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PC·INTERFACE

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GUIDEBOOK

TEXAS INSTRUMENTS
A C C E S S O R Y

PC-INTERFACE
G U I D E B O O K

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Table of Contents

This guidebook tells you how to connect the PC-Interface cable to a personal computer and a TI-74 or TI-95 calculator and run the installation software. Then you can use the calculator to access the computer's parallel printer, screen, and disk drives.

An Overview of the PC-Interface

The PC-Interface consists of a cable and computer programs.

Hardware

The PC-Interface hardware is a cable with a Dockbus™ connector at one end and a 25-pin parallel connector at the other. The parallel connector housing contains the PC-Interface circuitry.

Software

All software is provided on a 5¼ " DOS diskette. This includes software to install the PC-Interface, software to download to the TI-95, and utility software to help you use the PC-Interface effectively.

What Does the PC-Interface Do?

The PC-Interface enables the owner of a TI-74 BASICALC™ or a TI-95 PROCALC™ calculator to connect the calculator to a TI Professional Computer (TI PC) or to an IBM™ PC, PC/XT™, Personal Computer AT™, or 100%-compatible machine.

Description

Using the PC-Interface cable and software, a TI-74 or TI-95 can access a computer to perform several functions:

► Print on the computer's parallel printer (if the computer has more than one parallel port).

► Use the computer screen like a printer.

► Transfer text to the computer's disk drives to store data and program listings. Transfer text data from the computer's disk drives to the TI-74.

► Write to and read from the computer's disk drives for storage and backup of TI-74 BASIC and Pascal programs and TI-95 program, register, file-space, and cartridge images.

Applications

You can store data from both the TI-74 and TI-95 on the computer's disks for later reference, including use in PC-based applications such as spreadsheets.

With the PC-Interface you can enter and edit program statements using a text editor on the computer, compress those statements into a loadable program image using a utility program, and then transfer the program image to the calculator for execution. This facilitates both the development of new software and its transfer to the user.

► The PC-Interface makes it easier to enter and edit program statements.

► The PC-Interface makes it easier to transfer programs to the end user from other users, TI, or custom software developers.

Chapter 1: Setting Up the System

This chapter tells you what you should know before you connect the PC-Interface cable or run the PC-Interface software. It describes how to connect the calculator, the cable, and a personal computer together. It also tells how to run the installation software.

How Does the PC-Interface Work?

The PC-Interface accesses the printer, display, and disk drives of a computer from the calculator by assigning each a unique device number.

Dockbus Devices

The TI-74 and TI-95 access devices attached to the Dockbus port by referencing various Dockbus device numbers. The PC-Interface defines the computer's parallel printer, screen, and disks as Dockbus devices.

Device	Number
The computer's parallel printer	14
The computer's screen	45
The computer's disk for program storage	100
The computer's disk for data storage	101

PC-Interface Documentation

This guidebook contains all the information you need to install and begin using the PC-Interface. Documentation for any new or special features is on the distribution diskette.

Written Documentation

This guidebook provides the documentation you need to start up and use the PC-Interface.

► Chapter 1 tells how to connect the PC-Interface and run the installation software for both the TI-74 and the TI-95 calculators.

► Chapter 2 tells how to use the PC-Interface with the TI-74 calculator.

► Chapter 3 tells how to use the PC-Interface with the TI-95 calculator.

► Appendix A contains reference material such as I/O error codes with suggested remedies, PC Access (TI-95) error messages, and ANSI escape sequences for on-screen cursor positioning.

► Appendix B contains warranty and service information.

Note: This manual only tells you how to use the PC-Interface with the TI-74 and TI-95 calculators. For more information on DOS, refer to your DOS manual. For more information on your calculator, refer to the user's guide and programming guide that came with the calculator.

Other Documentation

To allow inclusion of new utilities as they are developed, documentation for some utilities is on the distribution diskette itself.

To learn about utilities, features, and changes not documented in this guidebook, look for README files on the diskette.

Getting Started with the PC-Interface

The PC-Interface is easy to install. It involves two processes: connecting the cable and running the installation software.

Installation Steps

To install the PC-Interface:

1. Turn off the TI-74 or TI-95 calculator.

2. Connect the parallel connector on the PC-Interface cable to a parallel port on the computer. This step is described in more detail below.

3. Connect the Dockbus connector on the PC-Interface cable to the port on the calculator. This step is described in more detail on page 1-7.

4. Start the PCIF program on the computer. This step is described in more detail on page 1-7.

5. Turn on the calculator.

If you follow any other sequence, it is possible that you may need to reset the computer or calculator.

Note: When the cable is connected, but the PCIF program has not been run yet, the batteries in the calculator will run down rather quickly. This may happen when you leave the PC-Interface cable connected all the time and start the computer or reboot. Your PC-Interface disk contains utility programs that prevent this. See page 1-12 for more information.

Connecting the PC-Interface Cable to the Computer

With an IBM or compatible computer, you must decide which parallel port to use before connecting the PC-Interface cable to the computer. Because many expansion cards have a parallel port on them, it is not uncommon for a computer to have more than one parallel port.

In order to access the parallel printer through the PC-Interface, the computer must have more than one parallel port. If there is more than one parallel port available, do not use the port associated with LPT1: for the PC-Interface. LPT1: is often assigned to the parallel printer by DOS.

Connecting the PC-Interface Cable to the Calculator

Plug the Dockbus connector on the PC-Interface cable into the Dockbus port on the back of the calculator. Dockbus connectors are shaped so that you will insert them only one way. The raised key on the top of the connector fits into the notch on the top of the port.

Running the Installation Software

You start the PC-Interface software by executing a single program. You can execute this program in several ways.

► You can execute it from the DOS prompt by entering a command, including configuration options.

► You can execute it from the DOS prompt by entering a command that accesses a configuration file containing the options.

► You can include either of the above forms in an AUTOEXEC or other .BAT file.

The diskette contains two versions of the software.

► The version for the IBM PC, PC/AT, PC/XT, or compatible is PCIF.EXE.

► The version for the TI Professional Computer is PCIFTI.EXE.

Software Installation Options

Software installation options are related to the computer hardware available. They are the same for the TI-74 and TI-95.

Running the PC-Interface from the DOS Prompt

To start the PC-Interface software on the computer, at the DOS prompt type PCIF or PCIFTI, as appropriate. You can specify options in the command by preceding them with a "-" or "/" (forward slash). The default setting is used for any options you do not specify.

The options are:

► Indicate the parallel port to which the PC-Interface cable is attached.

/0 The PC-Interface is connected to the primary port. This is the default.

/1 The PC-Interface is connected to the secondary port.

/2 The PC-Interface is connected to the monochrome display adapter port.

► /p# Indicate the parallel port to which the parallel printer is attached. The above selections apply. (Example: /p1 indicates the secondary port.) This option is available only if you have more than one parallel port. The default is no printer.

► /r Intercept all messages to device 12 (the PC-324) and route them to device 45 (the computer screen). The default is to leave device 12 messages alone. Do not use this option if you have connected the PC-324 between the calculator and the PC-Interface.

► /s Disable top-of-form on the parallel printer and perform continuous printing. The default is top-of-form.

► /? Display the option list and the PC-Interface version number.

Running the PC-Interface from a Configuration File

You may start the PC-Interface using the options specified in a configuration file. This file may have any name; however, if you use the extension .CFG, you don't have to type it. To start the software from a configuration file, the form at the DOS prompt is:

A:\PCIF [*dir:*]*file-name*[.*ext*]

The computer then reads the configuration information from a file and uses the options in that file. For example, to run PCIF.EXE using the options from configuration file MYCALC.CFG in the current directory, type:

A:\PCIF MYCALC

The PC-Interface Configuration File

A configuration file is a standard DOS ASCII text file. You may include comment lines by placing an * in column one. The option lines may begin in any column. You may use any mixture of uppercase and lowercase letters. At least one blank space must precede and follow the ":". The format of the configuration file is:

LinkPort	:	0, 1, or 2
PrinterPort	:	0, 1, or 2
PC324-Replace?	:	Yes or No
SkipTopOfForm?	:	Yes or No

The options and defaults are the same as described on the previous page. Any options you do not list in the configuration file are set to their defaults.

Software Installation Options (Continued)

Examples

Each of the following examples would install the PC-Interface and tell it that the cable is attached to the parallel port on the monochrome display adapter, a parallel printer is attached to the primary port, printing should be continuous, and any messages to device 12 (the PC-324 printer) should be rerouted to the computer screen.

To start the software from the DOS prompt, you would enter:

    A:\PCIF /2 /p0 -s -r

    C:\PCIF /2rp0s

To start the software from a configuration file (on the TI PC), you would enter:

    A:\PCIFTI options

where the file OPTIONS.CFG contains:

    *PC-Interface mono, printer primary
    linkport   :   2
    PrinterPort   :   0
    skiptopofform?   :   yes
    PC324-replace?   :   YES

To start the software from a .BAT file, you would enter:

    A:\STRTPCIF

where the file STRTPCIF.BAT contains:

    PCIF OPTIONS

as shown above.

Exiting the PC-Interface Software

The steps for exiting the PC-Interface are the same whether you have a TI-74 or a TI-95 calculator.

Returning to DOS

You may use one of two methods to exit from the PC-Interface and return to DOS.

► Execute an I/O operation from the calculator (such as open, close, print, or list) that references device 253.

► Press the ESC key on the computer and then turn off the calculator.

Both methods execute these steps:

► Close any open devices and files on the computer that the PC-Interface is using.

► Exit the PC-Interface and return the computer to DOS.

Now, if you are using the same parallel port for the PC-Interface and your printer, you may want to disconnect the PC-Interface cable and run the port reconfiguration utility as described on page 1-13.

Conserving the Calculator Batteries

When the PC–Interface cable is attached, there is a significant drain on the batteries of your TI–74 or TI–95 calculator. You can reduce this drain to minimal power consumption by running the PCIF program or the SAVBAT utility.

Power Consumption

The PC–Interface circuitry receives its power from the calculator. Whenever the cable is connected to the parallel port of the computer and the computer is on, the PC–Interface is drawing power from the calculator.

This power drain can be reduced to a minimal level if the parallel port is configured appropriately. Both installation programs, PCIF and PCIFTI, perform this configuration. Even after you exit PCIF or PCIFTI, only minimal power is drawn.

However, if you reboot your computer or if you turn on your computer with the PC–Interface cable connected and do not run PCIF immediately, the batteries in your calculator can run down very quickly.

The SAVBAT Utilities

If you normally leave your PC–Interface cable connected, you should include a utility, SAVBAT.EXE or SAVBATTI.EXE (for the TI PC), in your AUTOEXEC.BAT file. These utilities are included on the PC–Interface diskette. This insures that whenever you turn on your computer or reboot, the parallel port is reconfigured to reduce power drain. See your DOS manual for instructions on altering your AUTOEXEC.BAT file.

For IBM PCs and compatibles, you must tell SAVBAT the port to which the PC–Interface cable is attached.

► /0 The cable is plugged into the primary port. This is the default.

► /1 The cable is plugged into the secondary port.

► /2 The cable is plugged into the monochrome adapter port.

For example, SAVBAT /1 in the AUTOEXEC file reduces power drained by the PC–Interface on the secondary port.

The TI PC has only one parallel port, so you should include the line SAVBATTI with no options in the AUTOEXEC file.

Undoing SAVBAT

If you only have one parallel port and have finished using your TI–74 or TI–95, you may wish to disconnect the PC–Interface cable and reconnect your printer. To access your printer, it is usually necessary to reconfigure the parallel port to its state before you ran SAVBAT, SAVBATTI, PCIF, or PCIFTI. To reconfigure the parallel port, you can reboot the computer. However, if you do not wish to reboot, you can run the PORT2PRN or PORT2PTI (for the TI PC) utility.

To run the reconfiguration utility, the form at the DOS prompt for IBM or compatibles is:

A:\PORT2PRN [/*port*]

The port options are the same as they are for SAVBAT.

For the TI PC, you type only PORT2PTI.

Chapter 2: Using the PC-Interface with the TI-74

This chapter tells you how to use the TI-74 calculator and BASIC to access the computer's printer, screen, and disks.

Printing on the PC's Printer from the TI-74

If the computer has more than one parallel port, you can access its printer directly from the TI-74.

Specifying the Printer

To access the printer, you must have selected the PC-Interface printer option by including either the /p# option in the command line or the PrinterPort option in a configuration file. These options are described in Chapter 1.

Note: You cannot redirect output intended for the PC-324 printer (device 12) to the computer's printer using the PC-Interface redirect option (/r). This option redirects output only to the computer screen.

Methods of Accessing the Printer

The PC-Interface specifies the computer's printer as device 14.

You can control the computer's printer with output commands from the TI-74 in BASIC mode. In general, two methods apply.

► The LIST command sends program listings to the printer.

► The OPEN # and PRINT # statements are used to send data to the printer.

These statements are described in detail in the *TI-74 Programming Reference Guide*. The general form of each statement and an example of its use with the PC-Interface are given here for your convenience. In the general form, KEYWORDS are capitalized, *variables* are in italics, and optional items are enclosed in brackets ([]).

Listing Programs on the PC's Printer

The LIST command sends all or a portion of a BASIC program listing to the computer's parallel printer (device 14). You must specify the printer as described on the previous page. The general form for the LIST command is as follows:

LIST "14[.*return-option*]"[,*line-group*]

Do not use the OPEN statement before using the LIST command. LIST opens and closes the device automatically.

The *return-option* is the only software option available for the printer in the LIST statement.

R = L Send both a carriage return and a line feed at the end of every record. This is the default.

R = N Do not add a carriage return or a line feed at the end of every record; send "as-is."

R = C Send a carriage return at the end of every record. Do not add a line feed.

Example

The following example opens the printer (device 14). Then it lists on the printer lines 100-150 of the BASIC program in the calculator, sending only a carriage return at the end of each line. LIST automatically closes the printer after the listing is completed.

LIST "14.R = C",100-150

Sending Data to the PC's Printer

After specifying the printer as described on page 2-2, you can send data to the computer's printer by opening the device, printing the data, and then closing the device. Device 14 can be open for only one *file-number* at a time. The general forms for the OPEN #, PRINT #, and CLOSE # statements are as follows:

OPEN #*file-number*,"14[*.return-option*]"[*,file-organization*][*,file-type*][*,record-length*][*,open-mode*]
PRINT #*file-number,string-variable*
CLOSE #*file-number*

The *return-options* are the same as those given for the LIST statement on the preceding page.

The *file-organization* must be SEQUENTIAL (the default). The *file-type* must be DISPLAY (the default). If you do not specify a *record-length* (VARIABLE *nnn*), the default *record-length* is 80 characters. You must specify the OUTPUT *open-mode* when accessing the printer.

Note: When device 14 is closed, the PC-Interface automatically sends a form feed if the paper is not at the top of the form.

Example

The following program opens the computer's printer (device 14) for output as file #2. Only a carriage return is sent after each record. The maximum line length is 132 characters. The printer prints the contents of the variable string A$, and then the program closes the printer.

```
100 A$ = "Texas Instruments, PC-Interface"
200 OPEN #2,"14.R = C",VARIABLE 132,OUTPUT
300 PRINT #2,A$
400 CLOSE #2
```

Note: Output from the PRINT (as opposed to PRINT #) statement is written only to the calculator display.

Using the TI-74 Software Cartridges with the PC-Interface

You can direct output to the computer's printer from the following TI-74 software cartridges:

► Chemical Engineering library

► Finance library

► Mathematics library

► Statistics library

► Learn Pascal cartridge

When the library cartridge program asks Use Printer?, respond Ⓨ and enter 14 for the device code.

The Learn Pascal cartridge installs a programming language that you can use to access device 14.

Displaying on the PC's Screen from the TI-74

The TI-74 can send data to the computer screen as if the screen were a printer.

Accessing the PC's Screen

The PC-Interface specifies the computer screen as device 45.

You can automatically redirect output intended for the PC-324 printer (device 12) to the computer screen using the /r option, which is described in Chapter 1.

Using the TI-74 in the BASIC mode, you can control the computer screen with the TI-74 output commands. In general, two methods apply.

► The LIST command sends program listings to the screen.

► The OPEN # and PRINT # statements are used to send data to the screen.

These statements are described in detail in the *TI-74 Programming Reference Guide*. The general form of each statement and an example of its use with the PC-Interface are given here for your convenience. In the general form, KEYWORDS are capitalized, *variables* are in italics, and optional items are enclosed in brackets ([]).

Listing Programs on the PC's Screen

The LIST command sends all or a portion of a BASIC program listing to the computer screen (device 45). The general form for the LIST command is as follows:

LIST "45[*.return-option,pause-option*]"[,*line-group*]

Do not use the OPEN statement before using the LIST command. LIST opens and closes the device automatically.

The *return-option* specifies what occurs at the end of each record.

R = L   Send both a carriage return and a line feed at the end of every record. This is the default.

R = N   Do not add a carriage return or a line feed at the end of every record; send "as-is."

R = C   Send a carriage return at the end of every record. Do not add a line feed.

The *pause-option* specifies what occurs when a screen is full of data.

P = N   The calculator writes to the screen without interruption. This is the default.

P = Y   When the screen is full of data, you must press a key on the computer's keyboard before the screen can receive more data from the calculator.

R = L (the default) and P = Y are the desirable options when listing programs to the screen.

Example

The following example opens the computer screen (device 45), lists lines 100-500 of the TI-74 program with a carriage return and line feed at the end of each line (by default), and then closes the screen. When the screen is full of data, the listing pauses until you press a key on the computer's keyboard.

LIST "45.P = Y",100-500

Sending Data to the PC's Screen

You may send data to the computer screen by opening the device, displaying the data with PRINT #, and then closing the device. Device 45 can be open for only one *file-number* at a time. The general forms for the OPEN #, PRINT #, and CLOSE # statements are as follows:

OPEN #*file-number*, "45[*.return-options,*
    pause-option]" [*,file-organization*][*,file-type*]
    [*,record-length*][*,open-mode*]
PRINT #*file-number,string-variable*
CLOSE #*file-number*

The *return-options* and *pause-options* are the same as for LIST. The P = N *pause-option* is desirable when you are writing to the screen using ANSI controls (see page 2-9).

The *file-organization* must be SEQUENTIAL (the default). The *file-type* must be DISPLAY (the default). If you do not specify a *record-length* (VARIABLE *nnn*), the default *record-length* is 80 characters. You must specify the OUTPUT *open-mode* when accessing the screen.

Example

The following program opens the computer screen (device 45) as file #2. Only a carriage return is sent after each record. The maximum line length is 40 characters. The screen displays the contents of the variable string A$, and then the program closes the screen.

```
100 A$ = "Texas Instruments, PC-Interface"
200 OPEN #2,"45.R = C",VARIABLE 40,OUTPUT
300 PRINT #2,A$
400 CLOSE #2
```

Note: Output from the PRINT (as opposed to PRINT #) statement is written only to the calculator display.

Using the TI-74 Software Cartridges with the PC-Interface

You can direct output to the computer screen from the following TI-74 software cartridges:

► Chemical Engineering library

► Finance library

► Mathematics library

► Statistics library

► Learn Pascal cartridge

When the library cartridge program asks Use Printer?, respond [Y] and enter 45 for the device code.

The Learn Pascal cartridge installs a programming language that you can use to access device 45.

Using ANSI Controls to Write to the PC's Screen

You can control the position and movement of the cursor on the computer screen using ANSI escape sequences.

To use ANSI escape sequences on an IBM or compatible machine, include the line DEVICE = ANSI.SYS in your DOS CONFIG.SYS file. This is not necessary on the TI PC.

Some common ANSI escape sequences are given in Appendix A.

The example below, if used appropriately in a TI-74 program or from calculator mode, would clear the computer screen by sending the sequence ESC[2J.

```
PRINT #1,CHR$(27);CHR$(91);"2J"
```

Before Accessing the PC's Disks

A useful feature of the PC-Interface is that it allows you to store program listings, data, and program images in files on the computer's disks. You can edit or create program listing files and data files on the computer.

Types of Files

The PC-Interface treats the computer's disk as two logical devices, one for data or text files (device 101), which may contain multiple records, and one for program images or binary files (device 100), which do not have more than one record.

You can access three categories of files on the computer's disks from a TI-74.

► Data files. You transfer these files to and from the computer by specifying device 101 and the file name.

► TI-74 program listings in text (ASCII) format. You can list these files to the computer from the calculator by specifying device 101 and the file name.

► TI-74 program images in binary format. You transfer these files to and from the computer by specifying device 100 and the file name.

Special Considerations

Although you may have up to five files open concurrently with the PC-Interface, DOS also controls the number of open files allowed. To permit the PC-Interface to have five open files, add the line FILES = 10 to the DOS CONFIG.SYS file.

The PC-Interface allows you to use the full DOS path (drive:\subdir\file.ext), such as A:\TI74\FILE1.TXT.

To type the backslash character from the TI-74 keyboard, press CTL and then 7. The TI-74 displays ¥ (the yen symbol). This character on the TI-74 has a decimal value of 092, which is the value for a backslash on the computer.

BASIC and Pascal Programs

After you type a BASIC or Pascal statement on the TI-74 and press ENTER, your typed statement is converted to a program statement in a form that the calculator uses internally. Conversely, the LIST command converts each internal program statement to present it in a text format that you can read.

A "program," therefore, may be an entire file of text statements or an entire file of binary program statements. You must manipulate those files appropriately, which is not difficult.

Using device 101 and the LIST command, you can transfer a program in the TI-74 to an ASCII text file on the computer. The file can then be edited using a text editor. You also can enter a new program on the computer using a text editor.

After you have finished a program on the computer, you use one of two utilities, TIC74.EXE for BASIC or TICP74.EXE for Pascal, to convert the file of text statements into a file of binary program statements. You then can transfer the binary file to the TI-74 from device 100 using the OLD command or the RUN command.

These processes are described further in the "Transferring Programs to and from the PC's Disks" section of this chapter.

The TI-74 can use any of the computer's disk drives to store data.

Accessing the PC's Disk for Data Storage

The PC-Interface transfers data in record format from the TI-74 to the computer's disks and vice versa. The PC-Interface specifies the data disks as device 101. You should read the "Before Accessing the PC's Disks" section in this chapter before accessing device 101.

You can store data on the computer's disks from the TI-74 with I/O commands in the BASIC mode. In general, three methods apply.

► The LIST command sends program listings to an ASCII text file on the computer's disk.

► The OPEN #, PRINT #, and CLOSE # statements are used to send data to a file on the computer's disk.

► The OPEN #, INPUT #, LINPUT #, EOF( ), and CLOSE # statements are used to read data from a file on the computer's disk.

These statements are described in detail in the *TI-74 Programming Reference Guide*. The general form of each statement and an example of its use with the PC-Interface are given here for your convenience. In the general form, KEYWORDS are capitalized, *variables* are in italics, and optional items are enclosed in brackets ([]).

Note: Any application written to use the CI-7 Cassette Interface as a data-storage device can use the disks for storage by specifying device 101 instead of device 1.

Listing Programs to a PC Disk File

Example

The LIST command sends all or a portion of a BASIC program listing to a file on the computer's disk. The general form for the LIST command is as follows:

LIST "101.*file-name*"[,*line-group*]

Do not use the OPEN statement before using the LIST command. LIST opens and closes the file automatically.

If *file-name* is an existing file, the file is opened. If *file-name* does not exist, it is created. The *file-name* may include the full DOS path (drive:\subdir\file.ext), such as A:\TI74\FILE1.TXT.

The PC-Interface sends a new-line character at the end of every record written to device 101.

The following example opens a file named BASICPRG.B74 in directory TI74 on drive A of the computer, lists (with line numbers) the BASIC program in the calculator into the file in an ASCII text format, and then closes the file.

LIST "101.A:\TI74\BASICPRG.B74"

Storing Data on the PC's Disks

You may store data on the computer's disks by opening a file on device 101, writing the data with PRINT #, and then closing the file. Device 101 can be open for more than one *file-number* at a time. The general forms for the OPEN #, PRINT #, and CLOSE # statements are as follows:

OPEN #*file-number*,"101.*file-name*"[,*file-organization*] [,*file-type*] [,*record-length*] [,*open-mode*]
PRINT #*file-number*,*string-variable*
CLOSE #*file-number*

If the *file-name* is an existing file, the file is opened. If the *file-name* does not exist, it is created. The *file-name* may include the full DOS path (drive:\subdir\file.ext), such as A:\TI74\FILE1.TXT.

The *file-organization* must be SEQUENTIAL (the default). The *file-type* must be DISPLAY (the default). If you do not specify a *record-length* (VARIABLE *nnn*), the default *record-length* is 80 characters. The *open-mode* to store data can be OUTPUT or UPDATE (the default).

The PC–Interface sends a new-line character at the end of every record written to device 101.

Example

The following program opens the file DAT.FIL for output to the data disk (device 101) as file #2. The data is stored in directory TI74 of the computer's drive A. The default of DISPLAY *file-type* and SEQUENTIAL *file-organization* apply. The maximum record length is 60 characters. The program writes the contents of the *string-variable* A$ to the file and then closes the file.

```
100 A$ = "Texas Instruments, PC-Interface"
200 OPEN  #2,"101.A:\TI74\DAT.FIL",VARIABLE 60,OUTPUT
300 PRINT  #2,A$
400 CLOSE #2
```

Retrieving Data from the PC's Disks

You may retrieve stored data from the computer's disks by opening the file on device 101, reading the data, and then closing the file. Device 101 can be open for more than one *file-number* at a time. The general forms for the OPEN #, INPUT #, LINPUT #, and CLOSE # statements are as follows:

OPEN #*file-number*,"101.*file-name*"[,*file-organization*] [,*file-type*] [,*record-length*] [,*open-mode*]
INPUT #*file-number*,*string-variable*
LINPUT #*file-number*,*string-variable*
CLOSE #*file-number*

If the *file-name* is an existing file, the file is opened. If the *file-name* does not exist and *open-mode* is UPDATE, it is created; if *open-mode* is INPUT, an error is returned. The *file-name* may include the full DOS path (drive:\subdir\file.ext), such as A:\TI74\FILE1.TXT.

The *file-organization* must be SEQUENTIAL (the default). The *file-type* must be DISPLAY (the default). If you do not specify a *record-length* (VARIABLE *nnn*), the default *record-length* is 80 characters or the actual record length, whichever is greater. The *open-mode* to read data can be INPUT or UPDATE (the default).

INPUT # and LINPUT # both read one record of data from the disk. The difference between the statements is described in the *TI–74 Programming Reference Guide*.

The following program opens for input the file DAT.FIL on the data disk (device 101) as file #2. The file is in directory TI74 of the computer's drive A. The defaults of DISPLAY *file-type* and SEQUENTIAL *file-organization* apply. The *record-length* is determined as described above. The program reads the contents of a record into the *string-variable* RECORD$ and then closes the file.

```
100 OPEN  #2,"101.A:\TI74\DAT.FIL",INPUT
200 LINPUT  #2,RECORD$
300 CLOSE  #2
```

The TI-74 can use any of the computer's disk drives to store
TI-74 BASIC program images.

The EOF Function

Use the EOF function in TI-74 programs to do end-of-file handling with files opened for input. The value of EOF is 0 (false) if the program has not read past the last record on the file and −1 (true) if it has. The general form of the function is as follows:

EOF(*file-number*)

The PC-Interface stores TI-74 program images (and other data that should not be altered in transmission) in files on the program disk (device 100). It transfers files to and from this device as a single record. You should read the "Before Accessing the PC's Disks" section in this chapter before accessing device 100.

Example

The following example could be used in a loop in the previous example to stop the program when it has read past the last record in file #2.

IF EOF(2) THEN STOP

Using the TI-74 in the BASIC mode, you can store and retrieve program images on the computer's disks using several TI-74 commands as described in the remainder of this section.

Deleting a File on Disk

You can delete files on the computer's data disk from the TI-74 in BASIC mode. The general form of the command is as follows:

DELETE "101.*file-name*"

These commands are described in detail in the *TI-74 Programming Reference Guide*. The general form of each command is given here for your convenience. In the general form, KEYWORDS are capitalized, *variables* are in italics, and optional items are enclosed in brackets ([ ]).

The PC-Interface allows you to use the full DOS path (drive:\subdir\file.ext), such as A:\TI74\FILE1.TXT.

The PC-Interface allows you to use the full DOS path (drive:\subdir\file.ext), such as A:\TI74\FILE1.TXT, for the *file-name*.

Caution: Any file can be deleted by the PC-Interface, not only those files created through the PC-Interface.

Note: Any application written to use the CI-7 Cassette Interface as a program-storage device can use the disk drive for storage by specifying device 100 instead of device 1.

Example

The following example would delete the file created on the previous page.

DELETE "101.A:\TI74\DAT.FIL"

The SAVE command writes a copy of the program that is in the TI-74 memory onto the computer's program disk (device 100). The general form of the command is as follows:

SAVE "100.*file-name*"

The main utility for use with the TI-74 converts a file of ASCII program statements to an executable program image. To learn about other utilities or features not documented in this guidebook, examine the README files on the distribution diskette.

Retrieving and Running a Program from the PC's Disk

The OLD command reads a program image from the computer's program disk into the calculator's memory. You then can edit or run the program. The general form of the command is as follows:

OLD "100,*file-name*"

The RUN command reads a program image from the computer's program disk into the calculator's memory and then runs it.

RUN "100,*file-name*"

Verifying a Transfer

The VERIFY command compares the program image stored on the computer's disk with the program in the TI-74 memory. It is sometimes used after the SAVE or OLD commands. The general form of the command is as follows:

VERIFY "100,*file-name*"

Deleting a File on Disk

You can delete files on the computer's program disk from the TI-74 in BASIC mode. The general form of the command is as follows:

DELETE "100,*file-name*"

Caution: Any file can be deleted by the PC-Interface, not only those files created through the PC-Interface.

Co...ing BA... Text Li... to E...ble Pr...m Images

The PC-Interface diskette includes a program, TIC74.EXE, that reads a disk file containing ASCII BASIC statements and converts it to the proper form for the calculator to execute. Then you can use the OLD or RUN command to load it into the calculator from device 100.

To run the conversion program, at the DOS prompt type:

A:\TIC74 [/e] *file-name*[.*ext*]

The /e option echoes each line to the screen as it is converted. You do not need to type the file extension if it is .B74. The utility stores the program image in a file with the same *file-name*, but with the extension .PGM.

Co...ing Pa...l Text Li... to E...ble Pr...m Images

The PC-Interface diskette also includes a program named TICP74.EXE. This program reads an ASCII file containing Pascal statements from a computer disk and converts it to the proper form for the calculator to execute. You then can load it into the calculator from device 100 using the OLD or the RUN command in the Learn Pascal cartridge.

To run the conversion program, at the DOS prompt type:

A:\TICP74 [/e] *file-name*[.*ext*]

The /e option echoes each line to the screen as it is converted. You do not need to type the file extension if it is .P74. The utility stores the program image in a file with the same *file-name*, but with the extension .PGM.

R...ements, R...ctions, a...rors

If an error occurs during the conversion process, an error message displays on the screen, including the program line in error, and the program ends. Correct the error using a text editor and rerun TIC74 or TICP74.

Details on requirements, restrictions, and error messages in TIC74 and TICP74 are in README files on the distribution diskette.

Example of a Typical Program Process

The following example takes a BASIC program originally developed to run on a computer and demonstrates the steps that you might go through in manipulating the files.

Procedure

The example uses PC-Interface, the conversion utility, and TI-74 BASIC commands. Follow similar steps with Pascal programs.

1. The file must be in ASCII format. You cannot run the program images from any other BASIC on the TI-74. It is easy to convert a program from another BASIC to ASCII. Exit PCIF and load the file into that BASIC editor on the computer. You may wish to change a few statements at this time, including those commands not in TI-74 BASIC.

2. In the BASIC editor, type SAVE "NEWPROG.B74",A. The ,A option saves the file in ASCII format on the computer's disk. It is best to name listed or edited files with the .B74 extension. Never use .PGM for text files.

3. In DOS, type TIC74 /e NEWPROG. The statements display on the screen as the program converts them into TI-74 format and stores them in the file NEWPROG.PGM.

4. In the BASIC mode on the TI-74, type OLD "100.NEWPROG.PGM", specifying the DOS path as appropriate. You may want to make some changes on the TI-74 before you run the program.

5. Suppose you want to make additional changes. Rather than typing the changes on the TI-74 keyboard, type LIST "101.BETRPROG.B74" and list the program into an ASCII file on the computer's disk.

6. Use a PC text editor to make the changes, and then repeat steps 3 and 4.

Notice that you specify device 100 and device 101 only when you transfer between the TI-74 and the computer. The ASCII file and the program image file may be in the same directory on the PC.

Chapter 3: Using the PC-Interface with the TI-95

This chapter tells you how to use the TI-95 calculator to access the computer's printer, screen, and disks.

Chapter Contents

Printing on the PC's Printer from the TI-95

If the computer has more than one parallel port, you can access its printer directly from the TI-95.

Specifying the Printer

To access the printer, you must have selected the PC–Interface printer option, using either the /p# option in the command line or the PrinterPort option in a configuration file. These options are described in Chapter 1.

Note: You cannot redirect output intended for the PC–324 printer (device 12) to the computer's printer using the PC–Interface redirect option (/r). This option redirects output only to the computer screen.

Accessing the Printer

The PC–Interface specifies the computer's printer as device 14.

In general, you can use the TI-95 printer functions to print to the computer's printer for two purposes:

► Sending program listings to the printer.

► Sending data to the printer.

The keystroke commands used in this section are described in detail in the *TI-95 Programming Guide* and the *TI-95 User's Guide.* The general form of each statement and an example of its use with the PC–Interface are given here for your convenience.

Listing Programs or Data on the PC's Printer

Example

The LIST command sends all or part of a program listing, register contents, labels, or status to the parallel printer. You must specify the printer as described on page 3–2. Then follow these steps.

1. Specify device 14 as the device number for printer functions by pressing I/O ⟨PRT⟩ ⟨DEV⟩ 014.

   You then can specify additional printer options, such as line width.

2. Press LIST and the desired list option: ⟨REG⟩, ⟨PGM⟩, ⟨LBL⟩, or ⟨ST⟩.

The following example opens the printer (device 14) and lists the entire program in the program file space of the calculator on the printer. It uses a line width of 40 with word break on.

I/O ⟨PRT⟩ ⟨DEV⟩ 014 ⟨WID⟩ 40 ⟨WB⟩
LIST ⟨PGM⟩ ⟨1st⟩

Using Printer Functions to Access the PC's Printer

The printer functions, PRT, ADV, and TRC, control the output to the printer from the keyboard or from within user-written keystroke programs.

1. Specify device 14 as the device number for printer functions by pressing [I/O] ⟨PRT⟩ ⟨DEV⟩ 014.

   You can specify additional printer options, such as line width.

2. Use the appropriate keystrokes in calculator mode or programming mode. For example, the keystroke sequence [2nd] [PRINT] prints the contents of the record in the display on the printer, whether entered in calculator mode or as part of a program.

Using TI-95 Software Cartridges with the PC-Interface

You can direct output to the computer's printer from the following TI-95 software cartridges:

► Chemical Engineering library

► Mathematics library

► Statistics library

Press [I/O] ⟨PRT⟩ ⟨DEV⟩ 014 before beginning the application to specify device 14 as the device number for printer functions.

Displaying on the PC's Screen from the TI-95

The TI-95 calculator can send data to the computer screen as if the screen were a printer.

Accessing the PC's Screen

The PC–Interface specifies the computer screen as device 45.

You can redirect output intended for the PC-324 printer (device 12), to the computer screen using the /r option, which is described in Chapter 1.

In general, you can use the TI-95 printer functions to print to the computer screen for two purposes:

► Sending program listings to the screen.

► Sending data to the screen.

The keystroke commands used in this section are described in detail in the *TI-95 Programming Guide* and the *TI-95 User's Guide*. The general form of each statement and an example of its use with the PC–Interface are given here for your convenience.

Listing Programs or Data on the PC's Screen

The LIST command sends all or part of a program listing, register contents, labels, or status to the screen.

1. Specify device 45 as the device number for printer functions by pressing I/O ⟨PRT⟩ ⟨DEV⟩ 045.

   You can specify additional printer options, such as line width.

2. Press LIST and the desired list option: ⟨REG⟩, ⟨PGM⟩, ⟨LBL⟩, or ⟨ST⟩.

Example

The following example opens the computer screen (device 45) with a line width of 80. It lists the keystroke program in the calculator, beginning at the current step, on the computer screen.

I/O ⟨PRT⟩ ⟨DEV⟩ 045 ⟨WID⟩ 80
LIST ⟨PGM⟩ ⟨1st⟩

Using Printer Functions to Access the PC's Screen

The printer functions, PRT, ADV, and TRC, control the output to the computer screen from the keyboard or from within user-written keystroke programs.

1. Specify device 45 as the device number for printer functions by pressing I/O ⟨PRT⟩ ⟨DEV⟩ 045.

   You can specify additional options, such as line width.

2. Use the appropriate keystrokes in calculator mode or programming mode. For example, the keystroke sequence 2nd [PRINT] prints the contents of the record in the calculator display to the screen, whether entered in calculator mode or as part of a program.

Using TI-95 Software Cartridges with the PC-Interface

You can direct output to the computer screen from the following TI-95 software cartridges:

► Chemical Engineering library

► Mathematics library

► Statistics library

Press I/O ⟨PRT⟩ ⟨DEV⟩ 045 before beginning the application to specify device 45 as the device number for printer functions.

Using ANSI Controls to Write to the PC's Screen

You can control the position and movement of the cursor on the computer screen using ANSI escape sequences.

To use ANSI escape sequences on an IBM or compatible machine, include the line DEVICE = ANSI.SYS in your DOS CONFIG.SYS file. This is not necessary on the TI PC.

Some common ANSI escape sequences are given in Appendix A.

When used appropriately in a TI-95 keystroke program or from calculator mode, the keystroke example below clears the computer screen by sending the sequence ESC [2J from the calculator display to the computer screen.

ALPHA ⟨CHR⟩ 027 2nd [[ ] 2 J ALPHA 2nd [PRINT]

Before Accessing the PC's Disks

A useful feature of the PC–Interface is that it allows you to store program listings, program images, register contents, file-space images, and cartridge images in files on the computer's disks.

Types of Files

For most applications, the computer's disk is accessed using the PC Access utility program, which is described beginning on page 3–14. Therefore, it is usually not necessary for you to access the devices directly.

The PC–Interface treats the computer's disk as two logical devices, one for data or text files (device 101), which may contain multiple records, and one for program images or binary files (device 100), which do not have more than one record.

You can access several categories of files on the computer's disks from a TI–95.

► Images of TI–95 PGM memory in binary format.

► Files containing TI–95 register contents.

► Images of the on-board MEM file space.

► Images of the 8K Constant Memory™ RAM cartridge.

► TI–95 program listings in text (ASCII) format.

Special Considerations

Although the PC–Interface allows five files to be open concurrently, DOS also controls the number of open files allowed. To permit the PC–Interface to have five open files, add the line FILES = 10 to the DOS CONFIG.SYS file.

The PC–Interface allows you to use the full DOS path (drive:\subdir\file.ext), such as A:\TI95\FILE1.TXT.

Loading the PC Access Utility onto the TI–95

You must transfer one of two programs supplied on the PC–Interface diskette to the TI–95 program area. Then the PC–Interface can transfer images between the computer's disks and the TI–95.

The PC Access Utility

To access the computer's disks, you must first load the PC Access utility into the TI–95 from the distribution diskette. You do this by entering and running a TI–95 keystroke program, which is listed on the next page.

On the PC–Interface diskette there are two files.

► PCL95 contains the full-sized PC Access utility program and the data file that the keystroke program will transfer into the TI–95. PC Access requires 2296 program steps, 13 registers, and 80 bytes of on-board file space. After transfer, the program portion of PC Access may be saved in a plug-in RAM cartridge or in the on-board MEM file space.

   Note: If you save PC Access into MEM file space, only about 2500 bytes of memory are available for storage of user-written programs while PC Access is being loaded into PGM space and saved into MEM file space.

► PCS95 is a much smaller version of PC Access. It has only a few features but allows larger programs to be saved on the TI–95. It requires 544 program steps, 13 registers, and 80 bytes of on-board file space. This version is most useful for the user who does not have a plug-in RAM cartridge.

Loading the PC Access Utility

To load the PC Access utility follow these steps:

1. Any program in the main program area of the TI-95 and any register data will be lost during loading, so save this information if necessary.

2. Enter LEARN ⟨1st⟩ 2nd [CP] to clear PGM memory. The loading program automatically sets the partition properly based on the program requested.

3. Enter the keystroke program listed below:

000	2296.4800	2296.4800	see Note 1
009	PAR 64 EE	2nd [PART] 64 EE	
013	7 + .0001 =	7 + .0001 =	
021	STO B	STO B	
023	UNF	CONV ⟨BAS⟩ ⟨UNF⟩	
024	0000	0000	
028	FF3F	2nd [F$_H$] 2nd [F$_H$] 3 2nd [F$_H$]	
032	STO C	STO C	
034	0010405043	0010405043	
044	4C3935	4 2nd [C$_H$] 3935	see Note 2
050	STO A	STO A	
052	CIO B	I/O ⟨CIO⟩ B	
054	DEC 30	CONV ⟨BAS⟩ ⟨DEC⟩ 30	
057	ST + B	STO + B .	
059	CIO B	I/O ⟨CIO⟩ B	
061	10.003	10.003	
067	PUT + PC	FILES ⟨PUT⟩ + PC	
071	6401	6401	
075	STO B	STO B	
077	CLR	CLEAR	
078	STO C	STO C	
080	CIO B	I/O ⟨CIO⟩ B	
082	HLT	HALT	
		LEARN	

Note 1: To load the small program, change this line to 896.62

Note 2: To load the small program, change this line to 533935

Loading the PC Access Utility (Continued)

4. This TI-95 program cannot be run from main program memory. You must save it and run it from memory.

   ► If an 8K RAM cartridge is plugged in, store the loading program on the cartridge by typing: FILES ⟨PUT⟩ ⟨*cartridge name*⟩ ⟨PGM⟩ LOD ⟨ENT⟩

   ► If there is no 8K RAM cartridge, store the loading program in the on-board MEM file space by typing: FILES ⟨PUT⟩ ⟨PGM⟩ LOD ⟨ENT⟩

5. On the computer, log into the subdirectory that contains the files PCL95 and PCS95. Run the PC-Interface software on the computer as described in Chapter 1. (**Note:** PCIF or PCIFTI must be in the current subdirectory, or a path must be declared to their location.)

6. Run the keystroke program in the TI-95 by typing RUN ⟨MEM⟩ ⟨LOD⟩. The program retrieves the correct file from the computer and loads the PC Access program (either the short or long version) into PGM memory and a data file, + PC, into MEM file space.

7. Transfer the PC Access program from PGM memory into a cartridge or the MEM file space.

   ► If an 8K RAM cartridge is plugged in, store PC Access on the cartridge by typing: FILES ⟨PUT⟩ ⟨*cartridge name*⟩ ⟨PGM⟩ PCA ⟨ENT⟩

   ► If there is no 8K RAM cartridge, store PC Access in the on-board MEM file space by typing: FILES ⟨PUT⟩ ⟨PGM⟩ PCA ⟨ENT⟩

Note: Normally you will run PC Access from the MEM file space or a RAM cartridge. However, you should not run the program from an area that you are going to load with a file image. For example, to use GET to retrieve a MEM file-space image from the computer, you should run PC Access from PGM memory, not from MEM file space.

Using the PC Access Utility

The full-size PC Access utility provides many functions. The smaller utility can only save or retrieve PGM memory images.

The PC Access Main Functions

PC Access is easy to use. You select the appropriate menu option at each level.

To run the PC Access utility program from MEM file space, type RUN ⟨MEM⟩ ⟨PCA⟩. The main menu of the PC Access utility has six options:

⟨GET⟩   Retrieve from the computer's disk.

⟨PUT⟩   Save to the computer's disk.

⟨VFY⟩   Verify that an image in a disk file matches that in the calculator.

⟨DF⟩   Delete a file on the computer's disk.

⟨DEV⟩   Change the Dockbus device number for the computer's disk.

⟨TXT⟩   Save a program or registers in text format in a file on the computer's disk.

⟨ESC⟩   Exit the PC Access program.

Note: The ⟨ESC⟩ option appears on all option menus. Selecting ⟨ESC⟩ on all but the main menu returns you to the main menu.

Each option is explained on the following pages.

Errors

PC Access error messages are printed or displayed if the printer device number has been set. A description of each error is in "Table of PC Access Error Messages" in Appendix A.

Saving to the PC's Disks

All images are saved to the computer's disks using the PUT menu.

The PUT Menu

You may save four types of images on the computer's disks through the ⟨PUT⟩ option.

⟨PGM⟩   Save a program image onto the computer's disk from the PGM memory on the TI–95.

⟨REG⟩   Save a data register image onto the computer's disk from data registers on the TI–95. After entering the file name (see below), you enter the number of registers to be saved. Register 0 is always the starting point.

⟨MEM⟩   Save a file-space image onto the computer's disk from the MEM file space on the TI–95.

⟨CAR⟩   Save an entire RAM cartridge image onto the computer's disk from the 8K RAM cartridge on the TI–95.

⟨ESC⟩   Return to the main menu.

After each choice you are asked to confirm your choice by selecting ⟨YES⟩ or ⟨NO⟩.

► If you select ⟨YES⟩, you then type in a file name, including the full DOS path if the path currently logged on the computer is not your desired choice. At the end of the file name, select ⟨ENT⟩ and the file is saved. To return to the main menu without saving the file, select ⟨ESC⟩.

► If you select ⟨NO⟩, you return to the PUT menu.

Saving to Text Files on the PC's Disks

Program listings and register contents can be saved to ASCII text files on the computer's disks using the TXT menu.

The TXT Menu

You may save two types of text data on the computer's disks through the ⟨TXT⟩ option.

⟨PGM⟩   Save a text listing, including statement numbers, of the program in PGM memory on the TI-95 into a file on the computer's disk. (See the discussion beginning on page 3-20 for an application of this.)

Before selecting this option, you should be running PC Access from MEM memory, and have loaded the program that you want listed into PGM memory with the FILES command.

⟨REG⟩   Save the contents of the data registers on the TI-95 into a text file on the computer. After entering the file name (see below), you enter the number of registers to be saved. Register 0 is always the starting point.

⟨ESC⟩   Return to the main menu.

After each choice you are asked to confirm your choice by selecting ⟨YES⟩ or ⟨NO⟩.

► If you select ⟨YES⟩, you then type in a file name, including the full DOS path if the path currently logged on the computer is not your desired choice. At the end of the file name, select the ⟨ENT⟩ option and the listing is saved. To return to the main menu without saving the listing, select ⟨ESC⟩.

► If you select ⟨NO⟩, you return to the TXT menu.

Other PC Access Functions

You may delete files on the computer's disks using the DF menu or change the Dockbus device number using the DEV menu.

The DF Menu

The ⟨DF⟩ option on the main menu allows you to delete files on the computer's disks from the PC Access program in the TI-95.

⟨YES⟩   Type in a file name, including the full DOS path if the path currently logged on the computer is not your desired choice. At the end of the file name, select the ⟨ENT⟩ option and the file is deleted. To return to the main menu without deleting the file, select ⟨ESC⟩.

⟨NO⟩   Return to the main menu.

Caution: Any file can be deleted by PC Access, not only those files created through PC Access.

The DEV Menu

The ⟨DEV⟩ option on the main menu allows you to enter a new device code. This allows you to access other Dockbus disk devices using the PC Access software on the TI-95.

Using the PC to Edit TI-95 Programs

TI-95 Programs

As you press each key on the TI-95, the calculator converts your keystroke into a program instruction in a form that the calculator uses internally. Conversely, the TXT and LIST commands convert each internal program instruction to present it in a text format (mnemonics) that you can read.

A "program," therefore, may be an entire file of mnemonics or an entire file of binary program instructions. You must manipulate those files appropriately, which is not difficult.

Using the TXT menu of PC Access, you can save a file of TI-95 mnemonics on the computer for editing with a text editor. You also can enter a new program of TI-95 mnemonics on the computer using a text editor.

After you have finished a program on the PC, use the utility, TIC95.EXE, on the PC-Interface disk to convert the file in mnemonic form into a file of binary program instructions. You then can transfer the binary file to the TI-95 using the PC Access utility.

These processes are described further in the "Example of a Typical Program Process" section of this chapter.

Utilities for Use with the TI-95

One of the utilities for use with the TI-95 converts mnemonics to a program image. To learn about other utilities or features not documented in this guidebook, examine the README files on the distribution diskette.

Converting TI-95 Text Listings to Programs

The program TIC95.EXE is on the PC-Interface diskette. This program reads a file of ASCII mnemonics that is on the computer disk and converts the mnemonics to the proper form for the calculator to execute. Then you can transfer this new program image to the calculator using the GET menu of the PC Access utility.

Note: There are some requirements for how the mnemonics should be typed. Information on special considerations is in the file TIC95.DOC on the distribution diskette.

To run the conversion program, the form at the DOS prompt is:

A:\TIC95 */options file-name*[*.ext*]

You do not need to type the extension if it is .K95. *Options* are available when running TIC95. They are explained in the file TIC95.DOC on the distribution diskette.

The program builds a file with the same *file-name*, but with the extension .LST. This file contains a program listing and any warning or error messages. The screen displays a count of the number of warnings and errors. You should review the .LST file, correct the errors using the editor, and then rerun TIC95.

The converted program is stored in a file with the same file-name, but with the extension .B95.

Example of a Typical Program Process

The following example demonstrates the steps that you might go through in manipulating files with the PC-Interface when developing a program.

Procedure

This example uses PC Access, the conversion utility, and TI-95 commands to develop a program on the TI-95 and the computer.

1. Enter a new program on the TI-95. Leave the program in PGM memory. Press [LEARN] to leave learn mode.

2. The PC-Interface software should be active on the computer. Now run PC Access by typing [RUN] ⟨MEM⟩ ⟨PCA⟩ on the TI-95.
   Save an ASCII listing to a disk file by typing ⟨TXT⟩ ⟨PGM⟩ ⟨YES⟩PROGRAM.K95 ⟨ENT⟩.

3. Exit the PC-Interface software and load the computer file PROGRAM.K95 into a text editor. Be sure you use an editor that can create an ASCII file. (If you TYPE an ASCII file to the screen, the file displays only as typewriter-keyboard letters.) Delete the statement numbers from the listing and be sure there is a space separating mnemonics, numbers, parentheses (before and after), and operators. Change or add statements to improve your program.

   Note: You also can begin with an ASCII file that has been entered on the computer using a text editor.

4. Save the file from the text editor as BETRPROG.K95. It is best to name ASCII program files with the .K95 extension. Never use .B95 or .LST for text files.

5. At the DOS prompt, type TIC95 BETRPROG. The program converts the mnemonics into TI-95 format and creates a file BETRPROG.B95. A program listing, including errors and warnings, is saved in the file BETRPROG.LST. If there are errors, correct them by repeating steps 3 through 5 before proceeding to step 6.

6. On the computer, run the PCIF installation program. On the TI-95, type [RUN] ⟨MEM⟩ ⟨PCA⟩ to run PC Access. Type ⟨GET⟩ ⟨PGM⟩ ⟨YES⟩ BETRPROG.B95 ⟨ENT⟩ to retrieve the PGM image from the computer's disk and load it into PGM memory. Now run the program.

Appendix A: Reference Information

The information in this appendix applies to the PC-Interface when used with either the TI-74 or the TI-95 calculator.

Contents

Table of I/O Error Codes

Listed below are the I/O error codes related to the operation of the PC-Interface.

Error Codes	Decimal Code	Meaning/Suggestions
	0	**Normal completion of command.** No error has occurred.
	1	**Device/file options error.** Check the software options you specified when opening the device. Make sure that you have used commas, periods, quotation marks, and equal signs correctly and that you have specified valid options.
	2	**Error in device/file attributes.** Check the file attributes (file-organization, file-type, record-length, and open-mode) that you specified (or allowed to default) when opening the device.
	3	**File not found.** You have attempted to input from a file that does not exist. Check the path and file name.
	4	**Device/file not open.** You have attempted to write to, read from, or close a device or file that is not open. Open the device before accessing it.
	5	**Device/file already open.** You have attempted to open a device or file that is already open. Check your program. Close the device and try again. If these steps are not successful, you can close all devices and files by turning off the calculator momentarily.

Error Codes (Continued)	Decimal Code	Meaning/Suggestions
	6	**Device-related error.** DOS has returned an error message to the PC-Interface. If the message occurs when you open the printer (device 14), the printer may be off-line. If you access a file that is bad or open a file for output when the disk is full, this message occurs. Illegal characters in a file-name also generate this message.
	7	**End-of-file error.** You are attempting to read from a file when you have already reached the end. Put EOF() processing in your program if you are using the TI-74.
	8	**Data too long.** Some commands, such as CLOSE, should have no accompanying data. The PC-Interface has encountered such a command with a nonempty data buffer. Check your program. If you are using the VERIFY command, this message indicates that the file lengths do not match.
	9	**File/disk write-protected.** You have attempted to write to a DOS file that has the write-protect (read-only) attribute set or to a diskette that is write-protected.
	12	**Buffer size error.** The buffer size is too small for the data length. Specify a larger data buffer when opening the device or file.
	13	**Command not supported.** You have attempted to use an I/O command that the PC-Interface does not support.

Table of I/O Error Codes (Continued)

Decimal Code	Meaning/Suggestions
14	**Device/file not open for output.** You have attempted to send data to a device or file that was not opened to receive output. Reopen the device in UPDATE or OUTPUT (disks only) mode.
15	**Device/file not open for input.** You have attempted to read from a device or file that was not opened to send data. Only the disks can be opened for input. Reopen the device in INPUT or UPDATE mode.
17	**Device/file organization incorrect.** You have opened a device or file for RELATIVE organization when it should be SEQUENTIAL. The PC-Interface can process only SEQUENTIAL files.
19	**Append mode not supported.** The PC-Interface does not support APPEND mode.
21	**Input mode not supported.** You have attempted to open a device that cannot operate in INPUT mode. The PC-Interface returns this message if you try to open the screen (device 45) or the printer (device 14) in INPUT mode. They only support output and must be opened in OUTPUT mode.
22	**Update mode not supported.** You have attempted to open a device that cannot operate in UPDATE mode. The PC-Interface returns this message if you try to open the screen (device 45) or the printer (device 14) in UPDATE mode. They only support output and must be opened in OUTPUT mode.

Decimal Code	Meaning/Suggestions
23	**File-type incorrect.** You have attempted to open a file or device with an INTERNAL file-type. The PC-Interface only supports DISPLAY file-type.
24	**Verify error.** The VERIFY command has found a discrepancy between the saved image on the disk and the image in the calculator.
28	**File is delete-protected.** You have attempted to delete a DOS file that has the write-protect (read-only) attribute set or is on a diskette that is write-protected.
33	**Too many files open.** The PC-Interface allows five open files at one time. You attempted to open a sixth file. Close a file before proceeding.
39	**I/O bus timing error.** The calculator has lost contact with the PC-Interface. Reconnect the devices, the cable, and the power connections; then retry operation. If this error occurs when you install the PC-Interface, you may have selected the wrong LinkPort.
80	**Printer not available.** You have attempted to open device 14, but you have not specified the /p# or PrinterPort option during installation as described in Chapter 1.
255	**Time-out error.** The calculator generates this code if it loses contact with the device. Check the cable connections. Check the device numbers in your program. This message occurs if the PC-Interface software is not running on the PC. The RESET command always returns this message.

Table of PC Access Error Messages

Listed below are the error messages related to the operation of the TI-95 PC Access utility.

PC Access Error Messages

Message	Meaning/Suggestions
No filename	Nothing was entered at the prompt for the name of the PC file.
Inadequate space	The TI–95 partition is not set properly to retrieve the PC file that was requested. Allocate more memory for the program steps or registers, as appropriate.
Mem = xxxx bytes File = xxxx bytes	The size of the partition for MEM file space is not equal to the size of the file that was requested to be loaded into memory. They must be equal.
Not retrieved	The file size does not match the area to be loaded, and the requested ⟨GET⟩ operation is not completed.
Dir not cleared	The directory for MEM file space or a RAM cartridge has not been cleared. Clear the directory with FILES ⟨CD⟩.
Wrong file type	The file that you requested to be loaded into the RAM cartridge is not 8K bytes.
Did not verify	The images compared with the ⟨VFY⟩ option did not match.
I/O error xxx	An I/O error has occurred. Refer to the preceding table.

ANSI Escape Sequences

ANSI escape sequences allow you to control the position and movement of the cursor on the PC's screen.

Standard ANSI Escape Sequences

PC-Interface supports the escape sequences contained in the ANSI.SYS driver for the PC's operating system.

To use ANSI escape sequences on an IBM or compatible machine, include the line DEVICE = ANSI.SYS in your DOS CONFIG.SYS file. This is not necessary on the TI PC.

Some standard ANSI escape sequences are listed below for your convenience. For further information, refer to the DOS system documentation.

Cursor Control

Command		Escape Sequence
CUP	Cursor Position	ESC[line#;col#H
CUU	Cursor Up	ESC[nA
CUD	Cursor Down	ESC[nB
CUF	Cursor Forward	ESC[nC
CUB	Cursor Backward	ESC[nD
HVP	Horizontal/Vertical Position	ESC[line#;col#f
SCP	Save Cursor Position	ESC[s
RCP	Restore Cursor Position	ESC[u
RVI	Reverse Index	ESC[nM

Text Control

Command		Escape Sequence
EOS	Erase to End of Screen	ESC[J
ED	Erase Display	ESC[2J
EOL	Erase Line	ESC[K

Color Control

Refer to the DOS system documentation for information on setting colors through ANSI escape sequences.

Appendix B: Service and Warranty

This appendix contains information you will find useful if you encounter problems with the PC-Interface.

Contents

In Case of Difficulty

If the PC-Interface or connected devices do not appear to be working properly, check the following.

Difficulty during Installation

The PC-Interface is sensitive to the order in which the installation steps are performed. Read ''Getting Started with the PC-Interface'' in Chapter 1, turn off the calculator, reset the computer, and perform the steps again.

If the TI-74 responds with an I/O error or the TI-95 does not access the device the first time you attempt to access the computer, there is a possibility that the PC-Interface is not on the port you specified. Repeat the entire installation procedure, specifying a different port.

Cables

Make sure the leads and connectors are not broken. Make sure that all cables are plugged in securely.

Connected Devices

If you are using a printer, check to see that it is on-line and has paper and ribbon.

If a printer has a self-test or local mode, use it to be sure that it is working properly when you are not using the PC-Interface. Turn off the printer briefly and try once more. If the malfunction persists, turn off the calculator momentarily and try again. Successive attempts that produce the same error may indicate a hardware fault.

Software Options

Even when all devices are operating correctly, they can appear to malfunction if software options are improperly set.

Service Information

If the solutions suggested by "In Case of Difficulty" do not correct a problem you may have with your PC-Interface, please call or write Consumer Relations to discuss the problem.

For Service and General Information

If you have questions about service or the general use of the PC-Interface, please call Consumer Relations at:

1-806-747-1882

Please note that this is a toll number, and collect calls are not accepted.

You also may write to the following address:

Texas Instruments Incorporated
Consumer Relations
P.O. Box 53
Lubbock, Texas 79408

Please contact Consumer Relations:

► Before returning the product for service.

► For general information about using the product.

For Technical Information

If you have technical questions about product operation or programming applications, write to Consumer Relations at the address given above, or call 1-806-741-2663. Please note that this is a toll number, and collect calls are not accepted.

Express Service

Texas Instruments offers an express service option for fast return delivery. Please call Consumer Relations for information.

Calculator Accessories

If you are unable to purchase calculator accessories (such as memory cartridges or replacement manuals) from your local dealer, you may order them from Texas Instruments. Please call Consumer Relations for information.

Service Information (Continued)

Returning your PC-Interface for Service

A defective product will be either repaired or replaced with the same or comparable reconditioned model (at TI's option) when it is returned, postage prepaid, to a Texas Instruments Service Facility.

Texas Instruments cannot assume responsibility for loss or damage during incoming shipment. For your protection, carefully package the product for shipment and insure it with the carrier. Be sure to enclose the following items with the product:

- ► Your full return address
- ► A note describing the problem you experienced
- ► A copy of your sales receipt or other proof of purchase to determine warranty status

Please ship the product postage prepaid; COD shipments cannot be accepted.

In-Warranty Service

For a product covered under the warranty period, no charge is made for service.

Out-of-Warranty Service

A flat-rate charge is made for out-of-warranty service. To obtain the service charge, call Consumer Relations before returning the product for service. (We cannot hold products in the Service Facility while providing charge information.)

Texas Instruments Service Facilities

U.S. Residents (U.S. Postal Service)
Texas Instruments
P.O. Box 2500
Lubbock, Texas 79408

U.S. Residents (other carriers)
Texas Instruments
2305 N. University
Lubbock, Texas 79408

Canadian Residents Only
Texas Instruments
41 Shelley Road
Richmond Hill, Ontario L4C 5G4

One-Year Limited Warranty

This Texas Instruments electronic product warranty extends to the original consumer purchaser of the product.

Warranty Duration

This product is warranted to the original consumer purchaser for a period of one (1) year from the original purchase date.

Warranty Coverage

This product is warranted against defective materials or workmanship. **This warranty is void if the product has been damaged by accident, unreasonable use, neglect, improper service, or other causes not arising out of defects in material or workmanship.**

Warranty Disclaimers

Any implied warranties, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above one-year period. Texas Instruments shall not be liable for loss of use of the product or other incidental or consequential costs, expenses, or damages incurred by the consumer or any other user.

Some states do not allow the exclusion or limitations of implied warranties or consequential damages, so the above limitations or exclusions may not apply to you.

Legal Remedies

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

Warranty Performance

During the above one-year warranty period, a defective TI product will be either repaired or replaced with a reconditioned comparable model (at TI's option) when the product is returned, together with proof of purchase, postage prepaid, to a Texas Instruments Service Facility.

The repaired or replacement product will be in warranty for the remainder of the original warranty period or for six months, whichever is longer. Other than the postage requirement, no charge will be made for such repair or replacement.

Texas Instruments strongly recommends that you insure the product for value prior to mailing.