, type in the name of the file you wish to download, in our case **`second.bas`**. Remember that you must download a translated file, meaning it has an extension of .BAS.

Executing

After you have successfully downloaded a file to the module, execute it by typing **`RUN`** to the right of **`>`**. To exit the program press [**`F3`**]. You can interrupt execution by pressing [**`Ctrl C`**], unless this interrupt feature has been disabled through programming. Chapter 9 of this manual describes how to debug a program on the BASIC or BASIC-T module.

Printing Your Program

This chapter describes how to set up a printer and print a program. Major topics include:

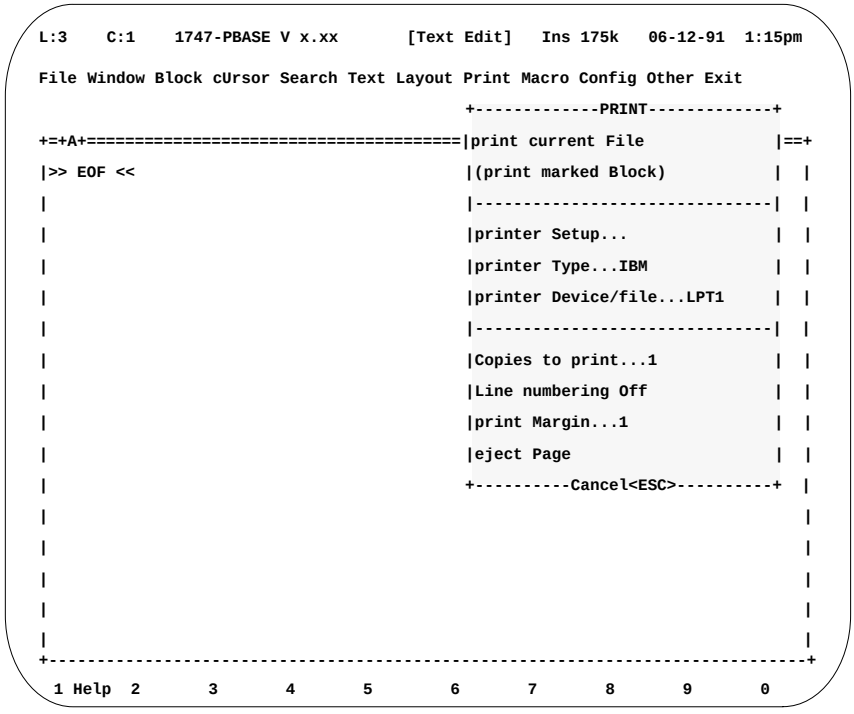
- selecting and setting up a printer
- using the printer controls
- printing all or part of a document

Setting Up Your Printer

The Print menu, accessed from the main menu, is used both to set up the printer and to control the printing of a file. Most of the discussion in this chapter involves features selected from this menu.

Path: Toplevel Menu → Edit mode → Print
QuickStroke: none

Figure 7.1 Print Menu

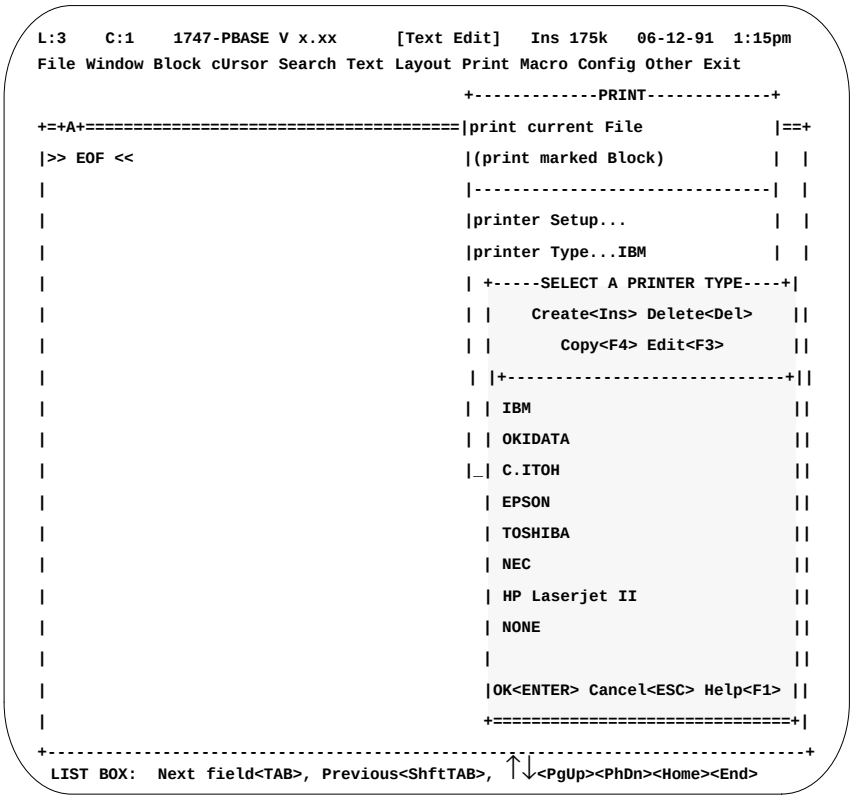


Printer Selection

The BASIC Development Software has printer setup parameters already defined for a number of common printers. Also, the software is designed with enough flexibility to accommodate almost any printer. Printer setup begins by selecting a printer.

Path: Toplevel Menu → Configuration menu → Printer
Path: Main Menu → Config → Printer
Path: Main Menu → Print → Printer type

Figure 7.2 Printer Selection



Select your printer from the list provided. If it is not on the list, you can select **Create<Ins>** to access the **PRINTER DRIVER SETUP** screen where you can assign it a name, initialization string, and print control codes.

If your printer is on the list provided and does not function properly or as you would like it to (possibly from being an older model with slightly different control codes), you can select **Edit<F3>** to modify the control codes.

IMPORTANT Pressing **[Enter]** after making changes to the **PRINTER DRIVER SETUP** screen saves those changes. If you have made changes that you do not want to save or if you just want to leave the **PRINTER DRIVER SETUP** screen, press **[Esc.]**.

Following is a description of the parameters that you can create or modify on the **PRINTER DRIVER SETUP** screen. Refer to the help screens for a more details.

- **printer Type** — is entered if you are creating a new printer driver setup
- **Initialization string** — is entered to initialize your printer (refer to the documentation provided with the printer)

You can define up to 19 different printer codes for each printer. Each printer code has the following definable fields:

- **Code name** — is a string for the user's benefit to identify the printer code. It can be up to 17 characters. For example, you may want to use the names of the fonts which correspond to each code. The string you enter here appears on the printer setup screen.
- **Printer control code** — is the actual string of characters you wish to send to the printer. This would normally be an escape sequence to initiate a particular action by the printer, such as changing font styles or line spacing; but is not restricted to that.

Printer Setup

Path: Main Menu → Print → printer Setup
QuickStroke: none

When you select **printer Setup**, a menu of printer-specific control codes is displayed. These codes originate in the PRINTER DRIVER SETUP screen (described in the previous section).

Typically, these printer codes determine things like letter quality, font, and line spacing. Printer codes differ depending on the printer. Move the cursor to highlight the desired printer code, and press **[Enter]** or click the left mouse button.

Printer Device/File

Path: Main Menu → Print → printer Device/file
QuickStroke: none

When you select **printer Device/file**, you get a screen from which you can select a printer device or file to direct your print output to. These device names can be edited, or additional devices can be created as needed.

Typically, you select either a filename or a printer port here. If you select a filename, print–data is sent to that file. If you select a port, print-data is sent directly to the printer connected to that port.

Most printers communicate with a personal computer through its parallel communications port (typically LPT1).

Serial Printers

Some printers use serial communications, and some are equipped for both serial and parallel. This section deals exclusively with serial printer configuration.

The BASIC Development Software supports both parallel and serial printers. The port set-up of your personal computer determines which port on your personal computer is the printer output port. Refer to the documentation provided with your personal computer and printer for additional information on port set-up.

IMPORTANT The following examples use COM2 as the serial printer port. Make sure the port you specify as the serial printer port is not already being used as the mouse port or as the interface port to the BASIC or BASIC-T module.

When printing to a serial printer, you must match the baud rate, parity, number of data bits, and the number of stop bits of your serial port to the corresponding parameters of your printer. One way of doing this is by using the DOS `Mode` command. For example:

```
mode COM2:9600,n,8,1
```

You can then use the DOS `Mode` command again to redirect printer output from the LPT1 port to one of your serial communication ports. For example:

```
mode LPT1:=COM2:
```

If you do not want to redirect printer output, you can add a serial printer device to the Print menu.

```
Path: Toplevel Menu → Edit mode → Print
QuickStroke: none
```

To specify a new printer device:

1. Select **`printer Device/file`** to access the **`PRINTER DEVICE`** dialog box.
2. Select **`Create<Ins>`** to enter a new printer device.
3. Enter the name of the serial communication port on your personal computer that is to be the printer port, then press **`[Enter]`**.

   For this example, you would type in: **`COM2`**

   The **`PRINTER DEVICE`** dialog box is displayed with the communication port name you entered and is added to the top of the list of printer devices.
4. Highlight the port you named as the serial printer port and press **`[Enter]`**.

All printer output is sent to the serial port you specified.

Using the Printer Controls

We have already discussed printer setup; but before we actually print a file, this section explains the various printer controls available from the BASIC Development Software. Remember that Hypertext help is available with more details.

Copies to Print

Path: Main Menu → Print → Copies to print
QuickStroke: none

This allows you to print multiple copies of a file or block. The default value is one.

Line Numbering

Path: Main Menu → Print → Line numbering
QuickStroke: none

This adds line numbers to the left hand side of your printout. These are *not* BASIC line numbers but simply print line numbers beginning with the number one.

Print Margin

Path: Main Menu → Print → print Margin
QuickStroke: none

This allows you to define a left margin for printing only (in addition to any margin or tab already defined in the file). The default value is one.

Eject Page

Path: Main Menu → Print → eject Page
QuickStroke: none

This causes the printer to scroll forward one page.

Printing All or Part of a Document

The Print menu, accessed from the main menu, allows you to print a block or file directly from a window.

Path: Main Menu → Print → print current File
QuickStroke: none

Following is a brief explanation of the two print options available from the Print menu. Remember that Hypertext help is available with more details.

- **Print current file** — prints all of the file in the currently active window. To abort printing at any time press **[Esc]**.
- **print marked Block** — prints the currently marked block. This allows you to print a portion of a file instead of the entire file. Refer to the block operations discussion in Chapter 4 for information on the three block marking methods.

There are other print options available by using the DOS shell. Refer to your DOS manual for details.

Printing In Background

This requires that the DOS print spooler, PRINT.COM, be loaded prior to running the BASIC Development Software. Also, there must be a path to where the PRINT.COM file resides. Printing in the background is possible by:

1. Printing the file to disk.
2. Selecting it through the DOS directory shell (discussed in Appendix B).
3. Pressing **[F8]**.

Translating Your Program

When you have completed this chapter, you will know how to:

- translate your program
- locate and correct programming errors
- configure your translator

Translating Feature

The translate/compile feature available with the BASIC Development Software is executed based on the extension portion of a filename. Refer to Chapter 3 for details on setting up filename extensions. For proper program translation, the following file extensions must be used:

Table 8.1 Filename Extensions

File Extension	Description
name.BDL	This is your source file you have written in the BASIC development language. This is the file you should be translating.
name.BAS	This is the BASIC file created by the 1747-PBASE Translator. This file is the file you download to the BASIC module.
name.MAP	This file is generated by the 1747-PBASE Translator. It is used for tracking variables when executing the development software debugger discussed in chapter 9.

IMPORTANT The 1747-PBASE Translator **(BTRAN.EXE)** works only with these file extensions and cannot be reconfigured.

Before performing a translate/compile operation on a program, load the file into an edit window. If it already has been loaded, verify that the window is the currently active window. Once this is accomplished, translate/compile your program by using one of the following paths:

```
Path: Toplevel Menu → Translate/compile
Path: Toplevel Menu → Edit mode → Other → Translate/compile
QuickStroke: Toplevel Menu → Edit mode → [CTRL F8]
```

The software checks the extension of the file in the active edit window and prompts you to select a translator/compiler.

IMPORTANT The 1747-PBASE Translator expects your filename to have a .BDL extension. If it does not, you get an error.

The file in the active edit window is always saved prior to translating. Other open, altered files may be saved if the translator is configured to save all files as discussed in the last section of this chapter.

Once selected, the translator/compiler translates the source code you have written in the BASIC Development Language into BASIC. The translator:

- removes comments
- adds BASIC line numbers
- replaces labels with line numbers
- brings in include files
- expands programming macros
- checks for syntax errors

For example, the translator will accomplish these tasks in the following program:

Figure 8.1 Second Program, Before Translation (SECOND.BDL)

```
REM SECOND PROGRAM
{will print screen below, then check operator number}
{$I Include.bdl}
{screen setup}
background_Black( )
High_Intensity ( )
foreground_Yellow ( )
cls ( )
{print statements}
print
P.tab(10),"                          "
P.tab(10),"WARNING                   "
P.tab(10),"Use of this machine is restricted"
P.tab(10),"                          "
hit_any_key( )
{pause and wait for keystroke}
cls ( )
{$L loop1}
Print "Enter your Operator Number"
{pause and wait for input}
get_key (op)
{check for input of 49 or 50 which are ASCII decimal for 1 or 2}
if op=49 then goto op1setup
if op=50 then goto op2setup
{print error and loop back for another entry}
cls ( )
print "Invalid Entry . . Operator number not recognized"
goto loop1
{$L op1setup}
```

```
get_time (d1,m1,y1)
{setup for operator #1}
goto acknowledge
{$L op2setup}
get_time (d2,m2,y2)
{setup for operator #2}
{$L acknowledge}
cls ( )
cursor_down(11)
print_time ( )
print "Operator #",op-48." acknowledged"
end
```

If no syntax errors are encountered during the translation, the translator creates a native BASIC program (with the .BAS extension) ready for downloading to the module:

Figure 8.2 Second Program, After Translation (SECOND.BAS)

```
0    REM . . .
10   REM SECOND PROGRAM
20   P. CHR(27),"[40M",
30   P. CHR(27),"[1M",
40   P. CHR(27),"[33M",
50   P. CHR(27),"[2J",
60   P.
70   P. TAB(10),"
80   P. TAB(10),"
90   P. TAB(10),"
100  P. TAB(10),"
110  P.
120  P. "Hit any key to continue . . .",
130  If (EOF) THEN GOTO 130
140  PUSH A
150  A=GET
160  POP A
170  P.
180  P. CHR(27),"[2J",
190  P. "Enter your Operator Number"
200  IF (EOF) THEN GOTO 200
210  OP=GET
220  IF OP=49 THEN GOTO 270
230  IF OP=50 THEN GOTO 320
240  P. CHR(27), "[2J",
250  P. "Invalid Entry . .  Operator number not recognized"
260  GOTO 190
270  CALL 46
280  POP D1
290  POP M1
300  POP Y1
310  GOTO 360
320  CALL 46
330  POP D2
340  POP M2
350  POP Y2
360  P. CHR(27),"[2J",
370  P. CHR(27),"[11B",
380  PUSH A
```

```
                WARNING
Use of this machine is restricted
```

```
390  CALL 46
400  POP A
410  P. A,":",
420  POP A
430  P. A,":",
440  POP A
450  P. A," ",
460  POP A
470  P. "Operator #", OP-48," acknowledged"
480  END
```

It also creates a .MAP file for use when executing the debugger discussed in Chapter 9.

If the translator/compiler encounters any errors in your .BDL file, it aborts the translation and tags these errors for you to correct. When translator errors are found, you must correct them as discussed in the following section before continuing.

Eliminating Translator Errors

If the translator encounters errors when it translates your .BDL file, the translate operation is halted, and the error window is created. The error window contains a listing of all the errors that were generated and the corresponding program line number.

If an error is found in an include file during translation, another window is opened containing that include file. The cursor is placed at the error location in that file.

Find Next Compiler Error

This feature locates the next error in the source file window generated by the most recent compile. If you are not currently on the source file window, you are bumped to that window when the **find neXt error** option is selected.

Path: Toplevel Menu → Edit mode → Other → find neXt error
QuickStroke: Toplevel Menu → Edit mode → [Ctrl F2]

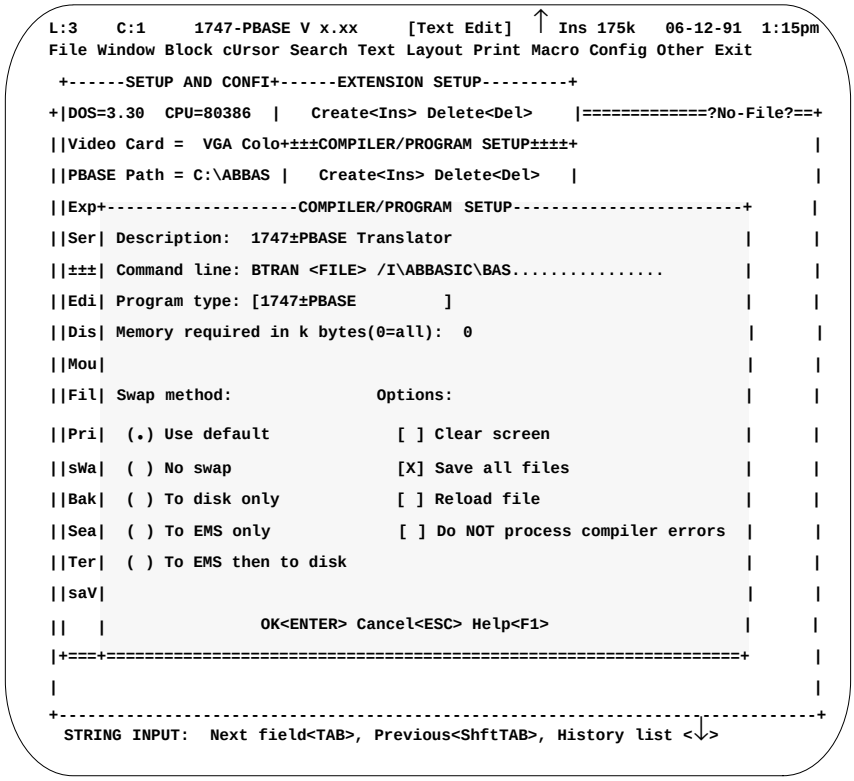
When the **find neXt error** option is selected, the cursor is positioned on the line that caused the translator error; and a brief description of the error is shown on the message line.

Translator Configuration

The configuration for the 1747-PBASE Translator converts .BDL files to .BAS files. The translator configuration can be altered through the COMPILER/ PROGRAM SETUP dialog box, accessed through the following path:

Path: Toplevel Menu → Configuration menu → Filename extensions → BDL → Compiler–Program setup → 1747-PBASE Translator

Figure 8.3 Compiler Program Setup Dialog Box



The following table lists the translator configuration options available through the COMPILER/PROGRAM SETUP dialog box. Included are descriptions specific to the 1747-PBASE Translator.

Table 8.2 Translator Configuration Options

Options	Description
Command line	This allows you to select different parameters for the translator call. The default command line is BTRAN <FILE> /I\ABBASIC\BAS. The options for this line are BTRAN filename[.ext] [/Ipath] [/Tpath] where: .ext - is replaced with .BDL Ipath - is the path where your include files are located. It is your current working directory if omitted here. Tpath - is the path where the translator puts the translated BASIC file. It will be put in the same directory as the source file if omitted here. The following example would translate the file in the current working directory using include files from a directory called INCLUDE in the D: drive. The translated file would be saved on the A: drive: BTRAN <FILE> /ID:\INCLUDE /TA:
Program type	This allows you to select a program or compiler type for each compiler–program interface.
Memory required	Enter the amount of memory required for your compiler in k bytes (0=all). When used in conjunction with swap method, this parameter helps determine how much memory swapping is necessary.
Swap method	The options here determine the location where memory swaps take place when they are necessary. They are affected by the amount entered under memory required. Use default should normally be selected for this. Options are: Use default - selecting this causes the swap method selected when configuring Swapping/expanded memory to be used. No swap - no additional memory is freed before invoking the compiler/program. To disk only - causes swapping the software out to disk whenever invoking the compiler/program. Use this if you need additional memory space but do not have expanded memory in your personal computer. To EMS only - causes swapping the software to expanded memory whenever invoking the compiler/program. To EMS then to disk - causes all available expanded memory to be used before any swapping to disk takes place.
Options	This includes a number of miscellaneous options as follows: Clear screen - clears the BASIC Development Software from the screen during a translate/compile. This allows you to watch for errors in the compile at the DOS level. This should normally not be selected (off). Save all files - When (on), this forces all files that are currently open and have been altered to be saved before the translator is executed. When (off), only the file in the currently active window will be saved before the translator is executed. Reload file - This reloads the file just compiled into the current window. This is useful if your compiler alters the original file in some way. This should normally not be selected (off). Do NOT process compiler errors - If this option is selected, then compiler errors are not processed. This should normally not be selected (off).

Communicating with the Module

After your application file has been translated into an understandable format for the BASIC or BASIC-T module (Chapter 8), you must establish communications between the module and the BASIC Development Software. Refer to Chapter 1 of this manual and the *SLC 500™ BASIC and BASIC-T Modules User Manual* (publication number 1746-UM004A-US-P) for details on connecting your personal computer to the module.

This chapter describes how to:

- change to Terminal mode
- download your translated files to the module
- upload files from the module
- debug your program interactively on the module
- set up terminal communication parameters

Changing to Terminal Mode

Changing to Terminal mode allows your personal computer to communicate with the module. The Communication mode on the module is determined by jumpers. (Refer to the *SLC 500™ BASIC and BASIC-T User Manual*, publication number 1746-UM004A-US-P or *BASIC Module Series B User Manual*, publication number 1771-6.5.113.) The Communication mode for your personal computer is set by the BASIC Development Software through the configuration menu (terminal selection in Chapter 3 of this manual). Verify that communication modes match before enteringTerminal mode.

You may be unsuccessful in establishing communications with the module the first time you enter Terminal mode. If so, there are several menu options in Terminal mode that you can select to try to match communication parameters (such as communication port, baud rate, parity). To modify the communication parameters of your personal computer, refer to the sections RS-232 Communications Setup and DH485 Communications Setup at the end of this chapter.

```
Path: Toplevel Menu → teRminal
Path: Main Menu → Other → teRminal
QuickStroke: Edit mode → [F3]
```

If the module is in Run mode when Terminal mode is entered, the output from the currently executing program is displayed on your personal computer's screen. If the module is not in Run mode, the **>** prompt appears as soon as you press **[Enter]**.

The following table shows the BASIC commands that are executable on your module from Terminal mode. Refer to the *BASIC Language Reference Manual* (publication number 1746-RM001A-US-P) for additional information on these commands

Table 9.1 Module Commands

Command:	Function:	Examples:
CONT	CONTinue program execution after a STOP statement or CONTROL C command.	CONT
[CTRL] C	Stop current program execution and return module to Command mode.	[CTRL] C
[CTRL] S	Interrupt a LIST command.	[CTRL] S
[CTRL] Q	Restart a LIST command after a CONTROL S command.	[CTRL] Q
DISABLING [CTRL] C	Disable the CONTROL C break function. CALL 18 disables the CONTROL C break function. CALL 19 re-enables the CONTROL C break function.	CALL 18 (disable) CALL 19 (re-enable)
ERASE	Erase the program stored in ROM.	ERASE
LIST	LIST current program or indicated lines of program to the console device.	LIST, LIST 10-50
LIST#	LIST current program or indicated lines of program to the device connected to port PRT1.	LIST#, LIST#50
LIST@	LIST current program or indicated lines of program to the device connected to port PRT2.	LIST@, LIST@50
MODE	Set up port parameters.	MODE(DH485,19200)
NEW	Erase the program stored in RAM.	NEW
NULL	Count the number of null characters the module outputs after a carriage return.	NULL, NULL4
PROG	Program the EEPROM module with the current program.	
PROG1	Program the EEPROM module with port information for all three ports and store MTOP information.	
PROG2	Execute the first program stored in EEPROM when the module is turned ON.	
RAM	Select the current program from RAM memory.	RAM
ROM	Select the current program from EEPROM memory.	ROM, ROM3
RUN	Execute the currently selected program.	RUN
XFER	Transfer a program from EEPROM to RAM, then select RAM mode.	XFER

Downloading File

After you have created and translated your program, your next step is to download the translated version to the module. Downloading is performed from the BASIC Development Software while in Terminal mode. Access the Terminal mode as discussed in the previous section.

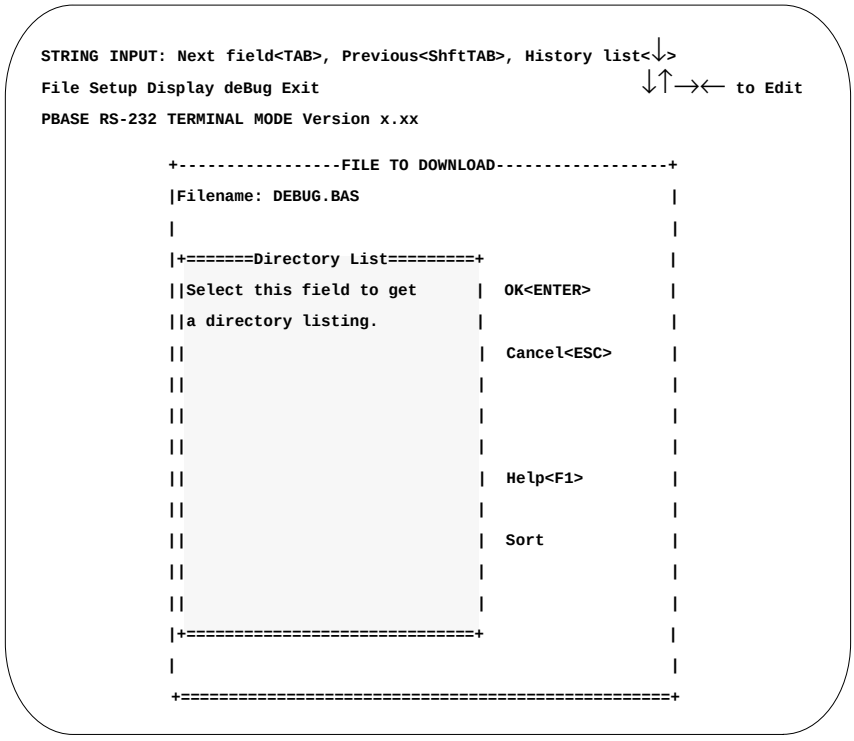
Programs can be downloaded using RS-232 or DH485 communications from your personal computer. If DH485 communications are desired, an adapter is available that converts RS-232 into DH485. (Refer to the *SLC 500 BASIC and BASIC-T User Manual*, publication number 1746-UM004A-US-P.)

1. Select **`Download from host to module`** using the path shown below:

`Path: Toplevel Menu → teRminal → File → Download from host to module`
`Path: Main Menu → Other → teRminal → File →Download from host to module`
`QuickStroke: Toplevel Menu → teRminal → [Page Down]`

You are prompted for a filename to download as shown on the following screen.

Figure 9.1 File to Download Screen



2. Enter the path, filename, and file extension of the file to be downloaded. Enter this filename using one of these methods:

- The default filename for this operation is the last file you successfully translated during this session. If you want to download the default file, skip to step 3.
- Either press **[Tab]**, or select Directory List to access the directory screen and select a file. Once this field is opened, you may select different directories or exit directories by selecting the ..\. Note that a sort option is also available that sorts the current directory. When you select **Sort**, you are prompted for a sort key. Enter the letter(s) of the desired sort operation into the sort key window.
- Type in the path, filename, and file extension (for example, \abbasic\bas\myfile.bas).

3. Once the filename has been keyed in or selected from the directory screen, begin the download operation by pressing **[Enter]**.

   DOWNLOADING flashes on the status line of the BASIC Development Software, and the lines of the file scroll across the screen as they are downloaded to the module.

Uploading File

The BASIC Development Software provides an upload utility that allows programs to be copied from the module to your personal computer. This feature is primarily used to back up files from the module.

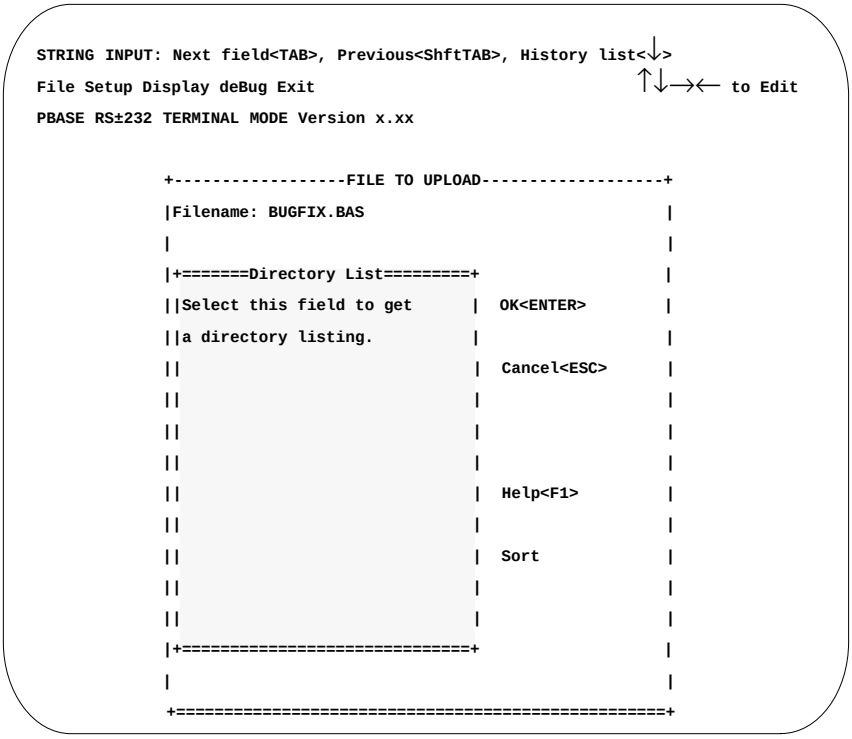
Programs can be uploaded using RS-232 or DH485 communications from your personal computer. If DH485 communications are desired, an adapter is available that converts RS-232 into DH485. (Refer to the *SLC 500™ BASIC and BASIC-T User Manual*, publication number 1746-UM004A-US-P.)

1. Select **Upload from module to host** using the path shown below:

```
Path: Toplevel Menu → teRminal → File → Upload from module to
host
Path: Main Menu → Other → teRminal → File → Upload from module
to host
QuickStroke: Toplevel Menu → teRminal → [Page Up]
```

   You are prompted for a filename to upload, as shown on the following screen:

Figure 9.2 File to Upload Screen



2. Enter the path, filename, and file extension that you intend to use to store the uploaded file. Enter this filename using one of these methods:

- The default filename for this operation is the last filename you successfully translated during this session. The default file extension is .UPL. If you want to upload the default file, skip to step 3.
- Either press the **[Tab]** key, or select Directory List to access the directory screen and select a file. Once this field is opened, you may select different directories or exit directories by selecting the ..\. Note that a sort option is also available that sorts the current directory. When you select **Sort**, you are prompted for a sort key. Enter the letter(s) of the desired sort operation into the sort key window.
- Type in the path, filename, and file extension (for example: **\abbasic\bas\myfile.bas**).

IMPORTANT When a file is uploaded without specifying a filename, it will be given the same filename as the most recently translated file and the file extension of .UPL.

3. Once the filename has been keyed in or selected from the directory screen, begin the upload operation by pressing **[Enter]**.

   UPLOADING flashes on the status line of the BASIC Development Software, and the lines of the file scroll across the screen as they are uploaded to the module.

IMPORTANT If the file specified already exists in your personal computer, (always the case if you selected a file from the directory screen), a confirmation box appears. This box asks you if you want to overwrite the existing file or abort the upload operation.

Hex File Transfers

Hex is an abbreviation for hexadecimal data format. This data format is typically used in electronic memories, including the module EEPROM and UVPROM optional memory modules. Hex file transfers are used to upload and download hex data to the module EEPROM or UVPROM. The primary use of hex file transfers is to transfer the entire contents of the EEPROM from one module to the EEPROM of another module. It can also be used to write the contents of EEPROM to UVPROM via a PROM programmer.

Uploading Hex Files

Uploading hex files is similar to uploading program files, with a few exceptions. Make sure you have changed to Terminal mode and established communications with the module as described earlier in this chapter, and then proceed as follows:

1. Select **Upload hex file from module to host** using the path shown below:

```
Path: Toplevel Menu → teRminal → File → uPload hex file from
module to host
Path: Main Menu → Other → teRminal → File → uPload hex file from
module to host
QuickStroke: none
```

   You are prompted for a filename to upload just as you would be if uploading a program file.

2. Enter the path, filename, and file extension that you intend to use to store the uploaded file, as you would with a program file. If the filename you specify already exists, you will be asked to confirm whether you wish to overwrite it.

3. A dialog box appears in which you must enter the starting and ending addresses for the hex file upload. Always type in **8000H** for the starting address. Press **[Tab]** or use the mouse to move the cursor to the Ending Address field.

4. If your module has the 1747-M1 memory module installed, type **9FFFH** for the ending address. If your module has the 1747-M2 memory module installed, type **FFFFH** for the ending address. Refer to the *SLC 500 BASIC and BASIC-T User Manual* publication number 1746-UM004A-US-P, if you need to verify whether you have the M1 or the M2 memory module. For the 1746-BAS-T, the memory modules are an 8K EEPROM, 1771-DBMEM1 (similar to the 1747-M1), and a 32K EEPROM, 1771-DBMEM2 (similar to the 1747-M2).

IMPORTANT You must enter the addresses exactly as indicated above to avoid a checksum error when downloading this file to other EEPROMs or UVPROMs.

5. Press **[Enter]** after typing in the ending address and the hex file upload begins.

Downloading Hex Files

Downloading hex files is exactly like downloading program files. The addressing information necessary when uploading hex files is embedded in the file and does not need to be entered for a download. Make sure you have changed to Terminal mode and established communications with the module as described earlier in this chapter. Proceed as follows:

1. Select **Download hex file from host to module** using the path shown below:

```
Path: Toplevel Menu → teRminal → File → dOwnload hex file from
host to module
Path: Main Menu → Other → teRminal → File → dOwnload hex file
from host to module
QuickStroke: none
```

   You are prompted for a filename to download just as you would be if downloading a program file.

2. Enter the path, filename, and file extension of the file to be downloaded, as you would with a program file.

3. Press **[Enter]** after typing in the filename and the hex file download begins.

   Besides the EEPROM memory options, the module also has two UVPROM memory options as explained in the *SLC 500 BASIC and BASIC-T User Manual* publication number 1746-UM004A-US-P, or the *BASIC Module Series B User Manual*, publication number 1771-6.5.113. We recommend using the utilities supplied with your PROM programmer when downloading hex files to program UVPROMs.

You can use any PROM programmer that:

- interfaces to your personal computer
- supports INTEL HEX file format
- accommodates the UVPROMs used in the module

Refer to the documentation provided with the PROM programmer for details on its configuration, interface, and protocol.

Backing Up the Module Image

Backing up the module image enables you to back up the entire module contents, including all programs contained in RAM, User PROM, battery-backed variables, and all module configuration information to disk. This feature is compatible with both the 1771-DB Series B and the 1746-BAS and 1746-BAS-T modules. Proceed as follows:

1. Select **`Backup module image`** using the path shown below:

```
Path: Toplevel Menu → teRminal → File → Backup module image
Path: Main Menu → Other → teRminal → File → Backup module image
QuickStroke: none
```

   You are prompted for a filename to back up.

2. Enter the path, filename, and file extension of the file to be backed up. The default filename is MODULE.IMG.
3. Press [Enter] after typing in the filename and the module image backup begins.

   The following information is uploaded from the module:

   - BASIC program residing in RAM and stored in an Intel HEX format named <FILENAME>.RAM
   - All programs and configuration information residing in User PROM and stored in a single Intel HEX format named <FILENAME>.ROM
   - Battery-backed parameters (baud rates, port configurations, MTOP, etc.) and stored All programs and configuration information residing in User PROM and stored in a single Intel HEX format named <FILENAME>.PRM
   - User Battery-backed variables stored in an Intel HEX format file named <FILENAME>.USR

An additional file, <FILENAME>.IMG will be created containing a list of files saved during the backup process.

IMPORTANT If the file specified already exists in your personal computer, a confirmation box appears. This box asks you if you want to overwrite the existing file, or abort the backup operation.

Restoring the Module Image

Restoring the module image enables you to completely restore the configuration of a module to precisely match the state of the module that was previously backed up. This feature is compatible with both the 1771-DB Series B and the 1746-BAS and 1746-BAS-T modules. Proceed as follows:

1. Select **`Restore module image`** using the path shown below:

```
Path: Toplevel Menu → teRminal → File → Restore module image
Path: Main Menu → Other → teRminal → File → Restore module
image
QuickStroke: none
```

   You are prompted for a filename to restore.

2. Enter the path, filename, and file extension of the file to be restored. The default filename is MODULE.IMG.
3. Press **`[Enter]`** after typing in the filename and the module image restoration begins.
4. Respond to the following prompts:
   - Restore both RAM and User PROM
   - Restore RAM only
   - Restore User PROM only

   You can restore the programs residing in RAM, User PROM, or both. All module configuration information (such as baud rates, port configuration) stored in RAM or User PROM, will be restored if the corresponding menu choice is selected. You can also restore all user defined battery-backed variables. If the user defined battery-backed are not restored, your program should re-initialize these variables.

Debugging Your Program

The BASIC Debugger is a source-level debugger for the module. This debugger is used exclusively to aid in debugging your BASIC programs (those that have a .BAS filename extension). It allows you to execute your program line by line, examine and modify variables, and stop at break points. All this can be done in Terminal mode while online with the module.

Debugging requires that you first download your program to the module as described earlier in this chapter. Start the debugger using the following path:

```
Path: Toplevel Menu → teRminal → deBug → Run Debugger
```

When the debugger is entered, it searches first for a .MAP file with the same program name as the program downloaded to the module. (This map file is generated during the translate process discussed in Chapter 8.) If no map file exists (as is the case when the translate step is skipped), the debugger loads the native BASIC file (the file that was previously downloaded) into the debug window.

Not having a .MAP file may make debugging your original source code more difficult. The DEBUGGING INFORMATION screen showing the name of the file to be loaded into the debugger window is displayed. Pressing any key from this screen brings up the source file debugger.

The following operations are available from inside the debugger:

Table 9.2 Operations from the Debugger

Function Key	Operation
[F1] Help	Brings up the help screen.
[F2] Inquire	Examines and modifies a variable.
[F3] Watch	Examines the value of an executing variable in the watch window.
[F4] Gotill	Executes your program until the line that currently contains the cursor is reached.
[F5] Screen	Displays the current status of the terminal screen.
[F6] Search	Searches for string in the current file.
[F7] Trace	Executes the program being debugged one line at a time.
[F8] Layout	Creates windows allowing combinations of the .BDL, .BAS, and Watch windows to be displayed.
[F9] Run	Executes the BASIC program from the current location of the cursor in the program.
[F10] Quit	Aborts, quits debugging.
[Tab] Field	Switches between the open debug windows.

IMPORTANT You may also manually insert breakpoints into your source code using the {$B} directive (described in Chapter 6). The {$B} breakpoint directive is not intended to be used with the debugger discussed in this section.

Debugging Example

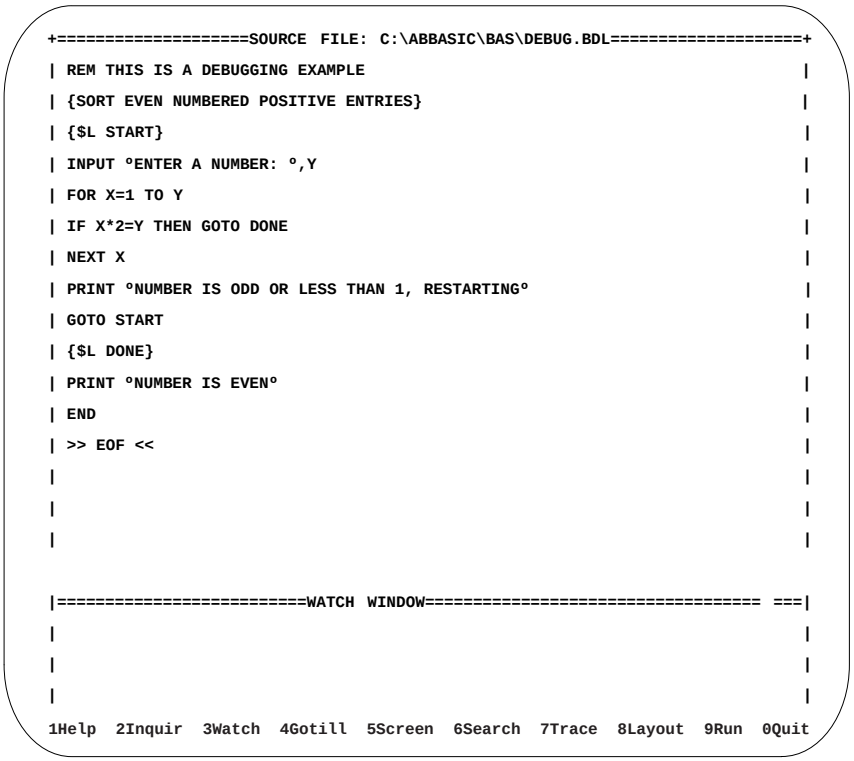
The following example program will be used to illustrate the debugging features. It is a simple program so that you can visualize each line's execution as it is being debugged.

```
REM THIS IS A DEBUGGING EXAMPLE
{SORT EVEN NUMBERED POSITIVE ENTRIES}
{$L START}
INPUT "ENTER A NUMBER: ",Y
FOR X=1 TO Y
IF X*2=Y THEN GOTO DONE
NEXT X
PRINT "NUMBER IS ODD OR LESS THAN 1, RESTARTING"
GOTO START
{$L DONE}
PRINT "NUMBER IS EVEN"
END
```

After entering the program, save it under the name DEBUG.BDL, and then translate/compile it. If there are no errors, go to Terminal mode and download the translated file (DEBUG.BAS) to the module. Follow the steps below to observe the features available with the BASIC Debugger:

1. After downloading, type **RUN** to execute the program. You are prompted to enter a number. If not, you may have a bug in the program, using the debugger may help you find it.
2. Enter an odd number (less than 100) and press **[Enter]**. A message appears indicating it is odd. You are prompted to enter a number again.
3. Enter an even number (less than 100) and press **[Enter]**. A message appears indicating it is even, and the program terminates.
4. Select **deBug** from the menu at the top of the screen, then select **Run Debugger**. If you have loaded a previously translated file for which a .MAP file exists (as is the case with this example), a message appears indicating that .MAP file will be used.
5. Press any key to continue. A split screen appears with your program (DEBUG.BDL) above and a watch window below. The watch window is where the variable values you designate will be displayed.

Figure 9.3 Watch Window



6. Press [**F1**] to bring up help on the BASIC Debugger, [**Esc**] to return to the debugger screen.
7. Move the cursor until it marks the variable **y** in the fourth line of the program.
8. Press [**F2**] to examine the value of that variable. Note that it is the even number you entered in step 3. Also note that you have the option here to force a value for this variable by typing it in and then pressing **[Enter]**.
9. Press [**Esc**] to return to the debugger screen without changing the variable's value.
10. Move the cursor down to mark the variable **x** in the fifth, sixth or seventh line of the program. Note that you can select a variable wherever it occurs in a program.
11. Press [**F2**] to examine the value of that variable. Note that it is half the value you entered in step 3, which is consistent with the way this program sorts even numbers.
12. Press [**Esc**] to return to the debugger screen without changing the variable's value.
13. While the cursor is still marking the variable **x** , press [**F3**]. Note that **x** and its value now appear in the watch window. You can do the same thing for **y**.

14. Move the cursor down to anywhere on the line **next x** and then press [**F4**]. This causes the program to execute until it reaches the line you marked (**next x** in this case). The Terminal mode screen appears, and the executing program prompts you to enter a number.
15. Type the number **3** and press **[Enter]**. The Debugger screen returns, the line **next x** is highlighted, the value for **x** in the watch window is **1** , and the value for **y** is **3**. You are stopped during program execution at the first encounter of the line **next x**.
16. Press [**F4**] again. This time **x** is **2**. Continue pressing [**F4**] until you fall through the for/next loop, get the number is odd message, and are prompted to enter another number.
17. Type the number **6** and press **[Enter]**. The Debugger screen returns, the value for **x** in the watch window is **1,** and the value for **y** is **6**.
18. Press [**F7**]. This traces you through the program one line at a time, flashing to the Terminal mode screen to execute, and then returning to the debugger. There you see the value for **x** changing each time the trace passes through the for/next loop.
19. Keep pressing [**F7**] until you trace through the program to completion. Note that the debugger is terminated and you are returned toTerminal mode.
20. Repeat steps 4 and 5 to return to the debugger.
21. Press [**F5**]. This temporarily returns you to the Terminal mode screen. Press any key to bring the debugger back.
22. Press [**F6**]. You see a search screen identical to the one in the BASIC Development Software. You can use this to search for any characters in your program, such as the variables you want to enter into the watch window.To cancel the search press [**Esc**].
23. Press [**F8**]. Your screen is now split into three sections, with the translated BASIC program at the top, your .BDL file in the middle, and the watch window at the bottom.
24. Press **[Tab]** to move the cursor to each of the three windows. You can now select variables from either the .BAS file or the .BDL file appearing on the screen, prior to pressing [**F2**] (to examine) or pressing [**F3**] (to watch).
25. Press [**F8**] again. Now only the BASIC program is on the screen with the watch window. To return to the original debugger screen, press [**F8**] again.
26. Press [**F9**] to run the program to completion and exit the debugger.You also can exit the debugger at any time by pressing [**Esc**] or [**F10**].

Making Corrections to Your Program

The normal sequence in writing programs using the BASIC Development Software is:

1. Write a .BDL file using the BASIC development language.
2. Translate/compile the .BDL file to create a .BAS file.
3. Download the file to the module.

After downloading, you should test and debug your program. Give careful consideration as to where you will make changes and corrections as a result of testing and debugging. Remember, at this time you have three versions: the .BDL and .BAS files in your personal computer and the downloaded file in your module.

Though it may be faster to make simple corrections in Terminal mode by line editing the program in the module (described in the *SLC 500 BASIC and BASIC-T User Manual* publication number 1746-UM004A-US-P and the *BASIC Module Series B User Manual*, publication number 1771-6.5.113), these corrections will not be reflected in the personal computer versions of the program.

If you do make minor changes to the program in the module, always go back to the original .BDL file, duplicate those changes, and translate/compile the program. Then download it to the module and verify that it works as intended. This ensures that the versions all match and that you have some backup for the program in the module.

If you must do extensive editing to a program, you should go back to the original .BDL file. Even though you can upload an edited file from the module to your personal computer, it will be a .BAS version of that file and *cannot be* reverse translated to the .BDL format.

RS-232 Communications Setup

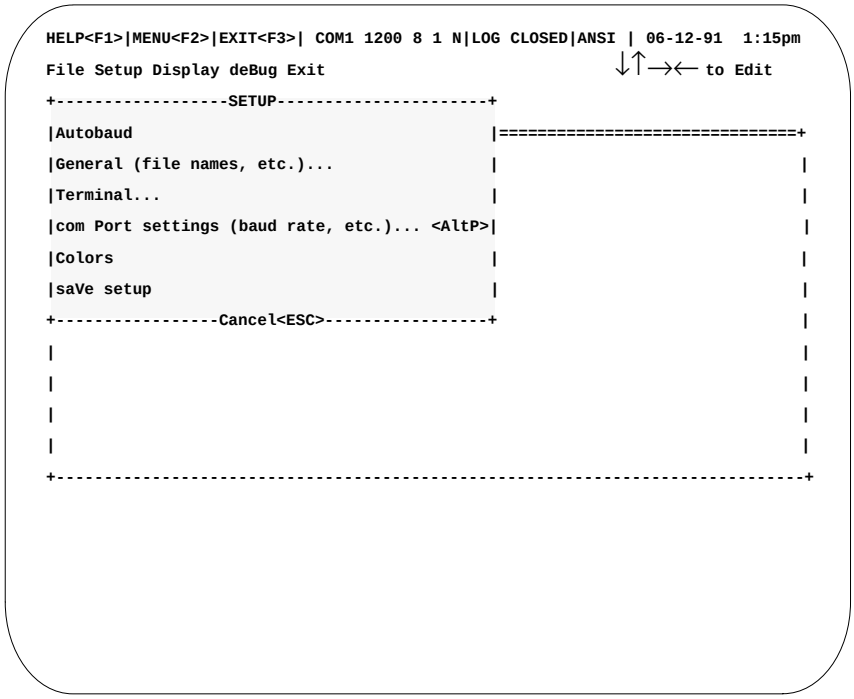
Before configuring the terminal communication parameters, the type of communications being used must be selected as either RS-232 or DH485.

NOTE General Purpose Communications is not intended for use with the module. This is done through the Terminal Selection menu accessed through the Setup and Configuration menu. Refer to Chapter 3 for details on terminal selection.

To configure the communication parameters for the communication type being used, access the Terminal Setup menu using the following path:

```
Path: Toplevel Menu → teRminal [RS-232] → Setup
Path: Main Menu → Other → teRminal [RS-232] → Setup
```

Figure 9.4 RS-232 Terminal Setup Menu



Autobaud

This menu selection automatically finds the baud rate of the module connected to your personal computer's currently configured RS-232 port. Note that Autobaud searches for the baud rate but does not modify the data bits, stop bits, parity, or port number. These selections must be correctly configured to match those of the module before Autobaud can successfully find the baud rate.

General Setup Parameters

This menu selection prompts you with a dialog box that gives you the following general setup parameters:

- **`Upload path`** — defines the DOS path in your personal computer where any files uploaded from the module will be sent
- **`Download path`** — defines the DOS path in your personal computer where any files downloaded to the module will come from
- **`Log File`** — is the name of the log file. You are always given the opportunity to edit this filename just before opening a log file.
- **`Beep on downloads and UPLOADs`** — causes your personal computer to sound a beep when the file upload or download operation is completed or terminated
- **`Word wrap in file viewer`** — allows word–wrap when viewing a file
- **`Right margin for file viewer`** — is the right margin for the word-wrap when viewing a file

Terminal

The Terminal selection brings up a **`TERMINAL SETUP`** dialog box that allows selection of ASCII or ANSI terminal emulation.

Com Port Settings

This menu selection brings up the **`PORT SETUP`** dialog box that allows configuration of communications port parameters. The default settings shipped with the BASIC Development Software match the default settings of the module's RS-232 port as follows:

Table 9.3 Default Settings

Com Port Settings	Defaults
Active com port	Com1
Baud rate	1200
Parity	No Parity
Data bits	8
Stop bits	1
Handshaking	enabled

The following parameters are available:

- **`active Com port`** — allows you to select the port on your personal computer for use in communicating with the module

> **IMPORTANT** Verify that the computer port you have selected for your mouse does not conflict with the port selected for serial communications with the module.

- **`Baud rate`** — allows you to select a communications baud rate. Choices are 300, 600, 1200, 2400, 4800, 9600, or 19200.
- **`Parity`** — allows you to select even, odd, or no parity
- **`Data bits`** — allows you to select the number of data bits contained in each character transferred to or from the module's program port. Valid choices are 7 or 8.
- **`sTop bits`** — allows you to select the number of stop bits. Valid choices are 1 or 2.
- **`Handshaking`** — selects whether or not the software handshaking occurs between your personal computer and the device it is communicating with. Always enable this menu item while downloading or uploading programs to or from the module.

Colors

Use this menu selection to change the screen background and foreground colors. The up and down cursor keys change the foreground colors; the left and right cursor keys change the background colors.

Save Setup

By selecting **`save Setup`**, you save all the current setup parameters pertinent to RS-232 Terminal mode.

DH485 Communications Setup

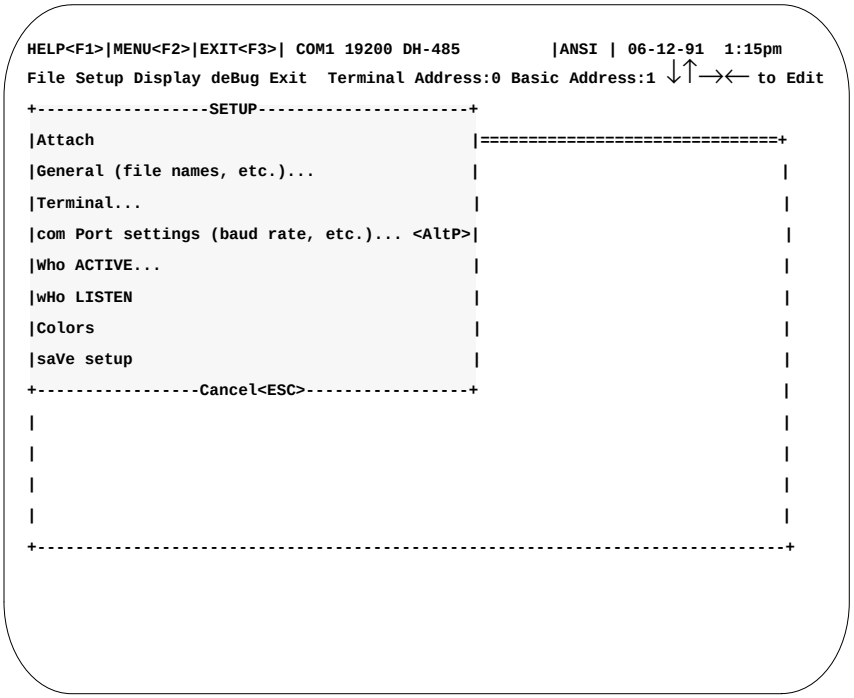
Before configuring terminal communication parameters, the type of communications being used must be selected as either RS-232 or DH485.

NOTE General Purpose Communications is not intended for use with the module. This is done through the Terminal Selection menu accessed through the Setup and Configuration menu. Refer to Chapter 3 for details on terminal selection.

To configure the communication parameters for the communication type being used, access the Terminal Setup menu using the following path:

Path: Toplevel Menu → teRminal [DH485] → Setup
Path: Main Menu → Other → teRminal [DH485] → Setup

Figure 9.5 DH485 Terminal Setup Menu



Attach

This parameter is used when it becomes necessary to re-establish lost communications with the module. When selected, your personal computer attempts to re-establish communications with the module at the configured module address on the DH485 network.

General Setup Parameters

This menu selection prompts you with a dialog box that gives you the following general setup parameters:

- **`Upload path`** — defines the DOS path in your personal computer where any files uploaded from the module will be sent
- **`Download path`** — defines the DOS path in your personal computer where any files downloaded to the module will come from
- **`Log File`** — is the name of the log file. You are always given the opportunity to edit this filename just before opening a log file.
- **`Beep on downloads and uploads`** — causes your personal computer to sound a beep when the file upload or download operation is completed or terminated
- **`Word wrap in file viewer`** — allows word-wrap when viewing a file
- **`Right margin for file viewer`** — is the right margin for the word-wrap when viewing a file

Terminal

The Terminal selection brings up a **`TERMINAL SETUP`** dialog box that allows selection of ASCII or ANSI terminal emulation.

Com Port Settings

This menu selection brings up the **PORT SETUP** dialog box that allows configuration of communications port parameters. The default settings shipped with the BASIC Development Software match the default settings of the module's DH485 port as follows:

The following parameters are available:

- **active Com port** — allows you to select the port on your personal computer for use in communicating with the module. Choose between COM1 or COM2.

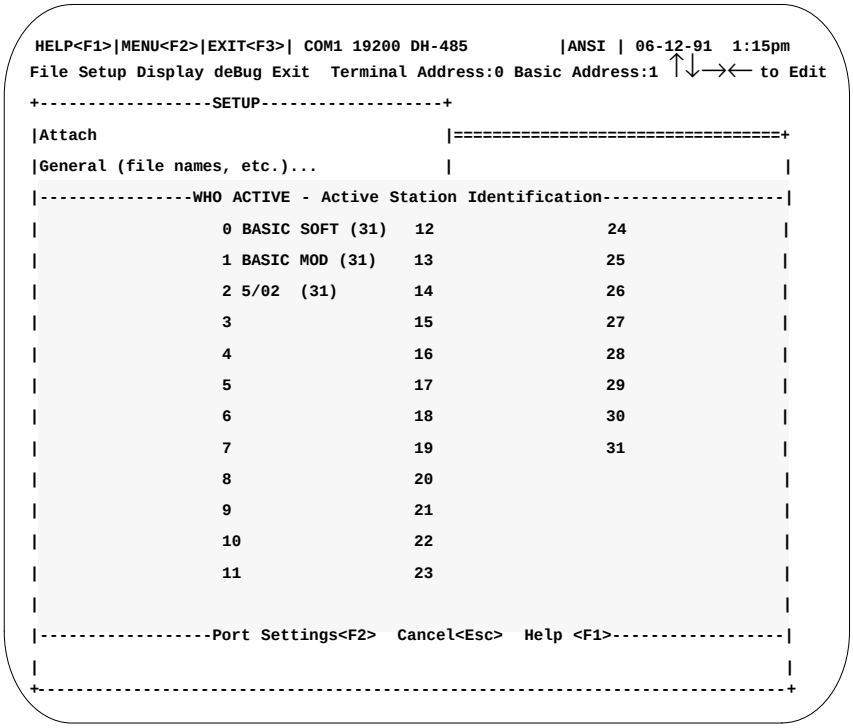
IMPORTANT Verify that the computer port you have selected for your mouse does not conflict with the port selected for serial communications with the module.

- **Baud rate** — allows you to select a communications baud rate. Choices are 1200, 2400, 9600, or 19200.
- **Terminal Address** — allows you to select the terminal address on the DH485 network
- **Module Address** — allows you to select the module's address on the DH485 network
- **Maximum Node Address** — allows you to select the maximum node address on the DH485 link. Valid selections range from 1 to 31.

Who Active

The Who Active screen allows you to see the active nodes on the DH485 network. Notice that your personal computer (BASIC SOFT) is included in the list at the address configured for the communications port parameter Terminal Address.

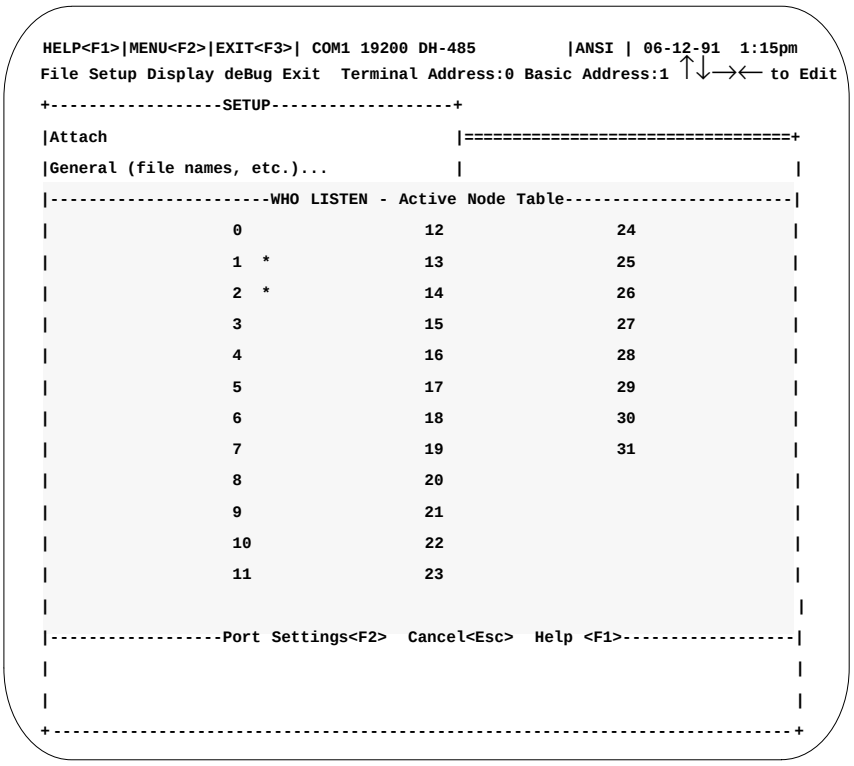
Figure 9.6 Who Active Screen



Who Listen

The Who Listen display shows the active nodes without placing the terminal on the network. This allows you to insure that there are no duplicate node addresses prior to going on line.

Figure 9.7 Who Listen Screen



Colors

Use this menu to change the screen background and foreground colors. The up and down cursor keys change the foreground colors; the left and right cursor keys change the background colors.

Save Setup

By selecting **`save Setup`**, you save all the current setup parameters pertinent to DH485 Terminal Mode.

BASIC Macro Library

This appendix contains important information you should be concerned with when using programming macros. The information is general in nature and supplements specific information contained in earlier chapters of this manual.

Topics include:

- screen functions
- keyboard functions
- backplane functions
- clock functions
- battery back-up
- program control
- string routines
- **[Ctrl-C]** functions
- port control functions
- DH485 functions

Library Overview

This library lists programming macros, or macro CALLs that you can use while programming with the BASIC development language. Included is a description of what the macro CALL does, along with a list of inputs and outputs associated with the macro.

Programming macros are described in Chapter 6 of this manual. The example program in that chapter (SECOND.BDL) makes extensive use of these macros.

IMPORTANT The file INCLUDE.BDL comes as part of the BASIC Development software package. It contains all of the BASIC programming macros listed in this library, along with the information necessary to translate them. Review the contents of the macro as listed in this file so you fully understand its functions and interaction with its application. The statement **{$I INCLUDE.BDL}** should appear at the beginning of any program in which you intend to use these programming macros.

Screen Functions

The following table describes the macro CALLs that you use to perform operations on the operator screen.

IMPORTANT Be aware that the screen macro CALLs pertain to the currently configured program port only. Attempts to direct output to other ports will be ignored during program translation

Table A.1 Operation Macros

Screen Macro CALLs	Macro	Inputs	Outputs
cls()	Clears the screen for an ANSI standard terminal.	None	None
home()	Places the cursor in the upper left hand corner of the screen on an ANSI standard terminal.	None	None
clr_to_eol()	Clears from cursor to end of line.	None	None
go_to_xy(%1,%2)	Positions the cursor. %1 column is the x coordinate in the range 1 to max_col. %2 row is the Y coordinate in the range 1 to max_row. Max_row and max_col change depending on the display mode.	%1 = Column (0 ≤ col ≤ 99) %2 = Row (0 ≤ row ≤ 99)	None
cursor_up(%1)	Moves the cursor up %1 rows.	%1 = the number of rows to move the cursor up	None
cursor_down(%1)	Moves the cursor down %1 rows.	%1 = the number of rows to move the cursor down	None
cursor_right(%1)	Moves the cursor right %1 columns.	%1 = the number of columns to move the cursor right	None
cursor_left(%1)	Moves the cursor left %1 columns.	%1 = the number of columns to move the cursor left.	None
cursor_save()	Saves the current cursor position.	None	None
cursor_restore()	Restores the cursor to the saved position.	None	None
high_intensity()	Prints characters in high intensity.	None	None
low_intensity()	Prints characters in low intensity.	None	None
blink()	Prints characters blinking.	None	None
reverse()	Prints characters in reverse video.	None	None
conceal_text()	Conceals printed text (no display of characters).	None	None
foreground_black()	Prints text with the foreground black.	None	None
foreground_red()	Prints text with the foreground red.	None	None
foreground_green()	Prints text with the foreground green.	None	None
foreground_yellow()	Prints text with the foreground yellow.	None	None
foreground_blue()	Prints text with the foreground blue.	None	None
foreground_magenta()	Prints text with the foreground magenta.	None	None
foreground_cyan()	Prints text with the foreground cyan.	None	None
foreground_white()	Prints text with the foreground white.	None	None

Table A.1 Operation Macros

Screen Macro CALLs	Macro	Inputs	Outputs
background_black()	Prints text with the background black.	None	None
background_red()	Prints text with the background red.	None	None
background_green()	Prints text with the background green.	None	None
background_yellow()	Prints text with the background yellow.	None	None
background_blue()	Prints text with the background blue.	None	None
background_magenta()	Prints text with the background magenta.	None	None
background_cyan()	Prints text with the background cyan.	None	None
background_white()	Prints text with the background white.	None	None
blink_off()	Has no special attributes.	None	None
lines()	Shows the user how fancy screens can be drawn.	None	None

Keyboard Functions

The following table describes the macro CALLs that you use to perform keyboard functions.

Table A.2 Keyboard Macros

Keyboard Macro CALLs	Macro	Inputs	Outputs
hit_any_key()	Prints **`Hit any key to continue`** , then waits on a program port key to be hit.	None	None
get_key(%1)	Gets the next key typed and places its ASCII decimal value in %1.	None	%1 = next key typed
get1_key(%1)	Gets the next character from PRT1.	None	%1 = next character
get2_key(%1)	Gets the next character from PRT2.	None	%1 = next character

SLC Backplane Functions

The following table describes the macro CALLs that you use to communicate and pass data on the backplane of the SLC 500. Backplane macros for the 1771-DB/B are located in the file INCLUDBB.BDL.

Table A.3 Communication Macros

Backplane Macro CALLs	Macro	Inputs	Outputs
write_m1_image_unsigned(%1,%2)	Converts a BASIC variable or constant value to an unsigned integer (0 to 65535), then writes this value to the M1 file. The offset position (0 to 63) in the M1 file is defined by the first input variable.	%1 = The offset position (0 to 63) in the M1 file %2 = BASIC variable or constant to be converted	None
read_m0_image_unsigned(%1,%2)	Reads an unsigned integer (0 to 65535) from the M0 file. The offset position (0 to 63) in the M0 file is defined by the first input variable. The variable which receives the data is the second input variable.	%1 = The offset position (0 to 63) in the M0 file to be converted	%2 = Variable
write_m1_image_signed(%1,%2)	Converts a BASIC variable or constant value to its binary representation (-32768 to 32767), then writes the value to the M1 file. The offset position (0 to 63) in the M1 file is defined by the first input variable.	%1 = The offset position (0 to 63) in the M1 file %2 = BASIC variable or constant to be converted	None
read_m0_image_signed(%1,%2)	Reads a binary value (-32768 to 32767) from the M0 image file. The offset position (0 to 63) in the M0 file is defined by the first input variable. The variable which receives the data is the second input variable.	%1 = The offset position (0 to 63) in the M0 file to be converted	%2 = Variable
copy_image_to_m1(%1,%2)	Allows the SLC processor to read the BASIC or BASIC-T module's M1 data.	%1 = Number of words to be copied	%2 = The success of the transfer 0 --> Run mode 1 --> Program mode 2 --> Test mode 10--> Illegal length 11--> Not supported
copy_bas_out_to_slc_in(%1)	Allows the SLC processor to read the module's output data into the SLC processor's input image table.	None	%1 = The success of the transfer 0 --> Run mode 1 --> Not Run mode 73--> No Response
copy_m0_to_image(%1,%2)	Allows the module to accept the SLC processor's M0 data.	%1 = Number of words to be copied	%2 = The success of the transfer 0 --> Run mode 1 --> Program mode 2 --> Test mode 10--> Illegal length 11--> Not supported
copy_slc_out_to_bas_in(%1)	Allows the module to read the SLC processor's output image table data.	None	%1 = The success of the transfer 0 --> Run mode 1 --> Not Run mode 73--> No Response

Table A.3 Communication Macros

Backplane Macro CALLs	Macro	Inputs	Outputs
wait_m1()	Waits for the M1 file to be read.	None	None
wait_m0()	Waits for the M0 file to be updated.	None	None
wait_input_image(%1)	Waits on the input image file to be read.	None	%1 = The success of the transfer: 0 = Not read yet 1 = Has been read 2 = Not supported
wait_output_image(%1)	Waits for the SLC output image file to be updated.	None	%1 = The success of the transfer: 0 = Not read yet 1 = Has been read 2 = Not supported

Clock Functions

The following table describes the macro CALLs that you use to set and read the clock.

Table A.4 Clock Macros

Clock Macro CALLs	Macro	Inputs	Outputs
input_time()	Asks the operator for the correct time, then sets the clock. No input or output variables.	None	None
set_time(%1,%2,%3)	Sets the clock to the time indicated by %1, %2, and %3.	%1 = Hours (0 to 23) %2 = Minutes (0 to 59) %3 = seconds (0 to 59)	None
set_date(%1,%2,%3)	Sets the clock to the date indicated by %1, %2, and %3.	%1 = Days (1 to 31) %2 = Months (1 to 12) %3 = Years (0 to 99)	None
input_date()	Sets the Wall Clock date. It asks the operator for the date, and sets the clock.	None	None
set_day()	Asks the operator for the day of week, and sets the Wall Clock day of week.	None	None
get_time(%1,%2,%3)	Reads the time from the clock and returns the time in the variables %1, %2, and %3.	None	%1 = Hours %2 = Minutes %3 = Seconds
print_time()	Reads the time from the clock and prints the time. The cursor is left at the end of the time. (That is, no carriage return/line feed is sent.)	None	None
print_date()	Reads the date from the clock and prints the date. The cursor is left at the end of the date. (That is, no carriage return/line feed is sent.)	None	None
print_day()	Reads the day from the clock and prints the day. The cursor is left at the end of the day. (That is, no carriage return/line feed is sent.)	None	None

Battery Back-Up

The following table describes the macro CALLs used to control the battery back-up.

Table A.5 Battery Back-up Macros

Battery Back–up Macro CALLs	Macro	Inputs	Outputs
battery_on()	Enables battery back-up.	None	None
battery_off()	Disables battery back-up.	None	None
alloc_bat_var(%1)	Allocates battery backed memory for non-volatile data storage. One parameter is required. %1 is the number of variables to be stored. If the MTOP is not 5FFFh, then this function is skipped.	%1 = Number variables	None
read_bat_var(%1,%2)	Retrieves battery backed variables.	%2 = storage number	%1 = variable to be retrieved
write_bat_var(%1,%2)	Writes battery backed variables.	%2 = storage number	%1 = variable to be written

Program Control

The following table describes the macro CALLs used for program control.

Table A.6 Program Macros

Program Control Macro CALLs	Macro	Inputs	Outputs
CALL_ram()	Transfers control of the BASIC program to the second line of the program in RAM.	None	None
CALL_rom(%1)	Transfers control of the BASIC program to the second line of the program specified in EEPROM.	%1 = number of ROM program	None
ret()	Transfers control back to were it was in the main program prior to the CALL.	None	None

String Routines

The following table describes the macro CALLs used for string routines.

Table A.7 String Routine Macros

String Routine Macro CALLs	Macro	Inputs	Outputs
string_repeat(%1,%2)	Allows you to repeat a character %1 times and copy it into $(%2).	%1 = Number of times to repeat the character. %2 = The string number containing the character.	$(%2) = The new string.
string_append(%1,%2)	Concatenates two strings (%1 and %2), then stores the result in %2.	%1 = Number of string to be appended. %2 = Number of the base string.	$(%2) = The concatenated string.
num_to_str(%1,%2)	Converts %1 from a numeric value to a string, then stores the result in $(%2).	%1 = Value to be converted. %2 = Number of the base string.	$(%2) = The string converted data.
str_to_num(%1,%2,%3)	Converts (%1) from a string to a numeric value, then stores the result in (%3). %2 is a validity code.	%1 = String number to be converted.	%2 = Validity of output value. 0 = Value not valid. 1 ≤ Valid Value ≤ 255 %3 = Converted value.
find_str_in_str(%1,%2,%3)	Finds a string within a string. It locates the first occurrence (position) of the string.	%1 = String to be found. %2 = String to be searched.	%3 = Result 0 = String not found 0 <> Found string
replace_str_in_str(%1,%2,%3)	Replaces a string within a string.	%1 = String which replaces the %2 string. %2 = String to be replaced. %3 = Base String number.	$(%1) = Base string
insert_str_in_str(%1,%2,%3)	Inserts a string into a string.	%1 = Position to begin insertion %2 = Number of characters to insert %3 = Base String number	$(%1) = Base string
delete_str_in_str(%1,%2,%3)	Deletes a string from a string.	%1 = Base string number. %2 = String number of string to be deleted.	$(%1) = Base string.
get_string_length(%1,%2)	Determines the length of a string.	%1 = Base string number	%2 = String length

[CTRL-C] Functions

The following table describes the macro CALLs used for **[Ctrl-C]** functions.

Table A.8 Control-C Macros

Control-C Function Macro CALLs	Macro	Inputs	Outputs
disable_c()	Disables the **[CTRL-C]** function.	None	None
enable_c()	Enables the **[CTRL-C]** function.	None	None

Port Control Functions

The following table describes the macro CALLs used for port control.

Table A.9 Port Control Macros

Port Control Function Macro CALLs	Macro	Inputs	Outputs
clear_prt1_buffers()	Clears the PRT1 input and output buffers.	None	None
clear_prt2_buffers()	Clears the PRT2 input and output buffers.	None	None

DH485 Functions

The following table describes the macro CALLs used during DH485 port communications.

Table A.10 DH485 Macros

DH485 Function Macro CALLs	Macro	Inputs	Outputs
wait_common_input()	Waits on the DH485 Common Interface Input File to be updated.	None	None
copy_common_to_basic_input(%1,%2)	Copies the DH485 Common Interface Input File to the BASIC Input buffer.	%1 = File Offset %2 = Number of words to copy	None

1771-DB/B Backplane Functions

The file INCLUDBB.BDL comes as part of the BASIC Development software package. It contains all of the BASIC programming macros listed in this library, along with the information necessary to translate them. Review the contents of the macro as listed in this file so you fully understand its functions and interaction with its application. The statement {$I INCLUDBB.BDL} should appear at the beginning of any program in which you intend to use these programming macros. This library only includes the backplane and number conversion macros for the 1771-DB/B. If you wish to use any of the general purpose BASIC macros, the statement {$I INCLUDE.BDL} must also appear at the beginning of your program.

Table A.11 1771-DB/B Backplane Macros

Number Conversion CALLs	Macro	Inputs	Outputs
db_to_plc_16(%1,%2)	Converts the number from BASIC Floating-Point to PLC 16-Bit Unsigned Binary (4 digit hex)	%1=Value to be converted %2=BTR word to store value	None
db_to_plc_bcd_3(%1,%2)	Converts the number from BASIC Floating-Point to PLC 3-Digit, Signed, Fixed Decimal BCD +/- XXX.	%1=Value to be converted %2=BTR word to store value	None
db_to_plc_bcd_3_3(%1,%2)	Converts the number from BASIC Floating-Point to PLC 3.3-Digit, Signed, Fixed Decimal BCD +/- XXX.XXX	%1=Value to be converted %2=BTR word to store value	None
db_to_plc_bcd_4(%1,%2)	Converts the number from BASIC Floating-Point to PLC 4-Digit, BCD XXXX	%1=Value to be converted %2=BTR word to store value	None
db_to_plc_bcd_6(%1,%2)	Converts the number from BASIC Floating-Point to PLC 6-Digit, Signed, Fixed Decimal BCD +/- XXXXXX	%1=Value to be converted %2=BTR word to store value	None
db_to_plc_oct(%1,%2)	Converts the number from BASIC Floating-Point to PLC 4-Digit, Signed, Octal +/-XXXX	%1=Value to be converted %2=BTR word to store value	None
db_to_plc5_float(%1,%2)	Converts the number from BASIC Floating-Point to PLC 5 Floating-Point	%2=BTR word to store value	None
plc_16_to_db(%1,%2)	Converts the number from PLC 16-Bit Unsigned Binary (4 digit hex) to BASIC Floating-Point	%1=BTW word that holds value to convert	2=Converted value
plc_bcd_3_to_db(%1,%2)	Converts the number from PLC 3-Digit, Signed, Fixed Decimal BCD +/- XXX to BASIC Floating-Point	%1=BTW word that holds value to convert	%2=Converted value
plc_bcd_3_3_to_db(%1,%2)	Converts the number from PLC 3.3-Digit, Signed, Fixed Decimal BCD +/- XXX.XXX to BASIC Floating-Point	%1=BTW word that holds value to convert	%2=Converted value
plc_bcd_4_to_db(%1,%2)	Converts the number from PLC 4-Digit BCD XXXX to BASIC Floating-Point	%1=BTW word that holds value to convert	%2=Converted value

Table A.11 1771-DB/B Backplane Macros

Number Conversion CALLs	Macro	Inputs	Outputs
plc_bcd_6_to_db(%1,%2)	Converts the number from PLC 6-Digit, Signed, Fixed Decimal BCD +/- XXXXXX to BASIC Floating-Point	%1=BTW word that holds value to convert	%2=Converted value
plc_oct_to_db(%1,%2)	Converts the number from PLC 4-Digit, Signed, Octal, +/ -XXXX to BASIC Floating-Point	%1=BTW word that holds value to be converted	%2=Converted value
plc5_float_to_db(%1,%2)	Converts the number from PLC 5 Floating-Point to BASIC Floating-Point	%1=BTW word that holds value to be converted	%2=Converted value

Table A.12 1771-DB/B Backplane CALLs

Backplane CALLs	Macro	Inputs	Outputs
btr()	Performs a block transfer read	None	None
btw()	Performs a block transfer write	None	None
btr_timed(%1)	Performs a block transfer read with a 2 second timeout	None	Status of block transfer
btw_timed(%1)	Performs a block transfer write with a 2 second timeout	None	Status of block transfer
set_btr_length(%1)	Sets block transfer read length (1 to 64)	%1=length of block transfer read buffer	None
set_btw_length(%1)	Sets block transfer write length (1 to 64)	%1=length of block transfer write buffer	None

The DOS Directory Shell

This appendix supplements specific information about the DOS directory shell contained in earlier chapters of this manual.

Topics include:

- shell operation
- file operations from the DOS directory shell

Using the DOS Directory Shell

The DOS directory shell allows you to perform a large number of DOS related tasks while the BASIC development software is still active. Not only does it display DOS directories and build directory trees from which you can select files, but it is also a fully integrated file/disk manager with the ability to:

- display up to four directories at a time, in either full directory display mode or condensed display mode
- build a graphic directory tree you can move through and select directories as the tree builds
- mark multiple files for copying, deleting, printing or loading, or prompt for a DOS command to be repeated on all marked files. For example, you can mark several .BDL files, enter the compiler command at the command prompt, press **[Enter]**, and all marked files are compiled.
- view or change file attributes
- view any file in a pop-up, Read-Only window for quick browsing
- sort directories by name, extension, size, date, and time (ascending or descending). Multiple sorts are supported. Note that the sorted directory *cannot* be stored on disk, but remains sorted for the current editing session. If the BASIC development software is exited, the next time the directory is displayed, it appears as it did before the sort.
- run any DOS command with the touch of a key
- examine the contents of any .ZIP or .ARC file by simply selecting it
- run any .EXE, .COM or .BAT file by simply selecting it

DOS Directory Shell Operation

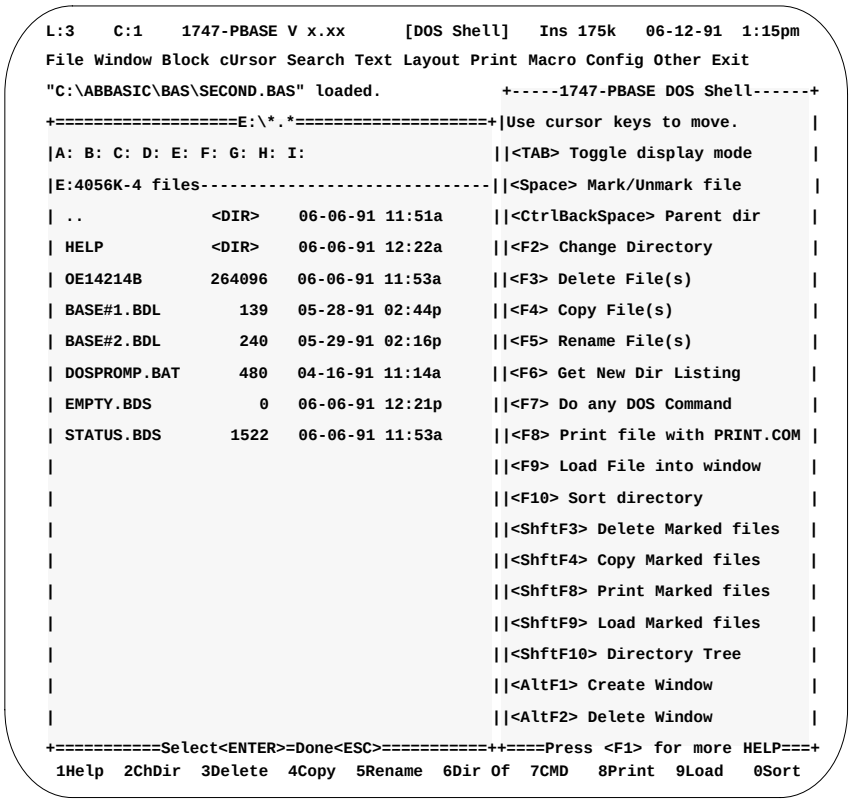
You can access the DOS directory shell two ways. From the main menu you can pull down the File menu and then select DOS directory shell. You can also press **[Ctrl–F4]** while you are in Edit mode. You cannot access the DOS directory shell from the Toplevel Menu, Terminal mode, or while using the Shell to DOS feature.

Path: Toplevel Menu → Main Menu → File → DOS directory shell
QuickStroke: Main Menu Æ [Ctrl-F4]

IMPORTANT Be aware that Shell-to-DOS and DOS directory shell are two distinctly different features. Shell-to-DOS temporarily drops out of the BASIC development software and takes you back to the DOS level where you can run programs or execute DOS commands.

The following figure shows the DOS directory shell with the main menu in the background. To the right is a listing of the keystrokes required to execute specific DOS commands. To the left is the listing of the currently selected DOS directory. (Files and directories listed here are examples.)

Figure B.1 DOS Directory Shell



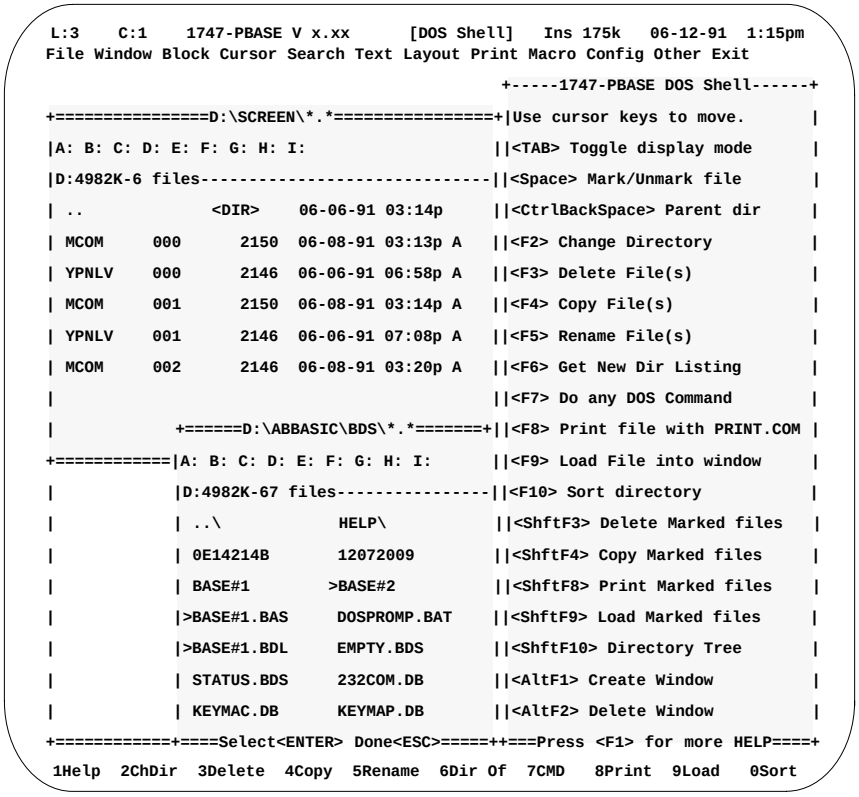
By pressing **[Shift–F10]**, a directory tree is built that replaces the directory list. The directory tree shows all directories and subdirectories for the current drive.

Once the initial screen is displayed, a highlight bar appears at the top and allows you to move up and down the tree. To select a new directory from the tree, press **[Enter]** when the desired directory is highlighted.

By pressing **[Alt–F1]**, a new directory window can be created. Up to four directory windows may exist on the screen at a time. Each directory window is independent and may display a different directory.

The following figure illustrates an example of two directory windows displayed on the screen at the same time. Notice that the bottom one is condensed while the top one displays a full directory list, complete with attributes.

Figure B.2 Two Directory Windows



Only one directory is active at a time; the active directory is indicated by the highlight bar (not visible in the above figure).

You may create, re-size, move, and delete directory windows in any order. Refer to the help screens available from the DOS directory shell.

File Operations from the DOS Directory Shell

Individual files can be copied, deleted, renamed, viewed, sorted, printed and loaded into a window from the DOS directory shell. Some of these operations can be performed on several files at once if the files have been marked.

Files are marked by pressing the space bar when the filename is highlighted. Marked files are indicated by the > character. In the previous figure with multiple directories, notice that several of the files in the bottom directory are marked.

Exit the DOS directory shell by selecting **Done<ESC>** with your mouse or pressing **[ESC]**.

Numerics

A

B

C

G

H

I

K

L

M

N

O

P

Q

R

W

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