

**Agilent 4352B VCO/PLL Signal Analyzer**  
**Manual Supplement for HP**  
**Instrument BASIC Users Handbook**

**SERIAL NUMBERS**

This manual applies directly to instruments with serial number prefix JP1KE .

For additional important information about serial numbers,  
read “Instruments Covered by This Manual” in Appendix A.



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## Manual Printing History

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

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## Typeface Conventions

**Bold** Boldface type is used when a term is defined. For example: **icons** are symbols.

*Italics* Italic type is used for emphasis and for titles of manuals and other publications.

Italic type is also used for keyboard entries when a name or a variable must be typed in place of the words in italics. For example: copy *filename* means to type the word copy, to type a space, and then to type the name of a file such as file1.

Computer Computer font is used for on-screen prompts and messages.

**HARDKEYS** Labeled keys on the instrument front panel are enclosed in **□**.

**SOFTKEYS** Softkeys located to the right of the LCD are enclosed in **▢**.

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## How to Use This Manual

This guide will help you learn how to effectively use HP instrument BASIC (IBASIC) of the 4352B VCO/PLL Signal Analyzer. It will help you to perform typical operations involving program creation, editing, and execution. It will also show you how to save and recall programs, and how to make the best use of the HP instrument BASIC's front-panel and keyboard interface. Here is a brief guide to help you locate the necessary information in this manual.

- Chapter 2 introduces the analyzer's HP instrument BASIC system and describes how to connect and use a keyboard.
- Chapter 3 and Chapter 4 show creating, getting, and saving programs to teach you front panel and keyboard operation.
- Chapter 5 introduces you to the editing environment.
- Chapter 6 describes interfacing features for graphics, external connector to trigger RUN/CONTinue of a program, and I/O port.
- Chapter 7 introduces special features for auto loading a program, and the On Key Label function (softkeys defined in a program). This chapter also describes techniques for speeding up your programs.
- Chapter 8 summarizes the unique features specified for the analyzer.
- Appendix A contains the information required to adapt this manual to earlier versions or configurations of the analyzer than the current printing date of this manual.
- Appendix B provides references for BASIC commands specific to the analyzer's HP instrument BASIC.
- Appendix C provides a handy reference guide to the analyzer's HP instrument BASIC's key definitions for the mini-DIN keyboard.
- Appendix D describes the softkeys that are used for the HP instrument BASIC operations.



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## Welcome to HP instrument BASIC

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This guide will help you learn how to effectively use HP instrument BASIC (IBASIC) of the 4352B VCO/PLL Signal Analyzer. It will help you to perform typical operations involving program creation, editing, and execution. It will also show you how to save and recall programs, and how to make the best use of the HP instrument BASIC's front-panel and keyboard interface.

If you are new to programming or to HP's dialect of BASIC, take the time to read this guide and perform the exercises. For many users, this will provide all the information that is needed to create and run programs.

---

### How to Use This Manual

The tasks in each chapter, when performed in sequential order, demonstrate a typical use of HP instrument BASIC and cover the most common tasks. Read the overview and try the sample tasks in each chapter to get you started. For more background information, you can read further into each chapter; otherwise, go to the next exercises and continue the session. You can refer back to the individual chapters for more information as necessary. Here is a brief guide to help you locate the necessary information in this manual and the other HP instrument BASIC manuals.

- Chapter 2 introduces the analyzer's HP instrument BASIC system and describes how to connect and use a keyboard.
- Chapter 3 and Chapter 4 show creating, getting, and saving programs to teach you front panel and keyboard operation.
- Chapter 5 introduces you to the editing environment.
- Chapter 6 describes interfacing features for graphics, external connector to trigger RUN/CONTinue of a program, and I/O port.
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- Appendix D describes the softkeys that are used for the HP instrument BASIC operations.

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**Note**

You should become familiar with the operation of the analyzer before attempting to control it using HP instrument BASIC. See the following documents that are better suited to this task.

*Function Reference*  
*GPIB Programming Manual*

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**Note**

This manual, *Using HP instrument BASIC with the 4352B*, is not intended to teach the HP instrument BASIC programming language; see the following document which is better suited to these tasks.

*HP instrument BASIC Users Handbook*

The handbook consists of the following three parts:

*HP instrument BASIC Programming Techniques*  
*HP instrument BASIC Interfacing Techniques*  
*HP instrument BASIC Language Reference*

If you want to port HP 9000 Series 200/300 BASIC programs to HP instrument BASIC, see Chapter 10, “Keyword Guide to Porting,” in the *HP instrument BASIC Programming Techniques*.

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## Introduction to the System

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This chapter introduces the analyzer's HP instrument BASIC (IBASIC) and describes how to connect and use a keyboard. Read this chapter before using HP instrument BASIC with the analyzer for the first time. The topics covered in this chapter are:

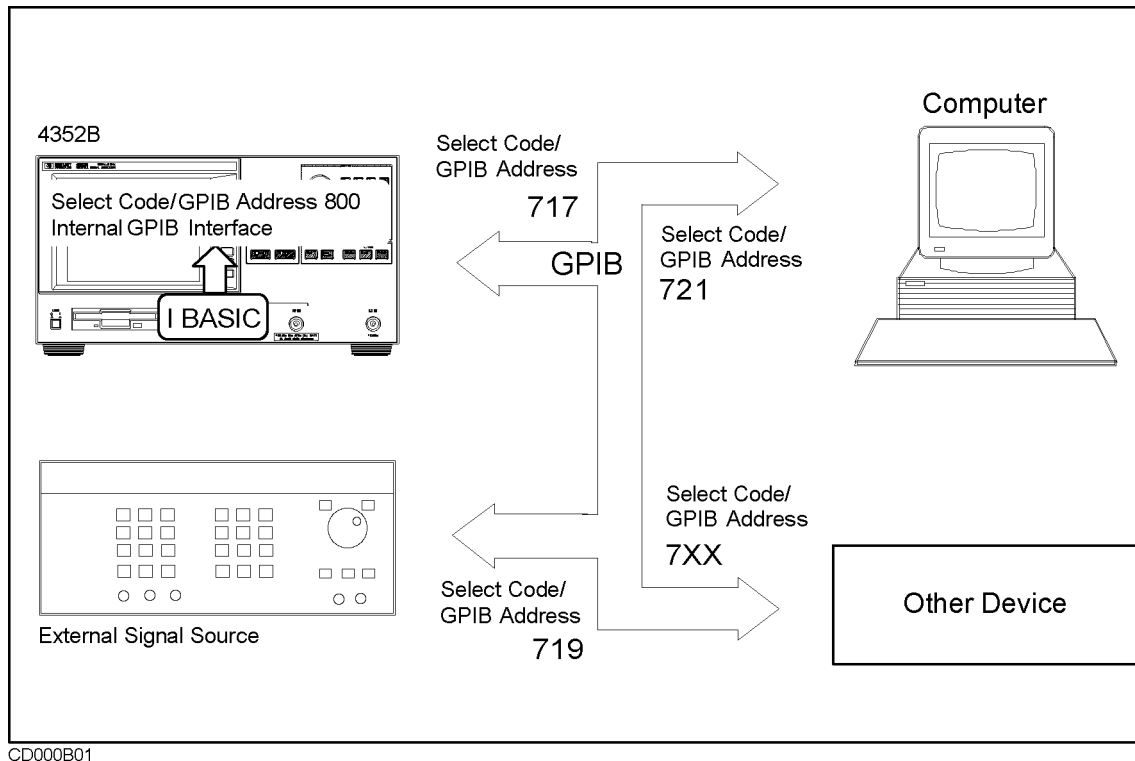
- Overview of HP instrument BASIC
- Connecting the keyboard
- Using HP instrument BASIC for the first time
- Using the keyboard
- Entering BASIC Statements from the front panel keys

---

### Overview of HP instrument BASIC

HP instrument BASIC (IBASIC) can be used for a wide range of applications from simple recording and playback of measurement sequences to remote control of other instruments.

HP instrument BASIC is a complete system controller residing inside your analyzer. It communicates with your analyzer via GPIB commands and can also communicate with other instruments, computers, and peripherals over the GPIB interface.



**Figure 2-1. Configuration Example of the HP instrument BASIC System**

The HP instrument BASIC's programming interface includes an editor and a set of programming utilities. The utilities allow you to perform disk I/O, renumber, secure, or delete all or part of your program.

The HP instrument BASIC command set is similar to the command set of HP 9000 Series 200/300 BASIC. Therefore, HP instrument BASIC programs can be run on any HP BASIC workstation with few if any changes. Porting information can be found in the *HP instrument BASIC Programming Techniques* of the *HP instrument BASIC Users Handbook*.

## Connecting the Keyboard

**Note** Turn OFF the analyzer before inserting or removing the keyboard connector.



When you use HP instrument BASIC, connect the furnished keyboard to the mini-DIN connector on the rear panel.

---

## Using HP instrument BASIC for the First Time

### Allocating Screen Area for HP instrument BASIC

Because all of the analyzer's screen is allocated for analyzer operation after power ON, you must allocate screen area for HP instrument BASIC when you want to use it. The analyzer provides four display allocation types.

#### Let's try

1. Press the following key and softkeys:

**Display** MORE

2. Press the following softkey.

ALL BASIC

The screen is cleared and all of the screen area is allocated for HP instrument BASIC.

3. Press the following softkey.

ALLOCAT'N ALL INSTR

The total screen area is reallocated as the analyzer display.

4. Press the following softkey:

HALF INSTR HALF BASIC

The screen area is allocated so that the upper half of the screen is used for the analyzer operation and the lower half is used for HP instrument BASIC.

5. Press the following softkey:

BASIC STATUS

Three blank lines appear at the display line (lower area of the screen). This area is used by HP instrument BASIC to input commands and to display messages.

More information on the display allocations for the HP instrument BASIC area is described in "**Display**" in Appendix D.

### Setting the Size of Memory Area for HP instrument BASIC

The size of the memory areas for the RAM disk memory and the variable of HP instrument BASIC (excluding common variables) can be changed according to your application.

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#### Caution



When the memory partition is reconfigured, the analyzer goes to the initial settings. That is, the RAM disk memory is initialized and all the data saved in the RAM disk memory is destroyed, and the program on the BASIC editor is destroyed.

---

#### Let's try

1. Press the following key and softkey.

**System** MEMORY PARTITION

2. Press the desired softkey and DONE.

3. **CHANGE YES** and **NO** softkey labels are displayed.

Press **CHANGE YES** to change the memory partition.

Press **NO** to cancel changing the memory partition.

---

## Using the Keyboard

### What can the Keyboard be Used for?

Furnished keyboard can be used as follows:

- Performing calculations
- Entering arguments to the active analyzer functions
- Entering titles
- Executing commands
- Using softkeys

The following simple operations show you how to use these functions.

### Performing Calculations

You can perform calculations while in any display allocation type except for ALL INSTRUMENT.

#### Let's try

1. Press the following key and softkeys:

**Display** **MORE** **ALL** **BASIC**

The screen is cleared and a cursor appears at the bottom left of screen.

2. Type the following key from the keyboard:

3\*2 **Return**

The characters you enter are displayed at the current cursor position. After pressing **Return**, the system responds with the following answer at the bottom of screen:

6

For more information, see "Numeric Computation" in the *HP instrument BASIC Programming Techniques* of the *HP instrument BASIC Users Handbook*.

### Entering Arguments to the Active Analyzer Functions

The numeric keys on the keyboard can be used to input the arguments for an active analyzer function the same as using the front panel keys.

#### Let's try

1. Press the following key and softkeys:

**Display** **MORE** **ALLOCAT'N** **ALL** **INSTR**

2. Then press the following key:

**DC POWER**

The current DC Power voltage is displayed on the screen and becomes the active analyzer function.

3. Type a value to change the frequency from the keyboard. For example, type this:

4

The DC Power value is cleared and the value you typed is displayed.

4. Then press the following key on the keyboard:

**Return**

The DC Power value is changed to 100 mV.

5. Next, type the following value and key:

100E-3 **Return**

After pressing **Return** the active function value is changed to 100 mV. You can use the character “E” and “e” in an exponential expression.

Pressing **BackSpace** on the keyboard deletes the last entry. This performs the same function as pressing **Back Space** on the front panel.

## Entering Titles

The character entry keys can be used to enter a title on the screen instead of using front panel operation.

### Let's Try

1. Press the following key and softkey:

**Display** **MORE TITLE**

A cursor appears at the top left of the graticule.

2. Type in characters using the keyboard, the characters you type appear at the top of the graticule.
3. Press the following key to terminate entry:

**Return**

You can enter standard uppercase and lowercase letters for the title, using the **Shift** key to access the alternate case as usual. For more information on the character entry keys, see “Character Entry Keys” in Appendix C.

## Executing Commands

You can type in and execute commands from the keyboard at all times except when:

- The display allocation is ALL INSTRUMENT.
- A command is being executed.
- The analyzer is in the EDIT mode.

At all other times, you can type in commands and press **Return** to present them to the system for execution. The system parses the command and takes the appropriate action.

## Let's Try

1. Press the following key and softkey:

**Display** MORE HALF INSTR HALF BASIC

2. To check the current mass storage, type the following command:

SYSTEM\$("MSI") **Return**

3. The system returns:

: ,4

## Using Softkeys

Pressing **f1** through **f8** on the keyboard performs the same function as pressing a softkey on the front panel.

---

## Entering BASIC Statements from the Front Panel Keys

The analyzer's HP instrument BASIC allows you to enter and execute statements from the front panel keys (if the external mini-DIN keyboard is not connected).

Press the following key and softkeys from the front panel:

**System** IBASIC MORE [1/3] MORE [2/3] COMMAND ENTRY

The Command Entry menu is displayed on the softkey menu area, and the active entry area displays the letters, the digits 0 through 9, and some special characters including mathematical symbols. Three sets of letters can be scrolled using the step keys, **↑** and **↓**. To enter a statement, press the step keys for the desired letter set, rotate the knob until the arrow "↑" points at the first letter, then press **SELECT LETTER**. Repeat this until the complete statement is entered, then press **DONE** to execute the statement.

## Writing and Running Programs

---

This chapter describes how to write, execute (run), and list programs. The example program in this chapter also describes how to control the analyzer from an HP instrument BASIC program. Topics covered in this chapter are:

- Getting into/out of the EDIT mode
- Writing programs
- Running (Executing) programs
- Listing programs

---

### Getting into/out of the EDIT Mode

When you write a program, you must be in the EDIT mode. For more information about the EDIT mode, see Chapter 5.

#### Getting into the EDIT Mode

Press the following key and softkeys from the front panel:

**System** **IBASIC** **Edit**

The system enters the EDIT mode. You can also get into the EDIT mode from the keyboard. Type and press as follows:

EDIT and press **Return**

#### Getting out of the EDIT Mode

Press the following softkey from the front panel:

**END EDIT**

The system exits the EDIT mode. If **END EDIT** does not appear on the softkey menu, press **System** **IBASIC** from the front panel, **END EDIT** will appear at the bottom of the menu.

You can also get out of the EDIT mode from the keyboard as follows:

Press **Shift** - **Alt** - **F4**, **ESC**, or **Home**

---

## Writing Programs

### Controlling the Analyzer

HP instrument BASIC can control the analyzer (itself) through the “internal” GPIB bus. This means that an analyzer with HP instrument BASIC includes both a controller and an analyzer in the same instrument. They are connected through an internal GPIB bus.

---

#### Note



The select code of the internal GPIB interface is 8, and the GPIB address of the analyzer can be any number from 0 to 30. In this manual, we use “800” for the device selector of the analyzer.

For more information on GPIB addresses and device selectors, see “Device Selectors” in the *HP instrument BASIC Interfacing Techniques* of the *HP instrument BASIC Users Handbook* and “Available I/O Interfaces and Select Codes” in Chapter 8.

---

#### Let's Try

The following example program sets the DC Power voltage to 4 V.

1. Turn the analyzer ON.
2. Press the following key and softkeys from the front panel:

**System** **IBASIC** **Edit**

The system enters the EDIT mode. The cursor appears at line number 10, which is the default line number of the first program line, as follows:

```
10 _
```

3. Press the following softkey:

**ASSIGN @Hp4352**

The commands are automatically entered at the current cursor position like this:

```
10 ASSIGN @Hp4352 TO 800_
```

4. Press the following key:

**(X1)**

The system reads the entire line.

```
10 ASSIGN @Hp4352 TO 800
20 _
```

5. Press the following softkey:

OUTPUT @Hp4352

The following characters are displayed on the screen:

```
10 ASSIGN @Hp4352 TO 800
20 OUTPUT @Hp4352;""
```

**Note**



“;” preceding the GPIB command is automatically added, when you write the program by pressing keys. “;” is a separator to send more than one command in the same message.

6. Press the following key to sets the DC Power Voltage to 4 V.

DC POWER POWER VOLTAGE 4

The program code is automatically generated:

```
10 ASSIGN @Hp4352 TO 800
20 OUTPUT @Hp4352;" ;VP0W4"
```

Then enter **X1**.

7. To terminate the program, type END and press **Return** key.

```
10 ASSIGN @Hp4352 TO 800
20 OUTPUT @Hp4352;" ;VP0W4"
30 END
70 _
```

8. Press the following softkey to exit the EDIT mode:

System IBASIC END EDIT

The screen returns to the analyzer display.

---

## Running (Executing) Programs

Press the following key and softkeys from the front panel to execute the program:

**(System)** **IBASIC** **Run**

The system executes the program. You can execute the RUN statement from the keyboard. Type and press as follows:

**RUN** **(Return)**

---

## Listing Programs

The system can list the program on the screen and to a printer.

### Listing on the Screen

You can list a program on the screen as follows:

#### Let's Try

1. Because the system lists a program in the print area, the Print Area must be allocated on the screen. For example:

**(Display)** **MORE** **ALL** **BASIC**

All of the screen area is allocated for the print area.

2. Type as follows:

**LIST** **(Return)**

The system lists the program as follows:

```
10 ASSIGN @Hp4352 TO 800
20 OUTPUT @Hp4352;" ;VP0W4"
30 END
```

### Listing to the Printer

#### Let's Try

1. Set the output device to a printer as follows:

**PRINTER IS PRT** **(Return)**

2. Type and press as follows:

**LIST** **(Return)**

The program is listed on the printer.

3. Set the output device to LCD as follows:

**PRINTER IS LCD** **(Return)**

## Saving and Getting Programs

---

This chapter describes how to save and get programs to or from the built-in flexible disk drive and RAM disk memory. Topics of this chapter are:

- Saving programs (SAVE)
- Listing file names (CAT)
- Getting programs (GET)

If you are using the disk drive for the first time, see “To Save and Recall” in Chapter 6 of the *Task Reference*.

---

### Note



HP instrument BASIC on the analyzer cannot communicate with an external disk drive.

---



---

### Note



The analyzer can use either LIF (Logical Interchange Format) or DOS (Disk Operating System) formatted disks. The instrument automatically detects the disk format. It can use most of the same operations for either disk format.

---



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## Saving Programs (SAVE)

1. To use the built-in disk drive, insert a 2DD disk or 2HD disk into the disk drive.
2. If you are using a flexible disk for the first time, set the disk format to LIF or DOS and initialize the disk.

---

### Note



Floppy disks can be initialized in the 2HD format only.

---



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### Note



When the analyzer is turned on, the RAM disk memory is automatically initialized by the format that is set by **FORMAT [ ]** under **FILE UTILITY** under **(Save)**. If you want to change the disk format, initialize it.

---

3. If the display allocation is ALL INSTRUMENT, change the allocation. For example:

**(Display)** MORE ALL BASIC

4. Specify the system mass storage device as follows:

When you want to use the built-in disk drive, type in **MSI ":INTERNAL,4"** or **MSI ":,4"**, then press **(Return)**.

When you want to use the RAM disk memory, type in `MSI ":MEMORY,0"` or `MSI ":,0"`, then press `(Return)`.

5. Press the following key among the 3 menus which leads to the `(Shift) - (F9)` key. And type in the filename to which you will store the program as follows:

`SAVE file_name (Return)`

You can also save the file from the keyboard. Type and press as follows:

`SAVE file_name (Return)`

The program is stored on the disk.

---

## Note



If you get the error -257, "File name error", a file on the disk already has the name you are trying to use. In this case, you have three choices:

- Pick a new file name that doesn't already exist. To determine which file names are already being used, use the "CAT" command (see below).
  - Replace an existing file, use the "RE-SAVE" statement.
  - Purge the old file using the PURGE command, then save the new one.
- 

---

## Listing File Names (CAT)

### Listing to Screen

Press the following keys and softkeys:

1. If the display allocation is ALL INSTRUMENT or BASIC STATUS, change the allocation to either HALF INSTRUMENT HALF BASIC or ALL BASIC. For example:

`(Display) MORE ALL BASIC`

2. Press the following key among the 3 menus which leads to the `(Shift) - (F9)` key:

`CAT (Return)`

You can list from the keyboard as follows:

Type in CAT then press `(Return)`.

The file names stored on the disk are listed on the screen.

---

## Note



Because the CAT statement outputs 80 columns to a line and the maximum number of columns to a screen is 61, each line is wrapped at the 62th column. If you do not want the list to wrap around, execute the following statement before executing the CAT command.

`PRINTER IS LCD;WIDTH 80`

CAT will list the file names with no wrap around, but anything after the 62th column in the output cannot be seen.

---

## Listing to Printer

---

**Note** For hard copy output, a parallel cable must connect the analyzer to the printer.



- 
1. Set the output device to be a printer as follows:

PRINTER IS PRT;WIDTH 80 Return

2. Type and press as follows:

CAT Return

The program is listed on the printer.

3. Get the output device back to CRT:

PRINTER IS LCD Return

---

## Getting Programs (GET)

You can retrieve a program from the disk as follows:

1. If the display allocation is ALL INSTRUMENT, change the allocation to either HALF INSTRUMENT HALF BASIC or ALL BASIC. For example:

Display MORE ALL BASIC

2. Press the following key among the 3 menus which leads to the Shift - F9 key and type the filename you want to retrieve:

GET *file-name* Return

You can get the file from the keyboard. Type and press as follows:

GET *file\_name* Return



## Editing Programs

---

This chapter describes how to edit programs using the EDIT mode. The topics covered in this chapter are:

- Getting into/out of the EDIT mode
- Editing programs in the EDIT mode
- Renumbering program line numbers

---

### Getting Into/Out of the EDIT Mode

#### Getting Into the EDIT Mode using the Front Panel Keys

Pressing the following key and softkey allows you to enter the EDIT mode immediately, irrespective of Display Allocation.

**System** **IBASIC** **Edit**

#### Entering the EDIT Mode from the Keyboard

Use the following keys to enter the EDIT mode with the cursor positioned at the specified line number. The *line\_number* can be omitted. Press the following key among the 3 menus which leads to the **Shift** - **F9** key.

**EDIT** *line\_number* **Enter**

or type as follows:

**EDIT** *line\_number* **Enter**

To use the keyboard, the Keyboard Input Line must be allocated on the screen. If it is not, press **Display** **MORE** **DISPLAY ALLOCATION** and select any allocation except ALL INSTRUMENT.

#### Getting Out of the EDIT Mode

The EDIT mode is exited by pressing **Shift** - **Alt** - **F4**, **ESC**, and **Home** from the keyboard (or by pressing the **END EDIT** softkey).

---

## Editing Programs in the EDIT Mode

This section describes how to edit a program while in the EDIT mode, the topics are:

- Deleting characters
- Inserting characters
- Moving the cursor
- Scrolling lines and pages
- Jumping lines
- Inserting/deleting/recalling lines
- Clearing lines

See Appendix C for more information on functions of each key.

### Deleting Characters

There are two functions you can use to delete characters: “Back space” and “Delete characters.”

#### Back Space

Pressing **(Back space)** on the front panel (or on the keyboard) erases the character to the left of the cursor and moves the cursor left to the position of the erased character.

#### Deleting Characters

Pressing **(Delete char)** from the keyboard deletes the character at the cursor’s position.

### Inserting Characters

The EDIT mode is always in the insert mode. Characters you type at the keyboard are inserted before the current cursor position. (Pressing **(insert)** performs no function.)

### Moving the Cursor

The following key operations allow you to move the cursor horizontally along a line:

| From the front panel | From the keyboard                  |
|----------------------|------------------------------------|
| Turning the knob     | Pressing <b>(←)</b> and <b>(→)</b> |

### Scrolling Lines and Pages

#### Scrolling Lines

The following key operations enable you to scroll lines up and down:

| From the front panel               | From the keyboard                  |
|------------------------------------|------------------------------------|
| Pressing <b>(↑)</b> and <b>(↓)</b> | pressing <b>(▲)</b> and <b>(▼)</b> |

#### Scrolling Pages

Pressing **(Page Up)** and **(Page Down)** from the keyboard causes the display to scroll up and down in one page increments.

## Jumping from the Current Line

### Jumping to a Specified Line

You can specify a line by using a line number or a label name when jumping from the current line as follows:

`GOTO LINE` *line\_number* (Enter)

or

`GOTO LINE` *label\_name* (Enter)

If the label specified is not defined in the program, an error will occur.

### Jumping to the Top/Bottom of a Program

Pressing the following keys allows you to jump to top or bottom of the program:

(Shift) - (▲)

(Shift) - (▼)

### Inserting/Deleting/Recalling Lines

(Shift) - (Insert) inserts a new line above the current cursor position.

(Shift) - (Delete) deletes the line at which the cursor is.

`RECALL LINE` recalls the last deleted line.

### Clearing Line

Pressing (Shift) - (End) clears a line from the current cursor position to the end of the line.

---

## Renumbering Program Line Numbers

The REN command allows you to renumber the program currently in memory. You should execute the REN command after exiting the EDIT mode. Press the following key among the 3 menus which leads to the (Shift) - (F9) key.

`RENumber` (Enter)

or

`REN` (Enter)

You can specify the starting value, increment value, beginning line number, and the ending line number when renumbering a program as follows:

`RENumber` *starting\_value, increment IN beginning\_line\_number, ending\_line\_number* (Enter)

or type as follows:

`REN` *starting\_value, increment IN beginning\_line\_number, ending\_line\_number* (Enter)

*line\_label* can be also use instead of *line\_number*. For more information, see the *HP instrument BASIC Language Reference* of the *HP instrument BASIC Users Handbook*.



## Program I/O

---

This chapter describes how to write programs that use the LCD, the I/O port, the external RUN/CONT connector in the analyzer, and the DOS file system.

Topics covered in this chapter are:

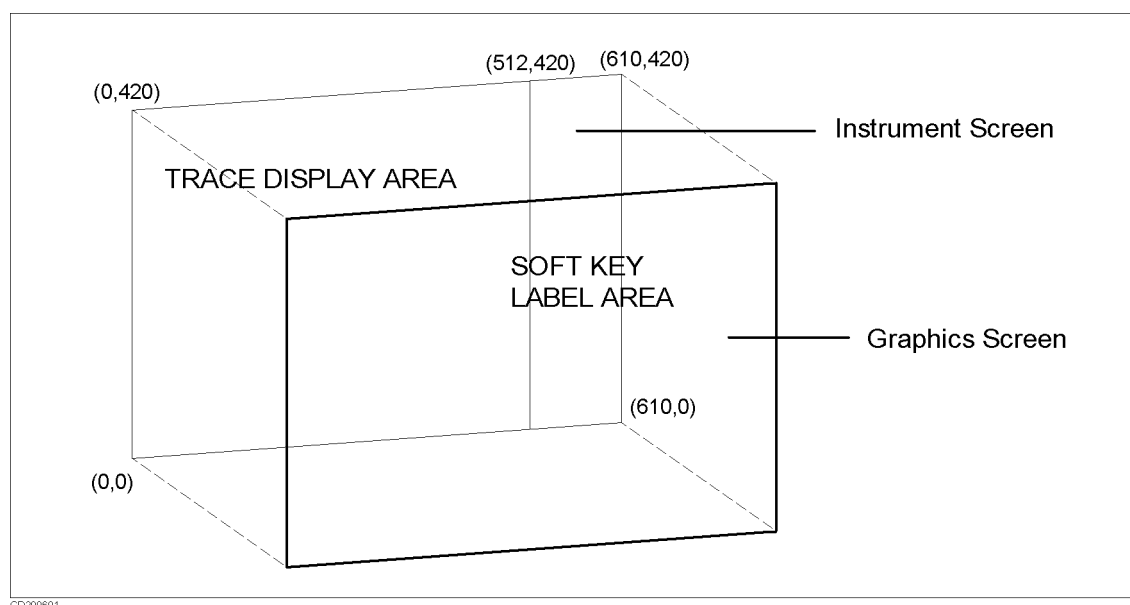
- Graphics
- Using the external RUN/CONT connector
- File system exceptions
- Using the I/O port in BASIC programs

---

### Graphics

HP instrument BASIC adds graphics capability to the analyzer. You can draw pictures on the LCD display independent of the grids and traces.

The analyzer has two screens, the instrument screen and the graphics screen. These two screens are always displayed together on the LCD and are not separately selectable. The instrument screen consists of a trace display area and a softkey label area. The HP instrument BASIC editor is also displayed on the trace display area. The graphics screen covers the entire instrument screen as shown in Figure 6-1. The graphics screen is like an independent transparent overlay in front of the instrument screen. Therefore, you can draw figures in both the trace display and softkey label areas.



**Figure 6-1. Screen Structure**

Each point on the graphics screen is addressable using a coordinate address as shown in Figure 6-1. The bottom left corner is the origin (0,0) and the top right corner is the maximum horizontal and vertical end points (610,420). The MOVE and DRAW statement parameters are specified using these coordinate values. Because the aspect ratio of a graphics screen is 1, you need not adjust the aspect ratio when drawing figures.

## HP instrument BASIC Graphics Commands

The analyzer's HP instrument BASIC has three graphics commands; MOVE, DRAW, and GCLEAR.

|        |                                                                                                             |
|--------|-------------------------------------------------------------------------------------------------------------|
| MOVE   | Moves the pen from its current position to the specified coordinates.                                       |
| DRAW   | Draws a line from the current pen position to the specified coordinates.                                    |
| GCLEAR | Clears the graphics screen, moves the pen from its current position to the origin (0,0), and selects pen 1. |

---

**Note** The total times of executing the MOVE and DRAW commands is up to 1933, even if the pen position is not changed.



## Hard Copies

Graphics hard copies can be obtained with the printing function.

### PRINT

**PRINT** under **Copy** prints a display image on a printer. See "Copy Menu" in Chapter 9 of the *Function Reference*.

## Initial settings

When power is turned ON, the default settings are as follows:

- MOVE 0,0

## Example of Graphics Programming

This section describes an example of a simple program for drawing lines on the graphics screen.

- Drawing a Straight Line

The following HP instrument BASIC program will draw a line from coordinate (50,200) to coordinate (300,200) on the display.

```
GCLEAR          ! INITIALIZE GRAPHICS MODE
MOVE 50,200      ! MOVE PEN TO COORDINATE (50,200)
DRAW 300,200     ! DRAW A LINE TO COORDINATE (300,200)
END
```

- Drawing a Circle

Trying to express all graphical images using only straight lines is tedious, slow, and difficult. This example describes a subprogram you can use to draw a circle. It can draw a circle by passing the center coordinates and the radius as arguments to the following subroutine. This subroutine can be used as a base for drawing arcs, setting different values for Theta, etc.

```
SUB Drawcircle(Centx,Centy,R)    !
```

```

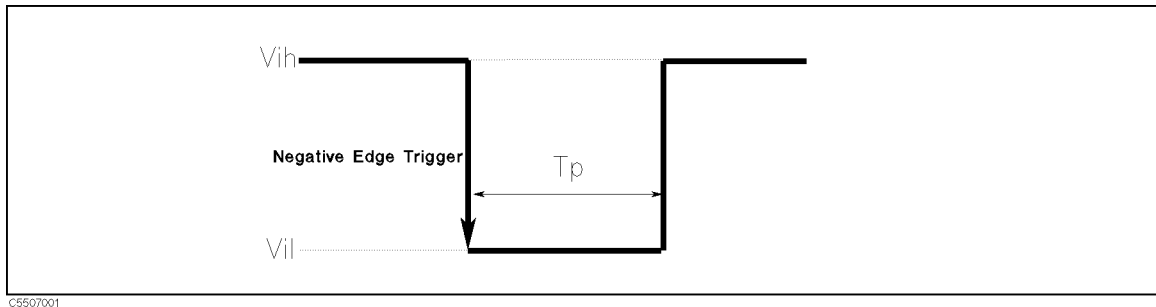
DEG                                ! USE DEGREES FOR ANGLE EXPRESSIONS
X=Centx+R                          !
Y=Centy                            !
MOVE X,Y                          ! MOVE PEN TO INITIAL POINT
For Theta=1 to 360                 !
    X=INT(COS(Theta)*R+Centx)      ! NEXT X COORDINATE ON CIRCLE
    Y=INT(SIN(Theta)*R+Centy)      ! NEXT Y COORDINATE ON CIRCLE
    DRAW X,Y                       ! DRAW LINE TO NEXT POINT ON CIRCLE
NEXT Theta                         ! UNTIL STARTING POINT IS REACHED
SUBEND                             !

```

---

## Using the External RUN/CONT Connector

You can use the RUN or CONT commands in a program by inputting a TTL-compatible signal to the External RUN/CONT connector on the rear panel. At the negative-going edge of a pulse more than 20  $\mu$ s wide ( $T_p$ ) in the LOW state will trigger RUN or CONT.



**Figure 6-2. RUN/CONT Trigger Signal**

---

## File System Exceptions

The analyzer supports both the LIF and DOS file formats. When using an LIF format disk, the CREATE and CREATE DIR commands will generate an error.

Because the analyzer does not support an external disk drive, the MASS STORAGE IS (MSI) statement cannot specify volumes other than the built-in disk drive (volume specifier "INTERNAL,4", the default volume) and RAM disk memory (volume specifier "MEMORY,0").

---

## Using the I/O Port in BASIC Programs

The HP instrument BASIC can directly control the I/O port without using GPIB commands. This is faster than using the `INP8IO?` and `OUTP8IO` GPIB commands.

`READIO(15,0)` Reads the 4-bit data from the I/O Port and returns a decimal value.

`WRITEIO 15,0;data` Outputs the decimal value of the 8-bit data to the OUT 0 to 7 lines of the I/O port. The OUT 0 signal is the LSB (least significant bit), while the OUT 7 signal is the MSB (most significant bit).

See Appendix B for more information on `READIO` and `WRITEIO` commands.

For more information on the I/O port, see Appendix B.

## Special Features and Advanced Techniques

---

The topics covered in this chapter are :

- Autoloading and running a program automatically (AUTOST)
- On Key Label function
- Increasing program speed

---

### Autoloading and Running a Program Automatically (AUTOST)

The analyzer allows you to create a special program file called AUTOST. This program is automatically loaded and run every time the analyzer is turned ON.

When you use this capability, the disk on which you saved AUTOST must be inserted in the disk drive before the analyzer is turned ON.

The system first checks to see if there is an AUTOREC file on the disk. If there is, the system reads the AUTOREC file to set up the analyzer, and then loads and runs the AUTOST program. (For more information on AUTOREC, see "Auto Recall Function" in Appendix D of the *Function Reference*.)

---

### On Key Label Function

The HP instrument BASIC allows you to define softkeys from within a program. The softkey labels you define will appear when pressing the (Shift) - (F10) key on the Keyboard. The labels are displayed while running the program.

The ON KEY statement is used to define the softkeys. For example:

```
.....
100 ON KEY 1 GOTO 150
110 ON KEY 2 LABEL "Print" GOSUB Report
.....
```

You can also use the KEY statement or USKEY command to automatically display the label. This prevents you to press (Shift) - (F10) keys or the ON KEY LABELS softkey while the user program is running. The KEY statement is used to display the softkey labels defined. The following set of statements is the same as the key strokes (System) IBASIC ON KEY LABELS:

```
.....
200 OUTPUT @Hp4352;"KEY 47"      ! SYSTEM key
210 OUTPUT @Hp4352;"KEY 0"       ! IBASIC softkey
220 OUTPUT @Hp4352;"KEY 7"       ! ON KEY LABELS softkey
.....
```

Note that the same result can be obtained with the program shown below.

```
.....  
200 OUTPUT @Hp4352;"USKEY"  
.....
```

For more information on the ON KEY statement, see the *HP instrument BASIC Language Reference* of the *HP instrument BASIC Users Handbook*.

---

## Increasing Program Speed

Because the analyzer's CPU interleaves processing measurements and executing a program, program execution speed depends on the measurement conditions. The display process also requires processing time.

To increase program speed (increase throughput), set the analyzer to the following conditions:

- If you do not need to measure the DUT when executing a program, set TRIGGER MODE to HOLD.
- If you need to measure the DUT but do not need to display the traces on the screen, set DISPLAY ALLOCATION to ALL BASIC.
- When you use the I/O port, use the READIO and WRITEIO commands to input or output data to the port directly.
- Turn the Display Params off.

## Analyzer Specific HP instrument BASIC Features

---

This chapter lists and summarizes the HP instrument BASIC features specific to the analyzer. Details of each feature are described in the previous chapters and in the appendixes.

This chapter covers the following topics:

- Available I/O interfaces and select codes
- Storage units
- GPIB commands for HP instrument BASIC

---

### Available I/O Interfaces and Select Codes

Available interfaces and their select codes in the analyzer's HP instrument BASIC are listed in the following table:

| Select Codes | Devices                 |
|--------------|-------------------------|
| 1            | LCD                     |
| 2            | Keyboard                |
| 7            | External GPIB interface |
| 8            | Internal GPIB interface |
| 15           | 12 bit I/O port         |
| 16           | 24 bit I/O port         |

---

### Storage Unit

The analyzer has two types of storage units: the built-in flexible disk drive and the RAM disk memory. Both the disk drive and RAM disk memory support the LIF and DOS formats.

To switch the system's storage units between the disk in the disk drive and the RAM disk under control of HP instrument BASIC,

MSI ":INTERNAL,4" or MSI ":,4" for the built-in disk drive

MSI ":MEMORY,0" or MSI ":,0" for the RAM disk memory

---

**Note**

When you want to manage the storage units using the following GPIB commands, use the STODDISK command (for the built-in disk drive) or the STODMEM0 command (for the RAM disk memory) to specify the storage unit.

- |        |        |           |           |
|--------|--------|-----------|-----------|
| • CHAD | • INID | • RESAVD  | • SAVDGRA |
| • CRED | • PURG | • SAVDASC | • SAVDSTA |
| • DISF | • RECD | • SAVDDAT |           |

---

To copy a file between the disk and RAM disk, use an FILC command.

---

**Note**

The FILC command cannot be used to copy a file if the format (LIF or DOS) of the disk in the built-in disk drive is different from that of the RAM disk.

---

Use the front panel key or enter an GPIB command to initialize the storage unit. When using an GPIB command to initialize the storage unit, execute the following procedure:

```
10 ASSIGN @Hp4352 TO 800
20 OUTPUT @Hp4352;"STODDISK" ! Selects the built-in disk drive
30 OUTPUT @Hp4352;"DISF DOS"  ! Selects the DOS format
40 OUTPUT @Hp4352;"INID"      ! Initializes the disk
50 END
```

## Built-in Flexible Disk Drive

The analyzer's HP instrument BASIC has the following disk drive limitations:

- Disk types which can be initialized by the analyzer's HP instrument BASIC INITIALIZE statement is 2HD (1.4 MB). 2DD disks cannot be initialized.
- The only INITIALIZE format option is the default (256 byte/sector).
- DOS formats supported. The DOS formats supported are:
  - 720 Kbyte, 80 tracks, double-sided, 9 sectors/track
  - 1.44 Mbyte, 80 tracks, double-sided, 18 sectors/track
- HFS format is not supported.
- External disk drives are not supported.

## RAM Disk Memory

A part of the RAM of the analyzer can be used as a virtual disk drive; RAM disk memory. RAM disk memory can be operated in the same way as the internal disk drive.

When the analyzer is turned OFF, the data saved in the RAM disk is lost, and the RAM disk memory is automatically initialized by the format that is set by **FORMAT [ ]** under **FILE UTILITIES** under **(Save)**.

---

## GPIB Commands for HP instrument BASIC

The PROGram subsystem commands of the analyzer's GPIB commands are used to control HP instrument BASIC. The PROGram subsystem commands do the following:

- Download the program from an external controller to the analyzer
- Upload the program from the analyzer to an external controller
- Delete the program on the BASIC editor of the analyzer
- Execute the program on the BASIC editor of the analyzer
- Set or query the variables and arrays in the program on the BASIC editor of the analyzer
- Set or query the state of the program on the BASIC editor of the analyzer

See the *GPIB Programming Manual* for more information.

---

### Note



The PROGram subsystem commands can be used from an external controller only.

---



## Manual Changes

---

### Introduction

This appendix contains the information required to adapt this manual to earlier versions or configurations of the analyzer than the current printing date of this manual. The information in this manual applies directly to the 4352B VCO/PLL Signal Analyzer serial number prefix listed on the title page of this manual.

---

### Manual Changes

To adapt this manual to your 4352B, see Table A-1 and Table A-2, and make all the manual changes listed opposite your instrument's serial number and firmware version.

Instruments manufactured after the printing of this manual may be different from those documented in this manual. Later instrument versions will be documented in a manual changes supplement that will accompany the manual shipped with that instrument. If your instrument's serial number is not listed on the title page of this manual or in Table A-1, it may be documented in a *yellow MANUAL CHANGES* supplement.

In additions to change information, the supplement may contain information for correcting errors (Errata) in the manual. To keep this manual as current and accurate as possible, Agilent Technologies recommends that you periodically request the latest *MANUAL CHANGES* supplement.

For information concerning serial number prefixes not listed on the title page or in the *MANUAL CHANGES* supplement, contact the nearest Agilent Technologies office.

Turn on the line switch or execute the \*IDN? command by GPIB to confirm the firmware version. See the *GPIB Programming Guide* manual for information on the \*IDN? command.

**Table A-1. Manual Changes by Serial Number**

| Serial Prefix or Number | Make Manual Changes |
|-------------------------|---------------------|
|                         |                     |

**Table A-2. Manual Changes by Firmware Version**

| Version | Make Manual Changes |
|---------|---------------------|
|         |                     |

---

## Instruments Covered by This Manual

Agilent Technologies uses a two-part, nine-character serial number that is stamped on the serial number plate (see Figure A-1) attached to the rear panel. The first four digits and the letter are the serial prefix and the last five digits are the suffix.



**Figure A-1. Serial Number Plate**

## BASIC Commands Specific to 4352B

---

### BASIC Commands Not Implemented

The following commands are listed in the *HP instrument BASIC Language Reference* of the *HP Instrument Users Handbook*, but are not implemented in the analyzer's HP instrument BASIC.

- OFF CYCLE
- ON CYCLE

---

#### Note



GCLEAR and ON TIMEOUT commands are available, but the following supplementary items are added.

- GCLEAR  
Moves the pen to (0,0).
  - OFF TIMEOUT and ON TIMEOUT  
The interface select code is 7 only.
- 

### BASIC Commands Specific to 4352B

The following commands are *not* listed in the *HP instrument BASIC Language Reference* of the *HP instrument BASIC Users Handbook*, but are available in the analyzer's HP instrument BASIC.

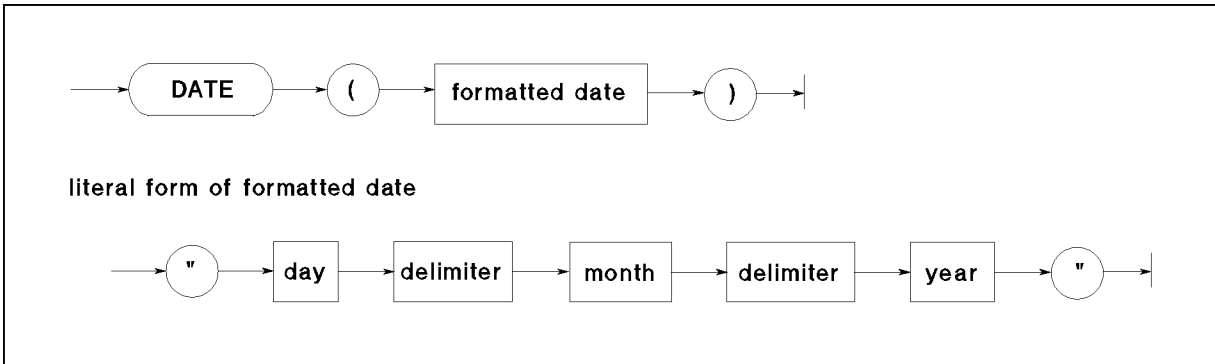
- DATE
- DATE\$
- EXECUTE
- READIO
- SET TIME
- SET TIMEDATE
- TIME
- TIME\$
- WRITEIO

---

## DATE

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command converts data formatted as (DD MMM YYYY) into the numeric value used to set the clock.



C2711004

| Item           | Description                   | Range                                                                |
|----------------|-------------------------------|----------------------------------------------------------------------|
| formatted date | string expression             | (see drawing and text)                                               |
| day            | integer constant              | 1 to end-of-month                                                    |
| month          | Literal (letter case ignored) | JAN, FEB, MAR, APR, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC |
| year           | integer constant              | 1900 to 2079                                                         |

### ■ Example Commands

```
PRINT DATE("21 MAY 1991")
SET TIMEDATE DATE("1 Jan 1991")
Days=(DATE("1 JAN 1991")-DATE("11 NOV 1990")) DIV 86400
```

### ■ Semantics

Using a value from the DATE command as the argument for SET TIMEDATE will set the clock to midnight on the date specified. The results from the DATE and TIME commands must be combined to set the date and time of day.

If the DATE command is used as an argument for SET TIMEDATE to set the clock, the date must be in the range: 1 Mar 1900 to 4 Aug 2079.

Specifying an invalid date, such as the thirty-first of February, will cause an error.

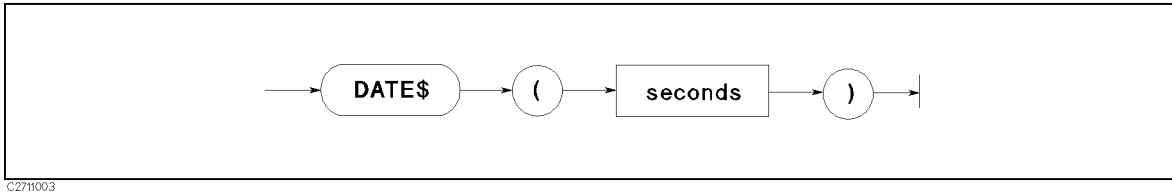
Leading blanks or non-numeric characters are ignored. ASCII spaces are recommended as delimiters between the day, month, and year. However, any non-alphanumeric character except the negative sign (–), may be used as the delimiter.

---

## DATE\$

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command formats the number of seconds into a date (DD MMM YYYY).



| Item    | Description        | Range                                      |
|---------|--------------------|--------------------------------------------|
| seconds | numeric expression | −4.623683256E+12 to<br>4.6534263350399E+13 |

### ■ Example Commands

```
PRINT DATE$(TIMEDATE)
DISP DATE$(2.111510608E+11)
```

### ■ Semantics

The date returned is in the form: DD MMM YYYY, where DD is the day of the month, MMM is the month, and YYYY is the year.

The day is a blank filled to two character positions. Single ASCII spaces delimit the day, month, and year.

The first letter of the month is capitalized and the rest are lowercase characters.

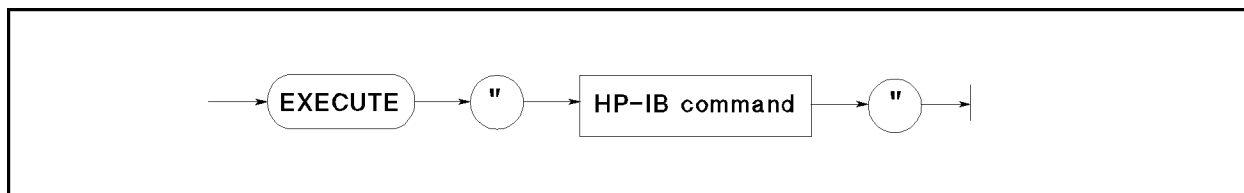
Years less than the year 0 are expressed as negative years.

---

## EXECUTE

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command executes specific GPIB commands faster than the OUTPUT statement.



C470A009

| Item         | Description       | Range              |
|--------------|-------------------|--------------------|
| GPIB command | string expression | refer to Table B-1 |

**Table B-1. GPIB Commands for EXECUTE**

|           |
|-----------|
| SING      |
| OUTPDATA? |
| OUTPMEMO? |
| INPT?     |

### ■ Example Commands

- (1) Commands with no parameter and no query

EXECUTE "SING"

### ■ Semantics

- (1) Measurement Trigger and Getting Data

The 4352B executes EXECUTE "SING" to sweep once. Execution of the next statement is suppressed until the sweep is completed. Therefore, the completion of the sweep need not be supervised using a status register.

When EXECUTE "SING" is executed, C=READIO(8,0) gets measurement data.

Example

```
100 EXECUTE "SING"
110 C=READIO(8,0)
```

---

### Note



When both an external controller and HP instrument BASIC are used at the same time, the EXECUTE command occasionally does not terminate normally. If the external controller queries the instrument while the 4352B is sweeping when triggered by EXECUTE "SING", the EXECUTE command does not terminate normally (In the worst case, a system halt occurs).

To avoid this problem, it is necessary to use an SRQ interrupt technique that uses the status register. In this case, the external controller waits to send query commands until HP instrument BASIC completes the execution of the EXECUTE command.

Trigger mode must be HOLD mode when EXECUTE "SING" is executed.

---

- (2) Check INPUT1 of the 24 bit I/O port using INP? command

```
100 REPEAT
110 EXECUTE "INPT?"
120 C=READIO(8,0)
130 UNTIL C=1
```

- (3) Using OUTDATA? and OUTPMEM0?

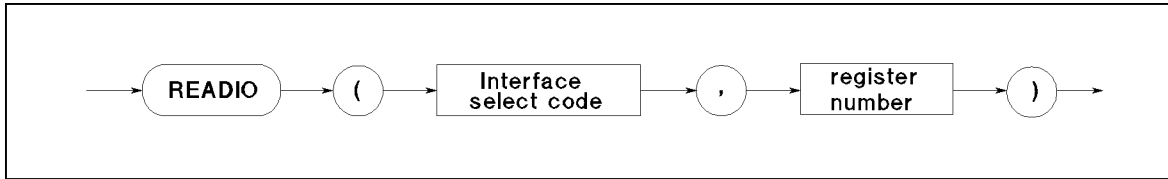
```
100 EXECUTE "OUTPDATA?"
200 C=READIO(8,0)
```

---

## READIO

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command reads the contents of the register used for an I/O port or EXECUTE command.



C27H001

| Item            | Description        | Range                                                                     |
|-----------------|--------------------|---------------------------------------------------------------------------|
| select code     | numeric expression | 8: EXECUTE register<br>15: 12 bit I/O port<br>16: 24 bit I/O port         |
| register number | numeric expression | 0 to 800 (Select code 8)<br>0: 12 bit I/O port<br>2 to 4: 24 bit I/O port |

### ■ Example Commands

```
Ioport=READIO(16,2)
100 EXECUTE "INPT?"
110 C=READIO(8,0)
```

### ■ Semantics

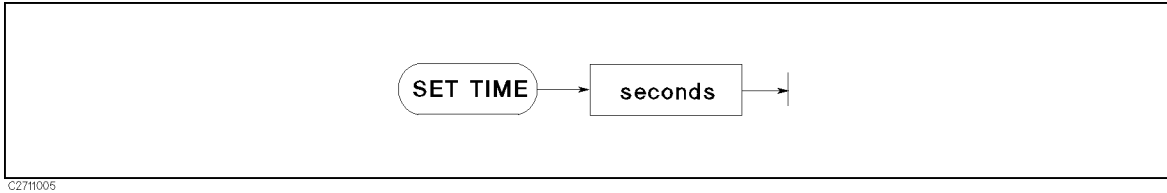
The EXECUTE command stores the query command's return values in registers. The READIO command reads a return value from one of these registers. Return values are sequentially stored in registers.

---

## SET TIME

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command resets the time-of-day given by the real-time clock.



| Item    | Description                                          | Range         |
|---------|------------------------------------------------------|---------------|
| seconds | numeric expression, rounded to the nearest hundredth | 0 to 86399.99 |

### ■ Example Commands

```
SET TIME 0
SET TIME Hours*3600+Minutes*60
```

### ■ Semantics

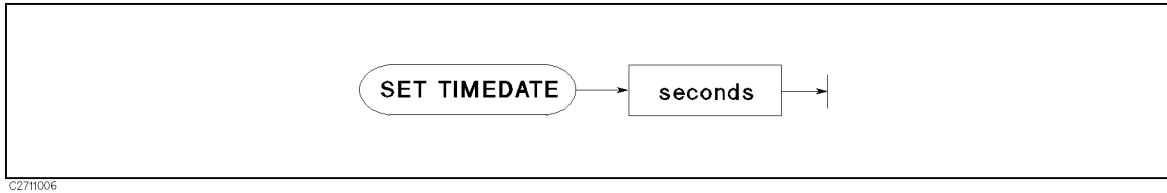
This command changes only the time within the current day, not the date. The new clock setting is equivalent to  $(\text{TIMEDATE DIV } 86400) \times 86400$  plus the specified setting.

---

## SET TIMEDATE

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command resets the absolute seconds (time and day) given by the real-time clock.



| Item    | Description                                          | Range                             |
|---------|------------------------------------------------------|-----------------------------------|
| seconds | numeric expression, rounded to the nearest hundredth | 2.08662912E+12 to 2.143252224E+11 |

### ■ Example Commands

```
SET TIMEDATE TIMEDATE+86400
SET TIMEDATE Strange_number
```

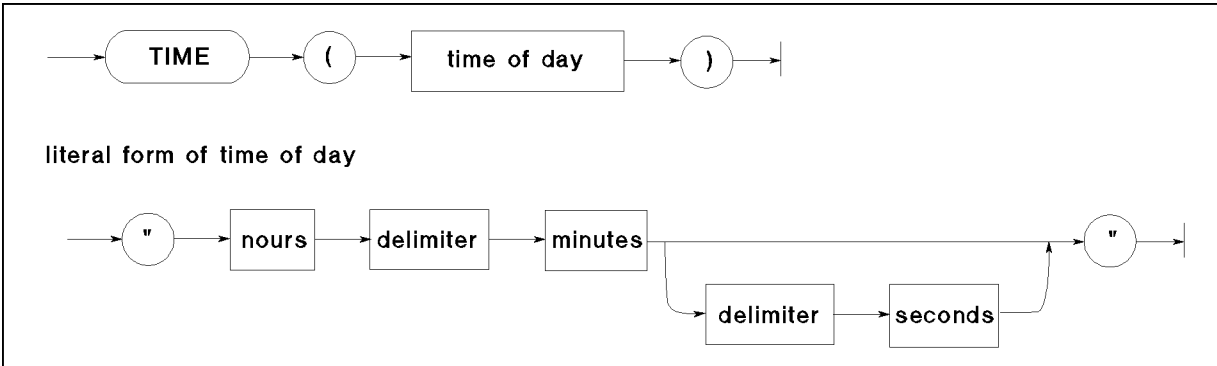
### ■ Semantics

The clock values represent Julian time, expressed in seconds.

## TIME

Keyboard Executable      Yes  
 Programmable              Yes  
 In an IF ... THEN ...      Yes

This command converts data formatted as time of day (HH:MM:SS), into the number of seconds past midnight.



C2711007

| Item        | Description                                               | Range         |
|-------------|-----------------------------------------------------------|---------------|
| time of day | string expression representing the time in 24 hour format | (set drawing) |
| hours       | literal                                                   | 0 to 23       |
| minutes     | literal                                                   | 0 to 59       |
| seconds     | literal; default = 0                                      | 0 to 59.99    |
| delimiter   | literal; single character                                 | (see text)    |

### ■ Example Commands

```
Seconds=TIME(T$)
SET TIME TIME("8:37:20")
ON TIME TIME("12:10") GOSUB Lunch
```

### ■ Semantics

This command returns a positive integer, in the range 0 to 86399, equivalent to the number of seconds past midnight.

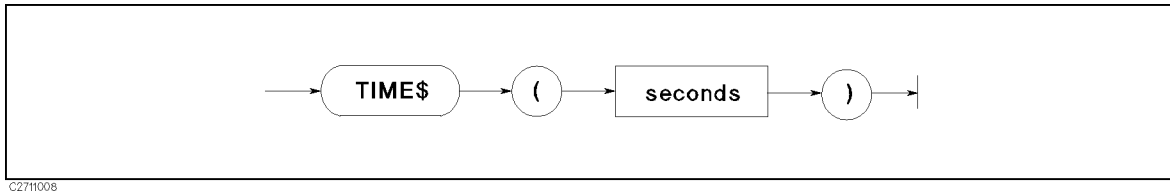
While any number of non-numeric characters may be used as a delimiter, a single colon is recommended. Leading blanks and non-numeric characters are ignored.

---

## TIME\$

|                       |     |
|-----------------------|-----|
| Keyboard Executable   | Yes |
| Programmable          | Yes |
| In an IF ... THEN ... | Yes |

This command converts the number of seconds past midnight into a string representing the time of day (HH:MM:SS).



| Item    | Description                                                                | Range      |
|---------|----------------------------------------------------------------------------|------------|
| seconds | numeric expression, truncated to the nearest second; seconds past midnight | 0 to 86399 |

### ■ Example Commands

```
DISP "The time is: ";TIME$(TIMEDATE)
PRINT TIME$(45296)
```

### ■ Semantics

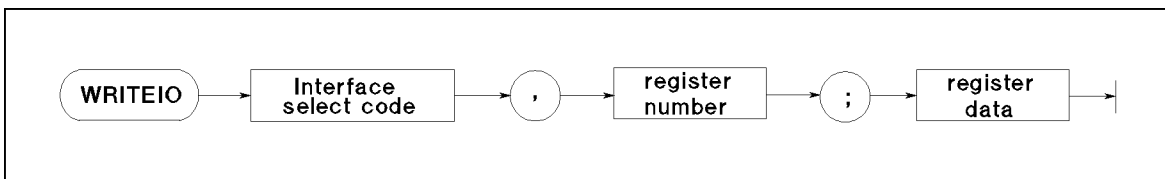
TIME\$ takes the time in seconds and returns the time of day in the form HH:MM:SS, where HH represents hours, MM represents minutes, and SS represents seconds. A module 86400 is performed on the parameter before it is formatted as a time of day.

---

## WRITEIO

Keyboard Executable      Yes  
Programmable              Yes  
In an IF ... THEN ...      Yes

This statement writes register data in decimal notation to a specified EXECUTE command parameter register or to a specified I/O port.



C2711002

| Item            | Description        | Range                                                                      |
|-----------------|--------------------|----------------------------------------------------------------------------|
| select code     | numeric expression | 8: EXECUTE register<br>15: 12 bit I/O port<br>16: 24 bit I/O port          |
| register number | numeric expression | 0 to 800 (Select code 8)<br>0: 12 bit I/O port<br>0 to 7 : 24 bit I/O port |
| register data   | numeric expression | −2147483648 to +2147483647: 24 bit I/O port<br>0 to 255: 12 bit I/O port   |

### ■ Semantics

- How to write data to the I/O port:

When writing data to an I/O port, use 15 or 16 as the select code and the register number that corresponds with the register.

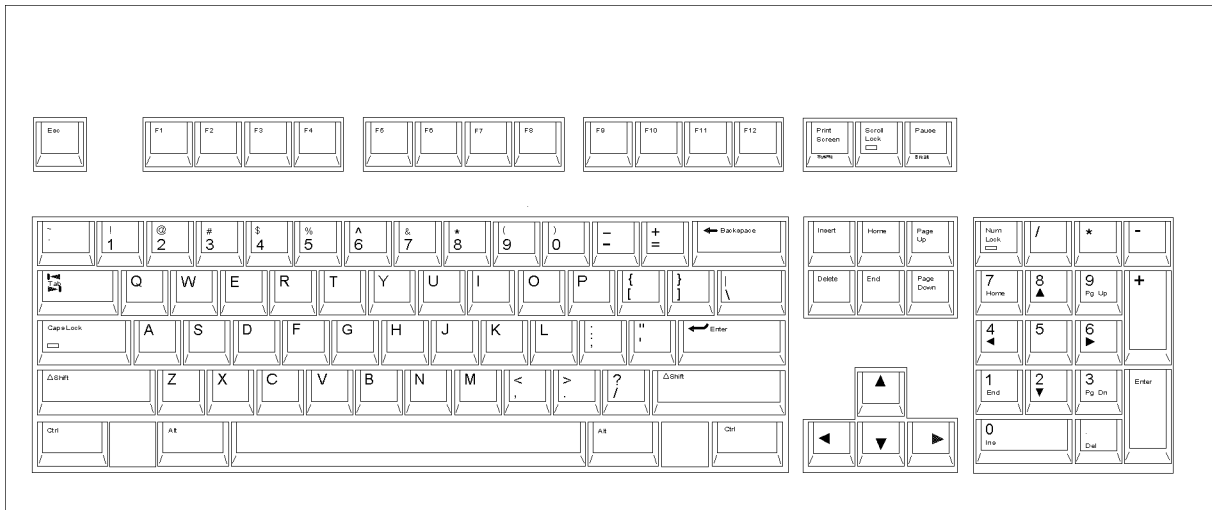
- How to write GPIB command parameters when the EXECUTE command is used:

The EXECUTE command uses the data stored in a register (select code 8) as a parameter. To store this parameter, the WRITEIO command must be executed before the EXECUTE command. The WRITEIO command stores one parameter in one register like the READIO command. For an GPIB command that requires multiple parameters, use as many WRITEIO commands as the number of parameters. For more information on the EXECUTE command, see the “EXECUTE” command.



## The Keyboard

Mini-DIN keyboard is following key layout.



**Figure C-1. mini-DIN Keyboard**

---

## Character Entry Keys

The character entry keys are arranged in the familiar QWERTY typewriter layout, but with additional features.

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Caps</b>      | Sets the unshifted keyboard to either upper-case (which is the default after power ON) or lower-case (normal typewriter operation).                                                                                                                                                                                                                                                                                                                                                             |
| <b>Shift</b>     | You can enter standard upper-case and lower-case letters, using the <b>Shift</b> key to access the alternate case.                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Enter</b>     | Has three functions: <ul style="list-style-type: none"><li>■ When a running program prompts you for data, respond by typing in the requested data and then press <b>Enter</b>. This signals the program that you have provided the data and that it can resume execution.</li><li>■ When typing in program source code, the <b>Enter</b> key is used to store each line of program code.</li><li>■ After typing in a command, the <b>Enter</b> key causes the command to be executed.</li></ul> |
| <b>CTRL</b>      | In the EDIT mode, <b>CTRL</b> allows you to control the editor in the same as using the cursor-control, display-control, and editing keys. For more detail, see “Using <b>CTRL</b> Key in Edit Mode”.                                                                                                                                                                                                                                                                                           |
| <b>Backspace</b> | Erases the character to the left of the cursor and moves the cursor to the erased character’s position on the line.                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Tab</b>       | Performs no function.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

---

## Cursor-Control and Display-Control Keys

|                                 |                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>▲ ▼</b>                      | Allow you to scroll lines up and down in the print display area. Shifted, these keys cause the display to scroll toward the top or bottom of the display. |
| <b>▶ ◀</b>                      | Allow you to move horizontally along a line. Shifted, these keys allow you to “jump” to the left and right limits of the current line.                    |
| <b>Page Up</b> <b>Page Down</b> | Cause the display to scroll up or down in one page increments.                                                                                            |

---

## Numeric Keypad

The numerical keypad provides a convenient way to enter numbers and perform arithmetic operations. Just type in the arithmetic expression you want to evaluate, then press **Enter**. The result is displayed in the lower-left corner of the screen.

|                 |                                                                                                                                                               |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Enter</b>    | Performs the same function as the <b>Enter</b> key. The numerical keypad serves the same function as the numerical keypad on the front panel of the analyzer. |
| <b>Num Lock</b> | Performs no function. Pressing the <b>Num Lock</b> key causes the LED ON/OFF, but the keys are performed as the numerical keypad only.                        |

---

## Editing Keys

|                              |                                                                                                                                                    |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Insert</b>                | Performs no function. The HP instrument BASIC is always in the insert mode. The characters you type are always inserted to the left of the cursor. |
| <b>Shift</b> - <b>Insert</b> | Inserts a new line above the cursor's current position (edit mode only).                                                                           |
| <b>Delete</b>                | Deletes the character at the cursor's position.                                                                                                    |
| <b>Shift</b> - <b>Delete</b> | Deletes the line containing the cursor (edit mode only).                                                                                           |
| <b>End</b>                   | Delete the line containing the cursor except the line number.                                                                                      |
| <b>Shift</b> - <b>End</b>    | Clears from the current cursor position to the end of the line.                                                                                    |
| <b>Home</b>                  | Clears the entire alpha screen. In EDIT mode, this exits the EDIT mode.                                                                            |

---

## Program Control Keys

The following keys allow you to control execution of the program stored in the analyzer's memory.

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pause</b>               | <b>Pause</b> or <b>Alt</b> - <b>F4</b> pauses program execution after the current line. Pressing <b>Continue</b> in the System menu resumes program execution from the point where it paused.<br><br><b>Shift</b> - <b>Alt</b> - <b>F4</b> stops program execution after the current line. To restart the program, press <b>Run</b> in the System menu.<br><br>When in the editor mode, <b>Shift</b> - <b>Alt</b> - <b>F4</b> exits the edit mode.                                          |
| <b>Ctrl</b> - <b>Break</b> | <b>Ctrl</b> - <b>Break</b> resets program execution immediately without erasing the program from memory ( <b>BASIC RESET</b> ).<br><br>Pauses program execution when the computer is performing or trying to perform an I/O operation. Press <b>Alt</b> - <b>F5</b> instead of <b>Pause</b> or <b>Alt</b> - <b>F4</b> when the computer is hung up during an I/O operation, because <b>Pause</b> or <b>Alt</b> - <b>F4</b> works only after the computer finishes the current program line. |

---

## System Control Keys

|                                          |                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(Shift)</b> - <b>(Page Up)</b>        | <b>(Shift)</b> - <b>(Page Up)</b> recalls the last line the you entered, executed, or deleted. Several previous lines can be recalled this way. Recall is particularly handy to use when you mistype a line. Instead of retyping the entire line, you can recall it, edit it using the editing keys, and enter or execute it again. |
|                                          | <b>(Shift)</b> - <b>(Page Down)</b> moves forward through the recall stack.                                                                                                                                                                                                                                                         |
| <b>(Alt)</b> - <b>(F3)</b> (Run)         | Starts a program running from the beginning.                                                                                                                                                                                                                                                                                        |
| <b>(Alt)</b> - <b>(F2)</b><br>(Continue) | Resumes program execution from the point where it paused.                                                                                                                                                                                                                                                                           |
| <b>(F12)</b> (IBASIC)                    | Allows you to type BASIC commands on Keyboard Input Line. If Display Allocation is ALL INSTRUMENT, pressing this key changes the Display Allocation to BASIC STATUS.                                                                                                                                                                |
|                                          | <b>(Shift)</b> - <b>(F12)</b> changes Display Allocation to ALL INSTRUMENT.                                                                                                                                                                                                                                                         |

---

## Softkeys and Softkey Control

There are eight softkeys (labeled **(f1)** through **(f8)**). The softkey labels are indicated on the right of the analyzer's screen.

### Softkey Control Keys

Pressing the following:

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(F9)</b>                  | Leads to the IBASIC menu, which controls programs and the editor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>(Shift)</b> - <b>(F9)</b> | leads to the BASIC menu from which to control a BASIC program. This menu is the same menu displayed when pressing <b>(SYSTEM)</b> <b>IBASIC</b> from the front panel.<br><br>In the edit mode, pressing <b>(F10)</b> leads to the Edit System menu, which provides softkeys to conveniently enter BASIC commands.<br><br><b>(Shift)</b> - <b>(F10)</b> (User) leads to the ON KEY LABEL menu, which are user defined softkeys in a BASIC program. (For information on getting to this menu through the HP instrument BASIC, see "On Key Label Function" in Chapter 7.) |

### Softkeys

**(F9)** and **(F10)** keys leads to the IBASIC menu. Pressing a softkey performs the command labeled or produces a sequence of characters on the keyboard input line (or on the "current line" in the EDIT mode).

Pressing the softkeys on the front panel of the analyzer performs the same functions as pressing the **(f1)** through **(f8)** function keys.

## Softkeys Accessed from **(Shift)** - **(F9)** Key

### IBASIC Menu

Pressing the following:

|                      |                                                                                                                                                                                                |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step</b>          | Produces the command “Step” on the keyboard input line. Step executes a program at every line.                                                                                                 |
| <b>Continue</b>      | Produces the command “Continue” on the keyboard input line. Resumes program execution from the point where it paused.                                                                          |
| <b>Run</b>           | Produces the command “Run” on the keyboard input line. Immediately executes a program.                                                                                                         |
| <b>Pause</b>         | Produces the command “Pause” on the keyboard input line. Pauses program execution after the current program line is executed.                                                                  |
| <b>Stop</b>          | Produces the command “Stop” on the keyboard input line. Stops program execution after the current line. To restart the program, press <b>Run</b> .                                             |
| <b>EDIT</b>          | Produces the command “EDIT” on the keyboard input line. After EDIT is entered, pressing <b>(Enter)</b> enters the edit mode.                                                                   |
| <b>ON KEY LABELS</b> | Leads to a softkey menu defined during program execution, if the softkey menu has been defined.                                                                                                |
| <b>CAT</b>           | Produces the command “CAT”. CAT lists the contents of a mass storage directory.                                                                                                                |
| <b>SAVE</b>          | Produces the command “SAVE”. SAVE creates an ASCII file and copies program lines as strings into that file.                                                                                    |
| <b>RE-SAVE</b>       | Produces the command “RE-SAVE”. RE-SAVE creates a specified ASCII file if it does not exist; otherwise, it rewrites a specified ASCII file by copying program lines as strings into that file. |
| <b>GET</b>           | Produces the command “GET”. GET reads the specified ASCII file and attempts to store the strings into memory as program lines.                                                                 |
| <b>PURGE</b>         | Produces the command “PURGE”. PURGE deletes a file or directory from the directory of a mass storage media.                                                                                    |
| <b>INITIALIZE</b>    | Produces the command “INITIALIZE”. INITIALIZE prepares mass storage media for use by the computer. When INITIALIZE is executed, any data on the media is lost.                                 |
| <b>MSI []</b>        | Produces the command “MSI []” on the keyboard input line. MSI [] specifies the mass storage. INTERNAL specifies the internal flexible disk, MEMORY specifies the RAM disk.                     |
| <b>SCRATCH</b>       | Produces the command “SCRATCH”. The SCRATCH erases the program in memory. After SCRATCH is entered, pressing <b>(Enter)</b> executes the command.                                              |
| <b>RENumber</b>      | Produces the command “REN”. REN renumbers all of the program lines currently in memory.                                                                                                        |
| <b>LIST</b>          | Produces the command “LIST”. Lists the program on the screen.                                                                                                                                  |
| <b>COMMAND ENTRY</b> | Leads to the Command entry menu, which allows you to execute the HP instrument BASIC commands from the front panel keys.                                                                       |
| <b>CLEAR I/O</b>     | Produces the command “CLEAR I/O”. Pauses I/O operation program. To restart the program, press <b>Continue</b> .                                                                                |

**RESET**

Produces the command “RESET”. Aborts the program.

## Softkeys Accessed form **(F10)** Key

**(F10)** key allows you to access three different softkey flows dependent on conditions as follows:

- Pressing **(F10)** accesses the Program Control menu
- In editor mode, pressing **(F10)** accesses the Edit System menu
- Pressing **(Shift)-(F10)** accesses the On Key Label menu.

The menus listed above are described in “Instrument BASIC Menu” in Chapter 8 of the *Function Reference*.

---

## Using **(CTRL)** Key in Edit Mode

In the edit mode, pressing **(CTRL)**, holding it down and pressing another key, allows you to control the editor in the same way as pressing control keys such as **(▲)**, **(▼)**, **(Insert line)**, etc.

| If you press ... | It performs ...                                                                                                                                                                                                                        |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(CTRL)-a</b>  | Moves the cursor to beginning of line, (the same function as <b>(Shift)-(◀)</b> ).                                                                                                                                                     |
| <b>(CTRL)-b</b>  | Moves cursor backward one character, (the same function as <b>(◀)</b> ).                                                                                                                                                               |
| <b>(CTRL)-d</b>  | Deletes a character, (the same function as <b>(Delete)</b> ).                                                                                                                                                                          |
| <b>(CTRL)-e</b>  | Moves the cursor to end of the line, (the same function as <b>(Shift)-(▶)</b> ).                                                                                                                                                       |
| <b>(CTRL)-f</b>  | Moves cursor forward character along a line, (the same function as <b>(▶)</b> ).                                                                                                                                                       |
| <b>(CTRL)-g</b>  | Allows you to move the cursor to any line number or label, after press <b>(CTRL)-g</b> , type a line number or label name and press <b>(Enter)</b> , the cursor moves to the specified line, (the same function as <b>GOTO LINE</b> ). |
| <b>(CTRL)-h</b>  | Deletes backward one character, (the same function as <b>(Back Space)</b> ).                                                                                                                                                           |
| <b>(CTRL)-j</b>  | Performs the same function as <b>(Enter)</b> .                                                                                                                                                                                         |
| <b>(CTRL)-k</b>  | Deletes a line from the cursor's current position to the end of the line.                                                                                                                                                              |
| <b>(CTRL)-m</b>  | Performs the same function as <b>(Enter)</b> .                                                                                                                                                                                         |
| <b>(CTRL)-n</b>  | Moves the cursor to the next line, (the same function as <b>(▼)</b> ).                                                                                                                                                                 |
| <b>(CTRL)-o</b>  | Inserts a new line above the cursor's current position, (the same function as <b>(Shift) - (Insert)</b> ).                                                                                                                             |
| <b>(CTRL)-p</b>  | Moves the cursor to the previous line, (the same function as <b>(▲)</b> ).                                                                                                                                                             |

## Softkeys Used for HP instrument BASIC Operation

---

The following softkeys are available with the HP instrument BASIC:

**System**

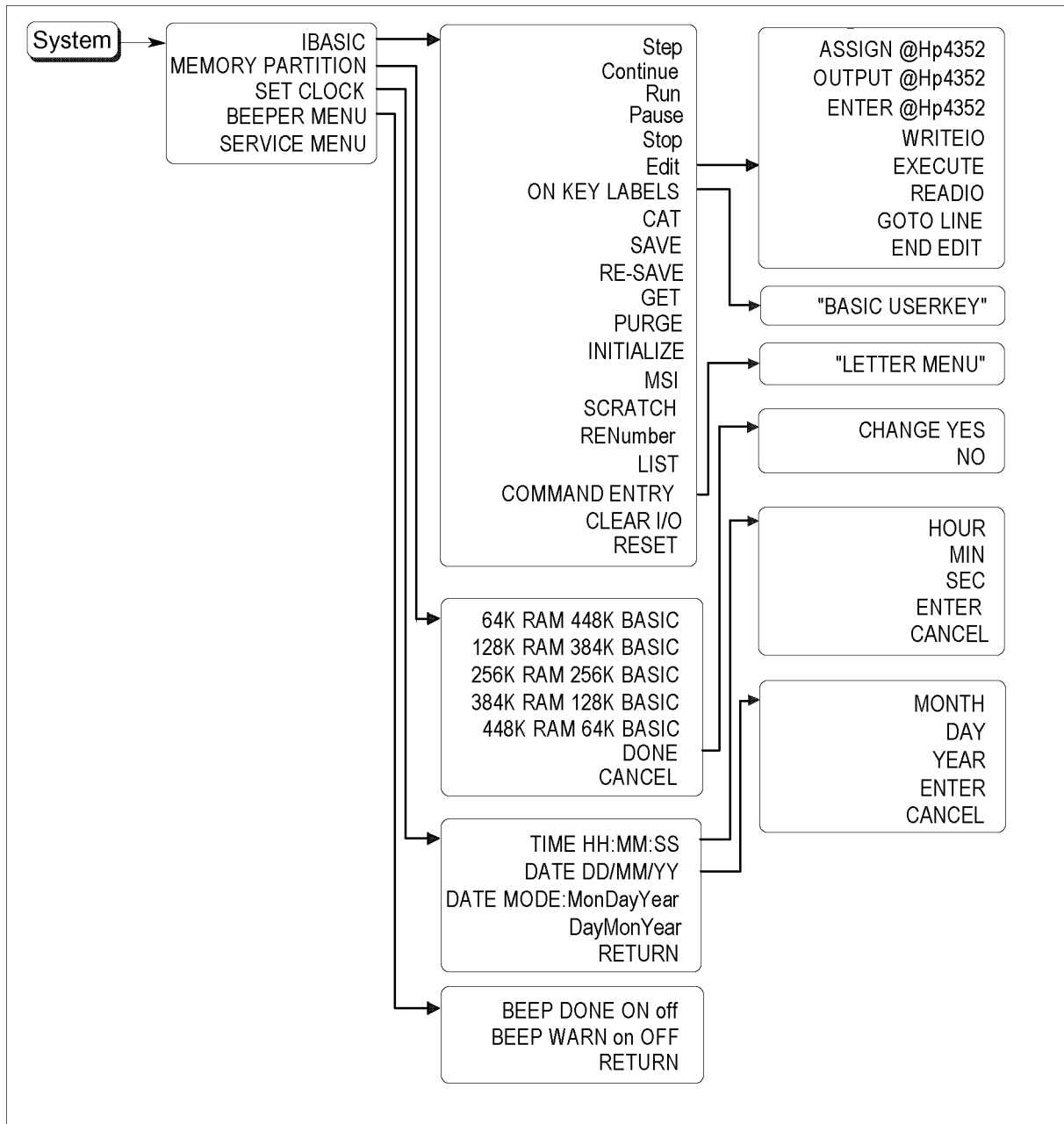
**IBASIC** controls HP instrument BASIC.

**MEMORY PARTITION** changes size of memory areas for HP instrument BASIC and the RAM disk.

## System

### IBASIC

Displays the following softkeys to control HP instrument BASIC (IBASIC):



CD009003

**Figure D-1. System menu**

### Step

Allows you to execute one program line at a time. This is particularly useful for debugging.

### Continue

Resumes program execution from the point where it paused.

## D-2 Softkeys Used for HP instrument BASIC Operation

|                |                                                                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Run            | Starts a program from its beginning.                                                                                                                                                                            |
| Pause          | Pauses program execution after the current program line is executed.                                                                                                                                            |
| Stop           | Stops program execution after the current line. To restart the program, press <b>Run</b> .                                                                                                                      |
| Edit           | Enters into the EDIT mode.                                                                                                                                                                                      |
| ASSIGN @Hp4352 | Produces the command "ASSIGN @Hp4352 TO 800" at the cursor's current position.                                                                                                                                  |
| OUTPUT @Hp4352 | Produces the command "OUTPUT @Hp4352;" at the cursor's current position.                                                                                                                                        |
| ENTER @Hp4352  | Produces the command "ENTER @Hp4352;" at the cursor's current position.                                                                                                                                         |
| END            | Produces the command "END".                                                                                                                                                                                     |
| GOTO LINE      | Allows you to move the cursor to any line number or to a label. After pressing <b>GOTO LINE</b> , type a line number or a label and then press <b>Return</b> . The cursor moves to the specified line or label. |
| RECALL LINE    | Recalls the last deleted line.                                                                                                                                                                                  |
| END EDIT       | Exits the edit mode.                                                                                                                                                                                            |
| ON KEY LABELS  | Leads to a softkey menu defined during program execution, if the softkey menu has been defined.                                                                                                                 |
| CAT            | Produces the command "CAT". CAT lists the contents of a mass storage directory.                                                                                                                                 |
| SAVE           | Produces the command "SAVE". SAVE creates an ASCII file and copies program lines as strings into that file.                                                                                                     |
| RE-SAVE        | Produces the command "RE-SAVE". RE-SAVE creates a specified ASCII file if it does not exist; otherwise, it rewrites a specified ASCII file by copying program lines as strings into that file.                  |
| GET            | Produces the command "GET". GET reads the specified ASCII file and attempts to store the strings into memory as program lines.                                                                                  |
| PURGE          | Produces the command "PURGE". PURGE deletes a file or directory from the directory of a mass storage media.                                                                                                     |
| INITIALIZE     | Produces the command "INITIALIZE". INITIALIZE prepares mass storage media for use by the computer. When INITIALIZE is executed, any data on the media is lost.                                                  |
| MSI []         | Produces the command "MSI []" on the keyboard input line. MSI [] specifies the mass storage. INTERNAL specifies the internal flexible disk, MEMORY specifies the RAM disk.                                      |
| SCRATCH        | Produces the command "SCRATCH". The SCRATCH erases the program in memory. After SCRATCH is entered, pressing <b>Enter</b> executes the command.                                                                 |
| RENumber       | Produces the command "REN". REN renumbers all of the program lines currently in memory.                                                                                                                         |
| LIST           | Produces the command "LIST". Lists the program on the screen.                                                                                                                                                   |
| COMMAND ENTRY  | Leads to the Command entry menu, which allows you to execute the HP instrument BASIC commands from the front panel keys.                                                                                        |

|               |                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------|
| SELECT LETTER | Selects the character pointed to by “↑”.                                                                        |
| SPACE         | Inserts a space.                                                                                                |
| BACK SPACE    | Deletes the last character entered.                                                                             |
| ERASE TITLE   | Deletes all characters entered.                                                                                 |
| DONE          | Terminates command entry, and executes the command you entered.                                                 |
| CANCEL        | Cancels command entry and returns to the BASIC menu.                                                            |
| CLEAR I/O     | Produces the command “CLEAR I/O”. Pauses I/O operation program. To restart the program, press <u>Continue</u> . |
| RESET         | Produces the command “RESET”. Aborts the program.                                                               |

## MEMORY PARTITION

Changes size of memory areas for HP instrument BASIC and the RAM disk memory.

**mm K RAM nn K BASIC** Selects memory partition so that *mm* Kbyte is for RAM disk memory and *nn* Kbyte is for HP instrument BASIC.

**DONE** Terminates selecting memory partition and displays the following softkey labels.

**CHANGE YES** Executes to change memory partition to one selected.

**NO** Cancels to change memory partition and return to the previous softkey menu.

---

### Caution

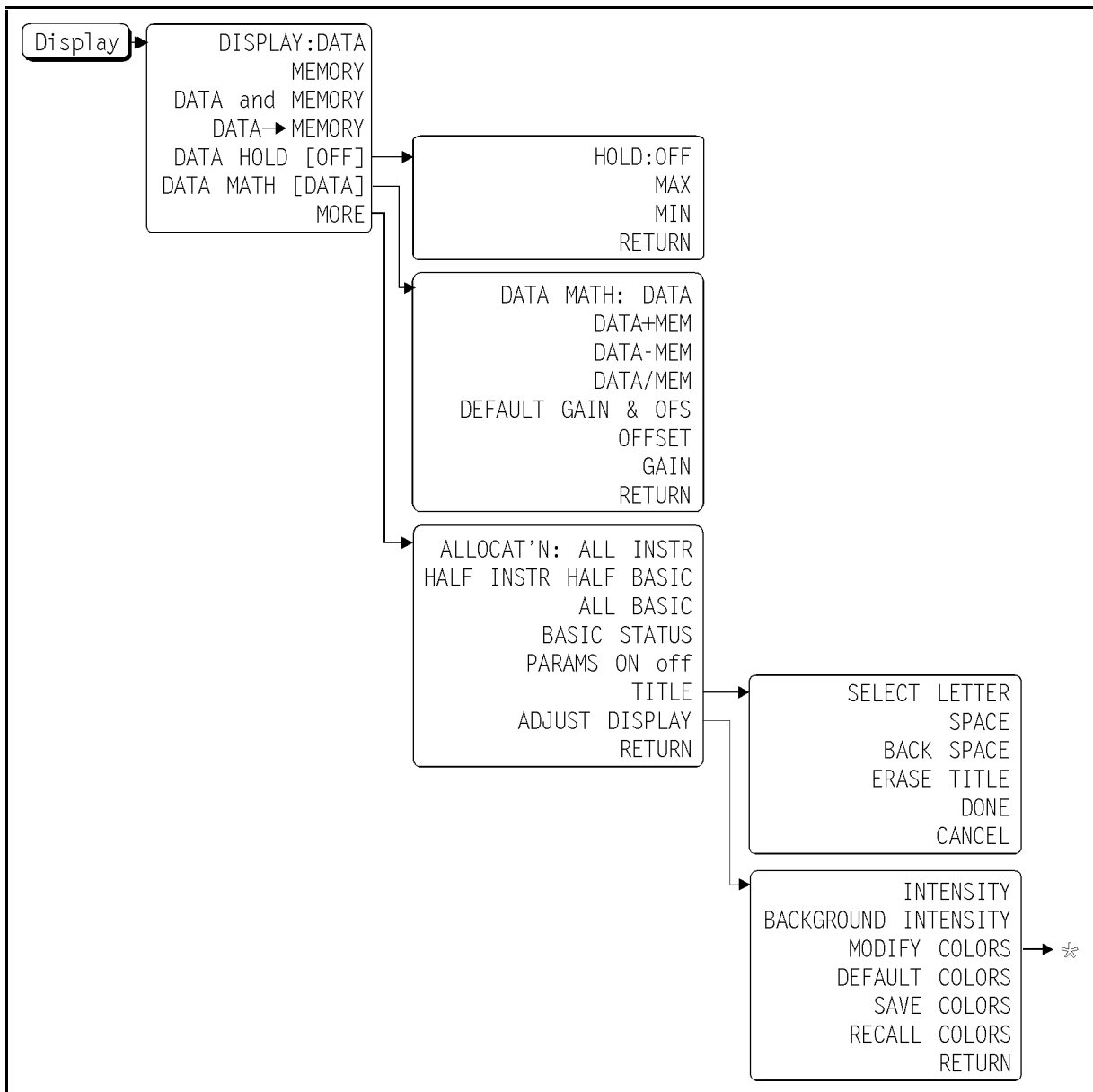


When the memory partition is reconfigured, the analyzer goes to the initial settings. That is, the RAM disk memory is initialized and all the data saved in the RAM disk memory is destroyed, and the program on the BASIC editor is destroyed.

---

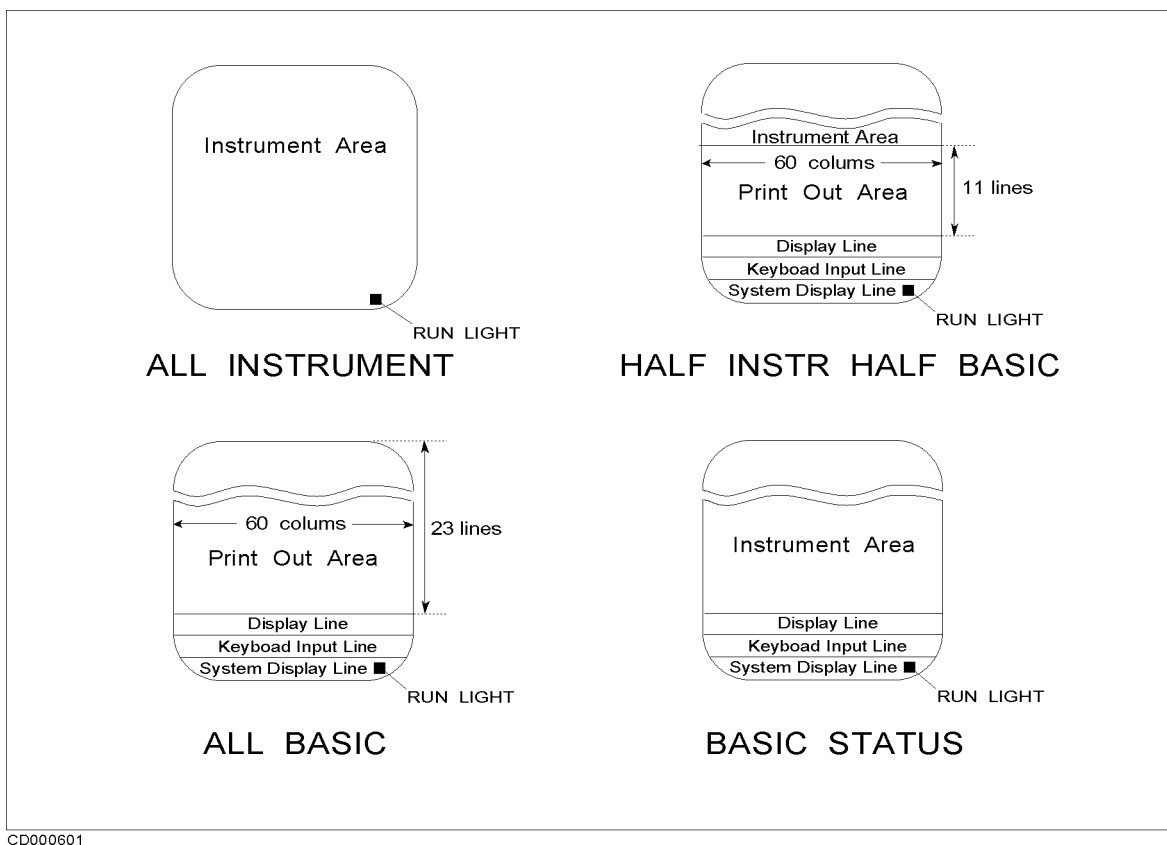
## Display

Displays the following menu to allocate the BASIC screen area on the display.



**Figure D-2. Display Menu**

|                       |                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------|
| ALLCOCT'N ALL INSTR   | Selects a full screen single screen or two half-screen graticules.                                  |
| HALF INSTR HALF BASIC | Selects two half-screens, one graticule display above the HP instrument BASIC display.              |
| ALL BASIC             | Selects a full screen single HP instrument BASIC display.                                           |
| BASIC STATUS          | Selects a full screen graticule and three status lines for HP instrument BASIC under the graticule. |



**Figure D-3. Display Allocation**

The following table lists the number of lines and columns in the BASIC print area for each display allocation. It also shows the keyboard input line status for each allocation. When the keyboard input line is available, you can execute BASIC commands from the keyboard.

| Display Allocation         | BASIC Print Area |       | Keyboard Input Line |
|----------------------------|------------------|-------|---------------------|
|                            | Columns          | Lines |                     |
| All Instrument             | 0                | 0     | not available       |
| Half Instrument Half BASIC | 60               | 11    | available           |
| ALL BASIC                  | 60               | 23    | available           |
| BASIC Status               | 0                | 0     | available           |

## Run Light Indications

- (blank) Program stopped; can execute commands; CONTINUE not allowed.
- Program paused; can execute commands; CONTINUE is allowed.
- ? BASIC program waiting for input from keyboard; cannot execute commands.
- \* This indication has two possible meanings:
  - Program running; CANNOT execute commands. CONTINUE not allowed.
  - System executing command entered from keyboard; CANNOT enter commands.



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