VAXELN

Run-Time Utilities Guide

VAXELN Run-Time Utilities Guide

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This manual explains how to use VAXELN run-time utilities in your VAXELN system.

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Preface

The *VAXELN Run-Time Utilities Guide* explains how to use VAXELN run-time utilities in your VAXELN system. This manual introduces the concept of a run-time utility and then explains in detail the DIGITAL-supplied run-time utilities — the VAXELN command language utility (ECL) and the VAXELN display utility (EDISPLAY). The manual also includes an ECL dictionary.

Intended Audience

This manual is intended for anyone seeking to interactively communicate with or monitor the VAXELN system at run time. However, it is assumed that the reader is familiar with the material in the *VAXELN Host System Guide* and the *VAXELN Run-Time Facilities Guide*.

Document Structure

This manual is organized into the following four chapters:

- Chapter 1, Run-Time Utilities Overview, introduces the concept of a run-time utility and gives overviews of the DIGITAL-supplied run-time utilities, ECL and EDISPLAY.
- Chapter 2, Using ECL, describes how to build ECL into a VAXELN system, how to access it at run time, and how to specify ECL commands, including such elements as file specifications, UIC codes, and protection codes.
- Chapter 3, ECL Dictionary, provides reference information on the ECL commands.

- Chapter 4, Using EDISPLAY, explains how to build EDISPLAY into a VAXELN system, how to access it at run time, and how to modify and interpret its screen displays.

Conventions

Convention	Meaning
CTRL	Keynames appear in uppercase and are usually abbreviated.
CTRL/C	A key combination consists of two keynames separated by a slash (/). Hold down the first key while you press the second key.
ECL> **show time** 3-FEB-1987 11:55:22.13	What you should type is shown in **bold**. What the computer displays is shown in normal text type.
ECL> **type myfile.dat** . . .	A vertical series of periods, or ellipsis, means either that not all the data that the system would display is shown or that not all the data you would enter is shown.
file-spec, . . .	A horizontal ellipsis means that you can repeat an item as many times as needed.
[file-spec]	Square brackets indicate that the enclosed item is optional.

Associated Documents

The following documents are relevant to the use of VAXELN run-time utilities:

- *VAXELN Host System Guide* — describes how to build programs (including run-time utilities) into a VAXELN system and methods for starting up the programs at run time; also describes utilities run from the host.
- *VAXELN Messages Guide* — lists and explains messages that can be issued by the VAXELN run-time utilities.
- *VAXELN Run-Time Facilities Guide* — describes the VAXELN run-time software and the mechanisms and services it provides, which are used in conjunction with, and/or monitored by, the run-time utilities.

Chapter 1

Run-Time Utilities Overview

The VAXELN *run-time software* includes the kernel executive, network and file servers, device drivers for standard DIGITAL peripherals, and run-time libraries. These DIGITAL-supplied components are combined with user programs, written in a high-level language, to form a VAXELN *system*.

DIGITAL also supplies several *utilities* to help you develop and support a VAXELN system. During the design or testing of an application, a utility can be included in a VAXELN system in order to obtain useful information or to perform other functions at run-time that will help you analyze the system.

Among the current DIGITAL-supplied utilities, there are *run-time utilities*, which offer a target-system-based user interface, and *host system utilities*, which offer a host-system-based user interface.

This manual describes the DIGITAL-supplied run-time utilities, which are as follows:

- VAXELN Command Language Utility (ECL) — provides a set of commands that you can issue at a target system terminal[1] in order to perform file manipulation, program manipulation, and (limited) system control functions on the VAXELN system
- VAXELN Display Utility (EDISPLAY) — dynamically displays information about target system resources, such as memory, pool, and slot table use and currently active jobs and processes, on a target system terminal

[1] ECL also supports terminal access from a remote VAX/VMS system.

NOTE

The host system utilities are described in the *VAXELN Host System Guide*.

This chapter describes how to build a run-time utility into your application and how to start up a run-time utility, and gives overviews of the two DIGITAL-supplied utilities, ECL and EDISPLAY.

1.1 Building a Run-Time Utility into Your Application

The general method for building a run-time utility into a VAXELN system — applicable to EDISPLAY and to user-coded run-time utilities — is simply to fill out a System Builder Program Description Menu for the utility as you would for any other program in your system.

Additional build-time measures may be necessary, depending on the nature of the utility. For example:

- If a utility requires a particular device, such as a console or other terminal (as does EDISPLAY), the device support must be specified, either explicitly or through menu defaults, in the System Builder information.
- You must provide for the method of run-time activation (among the methods listed in Section 1.2). For example:
  - If you want the utility to start up automatically when the system begins executing, you must specify **Run** equals *Yes* on the Program Description Menu.
  - If you want to activate the utility with an ECL or EDEBUG command, you must make sure that the appropriate command language or debugger support is present in the system.
  - If you want to activate the utility with a CREATE_JOB procedure call in your program, you must write and build the appropriate code.
- If the utility expects parameters or qualifiers to be passed as program arguments, you must supply the appropriate arguments at build time (using the **Argument(s)** item on the Program Description Menu) or at run time (as arguments to CREATE_JOB, ECL EXECUTE or RUN, or EDEBUG CREATE JOB).

The general build method described above does not apply to the ECL utility. In order to build command language support into your VAXELN system, you modify items on the System Builder menus for Console Characteristics, Terminal Description, and Network Node Characteristics. On the Console and Terminal menus, you specify which target system terminals are to run ECL sessions; on the Network menu, you specify whether the VAXELN system is to support ECL sessions on remote VAX/VMS system terminals. If you want ECL users to be prompted for a valid password at login time, you specify on the Network Node Characteristics Menu that authorization is required.

For the specifics of building ECL and EDISPLAY into a VAXELN system, see Chapter 2, Using ECL, and Chapter 4, Using EDISPLAY.

1.2 Starting Up the Utility at Run Time

The general methods for activating a run-time utility — applicable to EDISPLAY and to user-coded utilities — are as follows:

- Specifying **Run** equals *Yes* in the System Builder Program Description Menu for the utility; the utility will start when the system begins executing
- Calling the CREATE_JOB procedure from within your application
- Issuing an EXECUTE or RUN command to ECL
- Issuing a CREATE JOB call to the debugger

If the utility expects parameters or qualifiers to be passed as program arguments, you must supply the appropriate arguments at build time (using the **Argument(s)** item on the Program Description Menu) or at run time (as arguments to CREATE_JOB, ECL EXECUTE or RUN, or EDEBUG CREATE JOB).

The general start-up methods listed above do not apply to the ECL utility. ECL, if it is present in a VAXELN system, always starts running when the system begins executing. ECL then displays the following banner at any terminal on which it has been configured to run:

```
VAXELN Vn.n-nn xxx [on node XXXXXX]
Press <RETURN> to continue.
```

The characters *n.n-nn* represent the current VAXELN software version. The characters *xxx* represent the type of VAXELN kernel running on the system. The target's node name (XXXXXX) is displayed if it is not blank.

You initiate the login procedure for an ECL session by pressing the RETURN key (or a CTRL/C or CTRL/Y key). As part of the login process — detailed in Chapter 2, Using ECL — you will be prompted for a user name and, if you specified at build time that authorization would be required to access the target node, a password.

To initiate an ECL session from a remote terminal under VAX/VMS, you SET HOST to the VAXELN target node, wait for ECL to display its banner, and then proceed as described above.

For details on starting up ECL and EDISPLAY, see Chapter 2, Using ECL, and Chapter 4, Using EDISPLAY.

1.3 ECL Overview

The VAXELN Command Language utility (ECL) provides a set of commands you can issue at a VAXELN target system terminal to communicate with the VAXELN run-time system. In order to use the commands, you must build the ECL utility into your VAXELN system with the System Builder and initiate an ECL terminal session at run time, as outlined in earlier sections of this chapter.

The ECL commands allow you to perform tasks such as the following:

- Working with files
- Working with disks and magnetic tapes
- Executing programs (possibly including other utilities)
- Modifying the session work environment

ECL is used interactively; you issue commands either directly from a target system terminal or by first issuing a SET HOST command from a remote VAX/VMS system terminal.

The ECL utility can help you manipulate, debug, fine-tune, and otherwise enhance your VAXELN application.

For details about how to build ECL into your VAXELN system, how to initiate an ECL session at run time, and how to issue ECL commands interactively, see Chapter 2, Using ECL.

1.4 EDISPLAY Overview

The VAXELN Display Utility (EDISPLAY) is a run-time utility program that displays information about the resources in your VAXELN system, including processor run time, memory, pool, and slot table use, and job statistics. EDISPLAY allows you to measure or observe system performance without a debugger being present in the system.

EDISPLAY is built into the target system using the System Builder. It can be started up at run time either automatically, by a CREATE_JOB call from within your application, by an ECL EXECUTE or RUN command, or by a debugger CREATE JOB command.

Once started, EDISPLAY dynamically displays its information on a target system video terminal. Information is displayed in 24-line pages.

EDISPLAY offers three types of displays — *setup*, *memory*, and *job*:

- The setup display allows you to switch between memory and job displays — prompting you for a job number if you select the job display — and allows you to alter the rate at which information and displays are updated.
- The memory display provides basic information about the VAXELN target system and the jobs loaded into the system.
- The job display provides a detailed look at a particular user-specified job, listing statistics for the job and all its subprocesses.

For details about how to build EDISPLAY into your VAXELN system, how to provide for run-time startup of the utility, and how to manipulate and interpret the displays, see Chapter 4, Using EDISPLAY.

Chapter 2

Using ECL

The VAXELN Command Language utility (ECL) provides a set of commands you can issue at a VAXELN target system terminal to communicate with the VAXELN run-time system. The ECL commands allow you to perform tasks such as the following:

- Working with files
- Working with disks and magnetic tapes
- Executing programs (possibly including other utilities)
- Modifying the session work environment

You issue ECL commands either directly from a target system terminal or by first issuing a SET HOST command from a terminal on a remote VAX/VMS system.

The ECL utility can help you manipulate, debug, fine-tune, and otherwise enhance your VAXELN application.

NOTE

The ECL utility is not designed to provide a full development environment, such as that provided by the Digital Command Language (DCL) under VAX/VMS. VAXELN systems are developed in a VAX/VMS environment.

This chapter explains how to use ECL, including how to build the ECL utility into a VAXELN system, how to initiate an ECL session at run time, and how to issue ECL commands interactively. The chapter also describes the format for an ECL command and for specifying such elements as parameters, qualifiers, time values, file specifications, user identification codes (UICs), and protection codes.

2.1 Building ECL into Your Application

To build the ECL utility into your application, you must specify certain information to the System Builder:

- For the target console and for each terminal configured on the target, specify whether ECL is to run on it. That is, on each Console or Terminal Description Menu, specify *Yes* or *No* for the **Command Language** entry. (*No* is the default.) If you specify *Yes*, the ECL utility program and an ECL job control program are included in the system, and the job control program is executed when the system is booted.
- If you wish to run ECL from a remote VAX/VMS system terminal, specify *Yes* for the **Remote Command Language** entry on the Network Node Characteristics Menu. (The default is *No*.) If you specify *Yes*, the ECL utility and an ECL remote server program are included in the system, and the remote server program is executed when the system is booted.
- If you want ECL users to be prompted for a valid password at log-in time, specify *Yes* for the **Authorization required** entry on the Network Node Characteristics Menu.
- If you plan to use the ECL LOAD and RUN commands to load additional program images into your system at run time, you may need to allocate additional resources on the System Builder's System Characteristics Menu. Menu entries that may require adjustment include **Number of jobs**, **Dynamic program space**, and **Pool size**.

2.2 Initiating an ECL Session at Run Time

ECL, if present in a VAXELN system, always starts running when the system begins executing. ECL displays the following banner at any console and/or terminal on which it has been configured to run, in order to inform the user that ECL is running and waiting for user input:

```
VAXELN Vn.n-nn xxx [on node XXXXXX]
Press <RETURN> to continue
```

The characters *n.n-nn* represent the current VAXELN software version. The characters *xxx* represent the type of VAXELN kernel running on the system. The target's node name (XXXXXX) is displayed if it is not blank.

If the **Remote Command Language** option was selected at system build time, you can SET HOST to the VAXELN system from a remote VAX/VMS system terminal; the same banner is displayed.

To initiate an ECL session at a terminal displaying the ECL banner, you must:

1. Press the RETURN key (or CTRL/C or CTRL/Y) to begin login.
2. If you specified at build time that authorization would *not* be required to access the target node, you are prompted only for a user name, which is not subject to validation:

   ```
   RETURN
   Username: SMITHSON RETURN
   ```

   However, if you specified that authorization *would* be required, you are prompted for a user name and a password, which are verified by the Authorization Service.

   ```
   RETURN
   Username: SMITHSON RETURN
   Password: password RETURN
   ```

   In either case (assuming any authorization is successful), the user name you specify is used to set the initial default directory. (For more information on initial defaults, see Section 2.2.1.)
3. The ECL utility then indicates it is ready to accept commands by displaying its prompt (ECL>), as shown below:

   ```
   ECL>
   ```

2.2.1 Session Work Environment

When you initiate an ECL session by logging in, a session work environment is created. Among the characteristics defined for your session are the following:

- The user name under which you logged in.
- A default user identification code (UIC). Part of your UIC identifies the group to which you belong, which affects your ability to access files. (Your UIC is compared to the owner UIC of the file you attempt to access; see Section 2.13 for details.) You can reset the default UIC with the SET UIC command; you can reset the owner UIC of a file with the SET FILE command. If authorization was required at login time, the initial default UIC is the UIC value returned by the Authorization Service for your user name. If no authorization was

required, the initial default UIC is the value specified for the **Default UIC** entry on the System Builder's Network Node Characteristics Menu.

- A default disk device and directory name, which ECL and the File System use to locate and catalog files you create or use. You can reset the default device and directory with the SET DEFAULT command. The initial default directory matches the user name you specified at login time. The initial default device is DISK$DEFAULT_VOLUME:, which is either the first volume specified in the System Builder's System Characteristics Menu, under the **Disk/volume names** entry, or, if none was specified, the first volume mounted with the MOUNT_VOLUME procedure or the ECL MOUNT command.
- A default help file specification, accessed by the HELP command. The initial default help file specification is DISK$DEFAULT_VOLUME:[000000]ECL.HLP. To use the HELP command, you must copy the DIGITAL-supplied help file, ELN$:ECL.HLP, or another help file, to a local disk on the target system and/or use the DEFINE/HELP command to redefine the default help specification.

NOTE

When you invoke a program with EXECUTE or RUN, some characteristics of the session work environment, such as the user name and the default UIC, are propagated to the invoked program. However, the default device and directory are not passed, nor are they obtainable, to programs invoked with EXECUTE and RUN.

2.2.2 Terminating an ECL Session

You can terminate an ECL session with the LOGOUT command. After you log out, the ECL banner is again displayed, and ECL again waits for user input (RETURN, CTRL/C, or CTRL/Y).

2.3 Entering Commands

You use ECL by entering commands interactively from a correctly configured terminal. A command has to finish executing before you can enter another one.

2.3.1 The Parts of a Command Line

ECL command line syntax follows the general format shown below (items in square brackets [ ] are optional).

```
ECL> command [/qualifier...] [parameter[/qualifier...]]
```

ECL>	ECL> is the ECL prompt, indicating that the ECL utility is ready to accept a command.
Command	Specifies the name of the command.
Parameter	Specifies what the command acts upon. Examples of parameters are file specifications and device names.
Qualifier	Modifies the action taken by the command. Some qualifiers can accept values.
Value	Modifies a qualifier. A value can be a character string, a number, or an ECL *keyword*. A keyword is a word that has special meaning in ECL. For example, GROUP, WORLD, and OWNER are ECL keywords. An ECL keyword may also have a value.

Observe the following rules when entering ECL commands:

- You can use any combination of upper- and lowercase letters. The ECL command interpreter translates lowercase letters to uppercase.
- At least one blank space must separate the command name from the first parameter, and at least one blank must separate each additional parameter from the previous parameter. Multiple spaces and tabs are permitted in all cases where a single blank is required. The command interpreter compresses multiple blank spaces or tabs to a single blank space.
- Each qualifier must be preceded with a slash (/). The slash can be preceded or followed by any number of spaces or tabs.

The following is an example of an ECL command line:

```
ECL> DIRECTORY/SIZE=ALL AVERAGE.DAT
```

where:

- *ECL>* is the ECL prompt
- *DIRECTORY* is a command
- */SIZE* is a qualifier that modifies the command

- *ALL* is a qualifier value (in this case the value is a keyword)
- *AVERAGE.DAT* is a parameter (in this case the parameter is a file specification)

2.3.2 Command Prompting

If you enter a command that requires parameters and you do not specify the parameters, the ECL utility asks you for them. For example:

```
ECL> COPY AVERAGE.DAT
_To
```

The COPY command expects an output file specification. If you do not enter one, ECL asks you for it. A line beginning with an underscore (_) means that ECL is waiting for your response.

At any prompt, you can enter one or more of the remaining parameters and any additional qualifiers.

If you press CTRL/Z after a command prompt, ECL ignores the command and redisplays the ECL prompt.

2.3.3 Entering Comments

Indicate a comment by preceding it with an exclamation point (!). ECL considers everything to the right of an exclamation point to be a comment, and ignores this information when processing the command line. Comments are valid in the following positions:

- As the first item in a command line. In this case, the entire line is considered a comment.
- After the last character in a command line.

Some examples follow:

```
ECL> !THIS ENTIRE LINE IS A COMMENT
ECL> TYPE LAB.DAT        ! TYPE COMMAND COMMENT
```

2.3.4 Abbreviating Command Names

You can abbreviate any ECL command down to the fewest number of characters that uniquely represent the command. For example, because ECL has a CREATE command, the COPY command can be abbreviated to *CO* or *COP*, but not *C*.

You can also abbreviate qualifiers and keywords. For more information, see Section 2.5.3.

2.4 Entering Parameters

The following rules apply to entering parameters:

- Required parameters must be placed to the left of optional parameters.
- An input file parameter must precede an output file parameter.

2.4.1 Specifying a File

File specifications are the most common type of parameter. ECL commands can accept input file specifications (files that are acted upon by a command) and output file specifications (files that are created by a command). For complete details on file specifications, see Section 2.10.

The command descriptions in Chapter 3, ECL Dictionary, describe how each command interprets file specifications. Command descriptions provide information about defaults for file specifications that are entered as parameters.

2.5 Entering Command Qualifiers

Command qualifiers modify commands. You can place a command qualifier anywhere in the command line. For example:

```
ECL> DIRECTORY/SIZE FARM.DAT
ECL> DIRECTORY FARM.DAT/SIZE
```

The two DIRECTORY commands shown in this example are equivalent. The file size is displayed for the file FARM.DAT.

The qualifier section of the command descriptions in Chapter 3, ECL Dictionary, shows the qualifiers that are accepted by each command. It also indicates whether a qualifier accepts a value and what the value type must be. Although including any qualifier is optional, certain defaults are automatically supplied. You need to be aware of the defaults that apply for each qualifier.

2.5.1 Qualifier Defaults

A qualifier default is defined as what happens when you omit the qualifier from the command line. Qualifiers can be either present or absent by default. The following paragraphs explain the syntax used in Chapter 3, ECL Dictionary, to display qualifiers and defaults.

Qualifiers can take one of the following formats:

- Qualifiers with positive and negative forms. These qualifiers have a value of true or false. You indicate a true value by naming the qualifier. You indicate a false value by inserting the prefix NO.

  For example, the /LOG qualifier can be expressed positively or negatively. If you omit the qualifier, the default action is /NOLOG. The following shows how the /LOG qualifier is listed in a command description.

  ```
  /LOG
  /NOLOG (default)
  ```

- Qualifiers that require values. If you use a qualifier that requires a value, you must specify a value. If you omit the qualifier, then the default value is applied.

For example, if you omit a starting job priority value from the /JOB_PRIORITY qualifier to the LOAD/PROGRAM command, the default is 16. The following shows how the /JOB_PRIORITY qualifier is listed in a command description.

```
/JOB_PRIORITY=n
```

Qualifiers can also accept other types of values. For more information, see Section 2.5.2.

- Qualifiers that affect command execution only if explicitly present. There is no corresponding default.

  For example, the /NOUNLOAD qualifier does not affect a command — DISMOUNT for example — if it is not specified. The following shows how the /NOUNLOAD qualifier is listed in a command description.

```
/NOUNLOAD
```

- Qualifiers that override other qualifiers. Sometimes a command has a qualifier that is automatically applied as a default. Other qualifiers are available to override the default qualifier.

  For example, the /BRIEF qualifier is automatically applied as a default for DIRECTORY listings. However, you can override this mode with /FULL and other DIRECTORY qualifiers.

  The following example shows how /BRIEF and /FULL are listed in the DIRECTORY command description:

```
/BRIEF (default)
/FULL
```

The command line is processed from left to right. If two or more contradictory qualifiers are present, then the rightmost qualifier overrides the others. For example:

```
ECL>  DELETE/LOG/NOLOG MYPROGRAM
```

For this DELETE command, only the NOLOG qualifier is accepted.

Some commands contain conflicting qualifiers that cannot be specified in the same command line. If you use incompatible qualifiers, the command interpreter usually displays an error message. The command descriptions in Chapter 3, ECL Dictionary, indicate which qualifiers cannot be used together.

2.5.2 Qualifiers That Accept Values

Qualifiers can accept the following types of values:

- Keywords
- Character strings
- Numeric values

When you enter a value for a qualifier, separate the qualifier and the value with an equal sign (=); for example:

```
/JOB_PRIORITY=3
```

To specify multiple values for a qualifier, separate the values with commas and enclose the list in parentheses. For example:

```
/ARGUMENTS=(PARAM1,PARAM2)
```

Some qualifier keyword values require additional data. In these cases, separate the keyword from its data with a colon (:). For example:

```
/PROTECTION=GROUP:RW
/PROTECTION=(SYSTEM:R,OWNER:RWED,GROUP:RE)
```

2.5.3 Abbreviating Qualifiers and Keywords

You can abbreviate any ECL qualifier to the fewest number of characters that uniquely represent the qualifier. (In determining a unique abbreviation, disregard the slash character (/) but include any underscore (_) and include NO in the negative form of a qualifier.) For example, because ECL has a /PROCESS_PRIORITY qualifier, the /PROGRAM_NAME qualifier command can be abbreviated to */PROG*, */PROGR*, or */PROGRA*, but not */PRO*, */PR*, or */P*.

You can abbreviate keywords to the fewest number of characters that provide a unique abbreviation within a set of possible keywords.

2.6 Entering Dates and Times

The SET TIME command accepts a date and time value. You specify this value in the absolute time format. Absolute time is a specific date or time of day. The format for an absolute time is as follows:

```
[dd-mmm-yyyy] [hh:mm:ss.c]
```

The fields are as follows:

Field	Meaning
dd	Day of the month; an integer in the range of 1–31
mmm	Month; specified as JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC
yyyy	Year; an integer
hh	Hour of the day; an integer in the range of 0–23
mm	Minute of the hour; an integer in the range of 0–59
ss	Seconds; an integer in the range of 0–59
c	Hundredths of a second; an integer in the range of 0–99

You can specify an absolute time value using either the date or the time, or both. Follow these rules:

- If you specify both the date and the time, type a space between them.
- If you specify the date, include the hyphen (-).
- You can truncate either the date or the time on the right.
- You can omit any of the fields within the date or time, as long as you type the punctuation marks that separate the fields.
- When fields are omitted, the system supplies default values. If you omit a date field, the default is the corresponding field for the current date.

Some examples of valid absolute time specifications follow:

Time Specification	Result
31-DEC-1988 12	12:00 noon on December 31, 1988
15	3:00 P.M., today
31-DEC	Midnight (00:00 o'clock) at the beginning of the 31st of December
15-	The 15th day of the current month and year, at midnight
18:30	6:30 P.M., today
00:00:00.2	Two-hundredths of a second after midnight, today

2.7 Executing an ECL Command

The RETURN key is recognized as a line terminator. Once you type a command at the ECL prompt, press RETURN to terminate the line and send it to the ECL command interpreter for execution. CTRL/Z is also recognized as a line terminator.

2.8 Deleting Characters

The DELETE key backspaces over the most recently entered character and deletes it. On a hardcopy terminal, the deleted letters are displayed between backslash characters so you can see what is being deleted. On a video display terminal, pressing the DELETE key erases the character from the screen and moves the cursor backwards.

2.9 Deleting Lines

You can use CTRL/U to cancel an entire line. When you cancel a line with CTRL/U, ECL ignores the line; the ECL prompt is not redisplayed.

2.10 File Specifications

This section provides the rules for using file specifications and device names with ECL commands. It contains information about the following:

- Specifying the parts of a file specification: the node, device, directory, file name, and file type
- Defaults that apply to the device and directory
- Using wildcards in file specifications to indicate groups of files

A file specification provides the system with all the information it needs to identify a file. A full file specification has the following format:

```
node :device:[directory]filename type,version
```

The fields are as follows:

node — The node number of a remote network node. No node identification is needed to access a VAXELN File Service volume by its volume name. Furthermore, you do not have to specify this field if the volume being accessed is on the current node. A node specification has the following format:

```
node["access-control-string"]
```

The *access-control-string* is an optional 0 to 42-character string containing login information to be sent to the remote node. The information is used to log you into the remote node; the remainder of the file specification is passed to the remote node and interpreted there.

device — The name of the device on which the file is stored or is to be written; this field can be a volume label (such as DISK$VOLUME), an explicit physical device name (such as DUA1), or null. If null, the default device for the destination node is applied; for a local device, the current session default, established either in the System Builder, by the first MOUNT_VOLUME procedure call, or by the SET DEFAULT command, is applied.

directory — The name of the directory under which the file is catalogued. As in VAX/VMS, the directory can be suffixed with subdirectory names, separated by periods. If you do not specify this field, the current directory default, established at login or by the SET DEFAULT command, is applied.

filename	The name of the file. It can have up to 39 characters, including alphanumeric characters, underscore (_), and dollar sign ($). No defaults apply to an input file name; but input file names are applied as defaults for output file names.
type	Identification of the structure or the type of data in the file. It can have up to 39 characters, including alphanumeric characters, underscore (_), and dollar sign ($).
version	The version number of the file. Versions are identified by a decimal number, which is incremented by 1 each time a new version of the file is created. The version number cannot exceed 65,535. For input files, the highest version is assumed by default; for output files, the default version is the next highest version number or, if no file exists with the specified name and type, a version number of 1.

The following are some examples of file specifications:

File-spec	Refers to:
[TEST]FILE1.DAT	The highest version of the file FILE1.DAT in the directory [TEST] on the default volume for the current node
25.276::FILE1.DAT	The highest version of the file FILE1.DAT in the current default directory on the default volume for node 25.276
DISK$TEST:[DATA]FILE1.DAT;23	The file FILE1.DAT, version 23, in the directory [DATA] on the volume DISK$TEST, wherever it resides
DUA0:FILE1.DAT	The highest version of the file FILE1.DAT in the current default directory on the local volume DUA0:

Observe the following rules when entering a file specification:

- The maximum size of a file specification, including all delimiters, is 255 characters.
- Punctuation marks and brackets are required to separate the fields of the file specification.
- The directory field applies only to files on disks (as opposed to files on tape).

- The node field is used only if your system is part of a network and is not needed to access a VAXELN File Service volume by its volume name or to access a local volume.
- The fields for file name, type, and version apply only to files on mass storage devices (such as disks and tapes).

2.11 Using Wildcards

Wildcard characters let you manipulate large numbers of files without naming them individually. ECL provides a wildcard character for use in directory specifications — the hyphen (-) — and two wildcard characters that you can use to refer to groups of files — the asterisk (*) and the percent sign (%).

The following sections describe the general rules for using wildcard characters; particular uses of wildcard characters vary with the individual ECL commands. For information on the use of wildcards with a particular command, see Chapter 3, the ECL Dictionary.

2.11.1 Directory Specifications

The hyphen (-) wildcard is used in a directory specification to refer to the directory one level up from the current one. For example, if your current default directory is [JONES.TEST] and you want to set the default to [JONES], enter the following command:

```
ECL> SET DEFAULT [-]
```

2.11.2 Input File Specifications

Wildcard characters let you manipulate large numbers of files without naming them individually. The following sections describe how to use wildcard characters in file specifications for input files.

2.11.2.1 The Asterisk (*) Wildcard

Use the * wildcard to match the following:

- An entire field, or a portion of it, in the file name and file type fields
- The entire version number field

For example, the following file specification selects all versions of all files in the [FROGMAN] directory:

```
ECL> DIRECTORY [FROGMAN]*.*;*
```

2.11.2.2 The Percent (%) Wildcard

The % wildcard stands for any single character in the position that it occupies. You can use the percent sign in the file name and file type fields. You cannot, however, use the percent sign in the version number field.

The following example selects, within the [FROGMAN] directory, all DAT files that have names beginning with FOO followed by a single character:

```
ECL> DIRECTORY [FROGMAN]FOO%.DAT;*
```

Files that might be selected include FOO1.DAT, FOO2.DAT, and so forth. Files with fewer or more characters in the file name — for example, FOO.DAT or FOO10.DAT — would not be selected.

You can specify the percent sign as many times as necessary in a file name or file type. For example, the following file specification is valid:

```
ECL> DIRECTORY [FROGMAN]F%%%.D%%;*
```

2.11.3 Output File Specifications

The asterisk (*) wildcard is allowed in the name, type, and version fields for output file specifications. Use an asterisk in an output file specification when you want the output files to match the corresponding field in the input files.

You can use the asterisk wildcard to copy or rename an input file to an output file with a matching file name or type. For example, the following sequence renames the file FOO.DAT;1, from the current default disk and directory, FOO.OLD:

```
ECL> RENAME FOO.DAT;1 *.OLD
```

2.12 Device Names

Each physical device is uniquely identified by a device name. A device name has the following format:

```
ddcu
```

The fields are as follows:

dd	Device code. Valid device codes for VAXELN are shown in the device tables in Chapter 3 of the *VAXELN Host System Guide* and in Chapter 10 of the *VAXELN Run-Time Facilities Guide*. The disk device codes include DU (MSCP disk), DD (TU58), and DQ (RB-type disks). The tape device code is MU (MSCP tape).
c	Controller designation. The controller designation, along with the unit number, identifies the location of the device within the hardware configuration of the system. Controller designations are alphabetic letters A through Z.
u	Unit number. The unit number, along with the controller designation, identifies the location of the device within the hardware configuration of the system. Unit numbers are decimal numbers 0 through 65,535.

When entering a device name as part of a file specification, the device name must be followed by a colon (:).

Whenever a disk or tape is mounted on a device, the system recognizes it as a *volume*. To access a file on a volume, specify the name of the device — either the explicit device name, such as DUA1, or the volume label, such as DISK$TEST or TAPE$TEST (assuming that the device was initialized with the volume name TEST). If you do not specify a device name, the current default device name is supplied.

2.13 User Identification Code (UIC)

The UIC tells what group a user belongs to, followed by the user's unique identification within that group. The format of a UIC is as follows:

```
[group,member]
```

where:

- *group* is the number of the group you belong to. It is an octal number in the range of 0 through 37776.
- *member* is your unique member number, an octal number in the range of 0 through 177776.

You can omit leading zeros when you specify group and member numbers in numeric format. The brackets are required.

If you attempt to access a file, your UIC is compared to the owner UIC of the object. Once the two UICs are compared, you are put into one or more of the following *user categories*:

SYSTEM	Users with low group numbers, usually from 1 through 10(octal).
OWNER	The user with the same UIC as the user who created (and therefore owns) the object.
GROUP	All users, including the owner, who have the same group number in their UICs as the object's owner.
WORLD	All users, including those in the first three categories.

The file's protection code determines what type of access each user category has to the file. With UIC-based protection you can specify any of the following types of access:

- READ
- WRITE
- EXECUTE
- DELETE

2.13.1 The Protection Code

The protection code for a file lists each user category followed by the type of access that it has to the file. For example:

```
ECL> SET PROTECTION=(SYSTEM:RWED,OWNER:RWED,GROUP:RE,WORLD:RE) SURVEY.DIR
```

This protection code specifies that anyone in the SYSTEM and OWNER categories has READ, WRITE, EXECUTE, and DELETE access to the file SURVEY.DIR. Anyone in the GROUP and WORLD categories has READ and EXECUTE access.

The following syntax rules apply to protection codes:

- When you specify a protection code, abbreviate access types to one character (R, W, E, or D). User categories can be entered in full or truncated to any number of characters. Separate each user category from its access types with a colon or an equal sign. If you specify more than one user category, separate the categories with commas and enclose the entire code in parentheses.
- You can specify the user categories and access types in any order. If you omit an access type for a user category, that category of user is denied that type of access. If you want to deny all access to a user category, specify the user category but omit the colon and do not list any access types. The following example denies all access to those in the WORLD category:

  ```
  ECL> SET PROTECTION=(SYSTEM:RWED,OWNER:RWED,GROUP:R,WORLD) HIRE.DAT
  ```

- When you omit a user category from a protection code applied to one or more files, all access is denied for that category.
- When you omit a user category from a protection code applied to an entire volume, that category is denied all types of access. However, SYSTEM and OWNER always have access on magnetic tape volumes, regardless of the protection specified.

To determine access to an object, the system uses the object's protection code for each user category. The system checks user categories from outermost to innermost, in the following sequence:

1. WORLD
2. GROUP
3. OWNER
4. SYSTEM

You can access an object as soon as the system finds a user category that you fit into that gives you the access you have requested.

To deny access to a user category, be sure to deny access to all outer categories. For example, the following protection code denies DELETE access to a file's owner:

```
SYSTEM RWED, OWNER RW  GROUP RW, WORLD RWED
```

However, the owner can still delete the file because the owner is also a member of the WORLD category, which has DELETE access.

2.14 Establishing and Changing UIC-Based Protection

This section describes how to establish or change the UIC-based protection for volumes, directories, and files.

2.14.1 Volumes

Volume protection is coded into the home block of the disk or tape when it is initialized. It can be specified or defaulted from the device protection code. Set volume protection when you initialize the volume (INITIALIZE command).

For disk volumes, the system provides protection at the file, directory, and volume levels. For tape volumes, the system provides protection only at the volume level. The protection applied to a magnetic tape volume applies equally to all files on the volume.

When applied to volumes, access types have the following meanings:

READ	The right to examine or copy files on a volume
WRITE	The right to modify or to write existing files on a volume
EXECUTE	The right to create files on the volume and write into them
DELETE	The right to delete files on the volume

If you do not specify the protection when a volume is initialized, all users have all types of access. Moreover, system users and the owner are always given both READ and WRITE access, regardless of what you specify in a protection code. Granting a user category WRITE access automatically permits READ access.

Keep the following points in mind when setting the protection for a magnetic tape volume:

- EXECUTE and DELETE access are not valid for magnetic tapes.
- File protection on a given magnetic tape can be changed only if the tape is reinitialized.

2.14.2 Directories

Each directory file has a protection associated with it. Directory protection can be specified or defaulted from the directory level above it. Set directory protection with the SET FILE and SET PROTECTION commands.

When applied to directories, access types have the following meanings:

READ	The right to examine or list the directory file
WRITE	The right to modify or write to the directory file
EXECUTE	The right to look up files in the directory if you specify the file name
DELETE	The right to delete the directory file

READ access lets you display the contents of the directory file with the DIRECTORY command. You can use wildcards (explicitly or implicitly). In addition, you can access any file catalogued in the directory unless the file's protection denies you access. However, if a directory denies you READ access, you cannot look up or access even those files that permit access to users in your group.

WRITE access lets you write to the directory file. You must have both READ and WRITE access to a directory to create files in it, rename files, or perform any file operation that involves changes to the directory file.

EXECUTE access has a special meaning when it is applied to directories. EXECUTE access lets you use the DIRECTORY command to look up files that you can identify by name. In addition, if you do not perform an operation that modifies the directory file, you can access files that are not protected against users in your category. However, you cannot list all the entries in the directory by using wildcards. Therefore, EXECUTE access provides some, but not all, of the operations that READ provides.

DELETE access lets you delete a directory file. Before you delete a directory file, do the following:

1. Remove all the files that are in it.
2. Use the SET PROTECTION command to assign DELETE access to the OWNER category of the directory file.

Directory protection can override the protection of individual files in the directory. Make sure your files are adequately protected at both the directory and file level.

2.14.3 Files

Each file on a disk has its own protection code. You can specify a protection code when you create a file (CREATE/PROTECTION) or change the protection for an existing file (SET FILE or SET PROTECTION). If you do not define a protection code for a file when you create it, the system applies the default protection defined for the volume on which the file is created.

Use the ECL command DIRECTORY/PROTECTION to display the current file protection associated with a specific file or group of files.

When applied to files, access types have the following meanings:

READ	The right to examine or copy the file
WRITE	The right to modify or write to the file
EXECUTE	The right to execute a file that contains an executable program image
DELETE	The right to delete the file

Note the following:

- READ access also implies EXECUTE access.
- To open a file for a write operation, you must have both READ and WRITE access.
- To delete a file you must have DELETE access to both the file and the directory that contains the file.

Chapter 3

ECL Dictionary

This chapter provides reference information on the VAXELN command language utility (ECL) commands. The following commands are described:

COPY
CREATE
CREATE/DIRECTORY
DEFINE/HELP
DELETE
DIRECTORY
DISMOUNT
EXECUTE
HELP
INITIALIZE
LOAD/PROGRAM
Login Procedure
LOGOUT
MOUNT
PURGE
RENAME
RUN
SET DEFAULT
SET FILE
SET PROTECTION
SET TIME
SET UIC
SHOW DEFAULT
SHOW DEVICES
SHOW TIME
SHOW UIC
TYPE
UNLOAD/PROGRAM

COPY

Creates a new file by copying from an existing file.

Format

COPY *input-file-spec output-file-spec*

Parameters

input-file-spec
Specifies the name of an input file to be copied.

No wildcard characters are allowed in the file specification.

output-file-spec
Specifies the name of the output file into which the input file will be copied.

You must specify at least one field in the output file specification. If the device or directory is not specified, your current default device and directory are used. The COPY command replaces any other missing fields — file name, file type, or version number — with the corresponding field of the input file specification.

The asterisk wildcard character can be used in place of the file name, file type, and/or version number. The COPY command uses the corresponding field in the input file specification to name the output file. For example:

```
ECL> COPY A.A;1 *.C
```

This COPY command creates the file A.C;1 in the current default directory on the current default device.

When you use the /LOG qualifier, the COPY command displays the following:

1. The file specifications of the input and output files
2. The number of blocks or the number of records copied, depending on whether the file is copied on a block-by-block or record-by-record basis

Examples

1.
```
ECL> COPY TEST.DAT NEWTEST.DAT
```

   The COPY command copies the contents of the file TEST.DAT from the default disk and directory to a file named NEWTEST.DAT on the same disk and directory. If a file named NEWTEST.DAT already exists, the COPY command creates a new version of it.

2.
```
ECL> COPY/LOG TEST.DAT NEWTEST.DAT
%COPY-I-COPIED, DISK$EXAMPLE:[EXAMPLE]TEST.DAT;1 copied to
DISK$EXAMPLE:[EXAMPLE]NEWTEST.DAT;1 (1 block)
```

   The /LOG qualifier causes the COPY operation to display the input and output file specifications and the number of blocks copied.

Description

The COPY command creates a new file by copying from an existing file. If a field of the output file specification is missing or contains an asterisk wildcard character, the COPY command uses the corresponding field from the input file to name the output file.

Version Numbers

If no version numbers are specified for input and output files, the COPY command by default assigns a version number to the output file that is one of the following:

- The version number of the input file
- A version number one greater than the highest version number of an existing file with the same file name and file type

If the output file specification has an explicit version number, the COPY command uses that number for the output file specification. If a higher version of the output file already exists, no message is issued and the file is copied. If a version of the output file with the same version number already exists, a message is issued and the input file is *not* copied.

File Protection and Creation Dates

The COPY command considers an output file to be a new file; therefore the creation date for the new file is set to the current time and date.

The protection of the output file is determined by the default file protection specified when the volume was initialized (see INITIALIZE/FILE_PROTECTION). Use the SET FILE or SET PROTECTION commands to change the output file protection after the file has been copied.

The owner of the output file will be the same as the owner of the directory file the output file resides in.

Qualifiers

/LOG
/NOLOG (default)
Controls whether the COPY command displays the file specification of the copied file.

CREATE

Creates a sequential disk file from the records that follow the command in the input stream.

Format

CREATE *file-spec*

Parameter

file-spec
Specifies the name of the input file to be created.

If you omit either the file name or the file type, the CREATE command does not supply any defaults; the file name or file type is null. If you do not specify a file version number, and if a file already exists with the same file name and file type as the file specification, the CREATE command creates a new version of the file.

If the device and directory are not specified, your current default device and directory are used.

No wildcard characters are allowed in the file specification.

Description

The CREATE command creates a new sequential disk file. The contents of the file are determined by what you type after the command line. Each separate line that you type becomes a record in the newly created file. When you have finished entering records, use CTRL/Z to signal the end of input.

If you use an existing file specification with the CREATE command, the newly created file has a higher version number than any existing file(s) with the same specification.

Normally, the owner of the output file will be the same as the owner of the directory file in which the output file resides. However, you can use the /OWNER_UIC qualifier to specify a particular owner.

Qualifiers

/ALLOCATION=n
Forces allocation for the file to the number of 512-byte blocks specified by *n*. If you specify /ALLOCATION, the file is created without inputting the file contents from the input stream.

/LOG
/NOLOG (default)
Controls whether the CREATE command displays the file specification of the file it has created.

/OWNER_UIC=uic
Specifies the user identification code (UIC) to be associated with the file being created. Specify the UIC using the standard UIC format as described in Section 2.13.

/PROTECTION=(code)
Defines the protection code to be applied to the file. Specify the protection code using the standard protection code format as described in Section 2.13.1.

If you omit the /PROTECTION qualifier, the command applies the default protection for the volume on which the file is created.

Examples

1.
```
ECL> CREATE A.DAT
First input line for A.DAT
Second input line for A.DAT
   .
   .
   .
^Z
ECL>
```

After you issue the CREATE command from the terminal, the system reads input lines into the sequential file A.DAT until CTRL/Z terminates the input.

2.
```
ECL> CREATE/ALLOCATION=10 A.DAT
```

The CREATE command with the /ALLOCATION qualifier creates a contiguous sequential file with fixed-length records of 512 bytes. The file in this example is created with an initial allocation of 10 blocks.

CREATE/DIRECTORY

Creates a new directory or subdirectory for cataloguing files. The /DIRECTORY qualifier is required.

Format

CREATE/DIRECTORY *directory-spec*

Restrictions

When you create a first-level directory, you must have write access to the master file directory (MFD) of the volume on which you are creating the directory.

When you create a subdirectory, any intermediate directories must already exist. CREATE/DIRECTORY creates only the lowest-level directory in the directory specification. In addition, you must have write access to the lowest-level directory.

Parameter

directory-spec
Specifies the name of the directory or subdirectory to be created.

The directory specification must contain a directory name. A device name is optional. If you do not specify a device name, your current default device is used. When you create a subdirectory, separate the names of the directory levels with periods.

Note that the command creates only the lowest-level directory in the specification; any intermediate directories must already exist.

No wildcard characters are allowed in the directory specification.

Description

The CREATE/DIRECTORY command can be used to create new directories as well as subdirectories. Use the SET DEFAULT command to change from one directory to another. Use the SET FILE or SET PROTECTION command on the directory file to change the directory protection.

Qualifiers

/LOG
/NOLOG (default)
Controls whether the CREATE/DIRECTORY command displays the directory specification of the directory after creating it.

/OWNER_UIC=uic
Specifies the user identification code (UIC) to be associated with the directory being created. Specify the UIC using the standard UIC format as described in Section 2.13.

Examples

1.
```
ECL> CREATE/DIRECTORY [MALCOLM]
```

   This CREATE/DIRECTORY command creates a directory named [MALCOLM] on the default device.

2.
```
ECL> CREATE/DIRECTORY/LOG DISK$EXAMPLE:[EXAMPLE]
%CREATE-I-CREATED, DISK$EXAMPLE:[EXAMPLE] created
```

   This CREATE/DIRECTORY command creates a directory named [EXAMPLE] on the device DISK$EXAMPLE. The /LOG qualifier causes the CREATE/DIRECTORY command to display the name of the directory that it creates.

DEFINE/HELP

Specifies the help file to be accessed by the HELP command. The /HELP qualifier is required.

Format

DEFINE/HELP *file-spec*

Parameter

filespec
Gives the default specification for the file the HELP command uses to provide help. No wildcard characters are allowed in the file specification.

Description

The DEFINE/HELP command specifies the help file that is accessed by the HELP command. The initial default help file specification when you begin an ECL session is DISK$DEFAULT_VOLUME:[000000]ECL.HLP.

NOTE

The DIGITAL-supplied help file ECL.HLP resides in the ELN$: directory on the host system. If you choose to access this file for help with ECL commands, you can either copy the file to a local disk on the target system or use DEFINE/HELP to specify the file's location on the network.

Example

```
ECL> DEFINE/HELP 25.329::ELN$:ECL.HLP
```

This DEFINE/HELP command establishes the file 25.329::ELN$:ECL.HLP as the help file to be accessed when the HELP command is issued.

DELETE

Deletes one or more files from a mass storage disk volume.

Format

DELETE *file-spec*

Parameter

file-spec
Specifies the name of the file(s) to be deleted from a mass storage disk volume. You must specify a version number. You can use wildcard characters in the file name, file type, and file version fields. If the file specification contains only a file type, the DELETE command deletes all files of that type.

If you omit the device name and/or directory specification, the current default device and directory are assumed.

In the version number of a file specification, a semicolon followed by no file version number or by a version number of 0 results in the deletion of the latest version of the file.

Qualifiers

/CONFIRM
/NOCONFIRM (default)
Controls whether a request is issued before each individual DELETE operation to confirm that the operation should be performed on that file.

When the system issues the prompt, you can issue any of the following responses:

Affirmative	Negative	Other
YES	NO	QUIT
TRUE	FALSE	CTRL/Z
1	0	ALL
	RETURN	

You can use any combination of upper- and lowercase letters for word responses. Word responses can be abbreviated to one or more letters (for example, T, TR, or TRU for TRUE). Affirmative answers are YES, TRUE, and 1. Negative answers are NO, FALSE, 0, and RETURN. QUIT or CTRL/Z indicates that you want to stop processing the command at that point. When you respond with ALL, the command continues to process, but no further prompts are given. If you type a response other than those in the list, the prompt will be reissued.

/LOG
/NOLOG (default)
Controls whether the DELETE command displays the file specification of each file after deleting it.

Examples

1.
```
ECL> DELETE COMMON.SUM;2
```

   This DELETE command deletes the file COMMON.SUM;2 from the current default disk and directory.

2.
```
ECL> DELETE/LOG ALPHA.TXT;*
%DELETE-I-FILDEL, DISK$EXAMPLE:[EXAMPLE]ALPHA TXT;1 deleted (1 block)
%DELETE-I-FILDEL, DISK$EXAMPLE:[EXAMPLE]ALPHA.TXT;2 deleted (2 blocks)
%DELETE-I-TOTAL, 2 files deleted (3 blocks)
```

   This DELETE command deletes all versions of the file ALPHA.TXT. The /LOG qualifier causes DELETE to display the name of each file deleted, the total number of files deleted, and the number of blocks recovered from the operation.

3.
```
ECL> DELETE/CONFIRM [EXAMPLE.TEMP]*.TMP;*
DISK$EXAMPLE:[EXAMPLE.TEMP]AVERAGE.TMP;1, delete? [N]: Y
DISK$EXAMPLE:[EXAMPLE.TEMP]TEMP.TMP;1, delete? [N]: N
DISK$EXAMPLE:[EXAMPLE.TEMP]TEST.TMP;1, delete? [N]: N
DISK$EXAMPLE:[EXAMPLE.TEMP]TODAY.TMP;1, delete? [N]: Y
```

This DELETE command examines all versions of files with file type TMP in the subdirectory [EXAMPLE.TEMP] on the current default device. Before deleting each file, it requests confirmation that the file should be deleted. The default response — N for NO — is given in square brackets.

DIRECTORY

Provides a list of files or information about a file or group of files.

Format

DIRECTORY *[file-spec]*

Restrictions

Requires read (R) access to the directories to obtain information other than the file name.

Parameter

file-spec

Specifies the file(s) to be listed. The syntax of a file specification determines which file(s) will be listed, as follows:

- If you do not enter a file specification, the DIRECTORY command lists all versions of the files in the current directory.
- If you specify only a device name, the directory command uses your default directory specification.
- Whenever the file specification does not include a file name and file type, all versions of all files in the specified directory are listed.
- If a file specification contains a file name and/or file type and no version number, the DIRECTORY command lists all versions.
- If a file specification contains only a file name, the DIRECTORY command lists all files in the current default directory with that name, regardless of file type and version number.
- If a file specification contains only a file type, the DIRECTORY command lists all files in the current default directory with that file type, regardless of the file name and version number.

You can use wildcard characters in the file name, file type, or version number fields of the file specification to list all files that satisfy the components you specify.

DIRECTORY

Description

The DIRECTORY command lists the files contained in a directory. Certain qualifiers cause additional information to be displayed along with the names of the files.

The output of the DIRECTORY command depends on certain formatting qualifiers and their defaults. These qualifiers are /DATE, /FULL, /OWNER, and /SIZE. However, the files that are listed always appear in alphabetical order, with the highest-numbered versions first.

Qualifiers

/BRIEF (default)
Includes only the file name, type, and version number of each file to be listed. The brief format lists the files in alphabetical order from left to right on each line, in descending version-number order. However, the /BRIEF qualifier, whether specified explicitly or in effect by default, is overridden whenever one of the following formatting qualifiers is specified in the command: /DATE, /FULL, /OWNER, /PROTECTION, /SECURITY, or /SIZE.

/DATE
/NODATE (default)
Includes the creation date for each specified file. If you omit this qualifier, the default is /NODATE.

/FULL
Lists the following information for each file:

File name
File type
Version number
Number of blocks used
Number of blocks allocated
Date of creation
Date of last backup
Date last modified
Date of expiration
File owner's UIC
File protection
File identification number (FID)
File organization
Other file attributes

Record attributes
Record format
Access control list (ACL)

The /FULL qualifier overrides the default brief listing format.

/GRAND_TOTAL
Suppresses both the per-directory total and individual file information. /GRAND_TOTAL displays only the total line for all files that have been selected. (See the /TRAILING qualifier for information on displaying directory totals.)

/OWNER
/NOOWNER (default)
Controls whether the file owner's UIC is listed.

/PROTECTION
/NOPROTECTION (default)
Controls whether the file protection for each file is listed.

/SECURITY
Controls whether information about file security is displayed. Using the /SECURITY qualifier provides the same information as the two qualifiers /OWNER and /PROTECTION together.

/SIZE[=option]
/NOSIZE (default)
Provides the file size in blocks used and/or allocated for each file listed, according to the option you specify. If you specify /SIZE without an option, the listing provides the file size in blocks used. The options you can specify are:

ALL	Lists the file size both in blocks used and blocks allocated
ALLOCATION	Lists the file size in blocks allocated
USED	Lists the file size in blocks used

/TOTAL
Suppresses the listing of all individual file information and displays only the trailing lines, as described under the /TRAILING qualifier.

By default, the output format is /BRIEF, which gives this total, but also lists all the file names, file types, and their version numbers.

/TRAILING
/NOTRAILING

Controls whether trailing lines that summarize the following information are output:

- Number of files listed
- Total number of blocks used per directory
- Total number of blocks allocated
- Total number of directories and total blocks used and/or allocated in all directories (only if more than one directory is listed)

By default, the output format includes most of the summary information. The /SIZE and /FULL qualifiers determine more precisely what summary information is included. If you omit /SIZE or /FULL, only the number of files is displayed and possibly the total number of directories, if applicable. If you specify the /SIZE qualifier, the number of blocks is also displayed, according to the size option selected (USED and/or ALLOCATION). If you specify the /FULL qualifier, the number of files as well as the number of blocks used and allocated are displayed.

Examples

1.
```
ECL> DIRECTORY
```

   This DIRECTORY command lists all versions of all files in the current default disk and directory in the brief format. The heading identifies the disk and directory, and the trailing line gives the total number of files.

2.
```
ECL> DIRECTORY AVERAGE.DAT

Directory DISK$EXAMPLE:[EXAMPLE]

AVERAGE.DAT;2          AVERAGE.DAT;1

Total of 2 files
```

   This DIRECTORY command lists all versions of the file AVERAGE.DAT in the current default disk and directory.

3.
```
ECL> DIRECTORY AVERAGE.*

Directory DISK$EXAMPLE:[EXAMPLE]

AVERAGE.EXE;6          AVERAGE.OBJ;6          AVERAGE.PAS;6

Total of 3 files.
```

This DIRECTORY command lists all versions of all files with the file name AVERAGE in the current default disk and directory.

4.
```
ECL> DIRECTORY/SIZE=USED/DATE/PROTECTION AVERAGE

Directory DISK$EXAMPLE:[EXAMPLE]

AVERAGE.EXE;6       6       10-APR-1987 15:43 (RWED,RWED,RWED,RE)
AVERAGE.PAS;6       2        2-APR-1987 10:29 (RWED,RWED,RWED,RE)
AVERAGE.OBJ;6       2        9-APR-1987 16:27 (RWED,RWED,RWED,RE)

Total of 3 files, 10 blocks.
```

This DIRECTORY command lists all versions of all files with the file name AVERAGE in the current default disk and directory, along with size, date, and protection information.

5.
```
ECL> DIRECTORY/FULL AVERAGE.PAS

Directory DISK$EXAMPLE:[EXAMPLE]

AVERAGE.PAS;1              File ID:  <UNKNOWN>
Size:            1/3          Owner:    [1,1]
Created:   3-SEP-1987 15:16   Revised:   <None specified> (0)
Expires:   <None specified>   Backup:    <No backup done>
File organization:  Sequential
File attributes:    Allocation = 3, Extend = 0
Record format:      Variable length
Record attributes:  Carriage return carriage control
File protection:    System:RWED, Owner:RWED, Group:RE, World.
Access Cntrl List   <UNKNOWN>

Total of 1 file, 1/3 blocks.
```

This DIRECTORY command lists all versions of the file AVERAGE.PAS in the current default disk and directory in the full format.

6.
```
ECL> DIRECTORY BLOCKXXX
```

This DIRECTORY command locates all versions and types of files in the default device and directory whose names begin with BLOCK and end with any three additional characters. The default output format is brief.

7. `ECL> DIRECTORY/TOTAL/SIZE=ALL`

   This DIRECTORY command outputs only a header and a trailing line that identifies the total number of files, and the blocks used and allocated for all versions of all files in the default disk and directory.

8. `ECL> DIRECTORY/SIZE=ALL 25.239::DISK$EXAMPLE:[EXAMPLE]*.COM`

   This DIRECTORY command lists all versions of all files with the file type COM in the directory EXAMPLE on node 25.239 and device DISK$EXAMPLE. The listing includes the file size in both blocks used and blocks allocated for each file.

DISMOUNT

Releases a disk or magnetic tape volume that was previously mounted with the MOUNT command or when the system was bootstrapped.

Format

DISMOUNT *device-name[:]*

Parameter

device-name[:]
Specifies the name of the device to be dismounted.

Qualifiers

/TAPE
Specifies that the device to be dismounted is a magnetic tape volume.

/UNLOAD (default)
/NOUNLOAD
Controls whether the DISMOUNT command unloads the physical device on which a tape volume is mounted and makes the device not ready. The /NOUNLOAD qualifier pertains only to tape volumes; it is used to keep the device and volume in a ready state.

Examples

1. `ECL> DISMOUNT DUA0:`

   This DISMOUNT command releases access to the volume mounted in DUA0:.

2. `ECL> DISMOUNT/TAPE/NOUNLOAD MUA0:`

   This DISMOUNT command releases access to the volume mounted in MUA0:; the /NOUNLOAD qualifier requests that the volume remain in a ready state.

EXECUTE

Creates a new job that executes a specified program image.

Format

EXECUTE *prg-name*

Restrictions

The current default device and directory information maintained during an ECL session is not passed to — and is not obtainable by — programs invoked with EXECUTE. (The current default user name and UIC, by contrast, are propagated to an invoked program.)

Parameter

prg-name
Specifies the name of the program the job is to run. The program must have been specified to the System Builder or loaded with either the LOAD/PROGRAM command or the LOAD_PROGRAM procedure.

Description

The EXECUTE command creates a new job, which executes the specified program image. Note that the EXECUTE command runs a program image already installed in the system (via the System Builder, the LOAD/PROGRAM command, or the LOAD_PROGRAM procedure); it cannot add a new image to the system. (To execute an uninstalled image, use the RUN command.) Once the job is created, ECL prompts you for the next command without waiting for the job to complete. However, if the /WAIT qualifier is specified, ECL will wait for the job to complete before prompting for the next command.

Qualifiers

/ARGUMENTS=(arg[,...])
Specifies from 1 to 8 optional arguments to be passed to the program. Arguments can also be supplied to the program with the System Builder, as part of a program description. Note that any arguments supplied with

the /ARGUMENTS qualifier override arguments supplied with the System Builder.

If you specify only one parameter, you can omit the parentheses.

The commas delimit individual parameters. To specify a parameter that contains any special characters or delimiters, enclose the parameter in quotation marks. Each parameter can have up to 100 characters.

ECL always passes a minimum of 8 arguments to the invoked program. By convention, the name of the user's terminal — for example, CONSOLE: or TTA0: — is passed as the first three arguments (corresponding to SYS$INPUT, SYS$OUTPUT, and SYS$ERROR). Arguments specified with /ARGUMENTS are passed starting at the fourth argument. If no arguments are specified using /ARGUMENTS, the remaining arguments are passed as null strings ("").

To invoke programs that do not conform to the SYS$INPUT/ SYS$OUTPUT/ SYS$ERROR calling convention — or to specify a different terminal from the one you are currently using — specify the /NOSTANDARD_ARGUMENTS qualifier.

/STANDARD_ARGUMENTS (default)
/NOSTANDARD_ARGUMENTS
Controls whether the first three program arguments passed to the program give the name of the user's terminal. By default, the terminal names *are* passed, and correspond to SYS$INPUT, SYS$OUTPUT, and SYS$ERROR, respectively. Any program arguments you specify with the /ARGUMENTS qualifier are passed starting at the fourth program argument.

Use /NOSTANDARD_ARGUMENTS to prevent EXECUTE from passing the terminal name as the first three program arguments. If /NOSTANDARD_ARGUMENTS is specified, any arguments you specify with the /ARGUMENTS qualifier are passed starting at the first program argument. (The /ARGUMENTS and /NOSTANDARD_ARGUMENTS qualifiers are illustrated below.)

/WAIT
/NOWAIT (default)
Controls whether the EXECUTE command waits for the program to complete execution before prompting for the next command.

NOTE

If the program image you are executing performs terminal screen I/O, you should specify the /WAIT qualifier; this avoids possible contention for the terminal.

Examples

1. `ECL> EXECUTE MYPROGRAM`

EXECUTE creates a job to execute the installed program MYPROGRAM and passes the following program arguments:

```
Program Argument 1 => "CONSOLE:"
Program Argument 2 => "CONSOLE:"
Program Argument 3 => "CONSOLE:"
Program Argument 4 => ""
Program Argument 5 => ""
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
Program Argument 9 => ""
Program Argument 10 => ""
Program Argument 11 => ""
```

2. `ECL> EXECUTE MYPROGRAM/NOSTANDARD_ARGUMENTS`

EXECUTE creates a job to execute the installed program MYPROGRAM and passes the following program arguments:

```
Program Argument 1 => ""
Program Argument 2 => ""
Program Argument 3 => ""
Program Argument 4 => ""
Program Argument 5 => ""
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
```

3. `ECL> EXECUTE MYPROGRAM/ARGUMENTS=(PARAMETER1,PARAMETER2)`

EXECUTE creates a job to execute the installed program MYPROGRAM and passes the following program arguments:

```
Program Argument 1 => "CONSOLE:"
Program Argument 2 => "CONSOLE:"
Program Argument 3 => "CONSOLE:"
Program Argument 4 => "PARAMETER1"
Program Argument 5 => "PARAMETER2"
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
Program Argument 9 => ""
Program Argument 10 => ""
Program Argument 11 => ""
```

4. `ECL> EXECUTE MYPROGRAM/NOSTANDARD_ARGUMENTS/ARGUMENTS=PARAMETER1`

EXECUTE creates a job to execute the installed program MYPROGRAM and passes the following program arguments:

```
Program Argument 1 => "PARAMETER1"
Program Argument 2 => ""
Program Argument 3 => ""
Program Argument 4 => ""
Program Argument 5 => ""
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
```

5. `ECL> EXECUTE EDISPLAY/WAIT/NOSTAND/ARG=(TTA0:,TTA0:,TTA0:,"MEMORY/RATE=0 ::2")`

EXECUTE creates a job to execute the installed utility program EDISPLAY and passes the following program arguments:

```
Program Argument 1 => "TTA0:"
Program Argument 2 => "TTA0:"
Program Argument 3 => "TTA0:"
Program Argument 4 => "MEMORY/RATE=0 ::2"
Program Argument 5 => ""
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
```

The first three arguments cause the EDISPLAY utility to run on the terminal device TTA0: rather than on the console. The fourth argument passes a keyword and a qualifier to EDISPLAY. Once EDISPLAY is started, ECL waits for EDISPLAY to be terminated (with CTRL/C, CTRL/Y, CTRL/Z, or E) before prompting for the next command. (See Chapter 4, Using EDISPLAY, for details on the EDISPLAY utility.)

HELP

Displays information from the current default help file.

Format

HELP *[keyword...]*

Parameter

keyword...
Specifies one or more keywords that refer to the topic or subtopic on which you want information from a help file. Information within HELP is arranged in a hierarchical manner. The levels are:

1. None — If you do not specify a keyword, HELP lists the topics that are documented in the current default help file. Each item in the list is a keyword in the first level of the hierarchy.
2. Topic — If you specify a keyword that names a topic, HELP describes the topic as it is documented in the current default help file. Keywords for additional information available on this topic are listed.
3. Topic subtopic — If you specify a subtopic following a topic, HELP provides a description of the specified subtopic.

Description

The HELP command opens the current default help file and displays information from that file.

At the beginning of an ECL session, the default help file specification is DISK$DEFAULT_VOLUME:[000000]ECL.HLP. ECL.HLP is the DIGITAL-supplied help file that provides information on ECL commands. However, the file ECL.HLP is not automatically available to HELP. If you wish to access ECL.HLP — or any other help file — you must do one of the following:

- If your VAXELN target system has a local disk, you can copy the help file to the local disk. Use the DEFINE/HELP command to make the file's name and location known to HELP, unless the initial default help file specification — DISK$DEFAULT_VOLUME:[000000]ECL.HLP — is adequate.

- To establish a help file on a remote disk, use the DEFINE/HELP command to make the file's name and location on the network known to HELP.

To use the HELP facility in its simplest form, issue the HELP command from your terminal. HELP displays a list of topics at your terminal. If you want to see more information on one of the topics, type HELP *topic* at the command level prompt. The system will display information on that topic. If the topic has subtopics, HELP will list the subtopics. If you want information on one of the subtopics, type HELP *topic subtopic* at the command level prompt.

Examples

1.
```
ECL> HELP
Information available

      (List of ECL topics)

.
ECL>
```

Issuing the HELP command without any qualifiers or parameters produces a display of the HELP topics available from the default help file, ECL.HLP. The ECL.HLP file must have been copied to a local disk on the target system or established on a remote disk with a DEFINE/HELP command.

2.
```
ECL> HELP COPY
COPY

    Creates an exact copy of the input file to the output file

    Format:

        COPY input-file-spec  output-file-spec

    Additional information available:

    Parameters          Command_Qualifier
    /LOG                Examples
```

You can get HELP on a specific topic or subtopic. This example requests HELP on the topic COPY.

INITIALIZE

Formats and writes a label on a mass storage volume.

Format

INITIALIZE *device-name[:] volume-label*

Parameters

device-name[:]
Specifies the name of the device on which the volume to be initialized is physically mounted.

volume-label
Specifies the identification to be encoded on the volume. For a disk volume, you can specify a maximum of 12 characters, using alphanumeric characters and the characters dollar-sign ($) and underscore (_); for a magnetic tape volume, you can specify a maximum of 6 alphanumeric characters. Letters are automatically converted to uppercase.

Description

The INITIALIZE command, for disk volumes, initializes a disk for use as a file-structured volume. Disks must be initialized once before they are used. Disks cannot be initialized if they are mounted or open for logical I/O.

For magnetic tape volumes, the INITIALIZE command initializes a tape for use as a file-structured volume that conforms to ANSI standard X3.27–1978. Tapes must be initialized before they are used.

Qualifiers

/ACCESSED=n
Specifies, for disk volumes, the number of directories to be cached by the system for ready access.

Legal values for *n* are 0 through 255. If /ACCESSED is not specified, the INITIALIZE command uses the default value of 3.

/CLUSTERSIZE=n

Defines, for disk volumes, the minimum allocation unit, in blocks. The maximum size you can specify for a volume is one-hundredth the size of the volume. The cluster size default depends on the disk capacity; disks that are 50,000 blocks or larger have a default cluster size of 3, while those smaller than 50,000 blocks have a default of 1.

/DATA_CHECK[=option]

Defines, for a disk volume, a default for when data check operations occur; the options are:

READ	Performs checks following all read operations
WRITE	Performs checks following all write operations

If you specify /DATA_CHECK with no option, the default option is WRITE. If you do not specify /DATA_CHECK, the system by default performs no data checking.

/DENSITY=density-value

For magnetic tape volumes, specifies the density in bytes per inch (bpi) at which the magnetic tape is to be written. If the specified density is not supported, the magnetic tape volume will be initialized to the closest supported density. The default density is the highest density supported by the tape drive.

/DIRECTORIES=n

Specifies, for disk volumes, the number of entries to preallocate for user directories.

The legal values are in the range 16 through 16,000; if you do not specify a value, the INITIALIZE command uses a default value of 16.

/EXTENSION=n

Specifies, for disk volumes, the number of blocks to use as a default extension size for all files on the volume. The extension default is used when a file increases to a size greater than its initial default allocation during an update.

You can specify a value in the range 0 through 65,535. If you do not specify a default extension size, the INITIALIZE command uses a value of 5.

/FILE_PROTECTION=code

Defines, for disk volumes, the default protection to be applied to all files on the volume.

Specify the code according to the standard syntax rules for specifying protection, as described in Section 2.13.1. If you do not specify /FILE_PROTECTION, the INITIALIZE command assigns the default protection of RWED to the system and owner categories; RE to the group category; and no access to the world category.

/GROUP

Defines a disk volume as a group volume. The owner UIC of the volume defaults to the group number of the user issuing the command and to a member number of 0.

If this qualifier is specified in conjunction with the /NOSHARE qualifier, the volume protection is RWED for the system, owner, and group categories. However, the /GROUP qualifier specified alone defines the volume protection as RWED for all user categories.

/HEADERS=n

Specifies, for disk volumes, the number of file headers to be allocated initially for the index file. The minimum value you can specify is 16; the maximum value is set with the /MAXIMUM_FILES qualifier.

By default, the INITIALIZE command allocates 16 file headers.

/INDEX=position

Requests, for disk volumes, that the index file for the volume's directory structure be placed in a specific location on the volume.

You can specify one of the following options:

BEGINNING	Places the index file at the beginning of the volume
END	Places the index file at the end of the volume
MIDDLE	Places the index file in the middle of the volume

By default, the INITIALIZE command places the index file in the middle of the volume.

/MAXIMUM_FILES=n

Restricts, for disk volumes, the maximum number of files that the volume can contain, overriding the default value. The default is calculated from the volume size in blocks.

The minimum value is 0. Note, however, that you should specify a low file maximum only after careful consideration. Once set, the maximum can be increased only by reinitializing the volume.

/OWNER_UIC=uic
Specifies, for disk volumes, the user identification code to be assigned ownership of the volume and files. Specify the UIC using the standard UIC format as described in Section 2.13.

If you do not specify /OWNER_UIC, the default value of *[1,1]* is used. However, if you do not specify /OWNER_UIC, but /GROUP is specified, the UIC is assigned to be your current UIC with a member number of 0.

/PROTECTION=code
Specifies, for disk volumes, the protection to be applied to the volume. The protection controls who can read, write, create, and delete files on the volume. If you do not specify a protection code, protection defaults to all types of access for all user categories. Note that the /GROUP, /SHARE, and /SYSTEM qualifiers can also be used to define protection for disk volumes.

Specify the protection code according to the standard syntax rules for specifying protection, as described in Section 2.13.1.

When you specify a protection code for an entire disk volume, access type E (execute) indicates create access.

/SHARE (default)
/NOSHARE
Controls whether a disk volume is shareable. The protection code for the volume defaults to all types of access for all user categories. If you specify /NOSHARE, the protection code defaults to no access for group and world, unless /GROUP has been specified.

/SYSTEM
Defines a disk volume as a system volume. The protection for the volume defaults to all types of access for all users.

Note that only users with system UICs can create directories on system volumes.

/TAPE
Indicates that the device to be initialized is a magnetic tape volume.

/USER_NAME=string
Specifies, for disk volumes, a user name of up to 20 characters to be recorded on the volume. If /USER_NAME is not specified, the INITIALIZE command takes the user name under which you logged in.

/VERIFIED (default)
/NOVERIFIED

Indicates, for disk volumes, whether the disk has bad block data on it. The default is /VERIFIED; the INITIALIZE command assumes that disks contain bad block data and use the data to mark the bad blocks as allocated. Use /NOVERIFIED to request INITIALIZE to ignore bad block data on the disk.

Examples

1.
```
ECL> INITIALIZE DUA0: USERDISK/NOVERIFIED
ECL> MOUNT DUA0:
ECL> CREATE/DIRECTORY DUA0:[ARCHIE]
```

This sequence of commands shows how to initialize a disk volume. First, the INITIALIZE command is used to initialize the volume. When the volume is initialized, the MOUNT command makes the file structure available. The CREATE/DIRECTORY command creates a directory in which to place files on the volume.

2.
```
ECL> INITIALIZE/TAPE/DENSITY=1600 MUA0: SOURCE
ECL> MOUNT/TAPE MUA0:
ECL> COPY EXAMPLE.PAS MUA0:
```

These commands show the procedure for initializing a magnetic tape. First, the magnetic tape is loaded on the device, and the INITIALIZE/TAPE command writes the label SOURCE on it. Then, the MOUNT/TAPE command mounts the magnetic tape so that files can be written on it.

LOAD/PROGRAM

Loads a specified program image into the system. The /PROGRAM qualifier is required.

Format LOAD/PROGRAM *file-spec*

Parameter

file-spec
Specifies an executable image to be loaded into the system. If you do not specify a file type, the LOAD/PROGRAM command uses the default file type EXE.

If the device and directory are not specified, your current default device and directory are used.

No wildcard characters are allowed in the file specification.

Description

The LOAD/PROGRAM command loads a specified program image file into the system. After the image is loaded, the EXECUTE command may be used to start the program running.

Qualifiers

/DEBUG
/NODEBUG (default)
Controls whether the VAXELN debugger is to get control of the program when it is started. If you specify /DEBUG, debugger support must have been built into the VAXELN system.

/JOB_PRIORITY=n
Specifies the starting job priority for the program. The value for *n* is a decimal number from 0 through 31. The default is 16.

/KERNEL_STACK=n
Supplies the size, in pages, of the kernel-mode stack for jobs running this program. User-mode programs require at least 1 page (the default) of kernel stack.

/LOG
/NOLOG (default)
Controls whether the LOAD/PROGRAM command displays the program name associated with the loaded image. You can name the program with the /PROGRAM_NAME qualifier.

/MESSAGE_LIMIT=n
Specifies the maximum number of messages the job port can contain; the default is 0.

/MODE=option
Specifies the mode in which the program is to run. The options you can specify are:

KERNEL	Specifies the program is to run in kernel mode
USER	Specifies the program is to run in user mode

If you omit the /MODE qualifier, the default is user mode.

/POWER_RECOVERY
/NOPOWER_RECOVERY (default)
Specifies whether the job running the specified program is to be given the power-recovery exception if the power fails on the system.

/PROCESS_PRIORITY=n
Specifies the starting process priority (*n*) for the program. The value for *n* is a decimal number from 0 through 15. The default is 8.

/PROGRAM_NAME=prg-name
Specifies the name by which the program will be known for the purposes of invoking it with the EXECUTE command. If you do not specify the /PROGRAM_NAME qualifier, the image name supplied by the linker is used as the default.

/USER_STACK=n
Specifies the initial size (*n*), in pages, of the user-mode stack for jobs running this program. Programs require at least 1 page (the default) of user stack. This qualifier is ignored for kernel-mode programs.

Example

```
ECL> LOAD/PROGRAM/LOG MYPROGRAM
%LOAD-I-LOADED, image MYPROGRAM loaded
```

The LOAD command loads the image file MYPROGRAM.EXE, residing in the default device and directory, into the system. The /LOG qualifier causes ECL to display the program name associated with the loaded image (supplied by the linker since no /PROGRAM_NAME qualifier was specified).

Login Procedure

Initiates an interactive terminal session.

Format

CTRL/C

CTRL/Y

RETURN

Description

There is no login command. You initiate an ECL terminal session by pressing CTRL/C, CTRL/Y, or RETURN on a terminal displaying the ECL banner. The ECL utility prompts you for your user name. If authorization was specified at system build time to be required, you are also prompted for your password, and ECL validates the user name and password.

The login procedure then establishes the default characteristics of your terminal session, including defaults for UIC, disk device and directory name, and help file.

Example

```
RETURN
Username.  SMITHSON
Password:

ECL>
```

RETURN initiates the login procedure. ECL prompts for a user name and a password. (The password you enter is not echoed.) After validating the user name and password, ECL indicates that it is ready to accept commands by displaying the ECL prompt.

LOGOUT

Terminates an interactive terminal session.

Format LOGOUT

Description

You use the LOGOUT command to end a terminal session.

MOUNT

Mounts a File Service disk or tape volume to make it available for use as a file-structured volume.

Format

MOUNT *device-name[:]*

Parameter

device-name[:]
Specifies the device to be mounted.

Qualifier

/TAPE
Specifies that the device to be mounted is a magnetic tape volume.

Examples

1. `ECL> MOUNT DUA0:`

   The MOUNT command mounts the volume that is currently loaded in the indicated drive, making it available for use as a file-structured volume.

2. `ECL> MOUNT/TAPE MUA0:`

   The MOUNT command mounts the volume that is currently loaded in the indicated drive. The /TAPE qualifier specifies that the device is a tape drive.

PURGE

Deletes all but the highest-numbered version of the specified file.

Format

PURGE *[file-spec]*

Parameter

file-spec
Specifies the file(s) to be purged. If you do not provide a file specification, the PURGE command purges all files in the current default device and directory.

If you specify only a file name, PURGE purges all files with that file name, regardless of file type. If you specify only a file type, PURGE purges all files of that file type, regardless of file name. Version numbers cannot be specified. You can use wildcard characters in the file name field or the file type field.

If you omit the device name or the directory specification, the current defaults for device and directory are applied.

Description

You use the PURGE command to delete earlier versions of files. PURGE keeps the highest version of each file. If you do not include a file specification with the PURGE command, all files in the current directory are affected by the PURGE.

Qualifiers

/CONFIRM
/NOCONFIRM (default)
Controls whether a request is issued before each individual PURGE operation to confirm that the operation should be performed on that file.

When the system issues the prompt, you can issue any of the following responses:

Affirmative	Negative	Other
YES	NO	QUIT
TRUE	FALSE	CTRL/Z
1	0	ALL
	RETURN	

You can use any combination of upper- and lowercase letters for word responses. Word responses can be abbreviated to one or more letters (for example, T, TR, or TRU for TRUE). Affirmative answers are YES, TRUE, and 1. Negative answers are NO, FALSE, 0, and RETURN. QUIT or CTRL/Z indicates that you want to stop processing the command at that point. When you respond with ALL, the command continues to process, but no further prompts are given. If you type a response other than those in the list, the prompt will be reissued.

/LOG
/NOLOG (default)
Controls whether the PURGE command displays the file specification of each file it deletes and the total numbers of files and blocks deleted.

Examples

1.
```
ECL> PURGE COMMON.SUM
```

   The PURGE command deletes all but the highest-numbered version of the file COMMON.SUM in the current default disk and directory.

2.
```
ECL> PURGE/LOG SAMPLE.*
%PURGE-I-FILPURG, DISK$EXAMPLE:[EXAMPLE]SAMPLE.TMP;5 deleted (5 blocks)
%PURGE-I-FILPURG, DISK$EXAMPLE:[EXAMPLE]SAMPLE.TXT;2 deleted (3 blocks)
%PURGE-I-FILPURG, DISK$EXAMPLE:[EXAMPLE]SAMPLE.TXT;1 deleted (20 blocks)
%PURGE-I-TOTAL, 3 files deleted (28 blocks)
```

   The PURGE command deletes all but the highest-numbered versions of the files with the file name SAMPLE. The /LOG qualifier causes PURGE to display the name of each deleted file and the total numbers of files and blocks deleted.

3.
```
ECL> PURGE/CONFIRM [EXAMPLE.TEMP]*.TMP
DISK$EXAMPLE:[EXAMPLE]AVERAGE.TMP;1, delete? [N]  Y
DISK$EXAMPLE:[EXAMPLE]TEMP.TMP;1, delete? [N]  N
DISK$EXAMPLE:[EXAMPLE]TEST.TMP;1, delete? [N]  N
DISK$EXAMPLE:[EXAMPLE]TODAY.TMP;1, delete? [N]  Y
```

The PURGE command examines all versions of files with file type TMP in the subdirectory [EXAMPLE.TEMP] on the current default device. Before purging an earlier version of a file, it requests confirmation that the file should be deleted. The default response — N for NO — is given in square brackets.

RENAME

Changes the directory specification, file name, file type, or file version of an existing disk file or disk directory.

Format

RENAME *input-file-spec output-file-spec*

Parameters

input-file-spec
Specifies the name of the file whose specifications are to be changed.

No wildcard characters are allowed.

output-file-spec
Provides the new file specification to be applied to the input file. The RENAME command uses the device, directory, file name, and file type of the input file specification to provide defaults for fields in the output file that are not specified or are indicated by the asterisk (*) wildcard character.

The RENAME command supplies output file version numbers according to the first description below that applies:

1. If the output file specification contains an explicit version number, the RENAME command uses that version number.
2. If no file currently exists with the same file name and file type as that specified for the output file, the RENAME command gives the new file a version number of 1.
3. If a file currently exists with the same file name and file type as the output file, the RENAME command gives the output file a version number one higher than the highest existing version.

Description

The RENAME command enables you to change the directory name, file name, file type, or version number of a file. The node and disk designation for the input file specification must be the same as that for the output file specification.

Qualifiers

/LOG
/NOLOG (default)
Controls whether the RENAME command displays the file specification of each file that it renames.

Examples

1.
```
ECL> RENAME AVERAGE.OBJ OLDAVERAGE.OBJ
```

   The RENAME command renames the highest existing version of the file AVERAGE.OBJ to OLDAVERAGE.OBJ. If no file named OLDAVERAGE.OBJ currently exists, the new file is assigned a version number of 1.

2.
```
ECL> RENAME/LOG REPORT.TMP REPORT.PRM
%RENAME-I-RENAMED, DISK$EXAMPLE:[EXAMPLE]REPORT.TMP;1 renamed to
DISK$EXAMPLE[EXAMPLE]REPORT.PRM;1
```

   The RENAME command renames the highest existing version of the file REPORT.TMP to REPORT.PRM. The /LOG qualifier causes the result of the rename operation to be displayed.

RUN

Places a program image into execution as a job.

Format

RUN *file-spec*

Restrictions

The current default device and directory information maintained during an ECL session is not passed to — and is not obtainable by — programs invoked with RUN. (The current default user name and UIC, by contrast, are propagated to an invoked program.)

Parameter

file-spec
Specifies the executable image to be executed. If you do not specify a file type, the RUN command uses the default file type of EXE.

If the device and directory are not specified, your current default device and directory are used.

No wildcard characters are allowed in the file specification.

Description

The RUN command loads an uninstalled image, executes the image, and, upon program completion, removes the image from the system. Once the command is entered you cannot issue another command until the program completes.

To execute an already loaded program, use the EXECUTE command.

Qualifiers

/ARGUMENTS=(arg[,...])
Specifies from 1 to 8 optional arguments to be passed to the program.

If you specify only one parameter, you can omit the parentheses.

The commas delimit individual parameters. To specify a parameter that contains any special characters or delimiters, enclose the parameter in quotation marks. Each parameter can have up to 100 characters.

ECL always passes a minimum of 8 arguments to the invoked program. By convention, the name of the user's terminal — for example, CONSOLE: or TTA0: — is passed as the first three arguments (corresponding to SYS$INPUT, SYS$OUTPUT, and SYS$ERROR). Arguments specified with /ARGUMENTS are passed starting at the fourth argument. If no arguments are specified using /ARGUMENTS, the remaining arguments are passed as null strings ("").

To invoke programs that do not conform to the SYS$INPUT/ SYS$OUTPUT/ SYS$ERROR calling convention — or to specify a different terminal from the one you are currently using — specify the /NOSTANDARD_ARGUMENTS qualifier.

/DEBUG
/NODEBUG (default)
Controls whether the VAXELN debugger is to get control of the program when it is started. If you specify /DEBUG, debugger support must have been built into the VAXELN system.

/JOB_PRIORITY=n
Specifies the starting job priority for the program. The value for *n* is a decimal number from 0 through 31. The default is 16.

/KERNEL_STACK=n
Supplies the size, in pages, of the kernel-mode stack for jobs running this program. User-mode programs require at least 1 page (the default) of kernel stack.

/MESSAGE_LIMIT=n
Specifies the maximum number of messages the job port can contain; the default is 0.

/MODE=option
Specifies the mode in which the program is to run. The options you can specify are:

KERNEL	Kernel mode
USER	User mode

If you omit the /MODE qualifier, the default is user mode.

/POWER_RECOVERY
/NOPOWER_RECOVERY (default)
Specifies whether the job running the specified program is to be given the power-recovery exception if the power fails on the system.

/PROCESS_PRIORITY=n
Specifies the initial process priority (*n*) for the program. The value for *n* is a decimal number from 0 through 15. The default is 8.

/PROGRAM_NAME=prg-name
Specifies the name by which the program will be known. If you do not specify the /PROGRAM_NAME qualifier, the image name supplied by the linker is used as the default.

/STANDARD_ARGUMENTS (default)
/NOSTANDARD_ARGUMENTS
Controls whether the first three program arguments passed to the program give the name of the user's terminal. By default, the terminal names *are* passed, and correspond to SYS$INPUT, SYS$OUTPUT, and SYS$ERROR, respectively. Any program arguments you specify with the /ARGUMENTS qualifier are passed starting at the fourth program argument.

Use /NOSTANDARD_ARGUMENTS to prevent RUN from passing the terminal name as the first three program arguments. If /NOSTANDARD_ARGUMENTS is specified, any arguments you specify with the /ARGUMENTS qualifier are passed starting at the first program argument. (The /ARGUMENTS and /NOSTANDARD_ARGUMENTS qualifiers are illustrated below.)

/USER_STACK=n
Specifies the initial size (*n*), in pages, of the user-mode stack for jobs running this program. Programs require at least 1 page (the default) of user stack. This qualifier is ignored for kernel-mode programs.

Examples

1. `ECL> RUN MYPROGRAM`

   RUN loads the program image MYPROGRAM.EXE, creates a job to execute it, and passes the following program arguments:

   ```
   Program Argument 1 => "CONSOLE:"
   Program Argument 2 => "CONSOLE:"
   Program Argument 3 => "CONSOLE:"
   Program Argument 4 => ""
   Program Argument 5 => ""
   Program Argument 6 => ""
   Program Argument 7 => ""
   Program Argument 8 => ""
   Program Argument 9 => ""
   Program Argument 10 => ""
   Program Argument 11 => ""
   ```

   When the program completes, RUN removes the program image from the system.

2. `ECL> RUN MYPROGRAM/NOSTANDARD_ARGUMENTS`

   RUN loads the program image MYPROGRAM.EXE, creates a job to execute it, and passes the following program arguments:

   ```
   Program Argument 1 => ""
   Program Argument 2 => ""
   Program Argument 3 => ""
   Program Argument 4 => ""
   Program Argument 5 => ""
   Program Argument 6 => ""
   Program Argument 7 => ""
   Program Argument 8 => ""
   ```

3. `ECL> RUN MYPROGRAM/ARGUMENTS=(PARAMETER1,PARAMETER2)`

RUN loads the program image MYPROGRAM.EXE, creates a job to execute it, and passes the following program arguments:

```
Program Argument 1 => "CONSOLE:"
Program Argument 2 => "CONSOLE:"
Program Argument 3 => "CONSOLE:"
Program Argument 4 => "PARAMETER1"
Program Argument 5 => "PARAMETER2"
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
Program Argument 9 => ""
Program Argument 10 => ""
Program Argument 11 => ""
```

4. `ECL> RUN MYPROGRAM/NOSTANDARD_ARGUMENTS/ARGUMENTS=PARAMETER1`

RUN loads the program image MYPROGRAM.EXE, creates a job to execute it, and passes the following program arguments:

```
Program Argument 1 => "PARAMETER1"
Program Argument 2 => ""
Program Argument 3 => ""
Program Argument 4 => ""
Program Argument 5 => ""
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
```

5. `ECL> RUN EDISPLAY/NOSTAND/ARG=(TTA0:,TTA0:,TTA0:,"MEMORY/RATE=0 ::2")`

RUN loads the program image EDISPLAY.EXE and passes the following program arguments:

```
Program Argument 1 => "TTA0:"
Program Argument 2 => "TTA0:"
Program Argument 3 => "TTA0:"
Program Argument 4 => "MEMORY/RATE=0 ::2"
Program Argument 5 => ""
Program Argument 6 => ""
Program Argument 7 => ""
Program Argument 8 => ""
```

The first three arguments cause the EDISPLAY utility to run on the terminal device TTA0: rather than on the console. The fourth argument passes a keyword and a qualifier to EDISPLAY. When EDISPLAY is terminated (with CTRL/C, CTRL/Y, CTRL/Z, or E), RUN removes the utility image from the system. (See Chapter 4, Using EDISPLAY, for details on the EDISPLAY utility.)

SET DEFAULT

Changes the default device and/or directory name. The new default is applied to all subsequent file specifications that do not explicitly include a device or directory name.

Format

SET DEFAULT *device-name:*

Parameter

device-name:
Specifies a device and/or directory name to be used as the default device or directory in file specifications.

If you specify a physcial device name, terminate the device name with a colon. If you specify a directory name, you must enclose it in square brackets.

You can use the minus-sign as a directory-searching wildcard character in the directory specification.

Example

```
ECL> SET DEFAULT DISK$TEST:[FOO.BAR]
ECL> DIRECTORY

Directory DISK$TEST:[FOO.BAR]

AVERAGE.DAT;2              AVERAGE.DAT;1

Total of 2 files.
```

The SET DEFAULT command changes the default directory to be the device DISK$TEST: and the directory [FOO.BAR]. The device and directory DISK$TEST:[FOO.BAR] are assumed to be the default for subsequent file operations, such as the DIRECTORY operation shown.

SET FILE

Modifies the characteristics of a file.

Format

SET FILE *file-spec*

Parameter

file-spec
Specifies the file to be modified.

If you omit either the file name or the file type, the SET FILE command does not supply any defaults; the file name or file type is null. If you do not specify a file version number, SET FILE defaults to the file with highest version number.

If the device or directory is not specified, your current default device and directory are used.

No wildcard characters are allowed in the file specification.

Description

The SET FILE command enables you to modify the protection and/or the user identification code (UIC) of a file.

Qualifiers

/LOG
/NOLOG (default)
Controls whether the SET FILE command displays the file specification of each file after it is modified.

/OWNER_UIC=uic
Sets the owner user identification code (UIC) of the file to the specified UIC.

Specify the UIC using the standard UIC format described in Section 2.13.

/PROTECTION=code

Allows you to change the protection of the file.

Specify the code using the standard protection code format as described in Section 2.13.1.

Examples

1.
```
ECL> SET FILE/OWNER_UIC=[1,1] MYFILE.DAT
```

   The SET FILE command modifies the owner UIC of the highest version of the file MYFILE.DAT.

2.
```
ECL> SET FILE/PROTECTION=(SYSTEM:R,OWNER:RWED,GROUP:RE) PRFT.LIS
```

   The SET FILE command changes the protection code of the highest version of the file PRFT.LIS. The command gives the system read-only access; the owner read, write, execute, and delete access; and users in the owner's group read and execute access. World access is not permitted.

SET PROTECTION

Establishes the protection to be applied to a file. The protection of a file limits the type of access available to system users.

Format

SET PROTECTION[=(*code*)] *file-spec*

Parameters

code
Defines the protection to be applied to the specified file.

Specify the code using the standard protection code format as described in Section 2.13.1.

file-spec
Specifies the file for which the protection is to be changed.

If you omit either the file name or the file type, the SET PROTECTION command does not supply any defaults; the file name or file type is null. If you omit a file version number, the protection is changed only for the highest existing version of the file.

If the device or directory is not specified, your current default device and directory are used.

No wildcard characters are allowed in the file specification.

Description

You can use the SET PROTECTION command to change the protection for a file. If you include a protection code, the file access is changed to that code. When you omit the protection code and do not specify the /PROTECTION qualifier, the file protection remains unchanged.

All disks have protection codes that restrict access to the volume. The protection codes for disk volumes are assigned with the INITIALIZE command. They cannot be changed by the SET PROTECTION command.

Each file on a disk volume, including a directory file, can have a different protection associated with it. The SET PROTECTION command and other file manipulating commands allow you to define the protection for individual files.

Qualifiers

/LOG
/NOLOG (default)
Controls whether the SET PROTECTION command displays the file specification after it has reset the file's protection.

/PROTECTION=code
Defines the protection code to be applied to the file specification. If you specify the command's code parameter in addition to using the /PROTECTION qualifier with a file specification, the attributes specified with the /PROTECTION qualifier are applied.

Specify the protection code using the standard protection code format described in Section 2.13.1.

Example

```
ECL> SET PROTECTION=(SYSTEM:R,OWNER:RWED,GROUP:RE)PAYROLL.LIS
```

The SET PROTECTION command changes the protection codes applied to the highest version of the file PAYROLL.LIS. The command gives the system read-only access; the owner read, write, execute, and delete access; and users in the owner's group read and execute access. World access is not permitted.

SET TIME

Resets the system time.

Format SET TIME=*time*

Parameter

time
Specifies the date, time, or both, using the standard absolute time format. The absolute time format is as follows:

```
[dd-mmm-yyyy] [hh:mm:ss.c]
```

For more information on absolute time format, see Section 2.6.

Example

```
ECL> SET TIME=3-FEB-1987 03:21:24
ECL> SHOW TIME
3-FEB-1987 03:21:24 50
```

The SET TIME command sets the system time to the specified time. The SHOW TIME command requests a display of the current time.

SET UIC

Establishes a new user identification code (UIC) as the default. Use the SET UIC command to gain access to a restricted file; that is, a file contained in a directory whose protection restricts access to the owner of that directory.

Format

SET UIC *uic*

Parameter

uic
Specifies the group number and the member number. Specify the UIC using standard UIC format as described in Section 2.13.

Examples

1.
```
ECL> SET UIC [370,10]
```

   This command establishes your UIC as [370,10]. You can now read or modify files whose access is restricted to this UIC.

2.
```
ECL> SET UIC [214,4]
ECL> SET DEFAULT [ANDERSON]
```

   The SET UIC command sets your UIC to [214,4]; the SET DEFAULT command sets the default directory to [ANDERSON].

SHOW DEFAULT

Displays the current default device and directory names. These defaults are applied whenever you omit a device and/or directory name from a file specification.

Format SHOW DEFAULT

Description

The SHOW DEFAULT command displays the current device and directory names.

The default disk and directory are established when you log into the system. You can change these defaults during a terminal session with the SET DEFAULT command.

Example

```
ECL> SHOW DEFAULT
DISK$EXAMPLE:[EXAMPLE]
```

The SHOW DEFAULT command requests a display of the current default device and directory names.

SHOW DEVICES

Displays information about a device configured in the system.

Format

SHOW DEVICES *[device-name[:]]*

Parameter

device-name[:]
Specifies the name of a device for which information is to be displayed. You can specify a complete device name or only a portion of a device name. If you truncate the device name, the command lists information about all devices whose device names begin with the characters you enter — possibly a generic class of devices, depending on the use of device-naming conventions in the system. For example, if you specify D, SHOW DEVICES lists all the devices whose device names begin with D.

If you omit this parameter, the SHOW DEVICES command provides a listing of all devices configured in the system.

Description

The SHOW DEVICES command displays information about the devices you configured in your system using the System Builder. The information displayed for each device is as follows:

Device name	The name of the device controller — CONSOLE, a user-defined device name, or the first three characters of a standard *ddcu:* device name
CSR address	The physical address, in octal, of the device's first control register
Vector	The device's first interrupt vector, in octal
IPL	The device's bus-request priority, an integer in the range 4 to 7 that corresponds to VAX interrupt priority levels 14(hexadecimal) through 17(hexadecimal)

BI number	The number of the VAXBI bus on which the device is located, if applicable — an integer in the range 0 to 4
Adapter number	The number of the VAXBI adapter on which the device is located, if applicable — an integer in the range 0 to 15(decimal)

The SHOW DEVICES command does not verify the presence of the device hardware or the validity of the System Builder device information. Device drivers perform such verification and typically raise exceptions if the verification fails.

Examples

1.
```
ECL> SHOW DEVICES
Device                CSR          Vector   IPL    BI        Adapter
 Name                 Address                      Number    Number
DUA                   772150       154      4
XQA                   774440       120      4
CONSOLE               000000       370      4
```

The SHOW DEVICES command displays information for all the devices configured in a non-VAXBI target system.

2.
```
ECL> SHOW DEVICES
Device                CSR          Vector   IPL    BI        Adapter
 Name                 Address                      Number    Number
DUA                   000000       000      5      2         0
XBA                   000000       000      4      2         7
CONSOLE               000000       370      4      0         0
```

The SHOW DEVICES command displays information for all the devices configured in a VAXBI target system.

3.
```
ECL> SHOW DEVICES CONSOLE:
Device                CSR          Vector   IPL    BI        Adapter
 Name                 Address                      Number    Number
CONSOLE               000000       370      4
```

The SHOW DEVICES command displays information for the device CONSOLE:.

SHOW TIME

Displays the current date and time. The DAY element is optional.

Format SHOW [DAY]TIME

Example

```
ECL> SHOW TIME
3-FEB-1987 17:21:24.13
```

The SHOW TIME command displays the current date and time at the terminal.

SHOW UIC

Displays the current default user identification code (UIC).

Format SHOW UIC

Example

```
ECL> SET UIC [1,1]
ECL> SHOW UIC
UIC = [1,1]
```

The SET UIC command establishes your UIC as [1,1]; the SHOW UIC command displays the current default UIC.

TYPE

Displays the contents of a file on the current output device.

Format

TYPE *file-spec*

Parameter

file-spec
Specifies the file to be displayed. If you specify a file name and do not specify a file type, the TYPE command uses the default file type LIS.

No wildcard characters are allowed in the file specification.

Description

When the TYPE command displays output, you can control the display in the following ways:

- Use CTRL/S to suspend the output temporarily.
- Use CTRL/Q to resume the output display at the point it was suspended by CTRL/S.

The TYPE command opens the specified file with shared read-only access.

Example

```
ECL> TYPE COMMON.DAT
```

The TYPE command requests that the file COMMON.DAT be displayed at the terminal.

UNLOAD/PROGRAM

Unloads a specified program image from the system. The /PROGRAM qualifier is required.

Format

UNLOAD/PROGRAM *prg-name*

Parameter

prg-name
Specifies the name of the program to be removed from the system. The program must be already installed in the system (by means of the System Builder, the LOAD/PROGRAM command, or the LOAD_PROGRAM procedure).

Example

```
ECL> UNLOAD/PROGRAM MYPROGRAM
```

The UNLOAD/PROGRAM command removes the program image MYPROGRAM from the running system.

Chapter 4

Using EDISPLAY

The VAXELN Display Utility (EDISPLAY) is a run-time utility program that displays information about the resources in your VAXELN system, including processor run time, memory, pool, and slot table use, and job statistics. EDISPLAY allows you to measure or observe system performance without a debugger being present in the system.

EDISPLAY dynamically displays information on a target-system video terminal. Information is displayed in 24-line pages.

EDISPLAY offers three types of displays — *setup*, *memory*, and *job*:

- The setup display allows you to switch between memory and job displays — prompting you for a job number if you select the job display — and allows you to alter the rate at which information and displays are updated
- The memory display provides basic information about the VAXELN target system and the jobs loaded into the system
- The job display provides a detailed look at a particular user-specified job, listing statistics for the job and all its subprocesses

This chapter explains how to use EDISPLAY, including how to build the utility into a VAXELN system, how to start up the utility at run time, and how to manipulate and interpret its displays.

4.1 Building EDISPLAY Into Your Application

To build the EDISPLAY utility into your application, you must fill out a System Builder Program Description Menu, specifying the program name as ELN$:EDISPLAY. You must also set the **Job Priority** to a priority higher than those of the user jobs in the system. For example, in the memory display in Figure 4–2 (Section 4.4), user jobs run at priority 16 and EDISPLAY runs at priority 8. In most cases, the program name and the job priority are all that need be specified; the menu defaults meet EDISPLAY's requirements.

However, you must specify program arguments — either at build time or at run time — if EDISPLAY is to run on a terminal other than the target system console. By convention, the first two program arguments redirect input and terminal output, respectively (SYS$INPUT and SYS$OUTPUT), and default to CONSOLE:. (The third argument, which by convention redirects error message output, is ignored by EDISPLAY; error messages go to SYS$OUTPUT.) To run EDISPLAY on a terminal other than the console, you specify a terminal name in the following format:

```
TTcu
```

In this format, *TT* is the device mnemonic for a serial line (terminal) controller, *c* is an alphabetic controller identifier that you supply, and *u* is a unit number that you supply. For example, TTA0: specifies serial controller A, unit 0. In most cases, you give the same terminal name for each of the first three arguments — the third argument appearing only for the sake of convention — as in the following sample Program Description Menu entry:

```
Argument(s)          TTA0:,TTA0:,TTA0:
```

You can use the fourth program argument to pass EDISPLAY keywords and qualifiers — discussed in Section 4.2.1 — as a quoted string. For example, the keyword MEMORY and the qualifier /RATE could be passed using the following menu entry:

```
Argument(s)          ..."MEMORY/RATE=0 ::2"
```

You must provide for one of the methods of run-time activation listed in Section 4.2. For example:

- If you want EDISPLAY to start up automatically when the system begins executing, make sure the **Run** item on the Program Description Menu is set to *Yes* (the default).

- If you want to activate EDISPLAY with an ECL or EDEBUG command, make sure that the appropriate command language or debugger support is present in the system.
- If you want to activate EDISPLAY with a CREATE_JOB procedure call in your program, you must write and build the appropriate code.

4.2 Starting Up EDISPLAY at Run Time

If you want EDISPLAY to begin running and displaying information automatically when the VAXELN system boots, specify *Yes* for the **Run** parameter on the Program Description Menu for EDISPLAY. (*Yes* — automatic activation — is the default.)

If you specify that the EDISPLAY is not to become active at system startup (**Run** equals *No*), EDISPLAY must then be activated at run time. This can be accomplished by calling the CREATE_JOB procedure from within your application, by issuing an EXECUTE or RUN command to ECL, or by issuing a CREATE JOB command to the debugger. Below are some examples of run-time activation:

```
CREATE_JOB (identifier, 'EDISPLAY')

ECL> EXECUTE/WAIT EDISPLAY

ECL> RUN EDISPLAY

EDEBUG> CREATE JOB EDISPLAY
```

You can determine at run time which configured terminal EDISPLAY is to run on. To run EDISPLAY on a terminal other than the one specified in the EDISPLAY Program Description menu — the console by default — you specify a terminal name in the TTcu: format for the first three program arguments. (The TTcu: format and the special significance of the first three program arguments are described in detail in Section 4.1.) For example, each of the following commands causes EDISPLAY to run on the terminal device TTA0:

```
CREATE_JOB (identifier, 'EDISPLAY', 'TTA0:', 'TTA0:', 'TTA0:')

ECL> EXECUTE EDISPLAY/WAIT/NOSTANDARD_ARGUMENTS/ARGUMENTS=(TTA0:,TTA0:,TTA0:)

ECL> RUN EDISPLAY/NOSTANDARD_ARGUMENTS/ARGUMENTS=(TTA0:,TTA0:,TTA0:)

EDEBUG> CREATE JOB EDISPLAY ('TTA0:', 'TTA0:', 'TTA0:')
```

4.2.1 EDISPLAY Keywords and Qualifiers

The EDISPLAY keywords — SETUP, MEMORY, and JOB — select the display that appears on the terminal when EDISPLAY is activated. The /RATE qualifier selects the initial rate at which information and displays are updated.

Whether you choose to activate EDISPLAY automatically, with a CREATE_JOB program call, with an ECL EXECUTE or RUN command, or with a debugger CREATE JOB command, you can pass a keyword and qualifier in a quoted string as the fourth program argument. For example:

```
Argument(s)        ...,"MEMORY/RATE=0 ::2"

CREATE_JOB (identifier, 'EDISPLAY', '', '', '', 'MEMORY/RATE=0 ::2')

ECL> EXECUTE EDISPLAY/WAIT/ARGUMENTS="MEMORY/RATE=0 ::2"

ECL> RUN EDISPLAY/ARGUMENTS="MEMORY/RATE=0 ::2"

EDEBUG> CREATE JOB EDISPLAY ('', '', '', 'MEMORY/RATE=0 ::2')
```

The EDISPLAY keywords are summarized below:

Keyword	Action
SETUP	Activates the setup display, which allows you to switch between memory and job displays — prompting you for a job number if you select the job display — and allows you to alter the rate at which information and displays are updated
MEMORY	Activates the memory display (the default), which provides basic information about the VAXELN target system and the jobs loaded into the system
JOB = *j*	Activates the job display for the job specified by job identifier *j*, in order to provide a detailed look at the job and its subprocesses

The EDISPLAY qualifier, /RATE, is summarized below:

Qualifier	Action
/RATE = *rate*	Specifies an initial screen refresh rate *rate* — the frequency with which EDISPLAY updates information and displays; *rate* is specified using the format *ddd hh:mm::ss.cc*, in days, hours, minutes, seconds, and hundredths of a second

The default screen-refresh rate is *0 0:0:1*, or once per second. This qualifier is optional.

4.2.2 Manipulating Display Screens

You move between or within displays by typing one of EDISPLAY's screen manipulation characters. Table 4–1 summarizes these special characters.

The characters in the second column of Table 4–1 are provided as *non-escape equivalents* to the function keys supported by EDISPLAY; you must press the RETURN key after entering any of these characters.

Table 4–1: EDISPLAY Screen Manipulation Characters

Character	Non-Escape Equivalent[1]	Action
Setup Display		
Up-arrow	^	Move up 1 menu item
Down-arrow	v	Move down 1 menu item
RETURN ENTER		Select menu item
Do PF1	D	Exit (execute) setup display
Memory Display		
Down-arrow Prev Screen	v P	Display previous set of jobs

[1]Press the RETURN key after entering any key from this column.

Table 4–1 (Cont.): EDISPLAY Screen Manipulation Characters

Character	Non-Escape Equivalent[1]	Action
Memory Display		
Up-arrow	^	Display next set of jobs
Next Screen	N	
Right-arrow	>	Go to setup display
Select	S	
Job Display		
Down-arrow	v	Display previous set of subprocesses
Prev Screen	P	
Up-arrow	^	Display next set of subprocesses
Next Screen	N	
Right-arrow	>	Go to setup display
Select	S	
Left-arrow	<	Go to memory display

[1]Press the RETURN key after entering any key from this column.

4.2.3 Refreshing a Display Screen

You can force the entire current display screen to be refreshed by pressing CTRL/W.

4.2.4 Terminating EDISPLAY

You can terminate EDISPLAY by pressing CTRL/C, CTRL/Y, CTRL/Z, or E <RET> at the display terminal.

4.3 The Setup Display

The setup display, illustrated in Figure 4–1, allows you to switch between memory and job displays dynamically — prompting you for a job number if you select the job display — and allows you to alter the rate at which information and displays are updated. If EDISPLAY is invoked with the SETUP keyword, it comes up with the setup display menu. To get to the setup display from a different display, press the right-arrow, the Select key, or the non-escape equivalent > .

The setup display presents three menu items: DISPLAY RATE, MEMORY DISPLAY, and JOB DISPLAY. (The DISPLAY RATE item also displays the current refresh rate; in Figure 4–1, *0 ::1* means *once every (1) second.*) You use the up-arrow and down-arrow keys — or the non-escape equivalents ^ and v — to move the cursor to a menu item, then select the item by pressing the RETURN key or the ENTER key. (You also terminate responses to EDISPLAY prompts with RETURN or ENTER.)

When you are finished examining and/or altering items in the setup display, you exit by pressing the DO key, the PF1 key, or the non-escape equivalent D.

Figure 4–1: EDISPLAY Setup Display Example

```
                    EDISPLAY V3.0 SETUP

> DISPLAY RATE:   0 ::1
  MEMORY DISPLAY
  JOB DISPLAY
  EXIT
```

4.3.1 DISPLAY RATE Menu Item

The DISPLAY RATE item on the setup menu changes the screen refresh rate. When you select the DISPLAY RATE item, you are prompted for a new display rate; in the example below, a new rate of *once every 2.5 seconds* is specified.

```
> DISPLAY RATE:   <dddd hh:mm:ss.cc>    0 ::2.5
```

If this is the only item you change in the setup display, then exiting from setup returns you to the last-viewed display screen. (If there is no last-viewed display screen — that is, if EDISPLAY came up in the setup display — you get the default display, which is the memory display.)

4.3.2 MEMORY DISPLAY Menu Item

The MEMORY DISPLAY item on the setup menu selects the memory display for viewing. There is no associated prompt. The memory display is shown and described in Section 4.4.

When viewing the memory display, you can return to the setup display by pressing the right-arrow key or the Select key, or a non-escape equivalent, > or S.

4.3.3 JOB DISPLAY Menu Item

The JOB DISPLAY item on the setup menu selects the job display for viewing. When you select the JOB DISPLAY item, you are prompted for the number of the job you want displayed; in the example below, job number 2 is specified.

```
> JOB DISPLAY      ?? Job#  2
```

The job display is shown and described in Section 4.5.

When viewing the job display, you can return to the setup display by pressing the right-arrow key or the Select key, or a non-escape equivalent, > or S. You can return to the memory display by pressing the left-arrow key or the non-escape equivalent <.

4.3.4 EXIT Menu Item

The EXIT item on the setup menu causes EDISPLAY to terminate.

4.4 The Memory Display

The memory display, illustrated in Figure 4–2, is the default EDISPLAY display. If EDISPLAY is invoked with no keyword — or with the MEMORY keyword — it comes up with the memory display.

The memory display provides the following basic information about the system:

- Operating system and version
- DECnet node name and number
- Processor up time and idle time since last boot (days, hours, minutes, seconds, and hundredths of seconds)
- Date and time
- Memory use: pages available, largest block available, total pages
- Pool use: blocks available, total blocks
- S0 communication region use: pages available, largest block available, total pages
- P0/P1 slot table use: P0/P1 slots available, total P0/P1 page-table slots
- For each job loaded into the system:
  - Job number
  - Program image name
  - Processor mode: kernel (K) or user (U)
  - Job priority
  - Program size: read/write (R/W) pages, read-only (R/O) pages
  - Job state
  - CPU time used by job

No more than fourteen jobs can be displayed on a screen. If there are more than fourteen jobs in the system, then initially only the first fourteen jobs will be displayed. However, the up-arrow, down-arrow, Next Screen, and Prev Screen keys — or the non-escape equivalents, ^, v, N, and P — can be used to display the next or previous set of jobs.

Figure 4–2: EDISPLAY Memory Display Example

```
VAXELN - V3.0  PLYDIS   UP    0 22:41 10.06  29-MAY-1987 13 53 18 06
               (25.412)  IDLE: 0 00:00:01.89

PAGES:     7804/7792/10240              SO_REGION    14/14/128
POOL:      280/1000                     PO_SLOTS:    29/56
                                        P1_SLOTS:    171/256

                                  R/W   R/O
Job#  Program_name  Mode  Pri     Pages      State      Runtime
 2    XQDRIVER       K    1       62    66   WAIT     0 00:00:11.88
 3    CONSOLE        K    2       52    6    WAIT     0 00:02:48 94
 4    EDEBUGREM      K    3       4     22   WAIT     0 00:00:00.03
 5    EDISPLAY       U    8       24    21   RUN      0 00:27:31.63
 6    TOGGLE_ONE     U    16      3     2    READY    0 00:37.01.90
 7    TOGGLE_ONE;1   U    16      3     2    READY    0 00:34 52 61
 8    TOGGLE_ONE;2   U    16      3     2    READY    0 00 36:32.30
 9    TOGGLE_ONE;3   U    16      2     2    READY    0 00 36:22.67
 10   TOGGLE_ONE;4   U    16      2     2    READY    0 00:40:19.82
 11   TOGGLE_ONE;5   U    16      2     2    READY    0 00:37.41.62
 12   TOGGLE_ONE;6   U    16      2     2    READY    0 00:36:49.04
 13   TOGGLE_ONE;7   U    16      2     2    READY    0 00:34:04 38
 14   TOGGLE_ONE;8   U    16      2     2    READY    0 00:32:37 65
 15   TOGGLE_ONE;9   U    16      2     2    READY    0 00:36:32.15
```

Interpreting the memory display in Figure 4–2, from left to right and from top to bottom, the following information appears:

Display Item	Meaning
VAXELN — V3.0	Operating system and version number
PLYDIS	DECnet node name
0 22:41:10.06	Elapsed time since last boot is 0 days, 22 hours, 41 minutes, and 10.06 seconds
29–MAY–1987 13:53:18.06	Current date and time
25.412	DECnet node ID
0 00:00:01.89	Idle time since last boot
7804/7792/10240	Memory pages available / largest available block of pages / total number of pages
14/14/128	S0 communication region pages available / largest available block of pages / total number of pages

Display Item	Meaning
280/1000	Pool blocks available / total number of pool blocks
29/56	P0-slots available / total number of P0 page table slots
171/256	P1-slots available / total number of P1 page table slots
	Job information (sample):
2	Job number
XQDRIVER	Program image name
K	Processor mode (kernel)
1	Job priority
62	Read/write pages
66	Read-only pages
WAIT	Job state is Wait
0 00:00:11.88	CPU time used

To invoke the setup display while viewing the memory display, press the right-arrow key, the Select key, or a non-escape equivalent, > or S.

4.5 The Job Display

The job display, illustrated in Figure 4–3, is the initial display if EDISPLAY is invoked with the JOB keyword. The job display provides a detailed look at a particular job and its processes. The upper portion of the job display, detailing the system state, is identical to that of the memory display. In the lower portion of the display, the job display lists a single job (specified by the user) and its processes. The information provided for each process in the lower portion of the screen is as follows:

- Process name, if the process is named; otherwise *PROC*n*, where *n* indicates the process's position in the process list; for the first (*master*) process, the program name is displayed as the process name
- Process priority
- Stack size
- Process state
- CPU time used by process

No more than twelve subprocesses can be displayed on a screen. If there are more than twelve subprocesses in the job, then initially only the first twelve are displayed. However, the up-arrow, down-arrow, Next Screen, and Prev Screen keys — or the non-escape equivalents, ^, v, N, and P — can be used to display the next or previous set of subprocesses.

Figure 4–3: EDISPLAY Job Display Example

```
VAXELN - V3.0  PLYDIS   UP:   0 23:32:51.46  29-MAY-1987 14:44:55.46
               (25.412)  IDLE  0 00:00:01.89

PAGES:     7804/7792/10240              SO_REGION    14/14/128
POOL:      280/1000                     P0_SLOTS     29/56
                                        P1_SLOTS     171/256

    (Proc-name/ID)                  R/W   R/O
Job# Program_name Mode Pri Stack    Pages      State    Runtime
 6   TOGGLE_ONE    U   16        3     2      READY    0 01:15:53.73

     TOGGLE_ONE        8   2                 WAIT     0 00:00:00.00
     FIRST PROCESS     8   2                 READY    0 00:37:55.15
     SECOND PROCESS    8   2                 RUN      0 00:37:58.58
```

Interpreting the job display example in Figure 4–3 from left to right and from top to bottom, the following information appears:

Display Item	Meaning
VAXELN — V3.0	Operating system and version number
PLYDIS	DECnet node name
0 23:32:51.46	Elapsed time since last boot is 0 days, 23 hours, 32 minutes, and 51.46 seconds
29–MAY–1987 14:44:55.46	Current date and time
25.412	DECnet node ID
0 00:00:01.89	Idle time since last boot

Display Item	Meaning
7804/7792/10240	Memory pages available / largest available block of pages / total number of pages
14/14/128	S0 communication region pages available / largest available block of pages / total number of pages
280/1000	Pool blocks available / total number of pool blocks
29/56	P0-slots available / total number of P0 page table slots
171/256	P1-slots available / total number of P1 page table slots
	Job information:
6	Job number
TOGGLE_ONE	Program image name
U	Processor mode (user)
16	Job priority
3	Read/write pages
2	Read-only pages
READY	Job state is Ready
0 01:15:53.73	CPU time used
	Process information (sample):
TOGGLE_ONE	Main process name
8	Process priority
2	Stack size
WAIT	Process state is Wait
0 00:00:00.00	CPU time used
	Process information (sample):
FIRST PROCESS	Subprocess name
8	Process priority
2	Stack size
READY	Process state is Ready
0 00:37:55.15	CPU time used

To invoke the setup display while viewing the memory display, press the right-arrow key, the Select key, or a non-escape equivalent, > or S. To return to the memory display, press the left-arrow key or the non-escape equivalent <.

4.6 Date and Time Settings

In order for the current date and time shown by EDISPLAY to be meaningful, the date and time must have been set prior to running EDISPLAY. You set the time by calling the run-time procedure SET_TIME, by issuing the debugger command SET TIME, or by issuing the ECL command SET TIME.

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VAXELN Run-Time Utilities Guide
AA–KW06A–TE

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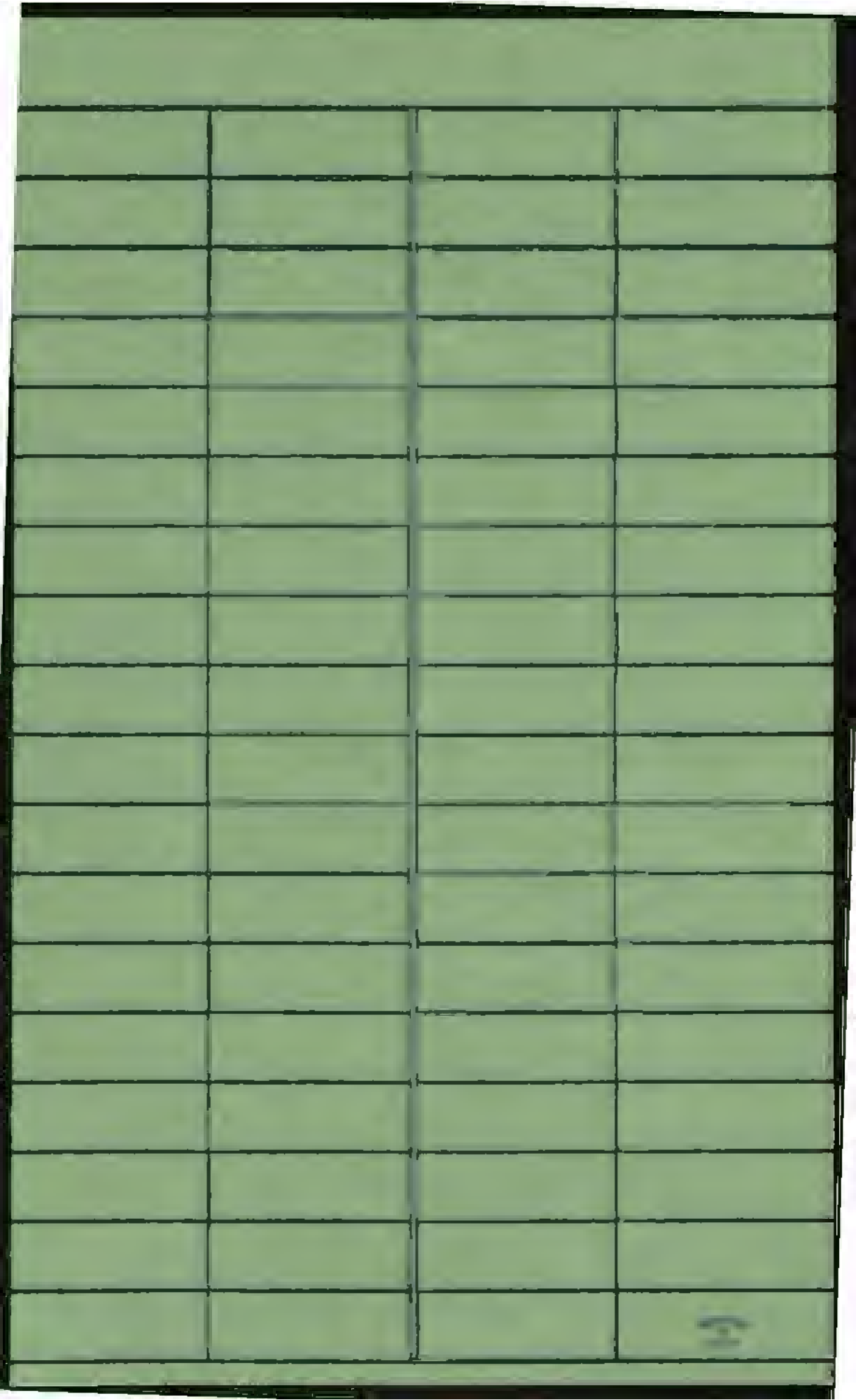

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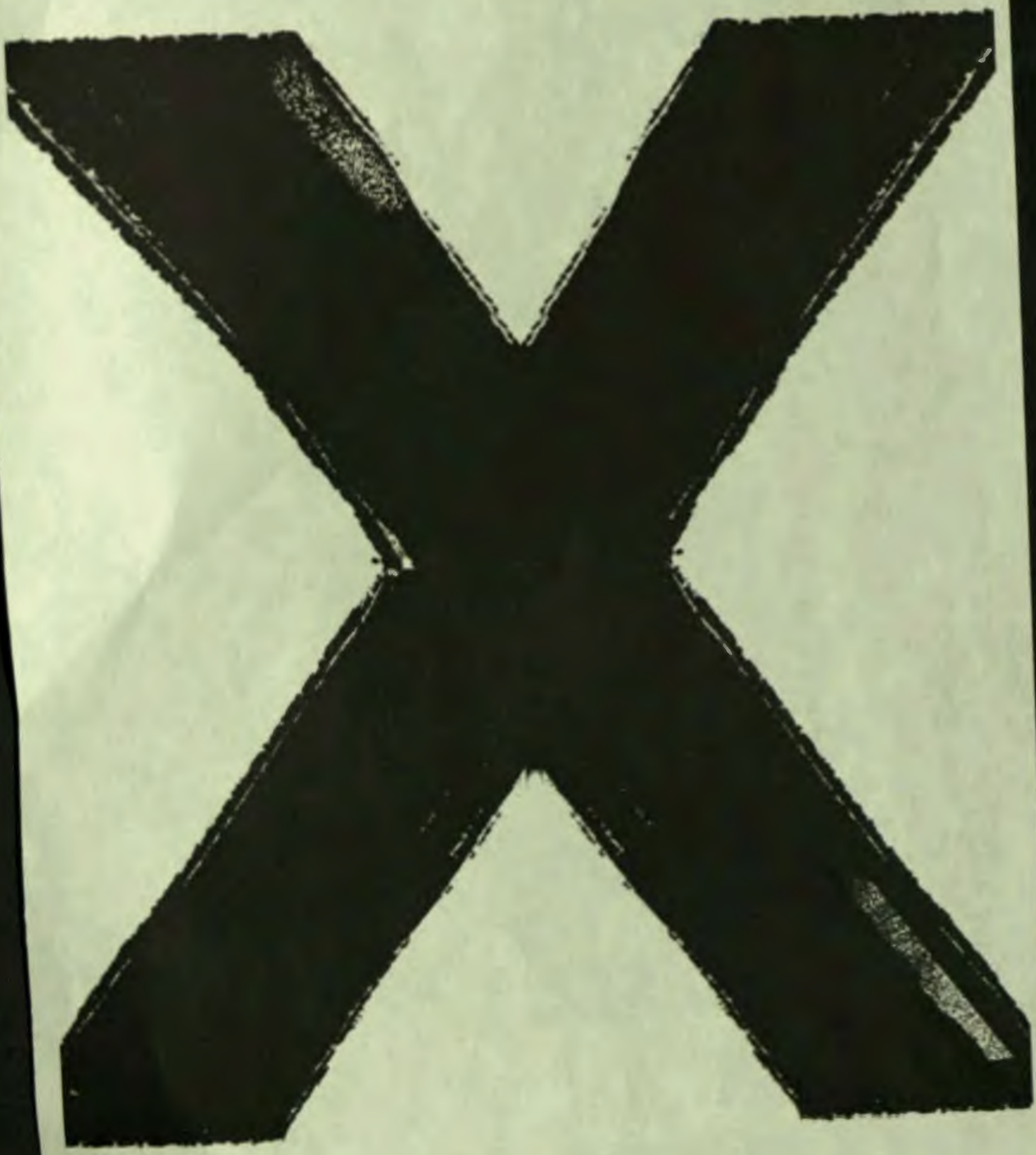

Professional™ 300 series

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PRO/GIDIS Manual

Order No. AA-HJ45A-TK

November 1985

This document describes PRO/GIDIS, DIGITAL'S General Image Display Instruction Set. as implemented for the PRO/Tool Kit. It is a user guide and reference manual for programmers developing graphics applications for the Professional

REQUIRED SOFTWARE: Professional Host Tool Kit V3.0
or PRO/Tool Kit V3.0

OPERATING SYSTEM: P/OS V3.0
or RT-11 V5.2

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Maynard, Massachusetts 01754-2571

First Printing, December 1983
Updated, April 1984
Revised, November 1985

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PREFACE

Manual Objectives

PRO/GIDIS is one of the tools you can use to develop graphics applications for the Professsional. This manual is both a user's guide and a reference manual for PRO/GIDIS, the General Image Display Instruction Set. It explains how to use PRO/GIDIS and describes each instruction in detail. It provides information about device-independent text and graphics programming with PRO/GIDIS.

Intended Audience

You should read this manual if you are developing a graphics application for the Professional and need information about PRO/GIDIS.

This document is intended for programmers who have had experience with systems programming and graphics applications software. You should also have experience with either MACRO-11 or FORTRAN.

This document explains how to use PRO/GIDIS on both the P/OS and RT-11 operating systems. All chapters except 4 and 5 apply to both operating systems. If you are using P/OS, read Chapter 4; if you are using RT-11, read Chapter 5.

Structure of This Document

This document has six chapters and eight appendixes.

Chapter 1, *Introduction to PRO/GIDIS*, describes PRO/GIDIS and places it in the context of other graphic tools. It provides guidelines so that you can determine whether to use PRO/GIDIS or some other graphics software.

Chapter 2, *Understanding PRO/GIDIS*, provides a conceptual framework for PRO/GIDIS. It explains key terms and introduces GIDIS instructions. Together with Chapter 4 (for P/OS), or Chapter 5 (for RT-11), this chapter serves as a user's guide.

Chapter 3, *PRO/GIDIS Syntax*, describes the GIDIS instruction syntax, which is the same for P/OS and RT-11.

Chapter 4, *Using PRO/GIDIS with P/OS*, explains how to use

PRO/GIDIS with P/OS, the Professional Operating System. The chapter describes the GIDIS Call Interface (GIDCAL), the devices accessed by GIDCAL, and error handling.

Chapter 5, *Using PRO/GIDIS with RT-11*, describes how to use PRO/GIDIS with the RT-11 operating system. The chapter describes three interfaces (including GIDCAL) and error handling.

Chapter 6, *PRO/GIDIS Instructions*, lists each GIDIS instruction in alphabetical order for quick reference. Information includes: format, arguments, notes explaining how the instruction works, and examples.

Appendix A, *PRO/GIDIS Instruction Summaries*, lists each PRO/GIDIS instruction, its operation code (opcode), argument length, opcode word, and associated arguments. Instructions are grouped two ways: by opcode and in alphabetical order.

Appendix B, *DEC Multinational Character Set*, shows the code table for the Professional's alphabet 0, the DEC Multinational Character Set.

Appendix C, *Font File Format*, describes the font file format required by the LOAD_BY_NAME instruction.

Appendix D, *Managing Fonts*, describes how to tell the font server about your font files.

Appendix E, *Area Texture and Color on the Plotter*, describes how Plotter GIDIS processes instructions that affect area texture and color.

Appendix F, *Alternate Access to Video GIDIS*, explains the Queue I/O Request (QIO$) and Queue I/O Request and Wait (QIOW$) system directives for P/OS. This access method is documented for backward compatibility with earlier versions.

Appendix G, *Glossary*, defines key terms used in this manual.

Associated Documents - P/OS

- *CORE Graphics Library Manual*
- *P/OS System Reference Manual*
- *RMS-11 Macro Programmers Guide*

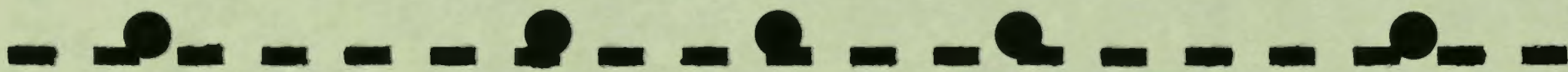
- *PRO/Document VDM Manual*
- Tool Kit Language Manuals

Associated Documents - RT-11

- *RT-11 Programmer's Reference Manual*

Conventions Used in This Document

Convention/Term	Meaning
[optional]	In a command line, square brackets indicate that the enclosed item is optional. In a file specification, square brackets are part of the required syntax.
UPPERCASE	Uppercase words and letters indicate that you should type the word or letter exactly as shown.
lowercase	Lowercase words and letters indicate that you should substitute a word or value of your own. Usually the lowercase word identifies the type of substitution required.
...	A horizontal ellipsis indicates that you can repeat the preceding item one or more times. For example: parameter [,parameter...]
. . .	A vertical ellipsis means that not all of the statements are shown.
red	Interactive input appears in red.
Tool Kit	This general term refers to the software you use to develop applications to run on a Professional computer.
Host Tool Kit	The Host Tool Kit is Tool Kit software that runs on a host computer, rather than on the Professional itself.
PRO/Tool Kit	The PRO/Tool Kit is the Tool Kit software that runs on the Professional computer.



CHAPTER 1

INTRODUCTION TO PRO/GIDIS

PRO/GIDIS, the *General Image Display Instruction Set*, is one of several tools used to develop graphics applications for the Professional 300 Series computer. It consists of a set of instructions that provide the lowest-level, virtual device interface to the Professional's graphics hardware.

1.1 USES OF PRO/GIDIS

PRO/GIDIS is aimed at applications creating *compass and ruler* graphics, those in which images can be described using geometrical entities such as lines, arcs, and shaded areas. You can also use PRO/GIDIS to display mixed text and graphics. Figure 1-1 shows typical PRO/GIDIS output, a graphical representation of some sample statistical data.

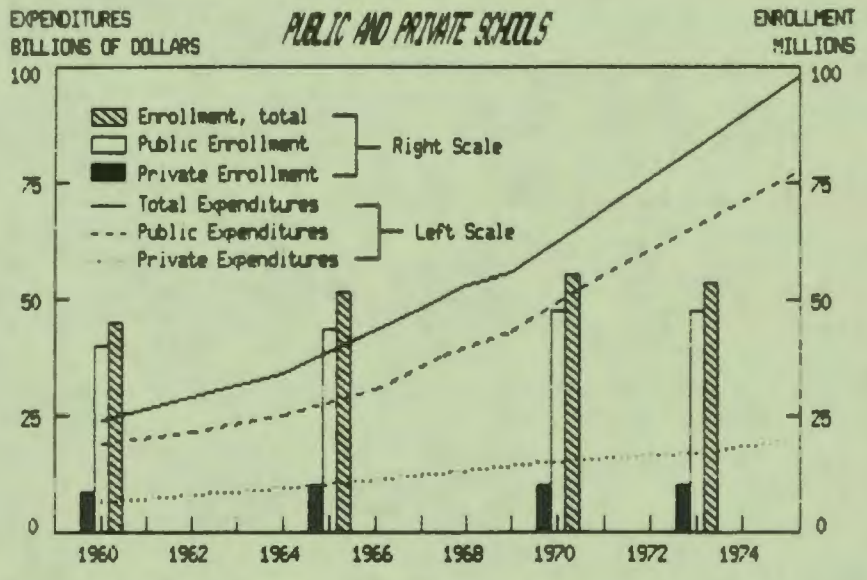


Figure 1-1: PRO/GIDIS Sample Output

PRO/GIDIS is the lowest layer of software that receives and interprets graphics instructions in a device-independent way. When the current output device cannot fully support an instruction, GIDIS provides an appropriate fallback.

With GIDIS under P/OS, you can write on a number of devices. Among them are the Professional video monitor, the LVP16 plotter, and various printers (the LN03, LA50 and LA100). You can also store GIDIS instructions in a file and later print the stored picture, either by itself or as part of a document. Under RT-11, you can write only on the video monitor.

The GIDIS Call Interface (GIDCAL) provides uniform access to each device supported by GIDIS. It also simplifies access to GIDIS from high-level languages.

1.2 RELATIONSHIP TO OTHER P/OS GRAPHICS TOOLS

PRO/GIDIS provides the foundation for several other graphics tools on the Professional. Because these tools are implemented as layers above PRO/GIDIS, each tool sets GIDIS attributes and expects to be in full control of them. As a result, use of more than one graphics protocol within an application is not supported.

Other graphics tools include:

- The PRO/Tool Kit CORE Graphics Library (CGL), a library of high-level graphics subroutines based on the ACM SIGGRAPH CORE Standard.

- ReGIS (Remote Graphics Instruction Set), a DIGITAL-developed, ASCII-based protocol, is used to transmit graphics instructions from a host computer to a remote Professional, VT125, VT240 or GIGI graphics terminal. A ReGIS to GIDIS converter (RTOG) translates ReGIS data files to GIDIS files that can be displayed (or printed) on the Professional. ReGIS currently cannot be used by applications that reside on the Professional itself; it can only be used in terminal emulation mode.

- NAPLPS, North American Presentation Level Protocol Syntax, is an ASCII-based protocol developed for Videotex/Teletext. NAPLPS currently cannot be used by applications that reside on the Professional itself; it can only be used in terminal emulation mode.

RELATIONSHIP TO OTHER P/OS GRAPHICS TOOLS

- TEK 4014 is an industry-standard Tektronix-based software protocol adapted from storage tube technology. TEK 4014 is available as a third party application that runs on the Professional only in terminal emulation mode.

- PRO/Document VDM, not a graphics tool itself, is the layer of P/OS that enables you to integrate graphics into documents.

Figure 1-2 shows the relationship between PRO/GIDIS and other graphic tools.

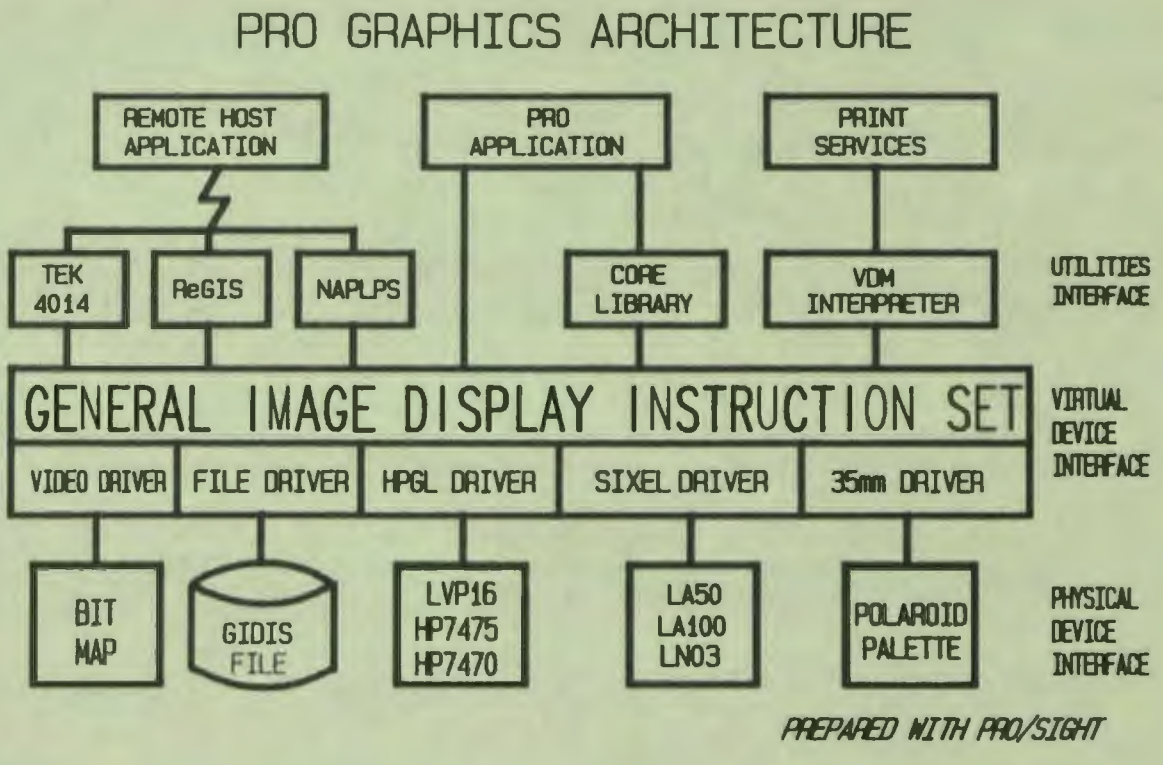


Figure 1-2: PRO/GIDIS Interface

1.2.1 When to Use PRO/GIDIS

Sometimes your choice of a graphics tool is a matter of taste, but there are some guidelines to go by.

- Use PRO/GIDIS if you want uniform access to the Professional's graphic devices.
- Use PRO/GIDIS if execution speed is most important.
- Use PRO/GIDIS to implement graphics utility layers, like CORE, or tools rather than applications.

1.2.2 When Not to Use PRO/GIDIS

Do not use PRO/GIDIS under the following conditions:

- If your program requires support for real (floating point) coordinates, curves, markers, and so forth, use the CORE Graphics Library.
- If you are concerned with portability of programs and industry-standard program interfaces to graphics routines, use the CORE Graphics Library.
- If you require VT100 or VT200 compatibility, use ReGIS with the Professional Terminal Emulator.

CHAPTER 2

UNDERSTANDING PRO/GIDIS

This chapter begins by briefly describing concepts in graphic programming. It then relates these concepts to GIDIS. Finally, it summarizes the types of instructions available in GIDIS.

2.1 INTRODUCTION TO GRAPHIC PROGRAMMING

Graphic systems typically provide the following functions:

- Viewing Transformation Instructions. These enable you to define your drawing area in coordinate units that are convenient for your application, then map the units to a device-independent coordinate system for displaying the image.
- Interactive Control Instructions. These enable you to interactively control how an image displays on a view surface. You can modify how a picture is mapped to a view surface, define cursors, scroll data, and output an image.
- Drawing Instructions. These enable you to draw figures within a picture.
- Attribute Instructions. These enable you to specify how the image appears when it displays.

The following sections describe the main functions and introduce terms commonly used in graphic programming.

2.1.1 Viewing Transformation Instructions

Two-dimensional graphic programming packages allow you to draw pictures in a Cartesian coordinate system, similar to drawing on graph paper. Most graphics systems allow you to define coordinate units that suit your particular application. Think of it as choosing graph paper with different scales, for example ten squares per inch versus fifteen squares per inch. These units are purely logical coordinates whose range is limited only by the arithmetic limits of the processor. Some systems allow floating point coordinates; others allow only integers. You draw pictures in user coordinate units that you define. All drawing instructions are stored in a database in user coordinates units. This user coordinate system is sometimes called the *World Coordinate System*.

Besides allowing you to create and store graphic data, a graphics system must have a way of displaying the contents of the database. (Display is used in a generic sense to include output to any device, not just screen display.) Because graphic output is displayed on a variety of output devices, a graphics system must have a way of mapping the user coordinates to a view surface. While a video monitor may be the most common view surface, printer and plotter output can also be considered a view surface.

The variety of output devices, both their shape and resolution, makes it desirable to have a device-independent way of describing the view surface. Hence, most graphics systems have a display coordinate system to describe the view surface. These coordinate system is sometimes called *Normalized Coordinate Space*. The exact way of defining the coordinate units within normalized space differs among graphic systems, but most allow you to choose coordinate units appropriate for any output device.

NOTE

> To avoid confusion, this manual refers to operations performed in user coordinates as *drawing a picture*. It refers to operations performed in display coordinates as *displaying an image*.

Each graphic system performs the computations necessary to map the contents of the user coordinate system to the display coordinate system. This process of mapping from the user coordinate system to the display coordinate system is called the *viewing transformation*. However, the way the mapping proceeds differs from system to system. For example, when some graphic systems map the picture to the displayed image, distortion

results. Other systems preserve the shape of the picture. Some systems supply device drivers to complete the mapping in a way that preserves the image and suits the hardware requirements of the displaying device.

2.1.2 Interactive Control Instructions

Besides the standard viewing transformation operation, most systems provide interactive control instructions for modifying the mapping and manipulating the display.

Graphics systems differ in how much control they give you over the mapping process, for example controlling the size and shape of the displayed image. An explanation of how a graphics system gives you control over mapping requires the introduction of several more terms.

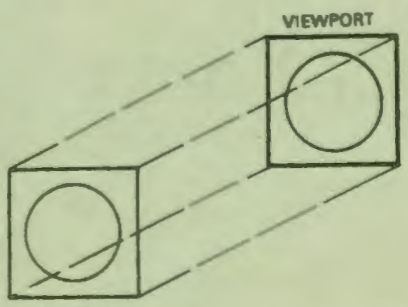
We refer to the entire contents of graphic data in the user coordinate space as a *picture*. You can map the entire picture to the view surface, or you can map only a portion of the picture to the view surface. You choose which portion to map by defining a *window*, a rectangular extent within the user coordinate space. By defining a window the same size as the picture, you map the entire picture to the view surface. By defining a window smaller than the picture, you map only a portion of the picture to the view surface. Only data within the defined window maps to the view surface. Anything outside the window is *clipped*. It remains in the picture, but is not displayed in the image on the view surface.

On the view surface, the image displays in a rectangular area called the *viewport*. The viewport is defined in display coordinates. Graphics systems allow you to define the viewport in a number of ways. For example, you can fill an entire view surface, providing you define your viewport as having the same shape as the output device. Or you can change the size and placement of a viewport. In some graphics systems, you can display more than one viewport simultaneously.

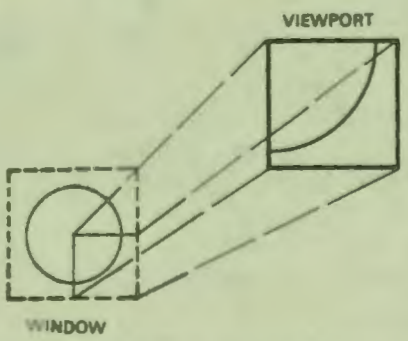
Because of all the options available both in defining the window and the viewport, mapping from user coordinates to display coordinates allows for many possibilities. You can, for example, define user and display coordinates to be identical and map an entire picture (the window encompasses the entire picture) to the entire viewport (which may or may not fill the display surface, depending on the shape of the viewport in relation to the shape of the display surface). Or you can define a window that includes only part of the picture, and map it to a larger viewport. This results in enlarging the image. Conversely, if

you define the window as larger than the picture and map it to a smaller viewport, you reduce the image. Besides affecting the size, enlarging or reducing the image also affects the granularity of the image.

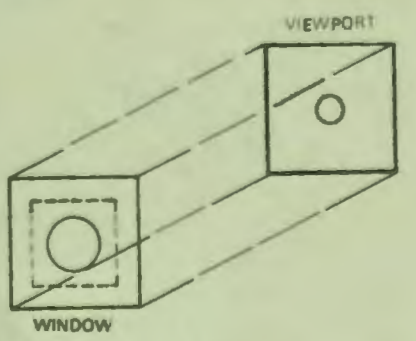
Figure 2-1 shows several mapping possibilities. Each case assumes a viewport that covers the entire view surface.



WINDOW, CLIPPING RECTANGLE, AND VIEWPORT SAME SIZE
NO CLIPPING OF PICTURE



WINDOW SMALLER THAN VIEWPORT, IMAGE ENLARGED, PICTURE CLIPPED



WINDOW LARGER THAN VIEWPORT, IMAGE REDUCED, NO CLIPPING OF PICTURE

MA 1148

Figure 2-1: Window to Viewport Mapping Options

Besides controlling mapping, graphics systems may also include instructions for using cursors or rubber bands to mark the current location. Other interactive control instructions enable you to erase, scroll, display, or print an image.

2.1.3 Drawing Instructions

Graphics systems provide you with building blocks to create a picture. These building blocks are called *output primitives*. Most systems have instructions for drawing points, lines, arcs, circles and text. Some also have instructions for filling figures, both closed and open figures. You build pictures by selecting appropriate drawing instructions.

2.1.4 Attribute Instructions

Graphics systems have attribute instructions that enable you to control how graphic output appears. Some attributes, like foreground and background color, affect all graphic output. Such attributes are called *global attributes*. Others affect only certain types of instructions, for example drawing lines or drawing text. These are typically called *line attributes* and *text attributes*, respectively. In most graphics systems, attributes are *modal*, that is they remain in effect until you explicitly change them.

2.2 INTRODUCTION TO GIDIS INSTRUCTIONS

GIDIS has the types of instructions common to most graphics systems, plus additional instructions for fonts and reports. This chapter describes GIDIS instructions in the following functional groupings:

- Picture Management Instructions. These provide the framework for creating and storing pictures, and for mapping them to an output device.
- Interactive Control Instructions. These include instructions for modifying the mapping process and manipulating the display.
- Drawing Instructions. These enable you to draw figures.

- Attribute Instructions. These enable you to specify how the figure appears when it displays.
- Alphabet and Font Instructions. These allow you to create alphabets and fonts.
- Report Instructions. These enable you to check the state of GIDIS.

2.2.1 Picture Management Instructions

Picture Management instructions provide a framework for defining pictures and set up the viewing transformation.

Because GIDIS attributes remain in effect until changed, you must include your specifications for the viewing transformation and all attributes in any picture you draw. The recommended way to do this is to frame all instructions for a given picture between a BEGIN_PICTURE and an END_PICTURE instruction.

In general, you use the Picture Management instructions as follows:

1. Use BEGIN_PICTURE to initiate definition of a picture.
2. You can use an INITIALIZE -1 next. This initializes GIDIS to its default values (see INITIALIZE in Chapter 6). Although it is more work, it is better practice to explicitly initialize each GIDIS attribute to a value of your own choice.
3. Set up an appropriate address space with SET_OUTPUT_IDS. Define coordinate values that are convenient for your application.
4. To control the appearance of your output, you should also set up the color map with SET_COLOR_MAP_ENTRY.
5. At this point you can use GIDIS attribute instructions and drawing instructions in any order you choose.
6. When you have finished, terminate the picture definition with an END_PICTURE.

The following paragraphs describe the GIDIS user and display coordinate spaces and how pictures are mapped to a view surface.

In GIDIS the user coordinate space is called *GIDIS Output Space (GOS)*. GOS units are limited to integers. The origin of GOS is the upper left-hand corner of the coordinate space. The pixel aspect ratio of X coordinate units to Y coordinate units is 1:1. All GIDIS instructions except SET_OUTPUT_IDS and SET_OUTPUT_VIEWPORT refer to GOS coordinates. You draw pictures and store them in GOS units. However, unless you use the Interactive Control instructions to alter the mapping process, you do not directly define a window in GOS coordinates. SET_OUTPUT_IDS defines the window and controls the mapping.

In GIDIS the display coordinate space is called *Imposed Device Space (IDS)*. Like GOS, the units are limited to integers, the origin is the upper left-hand corner of the coordinate space, and the pixel aspect ratio is 1:1. The left edge of the display surface is called the Y axis, and the top edge of the surface is called the X axis. You determine the extent of IDS by the coordinates you choose for the lower right-hand corner. You assign values to the bottom right-hand corner of the view surface with SET_OUTPUT_IDS.

You must always use a SET_OUTPUT_IDS instruction to set up a device- independent address space for displaying your image. SET_OUTPUT_IDS implicitly performs several other functions.

- It sets GIDIS Output Space (GOS) such that IDS and GOS units are identical. This means that the picture in GOS maps to the image in IDS identically.

- It sets your viewport to the entire view surface as defined by IDS. Your viewport is the rectangle (defined in IDS) within which the image is displayed on the view surface.

- It sets the clipping rectangle to the entire view surface as defined by IDS. The clipping rectangle is the window (defined in GOS) that contains the picture you want to map to the viewport. Thus, the window and viewport are identical.

The ability to define IDS in any coordinate units you choose allows you to control how your image displays in a device-independent way. Each output device has a certain shape (picture aspect ratio), resolution (number of physical pixels horizontally and vertically), and pixel aspect ratio (shape of physical pixel). These are hardware dependent. We call this hardware-dependent view *Hardware Address Space (HAS)*. For example, the Professional 350 video has a shape of 8 x 5 inches, a resolution of 960 horizontal by 240 vertical hardware pixels, and a pixel aspect ratio of 1:2.5. Because each X unit is not equal to each Y unit, the HAS is anisotropic. This means that you cannot map a coordinate system using a 1:1 ratio to the

Professional video without performing calculations to compensate for the distortion that would otherwise occur. The driver supplied for each of the supported output devices performs these adjustments.

You can choose, if you like, to tailor IDS for a particular output device. For example, if you want your image to fill the view surface, assign coordinate values that reflect the shape of the view surface. For example, if the view surface were 8 units wide by 5 units high, you might set [X,Y] of the bottom right corner to [79,49] or [799,499] or [959,599]. All these coordinates would fill the view surface and maintain the same shape. The only difference would be in the resolution. The more logical pixels (expressed in higher X and Y values), the finer the resolution of your drawing. In many cases, you will want to use the entire display surface.

If the shape you give IDS does not match the shape of the device's view surface, GIDIS starts at the upper left corner and maps as much as it can, leaving space on the bottom or to the right as necessary to maintain the proportions of your picture. This is why IDS is called device independent.

Figure 2-2 shows an example of a square IDS shape (with arbitrary coordinates of (500,500) that does not fill the view surface of an 8 by a 5-inch video display.

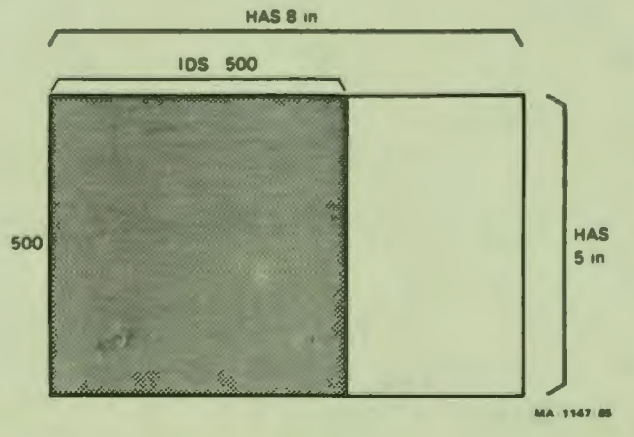


Figure 2-2: IDS Mapped onto a View Surface

You can use all picture management instructions either interactively or store them in a .GID file.

Table 2-1 lists the Picture Management instructions.

Table 2-1: Picture Management Instructions

Instruction	Action
NEW_PICTURE	Indicates the beginning of a new picture.
END_PICTURE	Indicates the end of a picture. Action depends on device.
INITIALIZE	Returns GIDIS to its power-up state. Aborts character, filled figure and picture definition blocks.
SET_OUTPUT_IDS	Specifies the coordinate units and shape of the image that displays on the view surface. Implicitly sets GOS, the clipping rectangle, and the viewport to be identical with IDS.
SET_COLOR_MAP_ENTRY	Sets red, green, blue mixture for the sperified color map entry.

2.2.2 Interactive Control Instructions

These instructions control drawing operations within an interactive environment. Consequently, these instructions are inappropriate in a .GID file, a stored picture. Most interactive environments presume a video display.

Interactive applications should allow you to modify the display quickly and easily. GIDIS has interactive control instructions for modifying how an existing picture displays on the view surface and for drawing new pictures. When drawing new pictures, you need to be able to mark the current position, erase, scroll, output the picture to a view surface, and make a hard copy of the displayed image.

Several instructions control how an existing picture maps to a view surface. GIDIS allows you to display only part of a picture or change the size and location of your viewport.

If you want to display only a part of picture, use SET_GIDIS_OUTPUT_SPACE to define a coordinate extent smaller than the picture. This is useful to blow up a portion of a picture. For complete details, see SET_GIDIS_OUTPUT_SPACE in Chapter 6.

If you want to draw on only part of the view surface, use SET_OUTPUT_VIEWPORT to specify the size and location of your viewport. You can also specify multiple viewports and map a separate picture into each. For details, see Chapter 6.

Normally, your clipping rectangle equals your viewport. (SET_OUTPUT_IDS, SET_GIDIS_OUTPUT_SPACE, and SET_OUTPUT_VIEWPORT all set the clipping rectangle to match your viewport.) However, you can use SET_OUTPUT_CLIPPING_REGION to make your clipping rectangle smaller than your viewport. You might do this if you want to display a picture (or part of a picture) within a rectangle smaller than your viewport.

If you want to clear a rectangle within your viewport, set the clipping rectangle to the desired size and use ERASE_CLIPPING_REGION.

When using Video GIDIS, you may want to scroll (vertically or horizontally) whatever has been drawn within your clipping rectangle. Use SCROLL_CLIPPING_REGION to do this. The cleared space reverts to the current secondary color. Data scrolled out may not be scrolled back in; it must be redrawn.

While drawing a new picture with Video GIDIS, you may want to mark the current position. GIDIS gives you the option of using a cursor or rubber band to mark the current position. See SET_OUTPUT_CURSOR and SET_OUTPUT_RUBBER_BAND in Chapter 6. You select whether the cursor or rubber band blinks or is continuous with SET_OUTPUT_CURSOR_RENDITION.

When you want your application to execute all pending drawing instructions and prompt a user for further input, use FLUSH_BUFFER.

With the Professional 380 video, you can work with several pictures at a time. SET_OUTPUT_BITMAP enables you to draw up to four pictures (two in high resolution mode) in separate pages of the video bitmap. You can quickly move among them.

While drawing, you may want to print all or some portion of the video bitmap. PRINT_SCREEN allows you to send a specified portion of the video bitmap to a sixel printer connected to the printer port.

Table 2-2 summarizes the GIDIS Interactive Control Instructions.

Table 2-2: Interactive Control Instructions

Instruction	Action
SET_GIDIS_OUTPUT_SPACE	Specifies the coordinate units and shape of a window you define in GOS. Sets the clipping rectangle to coincide with the window.
SET_OUTPUT_VIEWPORT	Specifies the size and location of your viewport.
SET_OUTPUT_CLIPPING_REGION	Specifies the rectangle on the view surface where GIDIS can draw.
ERASE_CLIPPING_REGION	Clears clipping rectangle.
SCROLL_CLIPPING_REGION	In Video GIDIS, scrolls data within clipping rectangle.
SET_OUTPUT_CURSOR	Specifies the type of cursor used to mark the current position.
SET_OUTPUT_RUBBER_BAND	Specifies the type of rubber band used to mark the current position.
SET_OUTPUT_CURSOR_RENDITION	Selects whether the cursor or rubber band blinks or is continuous.

Instruction	Action
FLUSH_BUFFER	Executes any pending GIDIS instructions.
SET_OUTPUT_BITMAP	Selects bitmap on which to draw or display. (Professional 380 video only)
PRINT_SCREEN	Sends a specified portion of the video bitmap to a sixel printer connected to the printer port.

2.2.3 Drawing Instructions

GIDIS supplies the graphic primitives to draw lines, arcs, filled figures and text. You draw all pictures in GOS coordinates.

GIDIS drawing instructions can specify coordinates in either absolute or relative terms. Absolute terms are simply the X and Y coordinates you designate. Relative terms are in relation to the current position.

2.2.4 The Current Position

All GIDIS drawing instructions begin at the current position and end by setting a new current position. When you do not want the next drawing instruction to start where the last drawing instruction finished, use SET_POSITION or SET_REL_POSITION to move the current position to any point within GIDIS Output Space.

2.2.5 Drawing Lines, Arcs, Filled Figures, Characters, Images

You can draw one or a series of lines. DRAW_LINES and DRAW_REL_LINES draw from the current position to the specified position. When you use either instruction in a series, each endpoint becomes the current position for the next line.

You can draw arcs in much the same way with DRAW_ARCS or DRAW_REL_ARCS. All drawing begins at the current position and continues around a center point that you specify. As with drawing lines, you can draw arcs in a series, with each endpoint becoming the current position for the next arc. You determine

the direction and length of the arc by the angle. See Chapter 6 for details.

To draw a filled figure, you issue a BEGIN_FILLED_FIGURE instruction. You then use the instructions for drawing lines and arcs to designate the vertices of the figure. GIDIS stores the coordinate pairs for the vertices in the filled figure table. The order of the coordinates determines how the drawing proceeds. When GIDIS receives an END_FILLED_FIGURE instruction, it draws the filled figure. See Chapter 6 for limitations on the filled figure table.

To draw characters you must first have selected the current alphabet with a SET_ALPHABET instruction. Section 2.2.11 describes how to do this. Once you have a current alphabet, you indicate which character you want to draw by an index. GIDIS has two instructions for drawing characters. You can use DRAW_CHARACTERS for any alphabet, whether a standard one or one you design. You can use DRAW_PACKED_CHARACTERS for ASCII strings or any alphabet with fewer than 256 characters. With either instruction you can draw several characters in succession. The rendition of the characters is governed by the Text Attributes, described in Section 2.2.10.

Table 2-3 summarizes the GIDIS Drawing Instructions.

Table 2-3: Drawing Instructions

Instruction	Action
SET_POSITION	Moves the current position to an absolute point you specify.
SET_REL_POSITION	Moves the current position to a point you specify relative to the current position.
DRAW_LINES	Draws a line from the current position to an absolute point you specify.
DRAW_REL_LINES	Draws a line from the current position to a point you specify relative to the current position.

Instruction	Action
DRAW_ARCS	Draws an arc from the current position around an absolute center point you specify.
DRAW_REL_ARCS	Draws an arc from the current position around a center point you specify relative to the current position.
BEGIN_FILLED_FIGURE	Begins definition of a filled figure.
END_FILLED_FIGURE	Completes definition of a filled figure and draws the figure.
DRAW_CHARACTERS	Draws the character you specify.
DRAW_PACKED_CHARACTERS	Draws two characters you specify in one word.

2.2.6 Drawing Attributes

Several classes of attributes affect how your drawing looks. Some, namely the Writing Attributes, affect everything you draw. (The GIDIS Writing Attributes can be called global attributes.) Others, for example Line, Filled Figure, and Text Attributes, affect only certain drawing instructions. See Table 2-4 for a summary of the Drawing Attributes instructions.

When you power-up GIDIS, there are default values for GIDIS attributes. These default values make it possible to use the virtual device immediately. Table 6-4 lists the default values for GIDIS attributes. You can restore these default values at any time by using an INITIALIZE instruction.

However, you can specify your own values for these attributes by using the instructions explained in the following sections.

2.2.7 Writing Attributes

A drawing instruction operates on a pattern of ON and OFF bits (1 and 0 respectively). When you draw a line or arc, GIDIS derives the pattern from the line texture you specify. When you fill a

figure, GIDIS derives the pattern from the area texture you specify. When you draw a character, GIDIS derives the pattern from the raster image of the character. For example, the character "L" would be a horizontal and vertical line of 1's on a field of 0's.

```
0000000000
0100000000
0100000000
0100000000
0100000000
0100000000
0100000000
0111111100
0000000000
```

When you specify a pattern, you also specify its size in GOS units. The size controls how many times each bit in the pattern is repeated. For example, each 0 and 1 in the sample "L" may be repeated several times, depending on the size specified. When the pattern is displayed on a view surface, each bit in the pattern may be applied to multiple hardware pixels.

The writing attributes control how each drawing instruction interprets the pattern. There are four writing attributes: writing mode, primary color, secondary color, and plane mask.

Writing mode controls the Boolean operation performed on each bit of the pattern. For example, the default writing mode, overlay, works as follows. For each 1 in the pattern, GIDIS sets the current pixel to the primary color. For each 0 in the pattern, GIDIS leaves the current pixel unchanged. Your choice of writing mode affects how the image displays. See SET_WRITING_MODE in Chapter 6 for a full description of the writing modes provided by GIDIS.

SET_PRIMARY_COLOR specifies the color map index to use for all 1's in the bit pattern.

SET_SECONDARY_COLOR specifies the color map index to use for all 0's in the bit pattern.

SET_PLANE_MASK determines which planes are enabled for writing. Usually, you enable writing to all planes. This instruction ANDs (Boolean) the current color index and the plane mask (a representation of the planes you select). For the effect of a plane mask that is not set to all planes, see SET_PLANE_MASK in Chapter 6.

2.2.8 Line and Curve Attributes

You can choose to draw lines and curves with a solid or patterned line. With SET_LINE_TEXTURE you select the bit pattern that determines the appearance of the lines you draw.

You can also select the thickness of your drawing line with SET_PIXEL_SIZE. SET_PIXEL_SIZE sets the size of the logical pixel used as a paintbrush in subsequent drawing. The pixel is always a rectangle orthagonal to the x and y axes. Because of this, diagonal lines appear thicker than horizontal and vertical lines, except on a stroke device.

Figure 2-3 shows different pixel sizes used to draw a line.

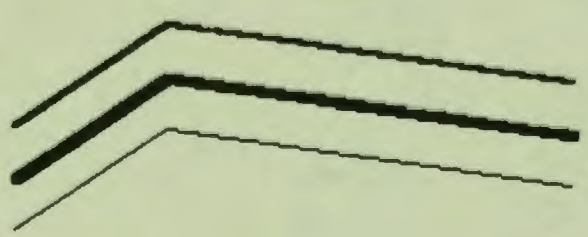


Figure 2-3: Various Logical Pixel Sizes

2.2.9 Filled Figure Attributes

GIDIS allows you to select the two-dimensional pattern to be used in filling polygons. The pattern you choose is called the area texture cell. With the SET_AREA_TEXTURE instruction, you can choose either a character from an alphabet, or the current line texture as your area texture cell. Whatever pattern you choose remains the current area texture cell until you change it with another SET_AREA_TEXTURE.

You can choose a character from any alphabet, for example the default DEC Multinational Character Set, or an alphabet you create. Note, there is a 16 by 16 bit size restriction for a character used as a texture cell. However, with SET_AREA_TEXTURE_SIZE, you can enlarge the character used in filling a figure. GIDIS does this by multiplying the pattern in the texture cell. You can also clip unwanted white space from a text cell with SET_AREA_CELL_SIZE.

If you want a solid fill, specify a solid line with SET_LINE_TEXTURE and choose the current line texture as your area texture cell.

2.2.10 Text Attributes

With GIDIS Text Attribute instructions you control the size, spacing, orientation, and rendition (such as bold or italics) of text.

The GIDIS text model is based on the notion of *character cell*. A character cell is a rectangular field of ON and OFF bits. ON bits form a character pattern; OFF bits form the background. The character cell that stores the bit patterns can be up to 64 bits high and 64 bits wide.

You determine how the character cell is displayed by specifying the unit cell size and display cell size. SET_CELL_UNIT_SIZE specifies the size of the character you want displayed. GIDIS can scale the stored character cell to create larger or smaller characters. Scaling up is restricted to multiples of the bit pattern in the character cell.

SET_CELL_DISPLAY_SIZE gives you a way of extending the background field if you want. Having a display cell larger than the unit cell is an easy way to create white space between characters. You must always set both unit and display cell size, even if they are identical.

Besides setting a display cell width larger than a unit cell width to create white space, you can control spacing between character cells by specifying how to update the current position after a character is displayed. You have three choices:

- Implicit movement only. Specify implicit movement with SET_CELL_MOVEMENT_MODE and set explicit movement to (0,0) with SET_CELL_EXPLICIT_MOVEMENT. This causes the current position to move a display cell width along the current angle of cell rotation. If the current angle is 0, normal left to right text results.

- Explicit movement only. Specify no implicit movement with SET_CELL_MOVEMENT_MODE and set explicit movement to whatever you want with SET_CELL_EXPLICIT_MOVEMENT. For example, if you want upright characters drawn diagonally up to the right, set explicit movement to (n,-n). Note, however, that unless your explicit movement is greater than the display cell size, your characters overwrite each other.

- Implicit and explicit movement. Specify implicit movement with SET_CELL_MOVEMENT_MODE and explicit movement with SET_CELL_EXPLICIT_MOVEMENT. If you use both implicit and explicit movement, your characters move a display cell width plus whatever explicit movement you specify.

Figure 2-4 shows the three possibilities.

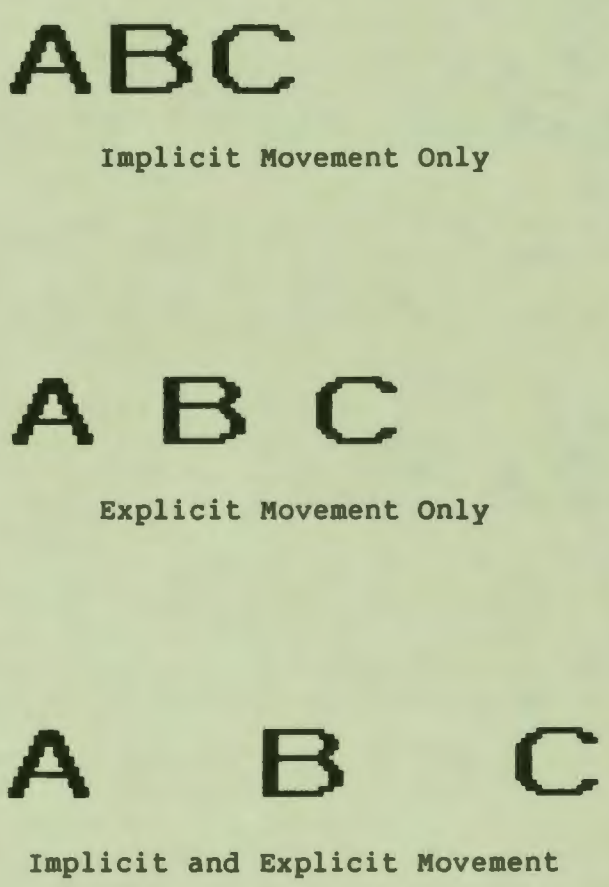


Figure 2-4: Implicit and Explicit Movement

GIDIS allows you to control how accurately the current position is updated. For device-independence and complete accuracy at the level of GOS, specify global symmetry. For best performance and constant intercharacter spacing, specify local symmetry. You specify symmetry with SET_CELL_MOVEMENT_MODE.

Accuracy and constant spacing are contradictory goals, because unit cell width may not be an integral number of hardware pixels. For example, suppose you specified a spacing of 25 GOS units, and the current output device had one hardware pixel for every two GOS units. With local symmetry, each character would move 24 GOS units. With global symmetry, each move would be 25 GOS units conceptually, but actually 12 pixels, then 13, 12, 13 and so on.

A character's orientation (the direction the character faces) depends on the angle of rotation as specified by SET_CELL_ROTATION. A character's angle of rotation is with respect to its top left corner. A positive angle rotates the left edge of the cell counter-clockwise; a negative angle rotates the left edge of the cell clockwise. The entire character cell rotates, without changing the shape of the cell. Figure 2-5 shows character cell rotation.

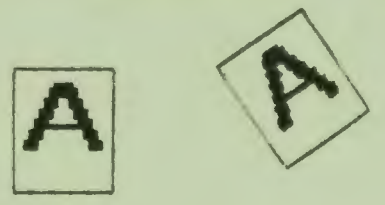


Figure 2-5: Character Cell Rotation

You can change the shape of the cell by using SET_CELL_OBLIQUE. When you specify a nonzero angle, the character cell becomes a parallelogram. A positive angle results in a back-slanted character; a negative angle in a front-slanted character.

You select various cell renditions by setting the appropriate flag with the SET_CELL_RENDITION instruction. If possible, GIDIS selects a font with the specified rendition. Otherwise, GIDIS algorithmically creates the specified rendition. You can specify the following rendition attributes: back-slant, italics, bold and proportional text.

Table 2-4 summarizes the GIDIS Drawing Attributes.

Table 2-4: GIDIS Drawing Attributes

Instruction	Action
Writing Attributes	
SET_PRIMARY_COLOR	Identifies the color map entry to use when drawing subsequent ON bits.
SET_SECONDARY_COLOR	Identifies the color map entry to use when drawing subsequent OFF bits.
SET_PLANE_MASK	Specifies which planes are accessible.
SET_WRITING_MODE	Selects writing mode to use in subsequent drawing.
Line and Curve Attributes	
SET_LINE_TEXTURE	Specifies the pattern used in drawing lines.
SET_PIXEL_SIZE	Specifies the thickness of the drawing line.

Instruction	Action
Filled Figure Attributes	
SET_AREA_TEXTURE	Selects the character to use as the texture cell in filling subsequent figures.
SET_AREA_TEXTURE_SIZE	Specifies the size to draw subsequent texture cells.
SET_AREA_CELL_SIZE	Clips or pads the last selected texture cell.
Text Attributes	
SET_CELL_UNIT_SIZE	Specifies the size to draw subsequent character cells.
SET_CELL_DISPLAY_SIZE	Specifies the size of a character's background field.
SET_CELL_EXPLICIT_MOVEMENT	Specifies the distance to move the current position after a character is drawn.
SET_CELL_MOVEMENT_MODE	Specifies how the current position moves after a character is drawn, and how accurately the current position is updated.
SET_CELL_OBLIQUE	Specifies how much to slant the character display cell.
SET_CELL_ROTATION	Defines the angle of rotation at which subsequent characters are drawn.
SET_CELL_RENDITION	Selects character renditions such as backslant, italics, bold, and proportional spacing.

2.2.11 Alphabets and Fonts

GIDIS uses the current alphabet in all text operations. To select an alphabet, use SET_ALPHABET. The selected alphabet remains current until you do another SET_ALPHABET.

A GIDIS alphabet is like an ASCII character set. When you specify an index within an alphabet, you know which particular character should be displayed. For example, the default alphabet (alphabet 0) is the DEC Multinational Character Set. When you specify index 101 (octal), you know that an uppercase "A" will be displayed.

A font, on the other hand, controls what the "A" looks like. A font's general appearance is denoted by typeface, for example Courier. A font has a rendition, for example roman, italic, bold, or bold italic. Fonts may be monospaced (each character cell has the same width) or proportionally spaced (character cell width varies with the character, for example the cell containing the character "m" is wider that the cell containing the character "i").

You create more than one font for an alphabet for improved quality. As Section 2.5 explained, GIDIS enables you to vary the appearance of text in a number of ways. GIDIS achieves these variations by either selecting a new font or algorithmically transforming the current font. Because there are limits to what can be effectively done by algorithmic transformation, you can ensure better quality by supplying a variety of fonts.

With GIDIS, you are not limited to standard alphabets and character sets. You can build your own alphabets and design your own *glyphs*, the graphic representations of each member of the alphabet. Section 2.2.13 explains how to do both. You may have up to 16 alphabets available at any time and an unlimited number of fonts. When you first select an alphabet from 1-15, it contains no characters. You fill the alphabet in one of two ways: you load a font file with LOAD_BY_NAME, or you dynamically create a font with CREATE_ALPHABET.

2.2.12 Font Files

A font file is simply a font that has been stored in a file. Appendix D explains how to name and store a font file so that the font server can use it.

You load a font file with the LOAD_BY_NAME instruction. LOAD_BY_NAME has two formats. Format 1 selects a specific font file. This format is primarily provided for compatibility with earlier versions of GIDIS. (See Chapter 6 for details.)

Format 2 (also called a family LOAD_BY_NAME) selects a typeface, known in GIDIS as a font family and identified by a family ID. When you do a Family LOAD_BY_NAME, you have really selected a pool of fonts. As you vary text attributes (such as unit cell size) and rendition attributes (such as bold), GIDIS automatically switches to the font file of the current family that best satisfies the attributes you have selected. (See Chapter 6 for details.)

2.2.13 Dynamically Created Fonts

You can build a font with CREATE_ALPHABET. This instruction establishes a storage cell size for each glyph in the font and the number of glyphs it contains. When you build a font with CREATE_ALPHABET you have two options for designing each glyph. With LOAD_CHARACTER_CELL you define a glyph by rows of bit patterns within a character cell. This method of defining glyphs is well-suited to raster devices.

With BEGIN_DEFINE_CHARACTER and END_DEFINE_CHARACTER, you create a glyph by drawing into the character cell with any of the GIDIS drawing instructions. All instructions between BEGIN_DEFINE_CHARACTER and END_DEFINE_CHARACTER draw into the character cell. This method of defining glyphs is well-suited to any device.

A font created dynamically with CREATE_ALPHABET has certain disadvantages.

- It takes time to build the font each time your application runs.
- The font remains defined only until you put another font into its alphabet.
- The font is stored in Read/Write memory. As a result, it is expensive to swap it to disk.

Thus, CREATE_ALPHABET should be used primarily for small, special alphabets like a set of patterns for filling figures.

If you are using P/OS, you can store a dynamically created font in a font file, by using the GIFONT routine of the GIDIS Call Interface. See Chapter 4 and Appendix D for details.

Table 2-5 summarizes GIDIS instructions for alphabets and fonts.

Table 2-5: Alphabet and Font Instructions

Instruction	Action
SET_ALPHABET	Selects the current alphabet.
LOAD_BY_NAME(1)	Loads the specified font file into the current alphabet.
LOAD_BY_NAME(2)	Associates the current alphabet with the specified font family.
CREATE_ALPHABET	Reserves storage space for a new alphabet font. Specifies the number of glyphs in the alphabet and the size of glyphs in the font.
LOAD_CHARACTER_CELL	Defines a glyph in terms of bit patterns within a character cell.
BEGIN_DEFINE_CHARACTER	Starts a character definition block. All subsequent instructions draw into the character cell.
END_DEFINE_CHARACTER	Completes a character definition block and draws the glyph.

2.2.14 Reports

You can ask GIDIS to generate various reports. You do this by issuing the appropriate request instruction. You read the report using GIREAD, as described in Chapter 4 (for P/OS) or Chapter 5 (for RT-11).

You can use reports to control program flow. For example, the position after a DRAW_ARCS or DRAW_CHARACTERS (local symmetry) may be different than what your program computes. You can check the actual current position with REQUEST_CURRENT_POSITION.

You can also use reports during debugging. In particular, every GIDIS instruction sets current status to SUCCESS or FAILURE. You may want to check current status after each GIDIS instruction when debugging. However, the cost of REQUEST_STATUS is too high for such use in a running application.

Table 2-6 summarizes all the GIDIS report generating instructions.

Table 2-6: Report Instructions

Instruction	Action
REQUEST_CELL_STANDARD	Reports in current GOS units the cell width and height to specify to generate standard size characters.
REQUEST_CURRENT_POSITION	Reports the current position.
REQUEST_OUTPUT_SIZE	Reports the attributes of the current device's view surface.
REQUEST_STATUS	Reports the success or failure of the last instruction.
REQUEST_VERSION_NUMBER	Reports characteristics of the current driver.

CHAPTER 3

PRO/GIDIS INSTRUCTION SYNTAX

The PRO/GIDIS interpreter accepts a stream of PRO/GIDIS instructions. An instruction consists of an operation code (opcode) word, and some number of argument words.

The format of an opcode word is:

Most GIDIS instructions require a fixed number of arguments. For example, SET_POSITION needs exactly two arguments.

Some GIDIS instructions accept a variable number of arguments, depending on whether optional arguments are included. Instructions in this category include: LOAD_BY_NAME and CREATE_ALPHABET. When an optional argument is omitted, GIDIS supplies a default as described in Chapter 6.

Some fixed length instructions are repeatable. You can repeat some of the arguments without repeating the opcode. For example, DRAW_REL_LINES X1, Y1, X2, Y2, X3, Y3 is equivalent to DRAW_REL_LINES X1, Y1 DRAW_REL_LINES X2, Y2, DRAW_REL_LINES X3, Y3. The instructions in this class include: DRAW_LINES, DRAW_REL_LINES, DRAW_ARCS, DRAW_REL_ARCS, DRAW_CHARACTERS, and DRAW_PACKED_CHARACTERS.

3.1 OPCODE BYTE

Each GIDIS instruction has a corresponding numeric code. For example, the INITIALIZE instruction has an opcode of 1, while the SET_PRIMARY_COLOR instruction opcode is 21. (Appendix A provides a list of PRO/GIDIS instructions and their corresponding opcodes.)

Your program can define PRO/GIDIS instruction names as numeric constants. For example, in MACRO-11, this could be:

```
G$INIT = 1.
G$PRIM = 21.
```

In FORTRAN, this could be:

```
INTEGER*2 GINIT,GPRIM
PARAMETER (GINIT = 1, GPRIM = 21)
```

In PASCAL, this could be:

```
CONST
  INITIALIZE = 1;
  SET_PRIMARY_COLOR = 21;
```

3.2 LENGTH BYTE AND THE ARGUMENT LIST

The length byte dictates the format of the instruction's argument list: counted or uncounted. Generally, you use a counted list for instructions with a fixed number of arguments, and an uncounted list for instructions with a variable number of arguments. However, you can use either a counted or uncounted argument list with any instruction.

A length value in the range 0 to 254 indicates a counted argument list. For example, if you specify a length value of two, PRO/GIDIS expects two argument words as shown below:

```
.BYTE   2.,29.  ;Instruction data block length = 2
                ;Opcode for SET_POSITION instruction = 29
.WORD   100.    ;x coordinate for current position
.WORD   350.    ;y coordinate for current position
                ;Following execution of this instruction,
                ;the current position is 100,350.
```

A length value of 255 indicates an uncounted argument list. Uncounted argument lists are terminated by an END_LIST instruction word (-32768), as shown below. Thus an argument word in an uncounted argument list cannot contain the value -32768.

```
.BYTE   255.,26.;introduces an uncounted argument list
                ;opcode for DRAW_REL_LINES
.WORD   10.     ;dx1
.WORD   -30.    ;dy1
.WORD   20.     ;dx2
.WORD   +60.    ;dy2
.WORD   -32768. ;END_LIST instruction opcode word
```

3.3 SYNTAX ERRORS

If GIDIS does not recognize an instruction opcode, it ignores that instruction and accompanying arguments. It also sets the status flag to FAILURE. If GIDIS encounters an instruction with insufficient arguments, it does not execute the instruction and sets the status flag to FAILURE. If GIDIS encounters an instruction with extra arguments, it executes the instruction as though the extra arguments did not exist.

For example, a SET_POSITION instruction with only one argument is ignored, while a SET_POSITION with three arguments is executed using only the first two arguments.

There are only two ways to confuse the GIDIS interpreter:

- Use END_LIST as an argument word in an uncounted argument list.
- Specify an argument count that differs from the actual number of arguments passed.

If you do either, you must reinitialize GIDIS. See the INITIALIZE instruction in Chapter 6.

CHAPTER 4

USING PRO/GIDIS WITH P/OS

This chapter describes how to use the GIDIS Call Interface (GIDCAL) with P/OS. It assumes you understand the conceptual framework of PRO/GIDIS (described in Chapter 2) and the PRO/GIDIS instruction syntax (described in Chapter 3).

- Section 3.1 describes the GIDIS Call Interface (GIDCAL).
- Section 3.2 describes the various devices accessed by GIDCAL.
- Section 3.3 explains how to build a task with GIDCAL.
- Section 3.4 documents GIDCAL error reporting.
- Section 3.5 lists sample programs for P/OS.

4.1 THE GIDIS CALL INTERFACE (GIDCAL)

The GIDIS call interface (GIDCAL) allows you to access each of the various GIDIS devices in the same way. GIDCAL consists of six routines:

- GIOPEN
- GIWRIT
- GIREAD
- GICLOS
- GIFONT

- GIPLAY

You access each routine by using the FORTRAN-compatible calling sequence (sometimes called the R5 calling convention). This means arguments are passed by reference, R5 is set to point to the argument list, and R1 through R5 are preserved by the called routine.

These standard routines make it easy for you to develop applications in high-level languages. You can use GIDCAL from MACRO-11 or any Tool Kit high-level language that supports FORTRAN-style calls.

Normally you use GIDCAL as follows:

1. Select the GIDIS driver you want to use with GIOPEN.

2. Pass GIDIS instructions with one or more calls to GIWRIT.

3. Read reports from REQUEST-type instructions, if any, with GIREAD.

4. Terminate the GIDIS connection with GICLOS.

Each GIDCAL routine returns a status code that indicates the results of the requested operation. If the operation is successful, a code of 1 is returned. If the operation is unsuccessful, a two-word error code block is returned. Section 4.4 explains how to interpret the codes.

You may have more than one GIDIS connection open at a time. This is useful if you want to print a GIDIS graphic while maintaining a connection to video GIDIS. GIDIS knows which driver to send instructions to by the Logical Unit Number (LUN) you specify with the GIOPEN call.

NOTE

Some high-level languages may reserve certain LUNs for their own use. If this is the case, you cannot access the same LUN. Check language documentation prior to assigning LUNs.

The following sections describe each GIDCAL routine and its arguments. The actual syntax for passing these arguments is specific to the high-level language you are using. See language documentation for details.

4.1.1 GIOPEN

GIOPEN initiates contact with the GIDIS driver of your choice. You choose a driver by specifying device type (Devtype) in the list of arguments. If you try to GIOPEN an active driver, Status is set to (-1,-7).

A GIOPEN does not affect the state of GIDIS. All attributes currently selected remain in force.

The list of arguments for GIOPEN follows.

GIOPEN (Status, LUN, Message, Msglen, Devtype, Driver)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	Unit-number associated with this GIOPEN. It should be an integer from 0 to 15. If not, Status is set to (-5,-1). If this LUN is already assigned to a GIDIS driver, Status is set to (-5,-4).
Message	Data to send to the driver when contact is initiated. Except as noted in Section 4.2, Message should be a word containing a 0.
Msglen	The number of words in Message. Except where noted, it should be 1. If Msglen is less than 0 or greater than 128, Status is set to (-5,-3).
Devtype	An integer that identifies the desired output device. If Devtype is invalid, Status is set to (-5,-2). If you try to GIOPEN a device for which there is no driver, Status is set to (-1,-2). The device types are: 0 - Disk File 1 - LA50 2 - LQP02 3 - LA100/LA210 4 - LVP16 5 - Other 6 - Video 7 - LN03 8 - Palette 9 - LQP03
Driver	Normally a 0. It should be nonzero only if you need to override the driver designated for the

device. (See Section 4.2 for driver names.) If you supply your own driver, identify it by the task name, in Radix-50.

Normally, the argument list for GIOPEN is (Status, LUN, 0, 1, Devtype, 0).

4.1.2 GIWRIT

GIWRIT outputs a buffer of GIDIS command data to the specified GIDIS driver. The data in a buffer does not have to start or end on a command boundary.

The list of arguments for GIWRIT follows.

GIWRIT (Status, LUN, Message, Msglen)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	Identifies the GIDIS driver to talk to. If no GIOPEN has been done for the specified value, Status is set to (-5,-1).
Message	The command data to send to the specified driver.
Msglen	The number of words in Message. If it is less than 0 or greater than 4095, Status is set to (-5,-3).

4.1.3 GIREAD

GIREAD waits for GIDIS to return the report and places it in the specified buffer. If the report is longer than the specified buffer, the end of the report is truncated. If the report is shorter than the specified buffer, the trailing words of the buffer are left unchanged.

The list of arguments for GIREAD follows.

GIREAD (Status, LUN, Buffer, Buflen)

Status	A two-word integer array used to return a code indicating the results of the requested operation.

LUN	Identifies the GIDIS driver sending the report. If no GIOPEN has been done for the specified device driver, Status is set to (-5,-1).
Buffer	Room for the report returned by GIDIS. Recall that the first word of a report contains a header specifying the type of report and the number of words in the buffer.
Buflen	The number of words in the report buffer.

4.1.4 GICLOS

GICLOS tells the specified GIDIS to end the connection. GICLOS does not return to its caller until the specified GIDIS has told it that all picture data has been output to the device.

A GIDIS driver processes a GICLOS by simulating an END_PICTURE instruction. (See Chapter 6 for details.) If the driver is not Video GIDIS, it exits when it has finished processing the picture.

If the driver is the type that buffers a picture before writing it, (for example, G$BITM) GICLOS causes picture output to commence if either:

- The user task **has not done** any END_PICTURE commands.
- The user task **has done** drawing commands since its last END_PICTURE.

The list of arguments for GICLOS follows.

GICLOS (Status, LUN)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	Identifies the GIDIS driver to terminate. If no GIOPEN has been done for the specified value, Status is set to (-5,-1).

4.1.5 GIFONT

GIFONT is independent of the other routines in GIDCAL. You use it to create a font file from the font loaded into alphabet 15. See CREATE_ALPHABET, SET_ALPHABET, BEGIN_DEFINE_CHARACTER, and LOAD_CHARACTER_CELL in Chapter 6 for information on how to create a GIDIS font.

The list of arguments for GIFONT follows.

GIFONT (Status, File spec, Len, Region name, Buffer, APR, LUN)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
File spec	Name of the font file you want created in ASCII. For example, "MYFONT.TSK."
Len	Number of characters in File spec.
Region name	Name (in Radix-50) to use for the font region when the font file is later used by GIDIS. See Appendixes C and D for details.
Buffer	256 word buffer that GIFONT uses as a temporary work area.
APR	APR that GIFONT maps alphabet fifteen's font into (8KB at a time).
LUN	Driver GIFONT should use when writing a font File spec

If you want to create a stroke font file (as opposed to a raster font file), you must run Plotter GIDIS. This ensures that the font is properly stored. To indicate a stroke font in the .FDF file (see Appendix D), specify a cell width and height of 1.

4.1.6 GIPLAY

Like GIFONT, GIPLAY is independent from the other GIDCAL routines. GIPLAY plays back the specified .GID file to the current output device, such as the video monitor. The file you want to play back must be on the local node. Only one task at a time can be doing a playback.

To use GIPLAY, you must first install the following file:

```
INSTALL [ZZSYS]CGLGRT.TSK
```

The list of arguments for GIPLAY follows:

GIPLAY (Status, LUN, File Spec, Len)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	Identifies the GIDIS driver writing the picture. If no GIOPEN has been done for the specified value, Status is set to (-5,-1).
File spec	Name of the file you want played back.
Len	Number of characters in File spec. A File spec can contain 1 to 59 characters. A length outside these bounds returns a Status of (-5,-5).

4.2 DEVICES ACCESSED BY GIDCAL

The Devtype value defined in a GIOPEN tells GIDIS which driver to access. Information about each device and its associated driver follows.

4.2.1 Disk File

The Message argument to GIOPEN should be the file specification that is the output device. There should be a null byte following the characters in the file spec. The Msglen argument to GIOPEN is the number of words in the file spec. Thus, whether the file specification is "A.GID" or "AB.GID", Msglen contains 3.

Calling GICLOS closes the file.

The driver is the task G$FILE.

4.2.2 LA50

The device area is assumed to be 8 inches wide by 10 and 2/3 inches high. The picture is automatically drawn to best fill the available area, so a landscape picture is drawn sideways.

Picture drawing starts when an END_PICTURE instruction is issued (or GICLOS simulates one).

The driver is the task G$BITM.

4.2.3 LQP02

No GIDIS driver is supplied for the LQP02. However, GIOPEN tries to access a task named G$LQP. If G$LQP does not exist, GIOPEN fails with Status set to (-1,-2).

4.2.4 LA100/LA210

The device area is assumed to be 8 inches wide by 10 and 2/3 inches high. The picture is automatically drawn to best fill the available area, so a landscape picture is drawn sideways.

Picture drawing starts when an END_PICTURE instruction is issued (or GICLOS simulates one).

The driver is the task G$BITM.

4.2.5 LVP16, HP7475, HP7470 Plotters

The user controls the device area by setting a dip switch. If set to A3, the area is about 17 inches wide by 11 inches high. If set to A4, the area is about 10 inches wide by 7.5 inches high. The picture is automatically drawn to best fill the available area, so a portrait picture is drawn sideways.

NOTE

> The large paper size and portrait output do not apply to the HP7470.

The driver is the task G$HPGL.

4.2.6 Other Device

This device type is for accessing a private GIDIS. This allows third-party suppliers to develop alternative GIDIS devices. The format and content of the initialization message depend on the device supplier. However, we do suggest that suppliers allow a one-word message containing a zero.

No device driver is supplied for device type Other. However, GIOPEN tries to access a task named G$OTH. If the device supplier gives his GIDIS driver a different name than G$OTH, he must specify that name in the Driver argument to GIOPEN. Remember, the driver name should be the task name in Radix-50.

4.2.7 Professional Video

The device area is the entire screen. The screen is 8 units wide by 5 units high.

Picture drawing occurs as GIDIS instructions are received.

The driver is part of the Terminal Subsystem.

4.2.8 LN03

The device area is assumed to be 8 inches wide by 10 and 2/3 inches high. The picture is automatically drawn to best fill the available area, so a landscape picture is drawn sideways.

Picture drawing starts when an END_PICTURE instruction is issued (or GICLOS simulates one).

The driver is the task G$BITM.

4.2.9 Polaroid Palette

The device area is the entire print or slide. It is nominally 4 units wide by 3 units high.

Picture drawing starts when an END_PICTURE instruction is issued (or when GICLOS simulates one). During picture drawing, the Palette driver uses the video screen as a work area. When a slide camera is being used, GIOPEN opens the camera's shutter; GICLOS closes it and advances the film.

The driver is the task G$PAL. If it sets Status to (-6, any), it means a Palette I/O error has occurred. The second word of Status is the code returned by the Palette system. Table 4-1 lists the error codes, their meanings, and user actions.

Table 4-1: GIDCAL Palette Errors

Palette Code	Decimal Value	Error	User Action
"0"	48	Invalid Palette command	Report to Polaroid if the error recurs.
"1"	49	Invalid argument to Palette command	Report to Polaroid if the error recurs.
"2"	50	Filter wheel error	Report to Polaroid if the error recurs.
"3"	51	Communications error	Try readjusting RS-232 cable. If the error recurs, report to Polaroid.
"4"	52	No vertical sync	Try readjusting video cables and turning Palette off and on. If the error recurs, report to Polaroid.

4.2.10 LQP03

No GIDIS driver is supplied for the LQP03. However, GIOPEN tries to access a task named G$LQP. If G$LQP does not exist, GIOPEN fails with Status set to (-1,-2).

4.3 BUILDING A TASK WITH GIDCAL

GIDCAL is part of the PRO/Tool Kit. To link GIDCAL with your task, specify GIDCAL/LB just as you would for any other .OLB file. GIDCAL.OLB is on LB:[1,5]. GIDCAL, without GIFONT, uses about 800 words of your address space.

When you use GIFONT, you must include RMS in your task, plus room for the data area you pass to it.

Note the driver-specific instructions in Sections 4.4.1 and 4.4.2.

4.3.1 Video GIDIS

- When accessing Video GIDIS, GIDCAL uses one event flag (EFN). The default EFN is 29. If you want to give the EFN a different value, specify GBLDEF=GI$EFN:value in the task build command file.
- GIOPEN assigns the LUN you specified, if Devtype is Video.

4.3.2 Other GIDIS Drivers

- The GIDIS tasks G$BITM, G$HPGL, and G$PAL were built with an assigned ASG of the form ASG=LP:1. When one of these tasks starts up, it attaches the device associated with LUN 1; consequently, you cannot attach this device.
- Do not use the RSUM$ and SPND$ system directives with GIDCAL.
- GICLOS sends a one-word message that contains a -1. Therefore, you should not send such a buffer using GIWRIT.
- If you plan to access an LA50, LA100, or LN03, put INSTALL [ZZSYS]GIBITM in your installation file. If you plan to access Palette, put INSTALL [ZZSYS]GIPAL in your installation file. If you plan to access a private GIDIS, add the appropriate INSTALL command to your installation file.

4.4 ERROR REPORTING

All GIDCAL routines return a two-word status value. If the value of the first word is less than 0, an error was detected. The first word identifies the class of error; the second word identifies which error of the class has occurred. Table 4-2 lists the error classes and user actions to deal with the problem.

Table 4-2: GIDCAL Errors Listed by Class - P/OS

Code	Meaning	User Action
-1	Directive error	Refer to *RSX-11M/M-Plus Executive Reference Manual* for specific error.
-2	I/O Error	Refer to *IAS/RSX-11 Operations Reference Manual* for specific error.
-3	RMS Error	Refer to *RMS-11 Macro Programmer's Guide* for specific error.
-4	Internal error in GIDIS driver	Report error to DIGITAL.
-5	Interface error	Refer to Table 4-3 for specific errors.
-6	Palette driver error	Refer to Table 4-1 for specific error.

An error is driver-related if the first word of Status is anything but -5. This usually indicates a device problem (for example, the device is offline), but it could also mean that you passed a bad File spec to File GIDIS. Table 4-3 lists the types of errors for the value -5.

Table 4-3: GIDCAL Interface Errors - P/OS

Code	Error	User Action
-1	Invalid or unassigned LUN	Assign LUN with GIOPEN.
-2	Invalid device type	See Section 4.3.
-3	Improper message length	Assign Msglen within range.
-4	LUN already attached to a GIDIS driver	Select a new LUN.

4.5 SAMPLE P/OS PROGRAMS

4.5.1 Sample MACRO-11 Program

```
        .BLKW   2.
OBUF:   .BYTE   0.,55.  ;Length=0 REQUEST_CURRENT_POSITION
RBUF:   .BLKW   3.


        MOV #OARG, R5
        JSR PC,GIOPEN   ;SEND INSTRUCTION TO PRO/GIDIS
        TST     STAT
        BLE     ERROR   ;BRANCH IF GIOPEN FAILED

        MOV #WARG, R5
        JSR PC,GIWRIT   ;SEND INSTRUCTION TO PRO/GIDIS
        TST     STAT
        BLE     ERROR   ;BRANCH IF GIWRIT FAILED
                        ;READ THE REPORT
        MOV #RARG, R5
        JSR PC, GIREAD  ;READ THE REPORT
        TST     STAT
        BLE     ERROR   ;BRANCH IF GIREAD FAILED
                        ;
                        ; NEW CONTENTS OF RBUF:
                        ; BYTE AT RBUF    2.  (LENGTH)
                        ; BYTE AT RBUF+1  1.
                        ;   (CURRENT POSITION REPORT HDR)
                        ; RBUF+2:  CURRENT X POSITION
                        ; RBUF+4:  CURRENT Y POSITION

        MOV #CARG, R5
        JSR PC, GICLOS
        TST     STAT
        BLE     ERROR   ;BRANCH IF GICLOS FAILED

ERROR:                  ; Error handling routine

OARG:   .BYTE   6.,0
        .WORD   STAT
        .WORD   LUN
        .WORD   OPMSGL
        .WORD   OPMLEN
        .WORD   DEVTYP
        .WORD   DRIVER

WARG:   .BYTE   4.,0.
        .WORD   STAT
        .WORD   LUN
        .WORD   OBUF
        .WORD   MSGLEN
```

```
RARG:    .BYTE   4.,0.
         .WORD   STAT
         .WORD   LUN
         .WORD   RBUF
         .WORD   BUFLEN

CARG:    .BYTE   2.,0.
         .WORD   STAT
         .WORD   LUN

STAT:    .WORD   0.,0.
LUN:     .WORD   5.
OPMSGL:  .WORD   1.
OPMLEN:  .WORD   0.
DEVTYP:  .WORD   6.
DRIVER:  .WORD   0.
MSGLEN:  .WORD   1.
BUFLEN:  .WORD   3.
```

4.5.2 Sample FORTRAN Program

```
  INTEGER*2  OBUF
  INTEGER*2  RBUF(3),STAT(2)

  OBUF = 55*256+0    !OPCODE 55=REQUEST_CURRENT_POSITION
                     !LENGTH=0

  CALL GIWRIT (STAT, 5, OBUF, 1)
  IF (STAT.LE.0) GO TO 999       !BRANCH IF GIWRIT FAILED

  CALL GIREAD (STAT, 5, RBUF, 3)
  IF (STAT.LE.0) GO TO 999       !BRANCH IF GIREAD FAILED

          ! NEW CONTENTS OF RBUF:
          ! RBUF(1):  258 (i.e., 1*256+2 BECAUSE
          ! 1 = THE REPORT HDR AND 2 = LENGTH OF DATA FOLLOWING)
          ! RBUF(2):  CURRENT X POSITION IN GIDIS OUTPUT SPACE
          ! RBUF(3):  CURRENT Y POSITION IN GIDIS OUTPUT SPACE

999       ! ERROR FOUND
```

CHAPTER 5

USING PRO/GIDIS WITH RT-11

This chapter describes how to pass instructions to the GIDIS interpreter under RT-11. It assumes you understand the conceptual framework of PRO/GIDIS (described in Chapter 2) and the PRO/GIDIS instruction syntax (described in Chapter 3).

RT-11 requires that the FPU (floating point unit) hardware be installed on the Professional running PRO/GIDIS. RT-11 V5.2 runs PRO/GIDIS only as the foreground job under the XM monitor. Information in Chapter 6 about other devices does *not* apply to PRO/GIDIS under RT-11.

PRO/GIDIS requires two files: GIDIS.SAV and ALPH00.FNT. GIDIS.SAV is the utility save image. ALPH00.FNT is the default GIDIS font file. Both files must be on the system (SY:) device.

Issue the following command to start PRO/GIDIS and make it available to application programs:

```
.FRUN GIDIS.SAV
```

RT-11 provides software access to PRO/GIDIS using three interfaces.

- The GIDCAL interface (GIDIS call routines)
- The MACRO-11 interface (.SPFUN programmed request)
- The FORTRAN interface (ISPFN/ISPFNC/ISPFNF/ISPFNW)

The Professional Interface (PI) handler controls the operation of PRO/GIDIS and is transparent to the user. PRO/GIDIS instructions from application programs are sent to and received from PI using any of the above interfaces.

5.1 THE GIDIS CALL INTERFACE (GIDCAL)

Under RT-11, the GIDCAL routines consist of four FORTRAN system subroutines:

- GIOPEN
- GIWRIT
- GIREAD
- GICLOS

The subroutines are located in the system subroutine library SYSLIB.OBJ.

With the following exceptions, the GIDCAL routines work the same under RT-11 as they do under P/OS.

- GIFONT and GIPLAY, two GIDCAL routines available under P/OS, are not currently supported.
- For RT-11 V5.2, GIDCAL addresses only the PRO Video (Devtype 6).
- In GIWRIT the maximum message length (msglen) is 2048 decimal words.

Normally you would use GIDCAL as follows:

1. Initiate the GIDIS operation with GIOPEN.
2. Pass GIDIS instructions with one or more calls to GIWRIT.
3. Read reports from REQUEST-type instructions, if any, with GIREAD.
4. Terminate the GIDIS connection with GICLOS.

Each GIDCAL routine returns a status code that indicates the results of the requested operation. If the operation is successful, a code of 1 is returned. If the operation is unsuccessful, a two-word error code block is returned. Section 5.1.5 explains how to interpret the codes.

NOTE

Some high-level languages may reserve certain LUNs for their own use. If this is the case, you cannot access the same LUN. Check language documentation prior to assigning LUNs.

The following sections describe each GIDCAL routine and its arguments. The actual syntax for passing these arguments is specific to the high-level language you are using. See language documentation for details.

5.1.1 GIOPEN

GIOPEN initiates contact with the Professional interface (PI) handler and assigns a logical unit number (LUN) for this GIDIS operation. A GIOPEN does not affect the state of GIDIS. All attributes currently selected remain in force.

To initialize the Professional video screen, execute the INITIALIZE -1 (complete initialization) instruction, followed by the NEW_PICTURE instruction.

The list of arguments for GIOPEN follows.

GIOPEN (Status, LUN, Message, Msglen, Devtype, Driver)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	Unit-number associated with this GIOPEN. It should be an integer from 0 to 15. If not, Status is set to (-5,-1). If this LUN is already connected to a GIDIS operation, Status is set to (-5,-4).
Message	Data to send to Video GIDIS. Message should be a word containing a 0.
Msglen	The number of words in Message. Except where noted, it should be 1. If Msglen is less than 0 or greater than 128, Status is set to (-5,-3).
Devtype	An integer that identifies the desired output device. For RT-11 V5.2 only Devtype 6 is valid. Integer values 0 through 5, 7 and 8 are reserved. If Devtype is invalid, Status is set to (-5,-2).
Driver	0, as RT-11 accesses only video GIDIS

Normally, the argument list for GIOPEN is (Status, LUN, 0, 1, Devtype, 0).

5.1.2 GIWRIT

GIWRIT outputs a buffer of GIDIS command data to the specified GIDIS driver. The data in a buffer does not have to start or end on a command boundary. The list of arguments for GIWRIT follows.

GIWRIT (Status, LUN, Message, Msglen)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	Identifies the unit number assigned by GIOPEN. If no GIOPEN has been done for the specified value, Status is set to (-5,-1).
Message	The command data to send to Video GIDIS
Msglen	The number of words in Message. If it is less than 0 or greater than 2048 (decimal words), Status is set to (-5,-3).

5.1.3 GIREAD

GIREAD waits for GIDIS to return the report and places it in the specified buffer. If the report is longer than the specified buffer, the end of the report is truncated. If the report is shorter than the specified buffer, the trailing words of the buffer are left unchanged.

The list of arguments for GIREAD is as follows.

GIREAD (Status, LUN, Buffer, Buflen)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	The unit number assigned by GIOPEN. If no GIOPEN has been done for the specified device driver, Status is set to (-5,-1).
Buffer	Room for the report returned by GIDIS. Recall that the first word of a report contains a header specifying the type of report and the number of words in the buffer.
Buflen	The number of words in the report buffer.

5.1.4 GICLOS

GICLOS ends the GIDIS connection to the Professional interface handler. The output device treats a GICLOS subroutine as an END_PICTURE instruction. Control is returned to the calling program once all data specified by the GIWRIT subroutine has been sent to the output device. (See Chapter 6 for details.)

The list of arguments for GICLOS is as follows.

GICLOS (Status, LUN)

Status	A two-word integer array used to return a code indicating the results of the requested operation.
LUN	The unit number to terminate. If no GIOPEN has been done for the specified value, Status is set to (-5,-1).

5.1.5 GIDCAL Error Reporting

GIDCAL subroutines can return the following error codes and subcodes in the two-word status array. The first word specifies the class of the error; the second word specifies the type of error within the class.

GIDCA running under RT-11 returns three classes of errors listed in Table 5-1.

Table 5-1: GIDCAL Errors Listed by Class - RT-11

Code	Meaning
-1	Directive error
-5	Interface error
-7	Operating System Error

The directive error code (-1) can return the following subcode:

-1	No handler. The output device handler is not loaded.

The interface error code (-5) returns the subcodes listed in Table 5-2.

Table 5-2: GIDCAL Interface Errors - RT-11

Code	Error
-1	Invalid or unassigned LUN
-2	Invalid device type
-3	Improper message length
-4	LUN already attached to a GIDIS driver

In addition to the directive and interface errors, RT-11 also reports operating system errors (-7). Table 5-3 describes the specific errors within this class.

Table 5-3: RT-11 Operating System Errors

Code	Error
Codes returned during a GIDIS operation	
-1	Required argument missing. A required argument in a GIDCAL subroutine is not specified.
-2	Handler not found. The indicated file was not found on the device.
-3	File not found. The indicated file was not found on the device.

Code	Error
-4	File open on nonsharable or non-file-structured device.
-5	An attempt was made to read or write past the end-of-file (EOF) mark.
-6	Hard error. The GIDIS operation experienced a hard error on the output device.
Codes returned when the .SERR programmed request is in effect.	
-129	Called USR from completion routine.
-130	No device handler; this operation needs one.
-131	Error doing directory I/O.
-132	.FETCH error. An I/O error occurred while the handler was being used, or an attempt was made to load the handler over USR or RMON.
-133	Error reading an overlay.
-134	No more room for files in the directory.
-135	Reserved.
-136	Invalid channel number; number is greater than actual number of channels that exist.
-137	Invalid EMT, and invalid function code has been decoded.
-138	Reserved.
-139	Reserved.
-140	Invalid directory.
-141	Unloaded XM handler.
-142	Reserved.
-143	Reserved.
-144	Reserved.
-145	Reserved.

Code	Error
-146	Reserved.

5.1.6 Sample Program Using GIDIS Call Interface

The following FORTRAN program fragment uses the GIDCAL subroutines to request the current cursor position.

```
C
C       Declare storage.
C
        INTEGER*2       BUFLEN , LUN , MSGLEN , OCLEN , OPCODE
        INTEGER*2       BUFFER( 3 ) , MESSAG( 1 ) , STATUS( 2 )
C
C       User program begins here...
C
        .
        .
        .
C
C       Assign Logical Unit Number.
C
        LUN     =       5
C
C       Assign opcode (REQUEST_CURRENT_POSITION) and opcode
C       length (0).
C
        OPCODE  =       55*256
        OCLEN   =       0
C
C       Insert opcode and opcode length into message buffer
C       (one word).
C
        MESSAG( 1 )     = OPCODE + OCLEN
        MSGLEN          = 1
C
C       Send the message to GIDIS
C
        CALL    GIWRIT( STATUS , LUN , MESSAG , MSGLEN )
C
C       Check for errors.
C
        IF      ( STATUS( 1 ) .LE. 0 ) GOTO 999
C
C       Assign buffer length for report.
```

```
C
      BUFLEN  =       3
C
CC    Get a report from GIDIS.
C
      CALL    GIREAD( STATUS , LUN , BUFFER , BUFLEN )
C
CC    Check for errors.
C
      IF      ( STATUS( 1 ) .LE. 0 ) GOTO 999
C
CC    Contents of BUFFER after successful return:
C
CC    BUFFER( 1 ) = 258 ( (1*256) + 2 )
CC                      1 = Report header,
CC                      2 = Number of data elements in buffer
CC    BUFFER( 2 ) = Current "X" position in GIDIS output space
CC    BUFFER( 3 ) = Current "Y" position in GIDIS output space
C
CC    User program continues from here...
C
      .
      .
      .
C
CC    Handle errors.
C
  999 ...
C
CC    End of GIDCAL example.
C
      END
```

5.2 THE MACRO-11 PRO/GIDIS INTERFACE

With the MACRO-11 interface, PRO/GIDIS instructions from application programs are sent to and received from the Professional interface handler using the .SPFUN programmed request. The .SPFUN programmed request is located in the distributed RT-11 MACRO library SYSMAC.SML.

RT-11 supports PRO/GIDIS from MACRO-11 or any supported high-level language that uses external MACRO-11 routines. The recommended method is to write callable MACRO-11 routines that issue the .SPFUN programmed request. For information on calling the .SPFUN programmed request from a supported high-level language, refer to the documentation for that language.

When programming for GIDIS using the .SPFUN request of ISPFN subroutines, you should initialize GIDIS before sending it your GIDIS instructions. Perform the following operations each time you begin a new program:

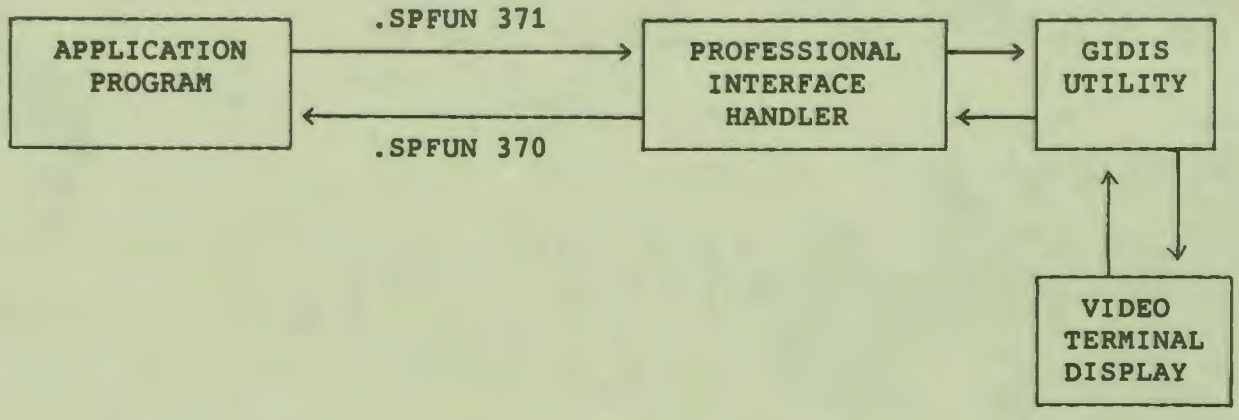
1. Establish a channel to PI with the .LOOKUP request.

2. Issue an .SPFUN 371 request and specify -1 for the wcnt argument.

3. Issue an .SPFUN 371 with the INITIALIZE instruction.

4. Issue the .SPFUN 371 that writes your data buffer to GIDIS.

RT-11 requires PRO/GIDIS to be the highest priority job.
The following is a simplified illustration of the RT-11 PRO/GIDIS data path:



5.2.1 .SPFUN 371

The .SPFUN 371 writes (sends) one or more PRO/GIDIS instructions and their associated parameter values to the Professional interface handler in a buffer. The buffer must begin at an even address. The Professional interface handler passes the buffer to the GIDIS utility for processing. You can pass a maximum of 2048 (decimal) words to the PI handler in one .SPFUN 371 request.

The following is the structure of the .SPFUN 371 programmed request when used with the Professional interface handler.

Macro Call: .SPFUN area,chan,func,buf,wcnt,blk

area	Is the address of a six-word EMT argument block
chan	Is the channel number in the range 0 to 376 (octal)
func	Is 371
buf	Is the address of the buffer containing the input to the GIDIS utility. Buf must start on a word boundary
bcnt	Is the number of bytes of information being sent
blk	Is zero

The .SPFUN 371 request can return error codes; see the *RT-11 Programmer's Reference Manual* for complete information.

Issuing a REQUEST_STATUS instruction returns a report on the success or failure of an instruction sent by .SPFUN 371. Check the carry bit on return from .SPFUN 371 to determine whether the instruction was successfully sent to PRO/GIDIS.

5.2.2 .SPFUN 370

The .SPFUN 370 reads (returns) a buffer of information generated from a PRO/GIDIS REQUEST-type instruction (sent using .SPFUN 371). The buffer must begin at an even address. The Professional interface handler passes the buffer address to PRO/GIDIS, and PRO/GIDIS loads the information into the buffer.

The following is the structure of the .SPFUN 370 programmed request when used with the Professional interface handler.

Macro Call:	.SPFUN area,chan,func,buf,bcnt,blk
area	Is the address of a six-word EMT argument block
chan	Is the channel number in the range 0 to 376 (octal)
func	Is 370
buf	Is the address of the buffer containing the input to the GIDIS utility. Buf must start on a word boundary
wcnt	Is the maximum number of words the GIDIS utility can place in the buffer
blk	Is zero

The .SPFUN 370 request can return error codes; see the *RT-11 Programmer's Reference Manual* for complete information.

5.2.3 SAMPLE MACRO-11 PROGRAM

The following example returns the current position of the cursor.

```
        G$RCP=:55.                      ; Specify instruction
        G$INT=: 1.                      ; codes

        .LOOKUP #IOAREA,#0,#PIBLK       ; Open PI on channel 0
        BCS     ERROR                   ; Check for success
                                        ;
        .SPFUN  #IOAREA,#0,#371,,#-1,#0
                                        ; Initialize GIDIS
        BCS     ERROR                   ; Check for success
                                        ;

        .SPFUN  #IOAREA,#0,#371,#REQPOS,#3,#0
                                        ; Send the instructions
                                        ; to initialize GIDIS
                                        ; internal symbols and
                                        ; REQUEST_CURRENT_POSITION.
                                        ;
        BCS     ERROR                   ; Check for success
                                        ;
        .SPFUN  #IOAREA,#0,#370,#REPBUF,#3,#0
                                        ; Read the current
                                        ; position.
        BCS     ERROR                   ; Check for success
                                        ;
```

```
                ; .SPFUN 370 causes the following report to be
                ; placed in REPBUF:
                ;
                ; BYTE 2.      (number of data words following).
                ; BYTE 1.      (CURRENT_POSITION_REPORT
                ;               identifier).
                ; WORD x       (PRO/GIDIS coordinates
                ; WORD y        for current position).
                ;
                ; The current position of the cursor will be in
                ; the second and third words of REPBUF.
        .
        .
        .
IOAREA: .BLKW   6         ; .SPFUN EMT argument block
PIBLK:  .RAD50  /PI /     ; File name in Radix-50 characters
        .WORD   0,0,0     ;
REQPOS: .BYTE   1,G$INT   ; Length=1, opcode = INITIALIZE
        .WORD   -1        ; Initialize operand
        .BYTE   0,G$RCP   ; Length=0,
                          ; opcode = REQUEST_CURRENT_POSITION.
REPBUF: .BLKB   6         ; Buffer for info returned from GIDIS.
ERROR:                    ; Error handling routine.
```

5.3 THE FORTRAN PRO/GIDIS INTERFACE

FORTRAN provides its own system subroutines (ISPFN/ISPFNC/ISPFNF/ISPFNW) that are used in the same manner as the MACRO-11 .SPFUN programmed requests. These subroutines are described in Chapter 3 of the *RT-11 Programmer's Reference Manual*. The four subroutines are located in the distributed RT-11 system subroutine library SYSLIB.OBJ.

Follow the order of operations described in Section 5.2.

A sample FORTRAN program using the ISPFNW system subroutine follows.

SAMPLE FORTRAN PROGRAM

The following example returns the current position of the cursor.

```
C
C       Sample FORTRAN program for PRO/GIDIS.
C
C       Declare storage.
C
        INTEGER*2       RDCPOS , RQCPOS
```

```
      INTEGER*2       BLOCK , CHAN , STATUS , WCNT
      INTEGER*2       FILSPC( 4 )

      BYTE            REPBUF( 6 ) , REQBUF( 2 )

      DATA            FILSPC/ 3RPI , 0 , 0 , 0 /
C
C     Assign SPFUN function codes ( Read, Request ).
C
      RDCPOS  =       "370
      RQCPOS  =       "371
C
C     Initialize default values.
C
      BLOCK   =       0
C
C     Get an RT-11 channel.
C
      STATUS  =       IGETC()
      IF              ( STATUS .EQ. -1 ) GOTO 900
      CHAN    =       STATUS
C
C     Open the PI handler.
C
      STATUS  =       LOOKUP( CHAN , FILSPC )
      IF              ( STATUS .NE. 0 ) GOTO 910
C
C     Send the instruction to request from PI the current
      position.
C
      CODE    =       RQCPOS
      WCNT    =       1
      STATUS  =
     ISPFNW( CODE , CHAN , WCNT , REQBUF , BLOCK )
      IF              ( STATUS .NE. 0 ) GOTO 920
C
C     Read the current position.
C
      CODE    =       RDCPOS
      WCNT    =       3
      STATUS  =
     ISPFNW( CODE , CHAN , WCNT , REPBUF , BLOCK )
      IF              ( STATUS .NE. 0 ) GOTO 930
C
C     User program continues from here...
C
      .
      .
      .
C
C     Close the channel.
```

```
C
      STATUS  =       ICLOSE( CHAN )
      IF              ( STATUS .NE. 0 ) GOTO 940
C
C     Return the channel to RT-11.
C
      STATUS  =       IFREEC( CHAN )
      IF              ( STATUS .NE. 0 ) GOTO 950
C
C     Go to common exit.
C
      GOTO            1000
C
C     Error messages begin.
C
  900 TYPE            1
    1 FORMAT          ( 1X , 'No channels available.' )
      GOTO            1000
C
  910 TYPE            2
    2 FORMAT          ( 1X , 'Lookup error on PI:.' )
      GOTO            1000
C
  920 TYPE            3
    3 FORMAT          ( 1X , 'Error requesting current
                       position.' )
      GOTO            1000
C
  930 TYPE            4
    4 FORMAT          ( 1X , 'Error reading current
                       position.' )
      GOTO            1000
C
  940 TYPE            5
    5 FORMAT          ( 1X , 'FATAL - SYSTEM ERROR.' )
      GOTO            1000
C
  950 TYPE            6 , CHAN
    6 FORMAT          ( 1X , 'Channel ' I2 ,
    1                        ' is not currently allocated.' )
C
C     Common Exit point.
C
 1000 CALL            EXIT
C
C     End of sample FORTRAN program for PRO/GIDIS.
C
      END
```

5.4 RESTRICTIONS

Observe the following restrictions when running PRO/GIDIS under RT-11:

- Run PRO/GIDIS only under the XM monitor.
- Run PRO/GIDIS only as the foreground job using the FRUN command.
- The area operation instruction PRINT_SCREEN is not supported.
- VT102 emulation is not supported.

CHAPTER 6

PRO/GIDIS INSTRUCTIONS

This chapter contains detailed reference information for all GIDIS instructions, which are listed in alphabetical order for convenience.

The entry for each GIDIS instruction includes the following information:

- A brief description of the instruction.
- Opcode - used by GIDIS to identify the instruction.
- Length - specifies the number of arguments for the instruction.
- Format - lists and describes each argument.
- Status - indicates conditions for success or failure of the instruction.
- Notes - explain in detail how to use the instruction.
- Device Notes - describe behavior specific to particular GIDIS drivers.
- Example - lists excerpts from a sample MACRO-11 program that uses the instruction.

Unless specified otherwise, all units are in GIDIS Output Space (GOS).

6.1 BEGIN_DEFINE_CHARACTER

BEGIN_DEFINE_CHARACTER starts a character definition block. This causes subsequent instructions to draw into the space associated with the given character, rather than drawing into the entire view surface. This instruction is paired with the END_DEFINE_CHARACTER instruction.

Opcode: 33 **Length:** 4 or 5

Format: BEGIN_DEFINE_CHARACTER char-index, width, nom-width, nom-height, [left-offset]

char-index	The index of the character cell to be loaded. This value must be within the extent of the alphabet (See CREATE_ALPHABET), or -1.
width	This field is used only if the font is defined as variable-width. It then specifies (in GOS units) the implicit movement that should be used for the character being defined. For example, if nom-width were 60, width for i would be about 20 and width for *m* would be about 60.
nom-width	Nominal width. The number of GOS units to assign to alphabet width.
nom-height	Nominal height. The number of GOS units to assign to alphabet height.
left-offset	Identifies where the character is placed relative to the current position when it is drawn. Zero, the default, places the left edge of the character at the current position. Values greater than 0 move the cell left; values less than 0 move it right. Units of movement are the same as those for width. Left-offset is specified in GOS units.

Status: SUCCESS if the current alphabet is not equal to 0 and is not a loaded font, char-index is within the extent of the current alphabet, and there are sufficient resources to define this character; otherwise, FAILURE.

Notes:

- Nom-width and nom-height select the natural shape of the character. If the character definition contains a circle, then drawing that character will yield a circle only when unit cell width and height are proportional to nom-width and nom-height.

- Besides affecting shape, nom-width and nom-height control resolution. For example, although 10 x 20 is the same shape as 100 x 200, the latter values give you finer drawing control.

- To define the error character and any undefined character within a font, specify a char-index of -1.

- A character created by a character definition block can be manipulated (for example, scaled and rotated) like any other GIDIS character.

- You cannot use the following instructions inside a character definition block:

```
BEGIN_DEFINE_CHARACTER
LOAD_CHARACTER_CELL
CREATE_ALPHABET
LOAD_BY_NAME
```

- If BEGIN_DEFINE_CHARACTER fails, GIDIS skips all subsequent instructions until it encounters an END_DEFINE_CHARACTER or INITIALIZE. This includes report handling instructions. For example, the following sequence will hang your program:

```
BEGIN_DEFINE_CHARACTER that fails
request report
END_DEFINE_CHARACTER
read report
```

- If left-offset is nonzero, the character should not be drawn in replace, complement negate, or overlay negate modes.

- To abort a character definition, send the INITIALIZE instruction with any argument (including 0). An INITIALIZE 0 instruction aborts a character definition without affecting anything else.

- This instruction implicitly saves all GIDIS attributes for the duration of the BEGIN_DEFINE_CHARACTER process. The END_DEFINE_CHARACTER instruction restores the saved GIDIS attributes. Table 6-1 lists the values in effect during the BEGIN_DEFINE_CHARACTER process.

Table 6-1: Attributes Initialized by BEGIN_DEFINE_CHARACTER

Attribute	Value
output IDS width	nominal width
output IDS height	nominal height
output viewport x origin	0
output viewport y origin	0
output viewport width	nominal width
output viewport height	nominal height
GIDIS output space x origin	0
GIDIS output space y origin	0
GIDIS output space width	nominal width
GIDIS output space height	nominal height
output clipping x origin	0
output clipping y origin	0
output clipping width	nominal width
output clipping height	nominal height
current position x	0
current position y	0
area texture	solid
line texture	solid
logical pixel x offset	0
logical pixel y offset	0
logical pixel width	1 hardware pixel
logical pixel height	1 hardware pixel
cell unit size width	nominal width
cell unit size height	nominal height
cell display size width	nominal width
cell display size height	nominal height
cell movement mode flag	2 (implicit)

Attribute	Value
cell movement mode flag	2 (implicit)
cell explicit movement dx	0
cell explicit movement dy	0
primary color	1
secondary color	0
character cell	all 0's
plane mask	1
writing mode	overlay

Device Notes:

- Plotter GIDIS does not store a character definition as a raster, but rather as a sequence of strokes.
- Except for Plotter GIDIS, a successful CREATE_ALPHABET instruction ensures sufficient resources to store the definition of the character.
- In Video GIDIS, do not allow the terminal subsystem to do a full screen scroll while defining a character.

Example: This illustrates an entire character definitiion.

```
                    ;assume current alphabet is 1, storage
                    ;size of alphabet 1 is 9 by 9.
.BYTE   4.,33.      ;length = 4,
                    ;opcode for BEGIN_DEFINE_CHARACTER
.BYTE   3.          ;defining character 3
.WORD   9.          ;width
.WORD   90.         ;nom-width
.WORD   225.        ;nom-height
                    ;now ready to draw into the 9 x 9
                    ;storage area using GOS of
                    ;90 X 225.
.BYTE   .2,29.      ;length = 2, opcode for SET_POSITION
.WORD   0.          ;[0,100] is middle of left hand side.
.WORD   100.
.BYTE .255.,25.     ;introduces uncounted argument list
                    ;opcode for DRAW_LINES
.WORD   40.         ;[40,200]
```

```
BEGIN_DEFINE_CHARACTER

.WORD   200.      ;
.WORD   80.       ;[80,100]
.WORD   100.      ;
.WORD   40.       ;[40,0]
.WORD   0.        ;
.WORD   0.        ;[0,100]
.WORD   100.      ;
.WORD   -32768.   ;end list
                  ;the four lines draw a diamond
.BYTE   0.,36.    ;END_DEFINE_CHARACTER
```

Figure 6-1 illustrates the character defined by this example.

Figure 6-1: Sample Character

6.2 BEGIN_FILLED_FIGURE

BEGIN_FILLED_FIGURE starts the definition of a filled figure. Use DRAW_LINES, DRAW_REL_LINES, DRAW_ARCS, and DRAW_REL_ARCS to enter positions in the filled figure table. Positions are stored in the order given. A corresponding END_FILLED_FIGURE instruction is required to actually fill the figure.

Opcode: 31 **Length:** 0

Format: BEGIN_FILLED_FIGURE

Status: SUCCESS

Notes:

- BEGIN_FILLED_FIGURE sets the filled figure flag to TRUE.
- You should not use the following PRO/GIDIS instructions between a BEGIN_FILLED_FIGURE instruction and its corresponding END_FILLED_FIGURE. (However, this is an unenforced restriction.)

```
BEGIN_FILLED_FIGURE
DRAW_CHARACTERS
DRAW_PACKED_CHARACTERS
SET_GIDIS_OUTPUT_SPACE
SET_OUTPUT_IDS
SET_OUTPUT_VIEWPORT
SET_POSITION
SET_REL_POSITION
```

- The filled figure table must contain at least 1 user-provided point for any drawing to occur. You can enter up to 255 points in the filled figure table. When GIDIS receives the END_FILLED_FIGURE instruction, it adds the original current position twice, as the first and last points of the figure. Thus, GIDIS automatically closes figures for you.
- If you specify too many points, GIDIS uses only the first 255 points. GIDIS ignores points that exceed the capacity of the filled figure table.
- An edge of the filled area is not guaranteed to be identical to a line drawn through the same points, due to differences in drawing direction and round-off errors.

- You may draw lines that cross earlier lines in the filled figure table. Only the enclosed areas will fill. Contrast the examples below. The first creates a square; the second, a bow tie.

- GIDIS attributes used in doing the fill are: primary color, secondary color, writing mode, plane mask, area texture cell, area cell size, and area texture size.

- Complement and complement-negate writing modes can give unexpected results when filled figure areas overlap or abut.

- To abort a filled figure definition, send the INITIALIZE instruction with any argument (including 0). An INITIALIZE 0 instruction aborts a filled figure definition without affecting anything else.

- No drawing is done by the BEGIN_FILLED_FIGURE instruction.

Example:

```
        .BYTE   2.,29.  ;Length=2,opcode for SET_POSITION
        .WORD   100.    ;Current position
        .WORD   100.    ;  now [100,100]
        .BYTE   0.,31.  ;Length=0,opcode for BEGIN_FILLED_FIGURE
                        ;filled figure table now has [100,100]
        .BYTE   6.,26.  ;Length=4,opcode for DRAW_REL_LINES
        .WORD   +100.   ;dx1
        .WORD   +0.     ;dy1
        .WORD   +0.     ;dx2
        .WORD   +100.   ;dy2
        .WORD   -100.   ;dx3
        .WORD   +0.     ;dy3
                        ;Adds points [200,100], [200,200],
                        ;  and [100,200]  to
                        ;  the filled figure table
        .BYTE   0.,32.  ;Length=0,opcode for END_FILLED_FIGURE
                        ;Adds point [100,100] to table
                        ;The area defined by [100,100],
                        ;  [200,100], [200,200], [100,200], and
                        ;  [100,100]--a square--is filled with
                        ;  the current area texture governed by
                        ;  the following writing attributes:
                        ;  writing mode, color map entry,
                        ;  plane mask, primary color,
                        ;  secondary color.
```

Figure 6-2 illustrates the filled figure created by this example.

Figure 6-2: Sample Filled Figure Square

Example:

```
        .BYTE   2.,29.  ;Length=2,opcode for SET_POSITION
        .WORD   100.    ;Current position
        .WORD   100.    ;  now [100,100]
        .BYTE   0.,31.  ;Length=0,opcode for BEGIN_FILLED_FIGURE
                        ;filled figure table now has [100,100]
        .BYTE   6.,26.  ;Length=4,opcode for DRAW_REL_LINES
        .WORD   +100.   ;dx1
        .WORD   +100.   ;dy1
        .WORD   +0.     ;dx2
        .WORD   -100.   ;dy2
        .WORD   -100.   ;dx3
        .WORD   +100.   ;dy3
                        ;Adds points [200,200], [200,100],
                        ;  and [100,200] to
                        ;  the filled figure table

        .BYTE   0.,32.  ;Length=0,opcode for END_FILLED_FIGURE
                        ;Adds point [100,100] to table
                        ;The area defined by [100,100],
                        ;  [200,200], [200,100], [100,200], and
                        ;  [100,100]--a bow tie--is filled with
                        ;  the current area texture governed by
                        ;  the following writing attributes:
                        ;  writing mode, color map entry,
                        ;  plane mask, primary color,
                        ;  secondary color.
```

```
BEGIN_FILLED_FIGURE
```

Figure 6-3 illustrates the filled figure created by this example.

Figure 6-3: Sample Filled Figure Bow Tie

6.3 CREATE_ALPHABET

CREATE_ALPHABET reclaims resources used for the current alphabet's font and reserves resources for a new font with the indicated storage size. Storage size in bytes is: 30 + (extent * 2) + (width/8 rounded up) * height * (extent + 1). See Appendix C.

Opcode: 46 **Length:** 4, 5, or 6

Format: CREATE_ALPHABET width, height, extent, flags, [initialize], [ave-width]

width	Is an integer in the range (0 to 64) that specifies the number of horizontal bits in a character pattern.
height	Is an integer in the range (0 to 64) that specifies the number of vertical bits in a character pattern.
extent	Is an integer that specifies the number of characters in the alphabet. Character indices can range from 0 to extent-1, (or 32 to extent +31, if bit 8 of flags is set).
flags	Is a word that specifies one or more of the character renditions and font attributes. Table 6-2 lists the supported renditions.

Table 6-2: CREATE_ALPHABET Flags

Cell Rendition	Bit	Value
Italics	1	2
Bold	3	8
Proportionally spaced	4	16
ASCII	8	256

If ASCII (bit 8) is set, you do not have to include indices 0 through 31 in the font, and the error character is automatically associated with those indices.

initialize — W to initializes all characters in the newly created font. If 0, initialize to blank. If not 0, initialize to solid. If not present, initialize to solid.

ave-width — Is the average width in pixels of glyphs in this font. It is not a true average, but an indication of how many characters fit on an average line of text when this font is used. If not specified, width is used.

Status: SUCCESS if width is 0 to 64, height is 0 to 64, current alphabet number is 1 to 15, extent is greater than or equal to 0, storage size is less than 64 KB, and there are sufficient resources to create the alphabet; otherwise, FAILURE.

Notes:

- To only reclaim the memory used for an alphabet's current font, execute a CREATE_ALPHABET instruction with width, height or extent set to 0.
- If alphabet 15 is current, CREATE_ALPHABET creates a region CRE$AL. See the description of the GIFONT routine in Chapter 4.
- The largest allowable storage size on the Professional is 64KB. If you create a font whose total size is greater than 8KB, the total extent must be less than or equal to 512.
- Specify ave-width for proportionally spaced fonts; width for monospaced fonts.
- When describing a font in an .FDF file (see Appendix D), use ave-width for proportionally spaced fonts and width for monospaced fonts.
- The true limits for font width and height are: (width in bytes) * (height) may not be greater than 512; height may not be greater than 80.
- SET_CELL_UNIT_SIZE uses ave-width, when trying to select the best font.

Device Notes:

- For Plotter GIDIS, no storage is reserved when a CREATE_ALPHABET is done. Space is reserved per character as character definition blocks are processed.

Example:

```
                        ;Current alphabet is alphabet number 2
        .BYTE   4.,46.  ;Length=4, opcode for CREATE_ALPHABET
        .WORD   10.     ;width
        .WORD   16.     ;height
        .WORD   32.     ;extent
        .WORD   8.      ;rend-type bold
                        ;Reclaims space occupied by alphabet 2's
                        ;  current font, allocates space for a
                        ;  new font, and initializes each
                        ;  character in the font to a solid
                        ;  block (because the initialize argument
                        ;  is omitted).
```

6.4 DRAW_ARCS

The DRAW_ARCS instruction draws one or more circular arcs starting from the current position around the specified center(s).

Opcode: 23 **Length:** 3N

Format: DRAW_ARCS x, y, angle

x	Specifies the x coordinate of the arc's center point
y	Specifies the y coordinate of the arc's center point
angle	The angle for the arc is given in degrees, with a positive value meaning counter-clockwise with respect to the view surface. For example, an angle of zero means no drawing is done; +360 or -360 means a full circle is drawn.

Status: SUCCESS if angle is from -360 to +360 and there is no filled figure table overflow; otherwise, FAILURE.

Notes:

- DRAW_ARCS is a repeatable instruction. You can, for example, draw three connected arcs by specifying: x1, y1, angle1, x2, y2, angle2, x3, y3, angle3. The coordinates can be specified either in a counted argument list (with the count supplied in the opcode word), or in an uncounted argument list (with 255 in the opcode word and an END_LIST instruction after the last argument). See END_LIST.

- GIDIS draws an arc as a series of straight lines. The PRO/GIDIS interpreter calculates one line endpoint per 10 degrees of arc (or portion thereof), regardless of the size of the circle.

- If the filled figure flag is TRUE then, instead of drawing the arc, all internally calculated line endpoints are added to the filled figure table.

- The current position is left at the end of the arc, whether the instruction returns SUCCESS or FAILURE.

- Full quadrant arcs (1/4 circle) always end at the exact point expected. Fractional quadrant arcs end at the closest available point. Multiple fractional quadrant arcs are not guaranteed to end at the exact point predicted by your program. For example, a full circle drawn as a 103 degree arc and a 257 degree arc is not guaranteed to leave the current position exactly where it started.

- DRAW_ARCS is affected by the following GIDIS attributes: writing mode, primary color, plane mask, secondary color, pixel size, line texture, and filled figure flag.

- DRAW_ARCS modifies the view surface only inside the clipping rectangle.

Example:

```
                        ;Not in a filled figure definition
                        ;(filled figure flag is FALSE)
                        ;Current position is [500,300]

        .BYTE   3.,23.  ;Length=3, opcode for DRAW_ARCS

        .WORD   400.    :x coordinate of center
        .WORD   300.    ;y coordinate of center
        .WORD   180.    ;180 degrees is one-half a circle
                        ; (counter-clockwise)
                        ;Draws the top half of the circle
                        ;centered at [400,300] with radius 100
                        ;Middle of the arc is [400,200]
                        ;New current position is [300,300]
```

Figure 6-4 shows the arc created by this sample program.

Figure 6-4: Sample Arc

Example:

```
                        ;Not in a filled figure definition
                        ;(filled figure flag is FALSE)
                        ;Current position is [500,300]

        .BYTE   3.,23.  ;Length=3, opcode for DRAW_ARCS

        .WORD   100.    :x coordinate of center
        .WORD   300.    ;y coordinate of center
        .WORD   -90.    ;90 degrees is one-fourth of a circle
                        ; (clockwise)
                        ;Draws a quadrant
                        ;centered at [100,300] with radius 400
                        ;Middle of the arc is [300,400]
                        ;New current position is [100,700]
```

Example:

```
                        ;Inside a filled figure definition
                        ; (filled figure flag is TRUE)
                        ;Current position is [500,300]

        .BYTE   3.,23.  ;Length=3, opcode for DRAW_ARCS

        .WORD   400.    ;Center is [400,300]
        .WORD   300.
        .WORD   -90.    ;90 degrees = 1 quadrant
                        ;Adds eight line endpoints
                        ;(internally calculated)
                        ;plus [400,400] to filled
                        ;figure table
                        ;New current position is [400,400]
```

6.5 DRAW_CHARACTERS

The DRAW_CHARACTERS instruction draws the character identified by the specified character index. The character is taken from the currently selected alphabet.

Opcode: 35 **Length:** N

Format: DRAW_CHARACTERS char-index

char-index Is an unsigned 16-bit word

Status: SUCCESS

Notes:

- DRAW_CHARACTERS is a repeatable instruction. You can, for example, draw several characters in succession by specifying: char-index1, char-index2, char-index3, . . . char-indexn. You can specify characters in either a counted argument list (with the count supplied in the opcode word) or in an uncounted argument list (with 255 in the opcode word and an END_LIST after the last argument.) See END_LIST.

- DRAW_CHARACTERS is affected by several attributes: unit and display cell size, cell slant, cell rotation, rendition mask, current alphabet, writing mode, primary and secondary color, and plane mask.

- If the specified character index is outside the extent of the current alphabet, the error character is drawn. Unless otherwise specified in the font itself, the error character is a checkerboard.

- The current position is updated after a character is drawn according to the cell movement controls. (See the descriptions of the SET_CELL_MOVEMENT_MODE and SET_CELL_EXPLICIT_MOVEMENT instructions.)

- To delete a proportionally spaced character, specify erase writing mode, specify mirrored text by negating the display cell width, and then redraw the character.

- When using local symmetry, the current position after a DRAW_CHARACTERS instruction could be different from that calculated by your program. It is suggested that any series of DRAW_CHARACTERS instructions be followed by a SET_POSITION instruction or a REQUEST_POSITION instruction, unless you do not care exactly where the string ends.

- DRAW_CHARACTERS modifies the view surface only inside the clipping rectangle.
- See also DRAW_PACKED_CHARACTERS.

Example:

```
                        ;Current alphabet = 0 (DEC Multinational)
        .BYTE   3.,35.  ;Length=3, opcode for DRAW_CHARACTERS
        .WORD   65.     ; 'A'
        .WORD   66.     ; 'B'
        .WORD   67.     ; 'C'
                        ; Draws A, B, C from current font for
                        ; alphabet 0
```

Example:

```
                        ;Current alphabet = 1 (user-defined)
        .BYTE   255.,35. ;introduces uncounted argument list
                        ; opcode for DRAW_CHARACTERS
        .WORD   0.
        .WORD   13.
        .WORD   7.
        .WORD   45.
        .WORD   -32768. ;END_LIST
                        ;Draws 4 characters from alphabet 1,
                        ;  which are user-defined characters
```

6.6 DRAW_LINES

The DRAW_LINES instruction draws a straight line from the current position to the specified endpoint. The endpoint is specified as an absolute coordinate pair.

Opcode: 25 **Length:** 2N

Format: DRAW_LINES xend, yend

end	Specifies the x coordinate of the line's endpoint
yend	Specifies the y coordinate of the line's endpoint

Status: SUCCESS, provided no filled figure table overflow occurs; on overflow, FAILURE.

Notes:

- The DRAW_LINES instruction is repeatable. You could, for example, draw 3 connected lines by specifying: xend1, yend1, xend2, yend2, xend3, yend3. The coordinates can be specified either in a counted argument list (with the count supplied in the opcode word), or in an uncounted argument list (with 255 in the opcode word and an END_LIST instruction after the last argument). See END_LIST.

- The DRAW_LINES instruction is affected by the following drawing attributes: writing mode, primary color, plane mask, secondary color, pixel size, line texture, and filled figure flag.

- When the filled figure flag is TRUE, this instruction does not draw a line from the current position to the specified point. Instead, it tries to insert [xend, yend] into the filled figure table.

- The current position is updated whether the instruction returns SUCCESS or FAILURE.

- In complement and complement negate modes, the first pixel of a line is skipped and the last pixel is drawn. But if [xend, yend] is itself the current position, the 1 pixel is drawn.

- DRAW_LINES modifies the view surface only inside the clipping rectangle.

Example:

```
                        ;Not in a filled figure definition
                        ;(filled figure flag is FALSE)
                        ;Current position is [200,300]
        .BYTE   2.,25.  ;Length=2, opcode for DRAW_LINES
        .WORD   150.    ;Draw a line from [200,300]
        .WORD   200.    ;to [150,200]
                        ;New current position is [150,200]
```

Example:

```
                        ;current position is [150,200]
                        ;not in a filled figure definition
        .BYTE   4.,25.  ;Length=4, opcode for DRAW_LINES
        .WORD   600.    ;xend1
        .WORD   -10.    ;yend1
        .WORD   300.    ;xend2
        .WORD   +10.    ;yend2
                        ;Draw lines from [150,200] to [600,-10]
                        ;then from [600,-10] to [300,10]
                        ;New current position is [300,10]
                        ;Note that both the -10 and the +10 are
                        ;absolute coordinates.
```

Example:

```
                        ;current position is [300,10]
                        ;not in a filled figure definition
        .BYTE   255.,25.;introduces uncounted argument list
                        ;opcode for  DRAW_LINES
        .WORD   400.    ;xend1
        .WORD   40.     ;yend1
        .WORD   -32768. ;ENDLIST terminator value
                        ;Draws a line from [300,10] to [400,40]
                        ;New current position is [400,40]
```

Example:

```
                        ;Inside a filled figure definition
                        ; (filled figure flag is TRUE)
        .BYTE   4.,25.  ;Length=4, opcode for DRAW_LINES
        .WORD   300.    ;xend1
        .WORD   200.    ;yend1
        .WORD   300.    ;xend2
        .WORD   300.    ;yend2
                        ;The points [300,200] and [300,300] are
                        ;added to the filled figure table
                        ;new current position is [300,300]
```

6.7 DRAW_PACKED_CHARACTERS

DRAW_PACKED_CHARACTERS makes drawing of ASCII strings more efficient, because it enables you to pack two ASCII characters into one word. You can use DRAW_PACKED_CHARACTERS for non-ASCII alphabets, if the indices are less than 255. It uses the low order byte before the high order byte. Otherwise, DRAW_PACKED_CHARACTERS is equivalent to DRAW_CHARACTERS.

Opcode: 74 **Length:** N

Format: DRAW_PACKED_CHARACTERS 2charindex

2charindex is two 8-bit character indices

Status: SUCCESS

Notes:

- DRAW_PACKED_CHARACTERS is appropriate for any alphabet whose extent is less than 255.
- A character index of 255 explicitly performs no operation. Thus, if you want to draw 1 character, place 255 in the high order byte of the argument.
- Using a DRAW_PACKED_CHARACTERS instruction with repeated arguments is the fastest way to draw a long string with GIDIS.
- DRAW_PACKED_CHARACTERS is a repeatable instruction. Characters can be specified either in a counted argument list (with the count supplied in the opcode word) or in an uncounted argument list (with 255 in the opcode word and an END_LIST after the last argument).
- The current position is updated after a character is drawn, according to the cell movement controls. (See SET_CELL_MOVEMENT_MODE and SET_CELL_EXPLICIT_MOVEMENT.)
- To delete a proportionally spaced character, specify erase writing mode, specify mirrored text by negating display cell width, and then redraw the character.
- When using local symmetry, the current position after a DRAW_PACKED_CHARACTERS instruction could be different from that calculated by your program. It is suggested that any series of DRAW_PACKED_CHARACTERS instructions be followed by

a SET_POSITION instruction or a REQUEST_POSITION instruction, unless you do not care exactly where the string ends.

- The DRAW_PACKED_CHARACTERS instruction is affected by several attributes: unit and display size, cell slant, cell rotation, rendition mask, current alphabet, writing mode, primary and secondary color, and plane mask.

- If the specified character index is outside the extent of the current alphabet, the error character is drawn. Unless otherwise specified in the font itself, the error character is a checkerboard.

- DRAW_CHARACTERS modifies the view surface only inside the clipping rectangle.

Example:

```
                        ;assume current alphabet is 0
        .BYTE   3.,74.  ;length=3 words,opcode for
                        ;DRAW_PACKED_CHARACTERS
        .BYTE   116.,101. ;'t', 'e'
        .BYTE   115.,116. ;'s', 't'
        .BYTE   49.,255.  ; '1', "no character"
                        ;draws the string "test1"
```

Example:

```
        .BYTE  1.,38.     ;length=1, opcode for SET_ALPHABET
        .WORD  1.         ;alphabet 1
        .BYTE  255.,74.   ;introduces uncounted argument list
                          ;opcode for DRAW_PACKED_CHARACTERS
        .BYTE  0.,1.      ;draw characters 0,1
        .WORD -32768.     ;draws characters that you defined in
                          ;index 0 and 1 of alphabet 1
```

6.8 DRAW_REL_ARCS

DRAW_REL_ARCS draws a circular arc from the current position around the specified center.

Opcode: 27 **Length:** 3N

Format: DRAW_REL_ARCS dx, dy, angle

dx	Specifies the x coordinate of the arc's center point as: x of current position + dx
dy	Specifies the y coordinate of the arc's center point as: y of current position + dy
angle	The angle for the arc is given in degrees, with a positive value meaning counter-clockwise with respect to the view surface. An angle of zero means no drawing is done; +360 or -360 means a full circle is drawn.

Status: SUCCESS, if angle is within a range of -360 to +360 and there is no filled figure table overflow or arithmetic overflow; otherwise, FAILURE.

Notes:

- An arc is drawn as a series of straight lines. The PRO/GIDIS interpreter calculates one line endpoint per 10 degrees of arc (or portion thereof), regardless of the size of the circle.
- If the filled figure flag is TRUE, instead of drawing the arc, all internally calculated line endpoints are added to the filled figure table.
- DRAW_REL_ARCS is a repeatable instruction. You can, for example, draw three connected arcs by specifying: dx1, dy1, angle1, dx2, dy2, angle2, dx3, dy3, angle3. The coordinates can be specified either in a counted argument list (with the count supplied in the opcode word), or in an uncounted argument list (with 255 in the opcode word and an END_LIST instruction after the last argument). See END_LIST.
- The current position is left at the end of the last arc.

- Full quadrant arcs (1/4 circle) always end at the exact point expected. Fractional quadrant arcs end at the closest available point. Multiple fractional quadrant arcs are not guaranteed to end at the exact point predicted by your program. For example, a full circle drawn as a 103 degree arc and a 257 degree arc is not guaranteed to leave the current position exactly where it started.

- DRAW_REL_ARCS is affected by the following GIDIS attributes: writing mode, primary color, plane mask, secondary color, pixel size, line texture, and filled figure flag.

- DRAW_REL_ARCS modifies the view surface only inside the clipping rectangle.

Example:

```
                        ;Current position is [400,300]
                        ;filled figure flag is FALSE
        .BYTE   3.,27.  ;Length=3,opcode for DRAW_REL_ARCS
        .WORD   -100.   ;Center is [-100,+30]
        .WORD   +30.    ;Relative to current position
        .WORD   -90.    ;90 degrees = one quadrant (clockwise)
                        ;Draws one quadrant from [400,300] to
                        ;[330,430] centered at [300,330]
                        ;New current position is [330,430]
```

Example:

```
                        ;Current position is [330,430]
                        ;filled figure flag is FALSE
        .BYTE   6.,27.  ;Length=3, opcode for DRAW_REL_ARCS
        .WORD     +35.  ;
        .WORD     -50.  ;Center is [+35,-50]
        .WORD      90.  ;[365,380], 90 degree arc
        .WORD     -35.  ;Current position is now [415,415]
        .WORD     +50.  ;Center is 380,465]
        .WORD      90.  ;90 degrees
                        ;draws a lens shaped object with two
                        ;circular arcs.
```

6.9 DRAW_REL_LINES

The DRAW_REL_LINES instruction draws a straight line from the current position to the specified endpoint. The endpoint coordinates are specified relative to the current position.

Opcode: 26 **Length:** 2N

Format: DRAW_REL_LINES dxend, dyend

dxend	Specifies the x coordinate of the line's endpoint as: current position + dxend
dyend	Specifies the y coordinate of the line's endpoint as: current position + dyend

Status: SUCCESS, if no last pair arithmetic overflow or filled figure table overflow occurs; on overflow, FAILURE. On success, the current position is set to [x of current position + dxend, y of current position + dyend]. On failure, the current position is not changed.

Notes:

- The DRAW_REL_LINES instruction is repeatable. You can,for example, draw 3 connected lines by specifying: dxend1, dyend1, dxend2, dyend2, dxend3, dyend3. The coordinates can be specified either in a counted argument list (with the count supplied in the opcode word), or in an uncounted argument list (with 255 in the opcode word and an END_LIST instruction after the last argument). See END_LIST.

- The DRAW_REL_LINES instruction is affected by the following drawing attributes: writing mode, primary color, plane mask, secondary color, pixel size, line texture, and filled figure flag.

- When the filled figure flag is TRUE, this instruction does not draw a straight line from the current position to the specified point. Instead, it tries to insert [x of current position + dxend, y of current position + dyend] into the filled figure table. No drawing occurs until the END_FILLED_FIGURE instruction is processed.

- In complement and complement negate mode, the first pixel of a line is skipped and the last pixel is drawn. But if [x of current position + dyend, y of current position + dyend] is itself the current position, the one pixel is drawn.

- DRAW_REL_LINES modifies the view surface only inside the clipping rectangle.

Example:

```
                        ;Not in a filled figure definition
                        ;(filled figure flag is FALSE)
                        ;Current position is [100,100]
        .BYTE   4.,26.  ;Length=4, opcode for DRAW_REL_LINES
        .WORD   +10.    :dxend1
        .WORD   -10.    ;dyend1
        .WORD   +30.    ;dxend2
        .WORD   +15     ;dyend2
                        ;Draw lines from [100,100] to [110,90]
                        ;and from [110,90] to [140,105]
                        ;New current position is [140,105]
```

Example:

```
                        ;Current position is [140,105]
                        ;not in a filled figure definition
        .BYTE   255.,26. ;introduces uncounted argument list
                        ;opcode for DRAW_REL_LINES
        .WORD   10.     ;dxend1
        .WORD   -30.    ;dyend1
        .WORD   20.     ;dxend2
        .WORD   +60.    ;dyend2
        .WORD   -32768. ;END_LIST
                        ;Draw line from [140,105] to [150,75]
                        ;and then to [170,135]
                        ;New current position is [170,135]
```

Example:

```
                        ;Inside a filled figure definition
                        ; (filled figure flag is TRUE)
                        ;Current position is [100,100]
        .BYTE   5.,26.  ;Length=5, opcode for DRAW_REL_LINES
        .WORD   100.    ;dxend1
        .WORD   0.      ;dyend1
        .WORD   0.      ;dxend2
        .WORD   100.    ;dyend2
                        ;Adds the points [200,100] and [200,200]
                        ;to the filled figure table
                        ;New current position is [200,200]
```

6.10 END_DEFINE_CHARACTER

END_DEFINE_CHARACTER terminates a character definition block and restores the GIDIS attributes saved by the BEGIN_DEFINE_CHARACTER instruction.

Opcode: 36 **Length:** 0

Format: END_DEFINE_CHARACTER

Status: SUCCESS if character definition flag is TRUE; otherwise, FAILURE.

Notes:

- The defined character can now be used like any other character in DRAW_CHARACTERS and DRAW_PACKED_CHARACTERS.

Device Notes:

- In Video GIDIS, while you are defining a large character, all but its bottom 16 lines (32 in high resolution mode on the Professional 380) are visible at the bottom of the screen. When END_DEFINE_CHARACTER is processed, the area occupied by the character is set to current secondary color.

Example: See BEGIN_DEFINE_CHARACTER.

6.11 END_FILLED_FIGURE

END_FILLED_FIGURE terminates the definition of a closed figure, and fills the figure. This instruction is used in conjunction with the BEGIN_FILLED_FIGURE instruction.

Opcode: 32 **Length:** 0

Format: END_FILLED_FIGURE

Status: SUCCESS if there is at least one point in the filled figure table; otherwise, FAILURE.

Notes:

- The filled figure table must contain at least 1 user-provided point for any drawing to occur. GIDIS provides the initial current position twice, at the beginning and end, thereby automatically closing the figure.
- If you specify too many points, GIDIS uses only the first 255 points, and draws a straight line connecting the 255th point with the initial current position. (255 is the maximum number of user-provided points in the filled figure table.)
- The current position is unchanged by END_FILLED_FIGURE. The current position remains wherever the last drawing instruction in the figure block set it.
- END_FILLED_FIGURE turns off the filled figure flag.
- This instruction modifies the view surface only inside the clipping rectangle.

Example: See BEGIN_FILLED_FIGURE

6.12 END_LIST

END_LIST indicates the end of an uncounted argument list. This instruction follows the last argument in the list. The PRO/GIDIS instructions often used with an uncounted argument list are: DRAW_LINES, DRAW_REL_LINES, DRAW_ARCS, DRAW_REL_ARCS, DRAW_CHARACTERS, DRAW_PACKED_CHARACTERS.

Opcode: 128 **Length:** must be 0

Format: END_LIST

Status: SUCCESS

Notes:

- You specify an uncounted argument list by placing a length of 255 in an instruction's opcode word.
- 128 * 256 + 0 equals -32768. Thus, -32768 may not be the value of an argument word in an uncounted argument list. However, -32768 is valid as an argument in a counted argument list. For example, the point [-32768,0] could not be sent in a DRAW_LINES instruction terminated by an END_LIST instruction, but could be sent in a DRAW_LINES instruction with counted arguments.

Example:

```
.BYTE   255.,25. ;length=255 is a special value that
                 ;  does not indicate 255 data words
                 ;  following, but that there are an
                 ;  unknown number of words
                 ;  following, to be terminated
                 ;  with the END_LIST instruction.
                 ;opcode for DRAW_LINES
.WORD   100.     ;DRAW_LINES data
.WORD   110.     ;DRAW_LINES data
.WORD   -32768.  ;END_LIST
```

6.13 END_PICTURE

END_PICTURE logically terminates the current picture. The action performed by END_PICTURE depends on the current device.

Opcode: 24 **Length:** 0

Format: END_PICTURE

Status: SUCCESS

Notes:

- It is recommended that you use NEW_PICTURE and END_PICTURE to enclose the instructions used in drawing a picture.
- END_PICTURE simulates a FLUSH_BUFFER instruction.

Device Notes:

- For a GIDIS that builds a virtual bitmap (for example, Palette GIDIS), END_PICTURE causes the bitmap to be output to the device.
- For Sixel GIDIS, an END_PICTURE does a formfeed. However if you are using the VDM interpreter to print the picture as part of a document, the formfeed is suppressed.
- For Palette GIDIS, an END_PICTURE advances the film, provided you are not passing the picture through the VDM interpreter.
- For Plotter GIDIS, an END_PICTURE advances the paper (or ejects the paper in the case of single sheet feed), provided you are not passing the picture through the VDM interpreter.

Example:

```
        .BYTE   0.,6.           ;length=0,opcode for NEW_PICTURE
          .                     ;
          .                     ;drawing instructions
          .                     ;
        .BYTE   0.,24.          ;length=0,opcode for END_PICTURE
          .                     ;
          .                     ;wait for operator response
          .                     ;perhaps
        .BYTE   0.,6.           ;length=0,opcode for NEW_PICTURE
          .                     ;
          .                     ;more drawing instructions
          .                     ;
```

6.14 ERASE_CLIPPING_REGION

ERASE_CLIPPING_REGION sets every pixel inside the current clipping rectangle to the current secondary color. This instruction provides a way to clear an area without implying the beginning of a new picture.

Opcode: 48 **Length:** 0

Format: ERASE_CLIPPING_REGION

Status: SUCCESS

Notes:

- Do not use this instruction as a substitute for NEW_PICTURE and END_PICTURE.
- You should use ERASE_CLIPPING_REGION, rather than BEGIN_FILLED_FIGURE and END_FILLED_FIGURE to clear a rectangular area of the view surface.
- The current writing mode, current area texture, and primary color do not affect this instruction. However, plane mask does.

Device Notes:

- Plotter GIDIS ignores ERASE_CLIPPING_REGION.

Example:

```
        .BYTE   0.,48.  ;Length=0,
                        ;opcode for ERASE_CLIPPING_REGION
```

6.15 FLUSH_BUFFER

FLUSH_BUFFER forces execution of any pending GIDIS processing.

Opcode: 28 **Length:** 0

Format: FLUSH_BUFFER

Status: SUCCESS

Notes:

- FLUSH_BUFFER enables you to ensure that all previous drawing instructions have been executed prior to requesting operator response or the like.

Example:

```
        .BYTE   0.,28.  ;length=0,opcode for FLUSH_BUFFER
```

6.16 INITIALIZE

INITIALIZE restores PRO/GIDIS subsystems to their default states. Also, if a character definition block or filled figure block is active, INITIALIZE aborts it.

Opcode: 1 **Length:** 1

Format: INITIALIZE sub-mask

sub-mask	Is a word that specifies zero or more of PRO/GIDIS's subsystems. The subsystems defined at this time are listed in Table 6-3. A subsystem is represented in the mask value as a bit, as shown in the table. For example, a value of 6 (bit 2 + bit 1) resets text and writing attributes.

Status: SUCCESS

Table 6-3: Initialization of Subsystems

Subsystem	Description	Bit	Value
Addressing	Sets IDS, Viewport, GOS and clipping region to 960 x 600. Also sets all attributes that specify distances or coordinates (for example, unit cell size).	0	1
Writing Attributes	Reinitializes writing mode, primary color, secondary color, line and area texture, planes selected, and pixel size.	1	2

Subsystem	Description	Bit	Value
Text	Resets the current alphabet, unit size, display size, cell rotation, cell rendition, implicit cell movement flag, and explicit cell movement.	2	4
Color Map	Reinitializes the color map.	4	16
Alphabet	Clears all user-defined alphabets and sets family ID of alphabet 0 to "DGIDIS".	5	32
Cursor	Resets the output cursor and output rubber band.	8	256

Notes:

- INITIALIZE 0 is useful, as it aborts any blocks begun with BEGIN_FILLED_FIGURE and BEGIN_DEFINE_CHARACTER without affecting any GIDIS subsystems.
- You can combine mask bits to initialize multiple subsystems in one instruction.
- A mask of -1 decimal (177777 octal) initializes all subsystems.
- The order of initialization is: (1) addressing, (2) writing attributes, (3) text, (4) color map, (5) alphabet storage, and (6) cursor.
- .GID files that use default text attributes may not come out as expected, because some defaults are appropriate only for Video GIDIS.
- Table 6-4 lists all of the GIDIS attributes affected and their values after initialization. Note that some attributes are included in more than one subsystem. All coordinates and distances are in GOS, unless otherwise noted.

Table 6-4: Values of GIDIS Attributes After an INITIALIZE

Attribute	Value
Addressing Subsystem	
output IDS width	960
output IDS height	600
output viewport x origin	0 in IDS
output viewport y origin	0 in IDS
output viewport width	960 in IDS
output viewport height	600 in IDS
GIDIS output space x origin	0
GIDIS output space y origin	0
GIDIS output space width	960
GIDIS output space height	600
output clipping x origin	0
output clipping y origin	0
output clipping width	960
output clipping height	600
current position x	0
current position y	0
line texture size	N/A
area texture width	12
area texture height	25
logical pixel width	0 (1 hardware pixel)
logical pixel height	0 (1 hardware pixel)
logical pixel x offset	0
logical pixel y offset	0
cell movement mode flag	2 (implicit)
cell explicit movement dx	0
cell explicit movement dy	0
cell display size width	12
cell display size height	25
cell unit size width	12
cell unit size height	25

Attribute	Value
Writing Attributes Subsystem	
primary color	7
secondary color	0
plane mask	all available planes
writing mode	overlay
logical pixel width	0
logical pixel height	0
logical pixel x offset	0
logical pixel y offset	0
line texture pattern	solid (all ones)
line texture length	N/A
line texture size	N/A
area texture alphabet	-1
area texture character	0 (solid)
area texture width	12
area texture height	25
Text Subsystem	
current alphabet	0
cell display size width	12
cell display size height	25
cell unit size width	12
cell unit size height	25
cell rotation	0
cell oblique	0
cell rendition	0
cell movement mode flag	2 (implicit)
cell explicit movement dx	0
cell explicit movement dy	0

Attribute	Value

Color Map Subsystem (values associated)

	R	G	B	M	Color	Mono
color map [0]	.0	.0	.0	.0	black	(dark)
color map [1]	.2	.2	.6	.2	blue	(dk. gray)
color map [2]	.7	.2	.2	.3	red	(lt. gray)
color map [3]	.2	.7	.2	.4	green	(light)
color map [4]	.6	.6	.6	.7	white	(light)
color map [5]	.6	.6	.6	.7	white	(light)
color map [6]	.6	.6	.6	.7	white	(light)
color map [7]	.6	.6	.6	.7	white	(light)

Alphabet Storage Subsystem

family name of alphabet 0	"DGIDIS"

Cursor Subsystem

output cursor alphabet	-1
output cursor character index	N/A
output cursor width	N/A
output cursor height	N/A
output cursor x offset	N/A
output cursor y offset	N/A
output cursor rendition	blinking
output rubber band type	none

Example:

```
        .BYTE   1.,1.           ;length=1,opcode for INITIALIZE
        .WORD   1.!2.!4.        ;addressing, writing attributes,
                                ;and text subsystems mask bits
                                ;are set
```

6.17 LOAD_BY_NAME(1)

LOAD_BY_NAME(1) loads a pre-built font into the current alphabet. The argument list is a pair of words which contain a region name in Radix-50.

Opcode: 37 **Length:** 2

Format: LOAD_BY_NAME(1) name-0, name-1

name-0	3 radix-50 characters
name-1	3 radix-50 characters

Status: SUCCESS if the region named identifies a valid region, the region has the proper format, the current alphabet number is not 0, and there are sufficient resources to load the font region; otherwise, FAILURE.

Notes:

- Subsequent SET_ALPHABET instructions do not affect previous LOAD_BY_NAME INSTRUCTIONS. For example, if you loaded font MYALPH into alphabet 1, it would remain alphabet 1's font until INITIALIZE 32, another LOAD_BY_NAME, or a CREATE_ALPHABET was processed for alphabet 1.
- If no such region can be found or installed, GIDIS simulates a LOAD_BY_NAME(2) and loads "DGIDIS", the default family ID for alphabet 0.
- A GIDIS font file is an RSX Common Library. In other words, installing a GIDIS font file creates a font region.
- A font region must conform to the format shown in Appendix C.
- A font region can be accessed in one of 3 ways:

  1. Prior to doing the LOAD_BY_NAME(1), you can create and load the region in your application.
  2. Prior to doing the LOAD_BY_NAME(1), you can install a font file with the DCL INSTALL command, PROTSK, or your application installation file (.INS).
  3. You can rely on GIDIS to install the region's font file when the LOAD_BY_NAME(1) is done. You enable GIDIS to install the file in either of two ways:

1. Place the font file on LB:[ZZFONT] and name it region-name.TSK. (Note: $'s and .'s in a region name become Z's in the filename).

2. Describe the font in an .FDF file. See Appendix D.

Example:

```
.BYTE   2.,37.  ;length=2, opcode for LOAD_BY_NAME
.Radix-50 "BOLD";let MACRO-11 compute the Radix-50 for
 BOLD
```

Example:

```
.BYTE   2.,37.                  ;Radix-50 for MYALPH
.WORD   050500+001750+000001    ;MYA
.WORD   045400+001200+000010    ;LPH
```

6.18 LOAD_BY_NAME(2)

LOAD_BY_NAME(2) associates the current alphabet with the specified font family. When a subsequent DRAW_CHARACTERS or DRAW_PACKED_CHARACTERS is done, GIDIS finds the font file in the family that best matches the current GIDIS text attributes. See Appendix D.

Opcode: 37 **Length:** 3 to 7

Format: LOAD_BY_NAME(2) Ch1, Ch2, Ch3, ...Chn

Ch1 - Chn Is a font family ID, encoded as 1 character per word

Status: SUCCESS

Notes:

- Subsequent SET_ALPHABET instructions do not affect previous LOAD_BY_NAME instructions. For example, if you loaded family ID MYALPH into alphabet 1, it would remain alphabet 1's family ID until INITIALIZE 32, another LOAD_BY_NAME, or a CREATE_ALPHABET was processed for alphabet 1.
- The default family ID for alphabet 0 is DGIDIS.
- Family IDs are mapped to uppercase. For example, specifying "dgidis" is equivalent to specifying "DGIDIS".
- A font must be described in an .FDF file on LB:[ZZFONT] to be accessible via a LOAD_BY_NAME(2) (see Appendix D).
- If the specified family has no members, GIDIS simulates a LOAD_BY_NAME(2) "DGIDIS."

Example:

```
.BYTE   1.,38.  ;Length=1,opcode for SET_ALPHABET
.WORD   1.      ;Selects alphabet 1 as current alphabet
.BYTE   6.,37.  ;Length=6,opcode for LOAD_BY_NAME
.WORD   68.     ;D
.WORD   71.     ;G
.WORD   73.     ;I
.WORD   68.     ;D
.WORD   73.     ;I
.WORD   83.     ;S,associates alphabet 1 with family
                ;ID "DGIDIS"
```

6.19 LOAD_CHARACTER_CELL

LOAD_CHARACTER_CELL defines a character cell from the specified data. This instruction acts on the current alphabet.

Opcode: 34 **Length:** 2 + N

Format: LOAD_CHARACTER_CELL char-index, width, d0, d1,...,dn

char-index	The index of the character cell to be loaded. This value must be in the range 0 to extent-1, where extent is the total character count for the current alphabet.
width	The width value must be in the range 0 to the width value given with the CREATE_ALPHABET instruction that established the alphabet.
d0, d1,...dn	Zero or more words of data to be loaded into the character cell. The top character cell row is loaded from the first data word(s), the second row from the next data words, and so forth. Excess data words are ignored, and missing data words are assumed to be 0's. Each row of the cell is (alphabet width + 15)/16 data words. For example, an 8-bit wide alphabet has 1 word per row, and a 20-bit wide alphabet has 2 words per row.

Status: SUCCESS if not within a character definition block (See BEGIN_DEFINE_CHARACTER), character index is in range (see CREATE_ALPHABET), width is in the range 0 to alphabet width, and a CREATE_ALPHABET has been done for the current alphabet; otherwise, FAILURE.

Notes:

- The defined character can now be used like any other character in SET_AREA_TEXTURE, SET_OUTPUT_CURSOR, DRAW_CHARACTER and DRAW_PACKED_CHARACTER instructions.
- The leftmost pixel in a row comes from the low-order bit in the appropriate data word.

Example:

```
                    ;Alphabet 2 has width of 5, height of 6,
                    ;  and extent of 10

        .BYTE   7.,34.  ;Length=7, opcode for LOAD_CHARACTER_CELL

        .WORD   9.      ;Character index (last cell in alphabet)
        .WORD   5.      ;Width
        .WORD   ^B00001 ;Pattern:        ON   --   --   --   --
        .WORD   ^B00011 ;                ON   ON   --   --   --
        .WORD   ^B00101 ; (Note the      ON   --   ON   --   --
        .WORD   ^B01001 ; bit reversal)  ON   --   --   ON   --
        .WORD   ^B11111 ;                ON   ON   ON   ON   ON
                        ;                --   --   --   --   --
                    ;Last row not given; set to 0's
                    ;automatically.
                    ;Character is a triangle
```

6.20 NEW_PICTURE

NEW_PICTURE indicates the beginning of a new picture.

Opcode: 6 **Length:** 0

Format: NEW_PICTURE

Status: SUCCESS

Notes:

- It is recommended that you use NEW_PICTURE and END_PICTURE to enclose the instructions used in drawing a picture.
- Secondary color is written to the view surface subject to the plane mask in effect at the time NEW_PICTURE executes. (See SET_PLANE_MASK.)
- A NEW_PICTURE clears all of hardware address space, regardless of the current clipping region. In particular, it clears the 32-pixel bands on both sides of the screen not normally used in Video GIDIS.

Device Notes:

o NEW_PICTURE does not affect picture background in Plotter GIDIS.

Example:

```
        .BYTE   0.,6.           ;length=0,opcode for NEW_PICTURE
```

6.21 NOP

NOP performs no operation. Execution of a NOP has no effect on the current state of PRO/GIDIS, other than to set the status flag to SUCCESS.

Opcode: 0 **Length:** 0

Format: NOP

Status: SUCCESS

Note:

- This instruction is useful for transparently inserting information from a higher level protocol into a stream of GIDIS instructions. Use a nonzero length, when you want to insert information.

Example:

```
        .BYTE   0.,0.   ;length=0,opcode for NOP
```

Example:

```
        .BYTE   2.,0.   ;length=2,opcode for NOP
        .WORD   1540.   ;private data (ignored by PRO/GIDIS)
        .WORD   71.     ;private data (ignored by PRO/GIDIS)
```

6.22 PRINT_SCREEN

PRINT_SCREEN sends the specified portion of the video bitmap to a sixel printer connected to the printer port.

Opcode: 141 **Length:** 6 or 7

Format: PRINT_SCREEN x, y, width, height, hxly, dxly, [mask]

x	Specifies the leftmost horizontal coordinate of the GOS data to be printed
y	Specifies the uppermost vertical coordinate of the GOS data to be printed
width	Width of the area to be printed
height	Height of the area to be printed
hxly	Specifies the horizontal offset from the current printhead location to where you want to begin printing the screen data.
dxly	Specifies the vertical offset from the current printhead location to where you want to begin printing the screen data.
mask	Specifies the color indexes that cause printing a dot on the paper. The low order bit is color 0, the next bit color 1, and so on. If mask is omitted, it is generated as follows. In a single plane system (no EBO), a pixel value of 0 is mapped to a skip (leaves paper white) and a 1 is mapped to a strike (prints on the paper). On multi-plane systems, the value of the color map is tested as follows. If the entry (color index of point) equals 0, the point is skipped (white). If not 0, the point prints.

Status: SUCCESS

Notes:

- Applies to Video GIDIS only.
- If the printer port does not have a sixel printer connected, nothing occurs.

Example:

```
        .BYTE   6.,141. ;Length=6, opcode for PRINT_SCREEN
        .WORD   100.    ;Upper left bitmap corner
        .WORD   100.    ;   is [100,100]
        .WORD   400.    ;Data to be printed is 400 units wide
        .WORD   200.    ;   by 200 units high
        .WORD   0.      ;Begin printing at current printhead
        .WORD   0.      ;   location
```

6.23 REQUEST_CELL_STANDARD

REQUEST_CELL_STANDARD reports the GOS dimensions you would have to specify to generate a standard size character. A standard size character has dimensions such that when its width/height = 8/5, 80 characters fit across the device and 24 lines fit vertically.

Opcode: 54 **Length:** 0

Format: REQUEST_CELL_STANDARD

Status: SUCCESS

The report consists of 5 words:

Report Header, unit-wd, unit-ht, display-wd, display-ht

where

unit-wd	Is the unit cell width of the standard size character.
unit-ht	Is the unit cell height of the standard size character.
display-wd	Is normally the same as unit-wd. However if the current alphabet is 0, this value is 11/12 of the current cell width.
display-ht	Is normally the same as unit-ht. However if the current alphabet is 0, this value is 11/12 of the current cell height.

Notes:

- This instruction takes into account the storage size of the current alphabet and the character rotation currently in effect. As a result, the standard size for alphabet 0 (DEC Multinational) is not necessarily the same as the standard size for a user alphabet.
- Rounding could take place converting from device coordinates to GIDIS space. If your program later sets unit cell size to 'n' times the size of the standard, the characters actually formed might not be precisely 'n' times the standard.

Example:

```
        .BYTE   0.,54.  ;Length=0,
                        ;opcode for REQUEST_CELL_STANDARD
                        ; Byte  4.   (Data words following)
                        ; Byte  5.   (Cell Standard Rpt. Tag)
                        ; Word  9.   (Unit-wd)
                        ; Word  20.  (Unit-ht)
                        ; Word  8.   (Display-wd)
                        ; Word  20.  (Display-ht)
                        ;
```

6.24 REQUEST_CURRENT_POSITION

REQUEST_CURRENT_POSITION reports the absolute location of the current position in GIDIS Output Space. The current position is the display location at which the next character, line, or arc would be drawn.

Opcode: 55 **Length:** 0

Format: REQUEST_CURRENT_POSITION

Status: SUCCESS

The report consists of 3 words:

Report header, current x, current y

Notes:

- The current position is not necessarily the same as the last position given to SET_POSITION or DRAW_LINES; DRAW_CHARACTERS and DRAW_ARCS instructions also move the current position.
- REQUEST_CURRENT_POSITION is most useful following a DRAW_ARCS or a DRAW_CHARACTERS (local symmetry), since your program cannot determine precisely where PRO/GIDIS leaves the current position after these instructions.

Example:

```
        .BYTE   0.,55.  ;Length=0,
                        ;opcode for REQUEST_CURRENT_POSITION
                        ;This instruction causes the following
                        ;  report to be placed in the report
                        ;  queue if there is sufficient room.
                        ;
                        ; Byte  2. Data words following
                        ; Byte  1. Current Position Report Tag
                        ; Word  x  PRO/GIDIS coordinates
                        ; Word  y  for the current position
```

6.25 REQUEST_OUTPUT_SIZE

REQUEST_OUTPUT_SIZE reports the attributes of the current device's view surface.

Opcode: 57 **Length:** 0

Format: REQUEST_OUTPUT_SIZE

Status: SUCCESS

The report consists of 10 words:
Report header, ulx, uly, screen_width, screen_height, total_width, total_height, resolution_x, resolution_y, Total_plane_mask

where

[ulx, uly]	Are the coordinates of the upper left corner of the device's view surface in IDS units
Screen_width	Is device width in IDS units
Screen_height	Is device height in IDS units
Total_width	Is device width in IDS units
Total_height	Is device height in IDS units
Resolution_x	Is device width in HAS x units
Resolution_y	Is device height in HAS y units
Total_plane_mask	Is the plane mask that contains a 1 for every plane accessible. See device notes of SET_PLANE_MASK.

Example:

```
                    ;Assume PRO 350 Video with EBO
                    ;Assume IDS is 960 by 600
        .BYTE   0.,57.  ;length=0,opcode for REQUEST_OUTPUT_SIZE
                    ;
                    ;BYTE 9.    9 words following output size
                    ;           report tag
                    ;BYTE 2.    OUTPUT_SIZE_REPORT tag
                    ;WORD -32.  IDS coordinate of device's
                    ;WORD 0.    upper left corner is [-32,0]
                    ;WORD 1024. IDS width and height of
                    ;WORD 600.  entire view surface
                    ;WORD 1024. IDS width and height of
                    ;           entire view surface
                    ;WORD 600.
                    ;1024.      number of pixels in total
                    ;           device width
                    ;WORD 240.  number of pixels in total
                    ;           device height
                    ;WORD 7.    total plane mask
```

6.26 REQUEST_STATUS

REQUEST_STATUS reports the success or failure of the last PRO/GIDIS instruction. All PRO/GIDIS instructions set the status variable.

Opcode: 58 **Length:** 0

Format: REQUEST_STATUS

Status: SUCCESS

The report consists of 2 words:

Report header, status

where the low-order bit of the status word is either

1 - indicating SUCCESS

0 - indicating FAILURE.

Notes:

- No other codes are defined. (Codes other than 0 or 1 are reserved for future use.)
- FAILURE status is not saved. If your program needs information about the success or failure of every instruction, you must place a REQUEST_STATUS instruction after each PRO/GIDIS instruction.
- Testing is recommended only following major PRO/GIDIS instructions, such as CREATE_ALPHABET.

Example:

```
                    ;assumes previous instruction failed
        .BYTE   0.,58.  ;Length=0,
                        ;opcode for REQUEST_STATUS
                        ; Byte  1. (Data words following)
                        ; Byte  4. (Current Status Report Tag)
                        ; Word  0  (FAILURE   status)
```

6.27 REQUEST_VERSION_NUMBER

The REQUEST_VERSION_NUMBER instruction reports the version number and driver of PRO/GIDIS.

Opcode: 71 **Length:** 0

Format: REQUEST_VERSION_NUMBER

Status: SUCCESS

The report consists of 3 words:

Report header, driver, version

where

driver	Is 21 for Video GIDIS, 22 for Plotter GIDIS, 23 for Sixel GIDIS, 24 for File GIDIS, 25 for Palette GIDIS.
version	Is the version number of GIDIS.

Notes:

- For P/OS V2.0, the version number of GIDIS is 21.
- For P/OS V2.0A, the version number of GIDIS is 29.
- For P/OS V3.0, the version numer of GIDIS is 32.

Example:

```
        .BYTE   0.,71.  ;Length=0,
                        ;opcode for REQUEST_VERSION_NUMBER
                        ;byte 2. data words following
                        ;byte 7. VERSION_NUMBER_REPORT tag
                        ;word 21. device code
                        ;word 25. version number
```

6.28 SCROLL_CLIPPING_REGION

The SCROLL_CLIPPING_REGION instruction moves data within the clipping region. The vacated display area is set to the current secondary color.

Opcode: 52 **Length:** 2

Format: SCROLL_CLIPPING_REGION dx, dy

dx	The distance to move the data horizontally. If dx is positive, the data is shifted right to left; if negative, the data is shifted left to right.
dy	The distance to move the data vertically. If dy is positive, the data is shifted toward the top of the screen; if negative, the data is shifted toward the bottom of the screen.

Status: SUCCESS

Notes:

- The instruction applies to Video GIDIS only.
- SCROLL_CLIPPING_REGION is affected by the current plane mask. Planes not selected are not scrolled or otherwise changed.
- For speed, hardware assist is used when possible. When the clipping rectangle is all of IDS, a vertical scroll scrolls the entire width of the screen.
- When a software scroll is done, screen images appear to move around rather than scroll.
- The data scrolled out is not saved. You cannot scroll out a portion of an image and then scroll it back in. Solid secondary color always scrolls in.
- After this instruction, shaded areas within the clipping region will not necessarily be aligned with shaded areas outside the clipping region.

Example:

```
        .BYTE   2.,52.  ;Length=0,
                        ;opcode for SCROLL_CLIPPING_REGION
        .WORD   -100.   ;dx
        .WORD   0.      ;dy
                        ;Slides data to the right 100 units
```

Example:

```
        .BYTE   2.,52.
        .WORD   0.      ;Scroll data down
        .WORD   -15.    ;15 units
```

Example:

```
        .BYTE   2.,52.
        .WORD   -30     ;Scrolls data in the clipping region
        .WORD   +30     ;30 units left and 30 units up.
```

6.29 SET_ALPHABET

SET_ALPHABET sets the current alphabet to the specified alphabet. Except as noted below, all alphabet-related operations act on the currently selected apphabet.

Opcode: 38 **Length:** 1

Format: SET_ALPHABET alphabet

alphabet	Is an integer value in the range 0 to 15. It identifies the alphabet to make current.

Status: SUCCESS if the alphabet number is valid (from 0 to 15); otherwise, FAILURE.

Notes:

- A GIDIS alphabet number is somewhat like a character set. Alphabet 0 is the DEC Multinational Character Set. Alphabets 1 through 15 are user alphabets.
- The first time you select a nonzero alphabet number, there is no font for the alphabet. You get a font in one of two ways: the LOAD_BY_NAME instruction or the CREATE_ALPHABET instruction.
- SET_OUTPUT_CURSOR and SET_AREA_TEXTURE are the only alphabet related operations that do not act on the current alphabet.
- No drawing is done by the SET_ALPHABET instruction.

Example:

```
        .BYTE   1.,38.  ;Length=1, opcode for
                        ;SET_ALPHABET
        .WORD   2.      ;Selects alphabet #2 as current
                        ;alphabet
```

6.30 SET_AREA_CELL_SIZE

SET_AREA_CELL_SIZE clips the current area texture cell.

Opcode: 69 **Length:** 2

Format: SET_AREA_CELL_SIZE width, height

width	The width of the area cell in hardware pixels. The width value must be in the range 1 to 16.
height	The height of the area cell in hardware pixels. The height value must be in the range 1 to 16.

Status: SUCCESS if both width and height are in the range 1 to 16; otherwise, FAILURE.

Notes:

- If the area cell width is greater than the specified width, GIDIS removes columns from the right side of the area texture cell.
- If the area cell height is greater than the specified height, GIDIS removes columns from the bottom of the area texture cell.
- The SET_AREA_TEXTURE and SET_AREA_TEXTURE_SIZE instructions set the area cell size from that of the character cell, overriding any previous SET_AREA_CELL_SIZE specification.
- No drawing is done by the SET_AREA_CELL_SIZE instruction.

Device Note:

- Plotter GIDIS ignores this instruction.

Example:

```
        .BYTE   2.,14.  ;Length=2, opcode for SET_AREA_TEXTURE
        .WORD   2.      ;Use character 23 from alphabet 2,
        .WORD   23      ;which is 8 x 10
                        ;Area Cell Size is now 8 by 10
        .BYTE   2.,69.  ;Length=2, opcode for SET_AREA_CELL_SIZE
        .WORD   9.      ;area cell width = 9 hardware pixels
        .WORD   9.      ;area cell heighth = 9 hardware pixels
                        ;Area cell size is now 9 by 9, padded on
                        ;the right, with one column of OFF's, and
                        ;with the bottom row of the character
                        ;cell removed
```

6.31 SET_AREA_TEXTURE

SET_AREA_TEXTURE specifies the rectangular bit pattern used to fill subsequent filled figures. Area texture is specified as a character in an alphabet.

Opcode: 14 **Length:** 2

Format: SET_AREA_TEXTURE alphabet, char-index

alphabet	The number of the alphabet containing the texture character. It can be the DEC Multinational character set (alphabet 0), a user-defined alphabet, or the special texture alphabet -1.
char-index	The index of the character to use.

Status: SUCCESS if the specified alphabet number is valid; otherwise, FAILURE.

Notes

- The character identified by SET_AREA_TEXTURE is copied to an internal GIDIS storage area. Deleting or changing the font does not affect the current area texture. Only another SET_AREA_TEXTURE or SET_AREA_TEXTURE_SIZE can change the current area texture.
- Alphabet -1 char-index 0 asks GIDIS to derive the area texture cell from the current line texture. The pattern is drawn vertically and replicated horizontally. The area texture height is taken from the line texture size, not from the area texture width and height.
- Solid fill is more efficient than patterned fill. To generate solid fill most efficiently, select alphabet -1, character 0 while line texture is set to solid.
- Filling is most efficient when area texture width is 8 or 16.
- If the selected alphabet is associated with a family ID (See LOAD_BY_NAME(2)), SET_AREA_TEXTURE chooses a font for you using the current area texture size. This option gives you a way of making GIDIS generate more consistent patterns across devices of differing resolutions.

- The current font of the specified alphabet should not have width or height greater than 16 pixels. If width is greater than 16, only the leftmost 8 bits of the selected glyph are used. If height is greater than 16, only the topmost 16 lines of the glyph are used. If the alphabet is associated with a family ID, the selected font is guaranteed to be less than or equal to 16 x 16, if the current family contains such a font.

- The bit pattern specified by this instruction always appears upright; there is no way to rotate the pattern.

- Area textures are self-aligning. When two adjacent or overlapping areas are filled, no seams show.

- Complement and complement-negate writing modes can give unexpected results when filled figure areas overlap or abut.

- Pixel size is not used when filling areas.

- No drawing is done by the SET_AREA_TEXTURE instruction.

Device Note:

- Plotter GIDIS processes SET_AREA_TEXTURE differently. See Appendix E for a description of how Plotter GIDIS handles this instruction.

Example:

```
        .BYTE   2.,14   ;length=2., opcode for SET_AREA_TEXTURE
        .WORD   8.      ;User-defined alphabet 2
        .WORD   23.     ;23rd character
```

Example:

```
        .BYTE   3.,17   ;length=3.,opcode for SET_LINE_TEXTURE
        .WORD   any     ;length of pattern
        .WORD   -1      ;solid
        .WORD   any     ;size of one repetition of pattern
        .BYTE   2.,14   ;length=2.,opcode for SET_AREA_TEXTURE
        .WORD   -1      ;alphabet -1 is derived from line texture
        .WORD   0       ;character 0
                        ;sets up solid area fill
```

6.32 SET_AREA_TEXTURE_SIZE

SET_AREA_TEXTURE_SIZE specifies the desired size of the area texture cell.

Opcode: 3 **Length:** 2

Format: SET_AREA_TEXTURE_SIZE width, height

width	Specifies the width of one repetition of the area texture cell.
height	Specifies the height of one repetition of the area texture cell.

Status: SUCCESS if width and height are greater than zero; otherwise, FAILURE.

Notes:

- If the glyph you select (perhaps with GIDIS's help as described in the next note) for the area texture cell is smaller than the specified width and height, GIDIS scales the selected glyph to the size you specified. However, scaling is restricted to an integral multiple of the texture cell. GIDIS uses the largest multiple that is not larger than the size specified. If the glyph you select is larger than the specified width and height, GIDIS uses the selected glyph as is.

- If the selected alphabet is associated with a family ID (see LOAD_BY_NAME(2)), SET_AREA_TEXTURE_SIZE chooses a font for you using the current area texture. This option gives you a way of making GIDIS generate more consistent patterns across devices of differing resolutions.

- No drawing is done by the SET_AREA_TEXTURE_SIZE instruction.

Device Note:

- Plotter GIDIS ignores this instruction.

Example:

```
        .BYTE   2.,3    ;length=2,
                        ;opcode for SET_AREA_TEXTURE_SIZE
        .WORD   12.     ;Area texture width = 12 units
        .WORD   8.      ;Area texture height = 8 units
```

6.33 SET_CELL_DISPLAY_SIZE

SET_CELL_DISPLAY_SIZE defines the size of a character's display cell, the rectangular area of the view surface modified when a character is drawn.

Opcode: 40 **Length:** 2

Format: SET_CELL_DISPLAY_SIZE width, height

width	Is the width of the display cell.
height	Is the height of the display cell.

Status: SUCCESS

Notes:

- The origin of the display cell is always the upper left corner of the cell and is aligned with the unit cell at that corner.
- Normally display cell size and unit cell size are set the same. One reason to make display cell width wider than unit cell size is to space characters further apart. (See implicit movement in SET_CELL_MOVEMENT_MODE.) In Replace Writing mode this approach can be preferable to using SET_CELL_EXPLICIT_MOVEMENT, because there will not be gaps between the cells.
- If the unit cell is smaller than the display cell, all of the character is drawn and the right and bottom portions of the display cell are treated as if the character pattern specified OFF.
- If the unit cell is larger than the display cell, the bottom and right portions of the character are clipped to the display cell size. In other words, the character is truncated.

  Figure 6-5 shows what happens when the unit cell and display cell are not the same size.

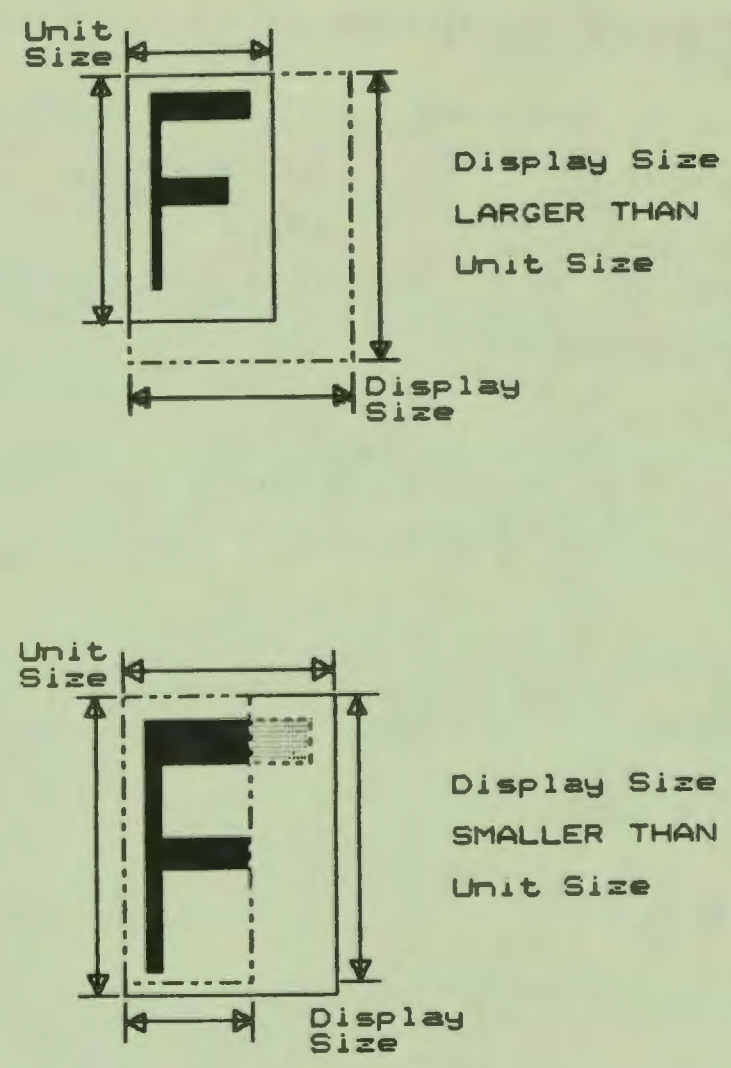


Figure 6-5: Character Unit Cell and Display Cell

- Negative values in width or height produce a mirroring in X and Y, respectively. This mirroring always occurs about the origin (the upper-left corner of the cell). Implicit movement always goes across the display cell; consequently, implicit movement for a display cell mirrored in X is in the opposite direction from the rotation angle.

- The smallest actual width or height is 1 hardware pixel.
- Display cell size, except for mirroring, is ignored for proportionally spaced fonts.
- No drawing is done by the SET_CELL_DISPLAY_SIZE instruction.

Example:

```
.BYTE   2.,40.  ;Length=2,
                ;opcode for SET_CELL_DISPLAY_SIZE
.WORD   12.     ;Width
.WORD   28.     ;Height
```

6.34 SET_CELL_EXPLICIT_MOVEMENT

SET_CELL_EXPLICIT_MOVEMENT specifies a distance to move the current position after a character is drawn.

Opcode: 41 **Length:** 2

Format: SET_CELL_EXPLICIT_MOVEMENT dx, dy

dx	Specifies the horizontal distance to move the current position.
dy	Specifies the vertical distance to move the current position.

Status: SUCCESS

Notes:

- Dx and dy define the total movement when implicit movement is OFF (see SET_CELL_MOVEMENT_MODE.)
- Explicit cell movement is not affected by SET_CELL_ROTATION or SET_CELL_OBLIQUE instructions.
- For left-to-right text, you normally use either implicit movement or explicit movement as follows:

Implicit Movement

```
        .BYTE    1.,42    ;Length=1,opcode for
                          ;SET_CELL_MOVEMENT_MODE
        .WORD    2        ;flag for implicit movement
        .BYTE    2.,41    ;length=2,opcode for
                          ;SET_CELL_EXPLICIT_MOVEMENT
        .WORD    0        ;dx
        .WORD    0        ;dy
```

Explicit Movement

```
        .BYTE    1.,42    ;length=1,opcode for
                          ;SET_CELL_MOVEMENT_MODE
        .WORD    0(or 1)  ;turns off implicit cell movement
        .BYTE    2.,41    ;length=2,opcode for
                          ;SET_CELL_EXPLICIT_MOVEMENT
        .WORD  width          ;as set by SET_CELL_DISPLAY_SIZE
        .WORD    0        ;
```

- No drawing is done by the SET_CELL_EXPLICIT_MOVEMENT instruction.

Example:

```
        .BYTE   2.,41.  ;Length=2,opcode for
                        ;SET_CELL_EXPLICIT_MOVEMENT
        .WORD   12.     ;dx
        .WORD   0.      ;dy
```

6.35 SET_CELL_MOVEMENT_MODE

SET_CELL_MOVEMENT_MODE specifies the manner in which the current position moves after a character is drawn.

Opcode: 42 **Length:** 1

Format: SET_CELL_MOVEMENT_MODE flag

flag	Specifies one of the following movement modes as shown in Table 6-5 below.

Table 6-5: SET_CELL_MOVEMENT_MODE Flag Values

Movement Mode	Value
Explicit cell movement, local symmetry	0
Explicit cell movement, global symmetry	1
Explicit and implicit movement, local symmetry	2
Explicit and implicit movement, global symmetry	3
Reserved	4-15

Status: SUCCESS if Flag is 0 to 3; otherwise, FAILURE.

Notes:

- Explicit cell movement is set by SET_CELL_EXPLICIT_MOVEMENT.
- Implicit movement means that the current position moves a distance equal to the display cell width. Movement is along the baseline of the angle of rotation. Thus, left-to-right text (aligned along a 0 degree angle) has implicit movement of dx = display cell width and dy = 0. Each successive

character is one display cell width to the right. Upwards perpendicular text (text aligned along a 90 degree angle), has implicit movement of dx = 0 and dy = -display cell width. Each successive character is one display cell width towards the top of the view surface.

- When using local symmetry, the current position after a DRAW_CHARACTERS instruction could be different from that calculated by your program. It is suggested that any series of DRAW_CHARACTERS instructions be followed by a SET_POSITION instruction or a REQUEST_POSITION instruction, unless you do not care exactly where the string ends.

- When using global symmetry, the final current position is exactly the value that would be calculated by your program. However, character spacing may not always be even due to round-off errors.

- For proportionally spaced fonts, you should normally specify implicit motion.

- If the current font is proportionally spaced, global symmetry is ignored.

- No drawing is done by the SET_CELL_MOVEMENT_MODE instruction.

Example:

```
        .BYTE   1.,42.  ;Length=1,
                        ;opcode for SET_CELL_MOVEMENT_MODE
        .WORD   0.      ;Set explicit movement, local symmetry
```

6.36 SET_CELL_OBLIQUE

Normally a character cell is a rectangle. An oblique character cell is a parallelogram. SET_CELL_OBLIQUE specifies how much to slant the rectangle. The top line of the display cell remains stationary, while the bottom of the cell is moved either forward or backward.

Opcode: 65 **Length:** 1

Format: SET_CELL_OBLIQUE angle

angle	The requested angle in degrees. A positive angle value indicates a backward slant (move bottom of cell forwards); a negative angle indicates a forward slant (move bottom of cell backwards)

Status: SUCCESS

Notes:

- If the specified angle is greater than 60 (or less than -60), GIDIS uses 60.
- The shape of the parallelogram is not affected by cell rotation.
- If x of the current position is at the left edge of the clipping rectangle, the bottom left of a forward-slanted character will be clipped. This is because a forward slant is achieved by moving the bottom of the cell backwards, rather than by moving the top of the cell forwards.
- No drawing is done by the SET_CELL_OBLIQUE instruction.

Example:

```
        .BYTE   1.,65.  ;Length=1, opcode for SET_CELL_OBLIQUE
        .WORD   -23.    ;Approximate italics (slant right
                        ;23 degrees)
```

Example:

```
        .BYTE   1.,65.  ;Length=1, opcode for SET_CELL_OBLIQUE
        .WORD   23.     ;Approximate back-slant (slant left
                        ;23 degrees
```

Figure 6-6 shows the two display cells that result from the above examples.

Figure 6-6: Italic and Back-Slanted Display Cells

6.37 SET_CELL_RENDITION

SET_CELL_RENDITION controls character rendition. The rendition options defined for the Professional are: back-slant, italics, bold, and proportionally spaced text.

Opcode: 43 **Length:** 1

Format: SET_CELL_RENDITION flags

flags	A word that specifies zero or more of the cell rendition options. A rendition is represented by the value of set bits as shown in Table 6-6. A 0 value establishes normal rendition: no slant, not bold, not proportional.

Table 6-6: SET_CELL_RENDITION Flags

Cell Rendition	Bit	Value
Back Slant	0	1
Italics	1	2
Bold	3	8
Proportionally spaced	4	16
Reserved	2, 5-15	

Status: SUCCESS

Notes:

- SET_CELL_RENDITION is not cumulative. A SET_CELL_RENDITION with an argument of 2 followed by another SET_CELL_RENDITION with an argument of 8 causes the character to be bold **not** slanted, rather than bold **and** slanted.
- SET_CELL_RENDITION with an argument of 3 (mask value B00011) selects italics.
- SET_CELL_RENDITION simulates a SET_CELL_OBLIQUE with an argument of 0, before processing the mask-value. This cancels the effect of earlier SET_CELL_OBLIQUE instructions.
- If possible, GIDIS satisfies a request for bold or italics by using a font with that attribute. Otherwise, it algorithmically creates the desired rendition.
- If font width size is less than or equal to 8 pixels, algorithmic bolding has no visible effect.
- Algorithmic italics is equivalent to SET_CELL_OBLIQUE -23.
- Algorithmic backslant is equivalent to SET_CELL_OBLIQUE 23.
- There is no algorithmic fallback for proportionally spaced text. The proportional bit is used only to request a proportional font from a font family. If no appropriate font is found, the argument is ignored. See LOAD_BY_NAME(2).
- For proportionally spaced fonts, you should normally specify implicit motion.
- If the current font is proportionally spaced, global symmetry is ignored.

Example:

```
        .BYTE   1.,43.  ;Length=1, opcode for SET_CELL_RENDITION
        .WORD   2.      ;Requests italics rendition
```

6.38 SET_CELL_ROTATION

SET_CELL_ROTATION defines the angle of rotation with which subsequent characters are drawn. The character is rotated about the current position (upper left corner of the display cell) to the angle specified.

Opcode: 44 **Length:** 1

Format: SET_CELL_ROTATION angle

angle	The requested angle in degrees. A positive angle value indicates counter-clockwise from normal text. For example, 90 degree text is sideways, facing up. A negative angle indicates clockwise from normal text.

Status: SUCCESS

Notes:

- The simplest way to make a string of rotated characters follow a baseline is to use SET_CELL_EXPLICIT_MOVEMENT with arguments of [0,0] and set the implicit movement flag with the SET_CELL_MOVEMENT_MODE instruction.
- An angle of N-360 is equivalent to an angle of N.
- No drawing takes place when the SET_CELL_ROTATION instruction executes.

Example:

```
.BYTE   1.,44.  ;Length=1, opcode for SET_CELL_ROTATION
.WORD   -90.    ;Text to face down the screen
```

6.39 SET_CELL_UNIT_SIZE

SET_CELL_UNIT_SIZE specifies the size to draw subsequent character cells.

Opcode: 45 **Length:** 2

Format: SET_CELL_UNIT_SIZE width, height

width	Is the desired cell width. The width must be greater than zero.
height	Is the desired cell height. The height must be greater than zero.

Status: SUCCESS if width and height are greater than zero; otherwise, FAILURE.

Notes:

- If the current alphabet is associated with a font family ID (See LOAD_BY_NAME(2)), GIDIS tries to find a font in the family whose size matches the specified size. If the size request is between two available fonts, GIDIS generally selects the smaller of the two.
- If the current alphabet has a CREATE_ALPHABET font or a LOAD_BY_NAME(1) font, GIDIS must use that font.
- If the available (or chosen) font does not match the specified size, GIDIS scales it. Width and height are scaled independently.
- GIDIS may not be able to scale the font exactly to the specified size. However, unit cell size will not be exceeded unless the specified size is less than half the size of the font being scaled.
- The width of a proportionally spaced font can only be scaled to an integral multiple of itself.
- The requested unit size does not change when the current alphabet changes, but the the font and/or scaling is recalculated in order to obtain the best match.
- The unit cell and the display cell are always aligned at their upper-left corners.

- Normally when you change unit cell size, you would also make an analogous change to display cell size.
- No drawing is done by the SET_CELL_UNIT_SIZE instruction.

Device Notes:

- Plotter GIDIS always sets unit cell size to display cell size.
- Plotter GIDIS always sets unit cell size exactly.

Example:

```
        .BYTE   1.,45.  ;Length=1, opcode for SET_CELL_UNIT_SIZE
        .WORD   10.     ;Width
        .WORD   30.     ;Height
```

6.40 SET_COLOR_MAP_ENTRY

The SET_COLOR_MAP_ENTRY instruction sets the specified color map entry. All pixels that were previously drawn using that color map entry are immediately affected.

Opcode: 16 **Length:** 6

Format: SET_COLOR_MAP_ENTRY map, index, red, green, blue, mono

map	an integer representing a specific color map. For the Professional, this value must be 0.
index	an integer from 0 to (color map size -1), to identify the color map entry.
red	an integer in the range of 0 to 65535, representing the intensity of red.
green	an integer in the range of 0 to 65535, representing the intensity of green.
blue	an integer in the range of 0 to 65535, representing the intensity of blue.
mono	an integer in the range of 0 to 65535, representing the intensity of monochrome.

Status: SUCCESS if map = 0 and index is in range; otherwise, FAILURE.

Notes:

- Table 6-7 shows color intensities in various formats: octal fraction, octal integer, unsigned decimal integer and signed decimal integer. Making an intensity value larger linearly increases intensity. For example, specifying 32768 sets a color to half its maximum intensity, while specifying 65535 sets a color to its maximum intensity.

6.41 SET_GIDIS_OUTPUT_SPACE

SET_GIDIS_OUTPUT_SPACE specifies the coordinate units and shape of a window you define in GOS. Simultaneously, it sets the output clipping rectangle to coincide with the window. This instruction also resets GIDIS attributes as shown in Table 6-8.

Opcode: 9 **Length:** 4

Format: SET_GIDIS_OUTPUT_SPACE ulx, uly, width, height

ulx	Is the x value to assign to the leftmost point in your window.
uly	Is the y value to assign to the topmost point in your window. In other words, [ulx, uly] is the origin of the window.
width	Specifies the number of x units in your window (See second note below.)
height	Specifies the number of y units in your window (See second note below.)

Status: SUCCESS if width and height are greater than zero; otherwise, FAILURE.

Notes:

- When drawing a picture with GIDIS, you normally just use a SET_OUTPUT_IDS instruction. This sets your viewport and clipping rectangle to the entire view surface, and makes GOS units and IDS units the same. For example, if the view surface width in IDS is 960, then the view surface width in GOS is also 960. You only need to use SET_GIDIS_OUTPUT_SPACE if you do not want to draw on the entire view surface or if you want to draw only a portion of a picture on the view surface. (See the third note.)

- If the window shape is not the same as the viewport shape, then space is left unused to the right or bottom of the picture. Figure 6-7 shows how a window with an extent of 1000 x 1000 maps to a viewport with an extent of 1500 x 1000. Note how GIDIS begins at the upper left-hand corner and fills as much of the viewport as possible. In this case the vertical extents match, so the picture extends to the bottom of the viewport. Since the horizontal extents do not match, GIDIS leaves space on the right.

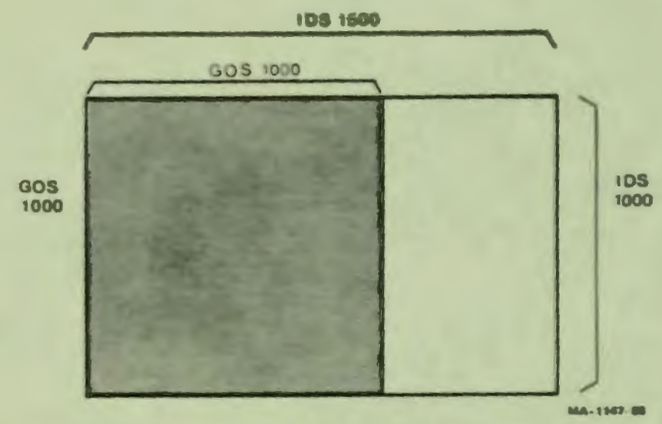


Figure 6-7: Mapping of GOS to a Different Shaped Viewport

- The SET_GIDIS_OUTPUT_SPACE instruction makes it easy to display a selected rectangle from a larger picture. Choose the portion of the picture you want. Use its origin, width, and height as arguments to SET_GIDIS_OUTPUT_SPACE, and then draw the whole picture. GIDIS will fill your viewport with the desired picture section and clip away the rest. The effect is that of enlarging a portion of your picture, while maintaining all existing proportions. (However, if the GIDIS instructions that comprise the whole picture include a SET_OUTPUT_GOS or SET_OUTPUT_IDS, you will not achieve the desired result.) Figure 6-8 shows how a selected portion of a GIDIS picture maps to a viewport with an extent in IDS of 500 x 500. The area to be drawn is identified by the following arguments:

  ulx = 300
  uly = 100
  width = 100
  height = 100

Table 6-7: Sample Color Map Values

Octal Fraction	Octal Integer	Unsigned Decimal Integer	Signed Decimal Integer
0.0	0	0	0
0.1	20000	8192	8192
0.2	40000	16384	16384
0.3	60000	24576	24576
0.4	100000	32768	-32768
0.5	120000	40960	-24576
0.6	140000	49152	-16384
0.7	160000	57344	-8192
Max	177777	65535	-1

Device Notes:

- Video GIDIS ignores this instruction unless the system has an Extended Bitmap Option (EBO).
- On a Video with an EBO, there are 8 color map entries. On Palette, there are 16 color map entries.
- On Professional 350 Video, there are 8 intensity levels available for mono, red, and green; and 4 for blue.
- On Professional 380 Video and Palette, there are 16 intensity levels available for mono, red, green, and blue.

- If any in-between value is specified, the next lower value is used. However, how "in between" values are treated is device specific. For example, the PRO 380 treats 0.16 (octal) for red as 0.15, while the PRO 350 treats 0.16 (octal) as 0.1.

- Sixel GIDIS and Plotter GIDIS ignore this instruction.

Example:

```
.BYTE   6.,16.  ;length=6,opcode for SET_COLOR_MAP_ENTRY
.WORD   0.      ;PRO's bitmap (value must be 0)
.WORD   1.      ;Color index 1
.WORD   49152   ;Red is three-quarters
.WORD   40960.  ;Green is five-eighths
.WORD   0       ;Blue is zero
.WORD   32768.  ;Monochrome is one-half
                ;This makes dark yellow on a color
                ;system.
```

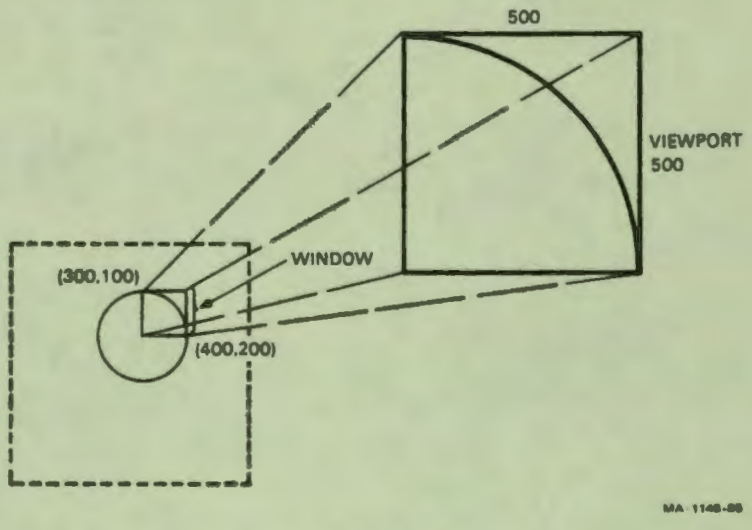


Figure 6-8: Mapping a Portion of a Picture to a Viewport

- It is recommended that ulx, uly, (ulx + width), and (uly + height) never be set larger than 16384 (2 to the 14th power). This will allow sufficient off-screen address space for accurate clipping.
- No drawing is done by the SET_GIDIS_OUTPUT_SPACE instruction.
- Table 6-8 lists all of the GIDIS attributes modified by the SET_GIDIS_OUTPUT_SPACE instruction. Standard text size is the number of GOS units needed to match hardware character size to the size set by INITIALIZE -1.

Table 6-8: GIDIS Attributes Affected by SET_GIDIS_OUTPUT_SPACE

Attribute	Value
GIDIS output space	as specified
clipping region	same as GOS
current position x	0
current position y	0
line texture size	N/A
area texture width	12
area texture height	25
logical pixel x offset	0
logical pixel y offset	0
logical pixel width	0
logical pixel height	0
cell movement mode flag	2, (implicit)
cell explicit movement dx	0
cell explicit movement dy	0
cell display size width	12
cell display size height	25
cell unit size width	12
cell unit size height	25

Example:

```
                    ;assume Video GIDIS
        .BYTE   2.,12.  ;length=2,opcode for SET_OUTPUT_IDS
        .WORD   960.    ;width
        .WORD   600.    ;height (upper left corner is [0,0] and
                        ;  lower right corner is [959,599])

        .BYTE   4.,13.  ;length=4,opcode for SET_OUTPUT_VIEWPORT
        .WORD   0.      ;
        .WORD   0.      ;Sets the viewport to the left half
        .WORD   480.    ;   of the screen
        .WORD   600.    ;
```

SET_GIDIS_OUTPUT_SPACE

```
.BYTE   4.,9.   ;length=4,opcode SET_GIDIS_OUTPUT_SPACE
.WORD   0.      ;Sets GOS to 0 to 2399 in X
.WORD   0       ;  and 0 to 2999 in Y  (all within the
.WORD   2400.   ;  left half of the screen).
.WORD   3000.   ;Because 480/600 = 2400/3000, there is
                ;  no wasted space at the bottom or
                ;  right of the viewport.
```

6.42 SET_LINE_TEXTURE

SET_LINE_TEXTURE defines the line texture, a bit pattern that is scaled and repeated in drawing straight lines and arcs.

Opcode: 17 **Length:** 3

Format: SET_LINE_TEXTURE patlen, pattern, size

patlen	Is the length (in bits) of the specified pattern. It must be in the range 1 to 16.
pattern	Is the bit pattern to use. PRO/GIDIS begins the pattern by using the low-order (rightmost) bit (bit 0) first.
size	Specifies the length of pattern repetition in GOS units. It must be greater than zero.

Status: SUCCESS if patlen is in the range 1 to 16, and if size is greater than 0; otherwise, FAILURE.

Notes:

- The size argument in this instruction is handled much like size in the SET_CELL_UNIT_SIZE instruction. However, scaling is limited to integral multiples of the pattern.
- Drawing with a solid pattern (that is, pattern = -1) is quite a bit more efficient than drawing with a nonsolid pattern.
- When specifying a nonsolid pattern, a highly multiplied pattern is best. For example, patlen = 2 and pattern = 1 are more efficient than patlen = 16 and pattern = 255 for drawing a dashed line.
- Pixel size does not change how often the pattern repeats, although the appearance of the line does change somewhat.
- The pattern is rotated as lines are drawn, so that the pattern is preserved around corners and bends.
- Conversely, the only way to force the pattern to bit 0 is to issue another SET_LINE_TEXTURE instruction.
- Except for Plotter GIDIS, the size given is used only for horizontal and vertical lines. Diagonal lines have a size that is larger by as much as a factor of the square root of 2 (1.414...).

- No drawing is done by the SET_LINE_TEXTURE instruction.

Device Notes:

- For Plotter GIDIS, the specified pattern is mapped to the closest pattern provided by the plotter hardware. The patterns provided are solid, dashes, long dashes, long dash short dash, long short short, and dots. The size of the line pattern is set to the value specified in the command, with a minimum of about .125 inches. The pattern is rotated rather than projected when a diagonal line is drawn.

- Plotter GIDIS maintains the correct size regardless of the direction of the lines.

Example:

```
        .BYTE   3.,17   ;length=3., opcode for SET_LINE_TEXTURE
        .WORD   8.      ;patlen
        .WORD   ^B10001111 ;ON, ON, ON, ON, OFF, OFF, OFF, ON
                        ;Bits are used in order low to high
        .WORD   100.    ;Size of one repetition of pattern in
                        ;GIDIS output space
                        ;makes subsequent lines dashed
```

6.43 SET_OUTPUT_BITMAP

SET_OUTPUT_BITMAP tells GIDIS which page of the 380 video bitmap to make current. All drawing executes on the current bitmap.

Opcode: 145 **Length:** 2

Format: SET_OUTPUT_BITMAP bitmap-no, dis-flag

bitmap-no	Specifies which bitmap to make current. In low resolution mode, the value can be 1 to 4. In high resolution mode, the value can be 1 to 2.
dis-flag	Controls whether the current bitmap is to be displayed. If flag is set, the current bitmap is displayed. If flag is not set, the current bitmap is not displayed.

Status: SUCCESS

Notes:

- Each bitmap is a complete environment with its own color map.
- SET_OUTPUT_BITMAP does not alter any other GIDIS attributes. It only affects the current bitmap.
- Do a SET_OUTPUT_BITMAP with a dis-flag of 0, if you want to continue looking at the current picture on the screen while GIDIS draws the next picture. This is a useful feature in a slide show application, for instance.
- SET_OUTPUT_BITMAP is available on the Professional 380 only.

Device Notes:

- You may scroll the displayed bitmap, provided you do not write to that bitmap while it is not the displayed bitmap.
- Always go back to bitmap 1 before using text mode. You can do this in several ways:
  - Use SET_OUTPUT_BITMAP with a bitmap-no argument of 1
  - Use the DCL command CLEAR
  - Use a RIS escape sequence

6.44 SET_OUTPUT_CLIPPING_REGION

SET_OUTPUT_CLIPPING_REGION specifies the output clipping rectangle. The clipping rectangle is the area on the view surface where PRO/GIDIS can draw.

Opcode: 4 **Length:** 4

Format: SET_OUTPUT_CLIPPING_REGION ulx, uly, dx, dy

ulx	Specifies the x coordinate of the left edge of the clipping region.
uly	Specifies the y coordinate of the top edge of the clipping region.
dx	Sets the rightmost x of the clipping rectangle to ulx + dx.
dy	Specifies the bottommost y of the clipping rectangle to uly + dy.

Status: SUCCESS if width and height are not negative; otherwise, FAILURE.

Notes:

- You cannot set the clipping region to an area larger than the device's Hardware Address Space (HAS). An attempt to do so reduces the clipping region to the available space.
- Clipping does not affect the setting of the current position. For example, if you draw a line that ends outside the clipping rectangle, the current position is set to the x and y you specified, even though only part of the line was drawn.
- Clipping applies to all drawing. For example, any part of a character outside of the clipping region is not drawn.
- Clipping does not affect drawing accuracy. In particular, if only part of an arc is inside the clipping region, that part is drawn correctly.

- Because the clipping rectangle includes the right and bottom borders,

```
SET_POSITION 100, 150
DRAW_LINES 500, 150
```

  draws pixels from [100,150] to [400,150] inclusive. Note that the current position is now [500,150].

- No drawing is done by the SET_OUTPUT_CLIPPING_REGION instruction.

Example:

```
.BYTE   4.,4.   ;length=4,
                ;opcode for SET_OUTPUT_CLIPPING_REGION
.WORD   100.    ;Sets output clipping region to rectangle
.WORD   100.    ;with the upper left corner at 100,100
.WORD   400.    ;and the lower right corner at 500,200.
.WORD   100.
```

6.45 SET_OUTPUT_CURSOR

SET_OUTPUT_CURSOR selects the symbol to be used as the cursor and aligns it relative to the current position. The cursor is a visible indication of the current position.

Opcode: 5 **Length:** 6

Format: SET_OUTPUT_CURSOR alphabet, index, width, height, offset-x, offset-y

alphabet	Specifies the alphabet containing the character or the special cursor alphabet (-1).
index	Specifies the character or special cursor.
width	Specifies the width of the cursor. The width must be greater than or equal to zero.
height	Specifies the height of the cursor. The height must be greater than or equal to zero.
offset-x	Specifies distance from the left edge of the cursor to the current position (range is 0 to width).
offset-y	Specifies distance from the top edge of the cursor to the current position (range is 0 to height).

Status: SUCCESS if alphabet is -1 to 15, alphabet width is less than or equal to 16, alphabet height is less than or equal to 16, and the offsets are in range; otherwise, FAILURE.

Notes:

- Applies to Video GIDIS only.
- If the alphabet is not -1, the width and height are treated as a unit cell size; there is no equivalent of a display cell. When the specified character is scaled to width and height (using the rules described under SET_AREA_TEXTURE_SIZE, the x and y offsets are scaled by the same ratios.

- An alphabet code of -1 specifies that one of the following special built-in cursors should be used:

-1	No cursor
0	Implementation default (same as 1)
1	Tracking cross (small cross)
2	Crosshairs (full clipping rectangle width and height)
3	Block (solid rectangle)
	All other values are reserved.

  Width, height, and the offsets are ignored when the tracking cross or crosshairs are used.

- If the chosen cursor is neither a special cursor nor a character in alphabet 0, your program must define the character before executing SET_OUTPUT_CURSOR. Redefining the selected character after a SET_OUTPUT_CURSOR does not change the cursor's appearance. You must use another SET_OUTPUT_CURSOR to change the appearance of the cursor.

- When the SET_OUTPUT_CURSOR instruction executes, the appearance of the cursor changes immediately.

Device Note:

- SET_OUTPUT_CURSOR changes only the GIDIS cursor. However, turning the Terminal Subsystem's text cursor ON or OFF has the side effect of turning the Video GIDIS cursor ON or OFF.

Example:

```
.BYTE   6.,5.   ;length=6,opcode for SET_OUTPUT_CURSOR
.WORD   1.      ;Alphabet 1 (user-defined alphabet)
.WORD   2.      ;Character index value
                ;(Assume that Alphabet 1, character-index
                ;2, is defined as an arrow pointing
                ;straight upward
.WORD   30.     ;Width of 30
.WORD   30.     ;Height of 30
.WORD   15.     ;offset-x
.WORD   0.      ;offset-y
                ;Makes the arrow the new cursor and
                ;aligns it such that its tip is at the
                ;current position.
```

Example:

```
        .BYTE   6.,5.   ;length=6,opcode for SET_OUTPUT_CURSOR
        .WORD   -1.     ;PRO/GIDIS Cursor Alphabet
        .WORD   -1.     ;No cursor
        .WORD   0.      ;Width value of zero  (ignored)
        .WORD   0.      ;Height value of zero  (ignored)
        .WORD   3.      ;offset-x (ignored)
        .WORD   4.      ;offset-y (ignored)
                        ;turns the GIDIS cursor off
```

6.46 SET_OUTPUT_CURSOR_RENDITION

SET_OUTPUT_CURSOR_RENDITION controls cursor and rubber band rendition. The rendition options are blinking and continuous.

Opcode: 72 **Length:** 1

Format: SET_OUTPUT_CURSOR_RENDITION mask

mask	Is a word that specifies the rendition. The rendition is represented in the mask as a bit. If the 0 bit is set, the cursor or rubber band blinks; if not, it is continuous.

Status: SUCCESS

Notes:

- Applies to Video GIDIS only.
- Bits 1-15 of mask are reserved.
- Using a continuous cursor during picture drawing is very expensive.

Example:

```
        .BYTE   1.,72.  ;length=1, opcode for
                        ;SET_OUTPUT_CURSOR_RENDITION
        .WORD   0.      ;set to continuous mode
```

6.47 SET_OUTPUT_IDS

SET_OUTPUT_IDS specifies the width and height of Imposed Device Space (IDS). It also sets GIDIS Output Space, the clipping rectangle, and the viewport to be identical with IDS, and sets all GIDIS attributes as shown in Table 6-9.

Opcode: 12 **Length:** 2

Format: SET_OUTPUT_IDS width, height

width	Specifies the number of x units on your device
height	Specifies the number of y units on your device

Status: SUCCESS if width and height are greater than 0; otherwise, FAILURE.

Notes:

- The upper left corner of IDS is always [0,0]. The coordinates of the lower-right corner are [width -1, height -1].
- When the shape of IDS is not equal to the shape of the hardware address space, only the top left portion of the view surface is used. This mapping mirrors the mapping of GOS to a different shaped viewport. See note 2 under SET_GIDIS_OUTPUT_SPACE.
- It is recommended that width and height never be set larger than 16384 (2 to the 14th power). This will allow sufficient off-screen address space for accurate clipping.
- No drawing is done by the SET_OUTPUT_IDS instruction.
- Table 6-9 lists all of the GIDIS attributes affected by the SET_OUTPUT_IDS instruction.

Table 6-9: GIDIS Attributes Affected by SET_OUTPUT_IDS

Attribute	Value
IDS width	as specified
IDS height	as specified
viewport	same as IDS
GIDIS output space	same as IDS
clipping region	same as IDS
current position x	0
current position y	0
line texture size	N/A
area texture width	12
area texture height	25
logical pixel x offset	0
logical pixel y offset	0
logical pixel width	0
logical pixel height	0
cell movement mode flag	2 (implicit)
cell explicit movement dx	0
cell explicit movement dy	0
cell display size width	12
cell display size height	25
cell unit size width	12
cell unit size height	25

Example:

```
                        ;assume Video GIDIS
        .BYTE   2.,12.  ;length=2,opcode for SET_OUTPUT_IDS
        .WORD   960.    ;width
        .WORD   600.    ;height (upper left corner is [0,0] and
                        ;  lower right corner is [959,599])

        .BYTE   4.,13.  ;length=4,opcode for SET_OUTPUT_VIEWPORT
        .WORD   0.      ;
        .WORD   0.      ;Sets the viewport to the left half
        .WORD   480.    ;   of the screen
        .WORD   600.    ;

        .BYTE   4.,9.   ;length=4,opcode SET_GIDIS_OUTPUT_SPACE
        .WORD   0.      ;
        .WORD   0.      ;Sets GOS to 0-to-2399 in X
        .WORD   2400.   ;  and 0-to-2999 in Y  (all within the
        .WORD   3000.   ;      left half of the screen)
                        ;Because 480/600 = 2400/3000, there is
                        ;no wasted space at the bottom and
                        ;right of the viewport.
```

6.48 SET_OUTPUT_RUBBER_BAND

SET_OUTPUT_RUBBER_BAND specifies if a rubber band is to be generated. It also gives the origin of the rubber band.

Opcode: 53 **Length:** 3

Format: SET_OUTPUT_RUBBER_BAND type, origin-x, origin-y

type	Is the type of rubber band to use. (See table 6-10.)
origin-x	Is the x coordinate of the desired rubber band's origin.
origin-y	Is the y coordinate of the desired rubber band's origin.

Status: SUCCESS if the type is legal; otherwise, FAILURE.

Table 6-10: Types of Rubber Bands

Type Code	Rubber Band
-1	No rubber band
0	Default (same as -1)
1	Rubber band line
2	Rubber band rectangle

Notes:

- Applies to Video GIDIS only.
- The SET_OUTPUT_CURSOR_RENDITION instruction applies to rubber bands as well as cursors.

- The rubber band line is drawn from its origin to the current position.
- The rubber band rectangle is a rectangle with one corner at the rubber band origin and the opposite corner at the current position. The rectangle will degenerate to a line (or point) if one or both of the coordinates of the current position and rubber band origin are the same.
- Since both the cursor and the rubber band are drawn in complement mode, it may be preferable to turn the cursor OFF when a rubber band is ON.

Example:

```
        .BYTE   3.,53.  ;length=3., opcode for
                        ;SET_OUTPUT_RUBBER_BAND
        .WORD   1.      ;rubber band line
        .WORD   50.     ;its origin is [50,60]
        .WORD   60.

        .BYTE   2.,29.  ;length=1., opcode for SET_POSITION
        .WORD   100.    ;new current position
        .WORD   300.    ;is [100,300]

                        ;there will be a rubber band line from
                        ;[50,60] to [100,300].
```

6.49 SET_OUTPUT_VIEWPORT

SET_OUTPUT_VIEWPORT specifies the size and location of your viewport. Your viewport is the rectangle on the view surface to which your picture is mapped for display. SET_OUTPUT_VIEWPORT also sets the clipping rectangle to match the viewport.

Opcode: 13 **Length:** 4

Format: SET_OUTPUT_VIEWPORT ulx, uly, width, height

ulx	specifies the x coordinate of the left edge of the viewport, in IDS units
uly	specifies the y coordinate of the top edge of the viewport, in IDS units
width	specifies the width of the viewport, in IDS units
height	specifies the height of the viewport, in IDS units

Status: SUCCESS if width and height are greater than 0; otherwise, FAILURE.

Notes:

- Use this instruction when you want the drawing area to be smaller than the view surface.
- To copy a picture to another part of the view surface and/or change its size, you need only do a SET_OUTPUT_VIEWPORT and then redraw the picture. You need to do a SET_GIDIS_OUTPUT_SPACE as well only if you want to draw a different portion of the picture.
- Unlike SET_OUTPUT_IDS and SET_GIDIS_OUTPUT_SPACE, this instruction does not initialize any of the GIDIS attributes. However, it does alter them. For example, suppose cell unit width in GOS is 36 and you make your viewport half as wide. This makes every GOS unit half as wide. Thus if cell unit width had been 18 pixels, it is now 9 pixels. Cell unit width in GOS is still 36, but 36 GOS units is half as wide as before.

- A SET_OUTPUT_IDS simulates a SET_OUTPUT_VIEWPORT with arguments as follows:

  ulx = 0
  uly = 0
  width = width of IDS
  height = height of IDS

- No drawing is done by the SET_OUTPUT_VIEWPORT instruction.

Example: See SET_GIDIS_OUTPUT_SPACE description.

6.50 SET_PIXEL_SIZE

SET_PIXEL_SIZE permits you to set the size of the logical pixel used for drawing straight lines and arcs. For large pixels, you also control where the pixel is aligned relative to the current position.

Opcode: 19 **Length:** 4

Format: SET_PIXEL_SIZE width, height, offset-x, offset-y

width	Specifies the width of the logical drawing pixel.
height	Specifies the height of the logical drawing pixel.
offset-x	Specifies distance from the left edge of the pixel to the current position.
offset-y	Specifies distance from the top edge of the pixel to the current position.

Status: SUCCESS if width and height are greater than or equal to zero, offset-x is greater than or equal to zero and not greater than width, and offset-y is greater than or equal to zero and not greater than height; otherwise, FAILURE.

Notes:

- The drawing pixel is always a rectangle orthogonal to the X and Y axes.
- Changing pixel size does not change the size of GOS units. It just tell GIDIS the size and alignment of the rectangle to draw at each point along the line. Thus patterned lines have less "off space" when pixel size is large.
- Default pixel size is device dependent. It is between 1/50 and 1/100 of an inch. If possible, one hardware pixel is used.
- A size value that maps to a size smaller than a hardware pixel is set to the hardware pixel size. However, width = 0 and height = 0 sets the logical drawing pixel to the default pixel size.

- Because the pixel is a rectangle, a diagonal line is thicker than a horizontal or vertical line.
- When pixel size is not 1 x 1, complement writing mode can produce unexpected results.
- No drawing is done when the SET_PIXEL_SIZE function executes.

Device Notes:

- On Plotter GIDIS, SET_PIXEL_SIZE sets line width to (width + height)/2.
- On Plotter GIDIS, one hardware pixel is the size of the pen.
- For purposes of drawing thick lines on a plotter, a hardware pixel is treated as 1/75 of an inch. However a double line is not drawn until line width is greater than 1/30 of an inch. This is to accommodate the fact that a .7mm pen is almost this thick.

Example:

```
.BYTE   4.,19.  ;length=4,opcode for SET_PIXEL_SIZE
.WORD   6.      ;width in GIDIS output space units
.WORD   6.      ;Height in GIDIS output space units
.WORD   3.      ;Centers the current position
                ;horizontally
.WORD   3.      ;Centers the current position vertically
```

6.51 SET_PLANE_MASK

SET_PLANE_MASK performs a Boolean AND operation on the plane-mask and the current color index and sets pixels using the resultant index. For example, if the current color index is 5 and the plane-mask is 3, a color index 1 (=3 AND 5) is actually used.

Opcode: 20 **Length:** 1

Format: SET_PLANE_MASK plane-mask

plane-mask	Is a bit mask representing a combination of planes. A set bit indicates an accessible plane.

Status: SUCCESS

Notes:

- Use a mask of -1 to ensure that all planes are accessible.
- No drawing is done by the SET_PLANE_MASK instruction.

Device Notes:

- When used with an EBO, the text portion of the Terminal Subsystem uses plane 3 for text. When not used with an EBO, it uses plane 1 for text.
- The various GIDIS devices have different numbers of planes:
  - Professional Video with the EBO has 3 planes.
  - Palette has 4 planes.
  - Plotter GIDIS has 3 planes.
  - All other devices have 1 plane.
- In Video GIDIS the color map can be used in combination with the plane mask to prepare separate images in separate planes for switching back and forth quickly. For example:

```
        .               ;Set all color map entries to dark
        .               ;and clear bitmap
        .

    .BYTE   1.,20.  ;length=1,opcode for SET_PLANE_MASK
```

```
.WORD   1.          ;plane 1
  .
  .                 ;draw image A in plane 1
  .
  .                 ;Set color map entry 1 to desired color
  .                 ;Image A appears
  .

.BYTE   1.,20.      ;length=1,opcode for SET_PLANE_MASK
.WORD   2.          ;plane 2
  .
  .                 ;draw image B in plane 2
  .
  .                 ;Set color map entry 1 to dark
  .                 ;Image A disappears
  .
  .                 ;Set color map entry  2 to desired color
  .                 ;Image B appears
  .
```

However long it took to draw Image B, it will appear all at once. You can continue flipping images A and B very quickly. In other words, you can draw B while A is being viewed and so forth.

Example:

```
.BYTE   1.,20.      ;length=1,opcode for SET_PLANE_MASK
.WORD   ^B011       ;Enables GIDIS access to planes 1 and 2
                    ;Plane 3 is write-protected
```

6.52 SET_POSITION

SET_POSITION sets the new current position to the specified coordinates.

Opcode: 29 **Length:** 2

Format: SET_POSITION x, y

x	Specifies the new x coordinate of the current position.
y	Specifies the new y coordinate of the current position.

Status: SUCCESS

Notes:

- Current position may be set outside the clipping region. However, x and y should never be set larger than 16384 (2 to the 14th power). This will allow sufficient off-screen address space for accurate clipping.
- No drawing is done by the SET_POSITION instruction.

Example:

```
.BYTE   2.,29.  ;Length=2, opcode for SET_POSITION
.WORD   100.    ;New current position
.WORD   350.    ;is [100,350]
```

6.53 SET_PRIMARY_COLOR

SET_PRIMARY_COLOR sets the primary color index to use in drawing subsequent objects. Primary color is the color used for ON bits in current line texture, current area texture, and character glyphs.

Opcode: 21 **Length:** 1

Format: SET_PRIMARY_COLOR color-value

color-value	Specifies primary color as an index. On a multi-plane system, color-value functions as an index into the color map. On a single-plane system it specifies ON (color-value not 0) or OFF (color-value 0).

Status: SUCCESS

Notes:

- Refer to the INITIALIZE instruction for a list of the power-on default colors.
- If color-value is greater than color map size, color-value modulus map size is used.
- This instruction is affected by the SET_PLANE_MASK instruction.
- No drawing is done by the SET_PRIMARY_COLOR instruction.

Device Notes

- See Appendix E for the relationship between color and pens in Plotter GIDIS.

Example:

```
        .BYTE   1.,21.  ;length=1,opcode for SET_PRIMARY_COLOR
        .WORD   4.      ;defines primary color as color number 4
```

6.54 SET_REL_POSITION

SET_REL_POSITION sets a new current position as an offset from the old current position.

Opcode: 30 **Length:** 2

Format: SET_REL_POSITION dx, dy

dx	Specifies the x coordinate of the new current position as: x of current position + dx.
dy	Specifies the y coordinate of the new current position as: y of current position + dy.

Status: SUCCESS.

Notes:

- SET_REL_POSITION [dx,dy] is always the same as SET_POSITION [Current x + dx, Current y + dy].
- Current position may be set outside the clipping region. However, x and y should never be set larger than 16384 (2 to the 14th power). This will allow sufficient off-screen address space for accurate clipping.
- No drawing is done by the SET_POSITION instruction.

Example:

```
                        ;Current position is [100,350]
        .BYTE   2.,30.  ;Length=2, opcode for SET_REL_POSITION
        .WORD   100.    ;Relative position is
        .WORD   -50.    ;[+100,-50]
                        ;New current position is [200,300]
```

6.55 SET_SECONDARY_COLOR

SET_SECONDARY_COLOR sets the secondary color, for use in drawing subsequent objects. Secondary color is the color used for OFF bits in the current line texture, current area texture, and glyphs. It is also the color generated by NEW_PICTURE and ERASE_CLIPPING_REGION, and scrolled in by SCROLL_CLIPPING_REGION.

Opcode: 15 **Length:** 1

Format: SET_SECONDARY_COLOR color-value

color-value	Specifies secondary color as an index. On a multi-plane system, color-value functions as an index into the color map. On a single-plane system, it specifies ON (color-value not 0) or OFF (color-value 0).

Status: SUCCESS

Notes:

- Refer to the SET_COLOR_MAP_ENTRY description for a list of the power-on default colors.
- If color-value is greater than color map size, color-value modulus map size is used.
- SET_SECONDARY_COLOR is affected by the SET_PLANE_MASK instruction.
- This instruction does not draw anything or affect the view surface.

Device Notes

- See Appendix E for the relationship between colors and pens.
- Plotter GIDIS never changes the secondary color: the paper always remains the same color. However there is an effect. If you set secondary color to N, drawing in color 0 will draw with the pen that is normally used when drawing with color N.
- If secondary color modulus 16 is greater than or equal to 8, Plotter GIDIS slows pen speed to 10 cps. The slower speed results in better quality when drawing a transparency.

Example:

```
        .BYTE   1.,15.  ;length=1,opcode for SET_SECONDARY_COLOR
        .WORD   1.      ;defines secondary color as index 1
```

6.56 SET_WRITING_MODE

SET_WRITING_MODE defines how PRO/GIDIS interprets ON and OFF bits in line textures, area textures, and glyphs. There are 10 options as described in Table 6-11.

Opcode: 22 **Length:** 1

Format: SET_WRITING_MODE mode-code

mode-code — Specifies one of the integer values listed in Table 6-11.

Table 6-11: Writing Mode Options

Code	Writing Mode	Description
0	Transparent	Updates the current position, but does no drawing.
1	Transparent Negate	Updates the current position, but does no drawing.
2	Complement	If current-pattern-bit is on, complements the color of the current pixel. This means the current pixel is set to (2 ** plane's current color). In a 3 plane system, complementing 2 sets it to 6 (2 ** 3 - 2).
3	Complement Negate	If current-pattern-bit is off, complements the current pixel.
4	Overlay	If current-pattern-bit is on, the current pixel is set to the current primary color.
5	Overlay Negate	If current-pattern-bit is off, the current pixel is set to the current primary color.

Code	Writing Mode	Description
6	Replace	If current-pattern-bit is on, the current pixel is set to the current primary color (same as overlay). If current-pattern-bit is off, the current pixel is set to secondary color.
7	Replace Negate	If current-pattern-bit is off, the current is set to the current primary color. If current-pattern-bit is on, the current pixel is set to secondary color.
8	Erase	The current pixel is set to secondary color.
9	Erase Negate	The current pixel is set to primary color.

Status: SUCCESS if a valid mode is requested; otherwise, FAILURE.

Notes:

- No drawing is done by the SET_WRITING_MODE instruction.

Figure 6-9 shows the same line texture (which includes ON and OFF bits) drawn over light and dark areas in all visible writing modes.

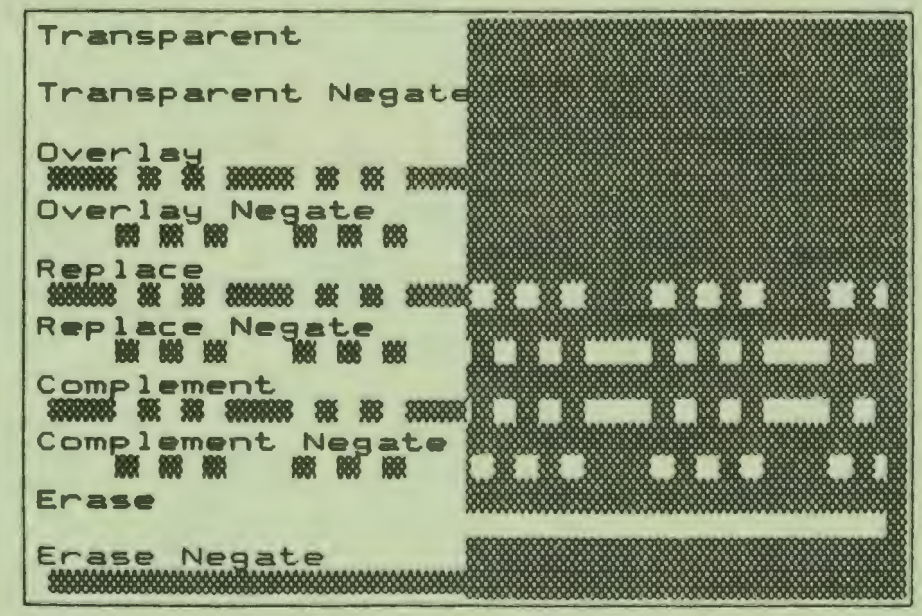


Figure 6-9: Writing Modes Shown with Line Texture

Device Notes

- Plotter GIDIS treats modes 2, 3, 4, 5, 6, 7 as overlay and modes 0, 1, 8, 9 as transparent.

Example:

```
        .BYTE   1.,22.  ;length=1,opcode for SET_WRITING_MODE
        .WORD   6.      ;Specifies REPLACE writing mode
```

APPENDIX A

PRO/GIDIS INSTRUCTION SUMMARIES

This appendix contains PRO/GIDIS instruction summaries and report tags for quick reference.

The instruction summaries are in two different formats: in ascending opcode order and in alphabetic order. The opcode and number of arguments are shown as separate byte values, and as opcode word values. The opcode word value = (opcode * 256) + number of arguments. Note, when the resultant opcode word value is greater than 32,000, it is subtracted from 65,536 (2**16) and a negative opcode word value results.

Table A-1: GIDIS Instructions in Opcode Order

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
0	0	0	NOP
1	1	257	INITIALIZE mask
3	2	770	SET_AREA_TEXTURE_SIZE w, h
4	4	1028	SET_OUTPUT_CLIPPING_REGION ulx, uly, w, h
5	6	1286	SET_OUTPUT_CURSOR alpha, index, w, h, ox, oy
6	0	1536	NEW_PICTURE

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
9	4	2308	SET_GIDIS_OUTPUT_SPACE x, y, w, h
12	2	3074	SET_OUTPUT_IDS w, h
13	4	3332	SET_OUTPUT_VIEWPORT ulx, uly, w, h
14	2	3586	SET_AREA_TEXTURE a, c
15	1	3841	SET_SECONDARY_COLOR color
16	6	4102	SET_COLOR_MAP_ENTRY m, color, r, g, b, mono
17	3	4355	SET_LINE_TEXTURE patlen, pattern, size
19	4	4868	SET_PIXEL_SIZE w, h, ox, oy
20	1	5121	SET_PLANE_MASK mask
21	1	5377	SET_PRIMARY_COLOR color
22	1	5633	SET_WRITING_MODE mode
23	3N	5888+3N	DRAW_ARCS x, y, angle
24	0	6144	END_PICTURE
25	2N	6400+2N	DRAW_LINES x, y
26	2N	6656+2N	DRAW_REL_LINES dx, dy
27	3N	6912+3N	DRAW_REL_ARCS dx, dy, angle
28	0	7168	FLUSH_BUFFER
29	2	7426	SET_POSITION x, y
30	2	7682	SET_REL_POSITION dx, dy
31	0	7936	BEGIN_FILLED_FIGURE
32	0	8192	END_FILLED_FIGURE
33	4 or 5	8448+N	BEGIN_DEFINE_CHARACTER c, w, nw, nh, [loff]

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
34	2+N	8706+N	LOAD_CHARACTER_CELL c, w, d0 . . .d15
35	N	8960+N	DRAW_CHARACTERS char-index
36	0	9216	END_DEFINE_CHARACTER
37	2	9474	LOAD_BY_NAME name_0, name_1
37	3-7	9472+N	LOAD_BY_NAME Ch1, Ch2, Ch3, ... Chn
38	1	9729	SET_ALPHABET alphabet
40	2	10242	SET_CELL_DISPLAY_SIZE w, h
41	2	10498	SET_CELL_EXPLICIT_MOVEMENT dx, dy
42	1	10753	SET_CELL_MOVEMENT_MODE flags
43	1	11009	SET_CELL_RENDITION flags
44	1	11265	SET_CELL_ROTATION angle
45	2	11522	SET_CELL_UNIT_SIZE w, h
46	5 or 6	11775+N	CREATE_ALPHABET w, h, extent, flags, [initialize], [ave-width]
48	0	12288	ERASE_CLIPPING_REGION
52	2	13314	SCROLL_CLIPPING_REGION dx, dy
53	3	13571	SET_OUTPUT_RUBBER_BAND type, x, y
54	0	13824	REQUEST_CELL_STANDARD
55	0	14080	REQUEST_CURRENT_POSITION
57	0	14592	REQUEST_OUTPUT_SIZE
58	0	14848	REQUEST_STATUS
65	1	16641	SET_CELL_OBLIQUE angle

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
69	2	17666	SET_AREA_CELL_SIZE w, h
71	0	18176	REQUEST_VERSION_NUMBER
72	1	18433	SET_OUTPUT_CURSOR_RENDITION mask
74	N	18944+N	DRAW_PACKED_CHARACTERS 2charindex
128	0	-32768	END_LIST
141	6 OR 7	-29434	PRINT_SCREEN x, y, w, h, hxly, dxly, [mask]
145	2	-28414	SET_OUTPUT_BITMAP bitmap-no, dis-flag

Table A-2 lists GIDIS instructions in alphabetical order.

Table A-2: GIDIS Instructions in Alphabetical Order

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
33	4 or 5	8448+N	BEGIN_DEFINE_CHARACTER c, w, nw,nh, [loff]
31	0	7936	BEGIN_FILLED_FIGURE
46	4,5 or 6	11775+N	CREATE_ALPHABET w, h, extent, flags [initialize], [ave-width]
23	3N	5888+3N	DRAW_ARCS x, y, angle
35	N	8960+N	DRAW_CHARACTERS char-index
25	N	6400+N	DRAW_LINES x, y
74	N	18944+N	DRAW_PACKED_CHARACTERS 2charindex
27	3N	6912+3N	DRAW_REL_ARCS dx, dy, angle
26	N	6656+N	DRAW_REL_LINES dx, dy
36	0	9216	END_DEFINE_CHARACTER
32	0	8192	END_FILLED_CHARACTER
128	0	-32768	END_LIST
24	0	6144	END_PICTURE
48	0	12288	ERASE_CLIPPING_REGION
28	0	7168	FLUSH_BUFFER
1	1	257	INITIALIZE mask
37	2	9474	LOAD_BY_NAME name_0, name_1

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
37	3-7	9472+N	LOAD_BY_NAME Ch1, Ch2, Ch3, ...Chn
34	2+N	8706+N	LOAD_CHARACTER_CELL c, w, d0, ...d15
6	0	1536	NEW_PICTURE
0	0	0	NOP
141	6 OR 7	-29434	PRINT_SCREEN x, y, w, h, hxly, dxly, [mask]
54	0	13824	REQUEST_CELL_STANDARD
55	0	14080	REQUEST_CURRENT_POSITION
57	0	14592	REQUEST_OUTPUT_SIZE
58	0	14848	REQUEST_STATUS
71	0	18176	REQUEST_VERSION_NUMBER
52	2	13314	SCROLL_CLIPPING_REGION dx, dy
38	1	9729	SET_ALPHABET alphabet
69	2	17666	SET_AREA_CELL_SIZE
14	2	3586	SET_AREA_TEXTURE a, c
3	2	770	SET_AREA_TEXTURE_SIZE w, h
40	2	10242	SET_CELL_DISPLAY_SIZE w, h
41	2	10498	SET_CELL_EXPLICIT_MOVEMENT dx, dy
42	1	10753	SET_CELL_MOVEMENT_MODE flags
65	1	16641	SET_CELL_OBLIQUE angle
43	1	11009	SET_CELL_RENDITION flags
44	1	11265	SET_CELL_ROTATION angle
45	2	11522	SET_CELL_UNIT_SIZE w, h

Opcode	Number of Arguments	Opcode Word	Instruction and Arguments
16	6	4102	SET_COLOR_MAP_ENTRY
9	4	2308	SET_GIDIS_OUTPUT_SPACE x, y, w, h
17	3	4355	SET_LINE_TEXTURE patlen, pattern, size
145	2	-28414	SET_OUTPUT_BITMAP bitmap-no,dis-flag
4	4	1028	SET_OUTPUT_CLIPPING_REGION ox, oy, w, h
5	6	1286	SET_OUTPUT_CURSOR a, c, w, h, ox, oy
72	1	18433	SET_OUTPUT_CURSOR_RENDITION
12	2	3074	SET_OUTPUT_IDS w, h
53	3	13571	SET_OUTPUT_RUBBER_BAND type, x, y
13	4	3332	SET_OUTPUT_VIEWPORT x, y, w, h
19	4	4868	SET_PIXEL_SIZE w, h, ox, oy
20	1	5121	SET_PLANE_MASK mask
29	2	7426	SET_POSITION x, y
21	1	5377	SET_PRIMARY_COLOR color
30	2	7682	SET_REL_POSITION dx, dy
15	1	3841	SET_SECONDARY_COLOR color
22	1	5633	SET_WRITING_MODE mode

Table A-3 lists report tags.

Table A-3: Report Tags

Tag Number	Argument Length	Opcode Word	Report Tag and Arguments
1	2	258	CURRENT_POSITION_REPORT x,y
2	9	521	OUTPUT_SIZE_REPORT ulx, uly, screen_width, screen_height, total_width, total_height, resolution_x, resolution_y, total_plane_mask
4	1	1025	STATUS_REPORT code
5	4	1284	CELL_STANDARD_REPORT uw, uh, dw, dh
7	2	1794	VERSION_NUMBER_REPORT code, version

APPENDIX B

DEC MULTINATIONAL CHARACTER SET

ROW	b8 b7 b6 b5 b4 b3 b2 b1	0		1		2		3		4		5		6		7	
	COLUMN	0		1		2		3		4		5		6		7	
	BITS	0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
0	0 0 0 0	NUL	0 0 0	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
1	0 0 0 1	SOH	1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
2	0 0 1 0	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
3	0 0 1 1	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
4	0 1 0 0	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
5	0 1 0 1	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
6	0 1 1 0	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
7	0 1 1 1	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
8	1 0 0 0	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
9	1 0 0 1	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
10	1 0 1 0	LF	12 10 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
11	1 0 1 1	VT	13 11 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
12	1 1 0 0	FF	14 12 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
13	1 1 0 1	CR	15 13 D	GS	35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
14	1 1 1 0	SO	16 14 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
15	1 1 1 1	SI	17 15 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

C0 CODES — GL CODES (ASCII GRAPHICS)

KEY

CHARACTER: ESC — 33 OCTAL, 27 DECIMAL, 1B HEX

DEC MULTINATIONAL CHARACTER SET

8		9		10		11		12		13		14		15		COLUMN	
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 b7 BITS b6 b5 b4 b3 b2 b1	ROW
	200 128 80	DCS	220 144 90		240 160 A0	°	260 176 B0	À	300 192 C0		320 208 D0	à	340 224 E0		360 240 F0	0 0 0 0	0
	201 129 81	PU1	221 145 91	¡	241 161 A1	±	261 177 B1	Á	301 193 C1	Ñ	321 209 D1	á	341 225 E1	ñ	361 241 F1	0 0 0 1	1
	202 130 82	PU2	222 146 92	¢	242 162 A2	2	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2	0 0 1 0	2
	203 131 83	STS	223 147 93	£	243 163 A3	3	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3	0 0 1 1	3
IND	204 132 84	CCH	224 148 94		244 164 A4		264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4	0 1 0 0	4
NEL	205 133 85	MW	225 149 95	¥	245 165 A5	µ	265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5	0 1 0 1	5
SSA	206 134 86	SPA	226 150 96		246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6	0 1 1 0	6
ESA	207 135 87	EPA	227 151 97	§	247 167 A7	·	267 183 B7	Ç	307 199 C7	Œ	327 215 D7	ç	347 231 E7	œ	367 247 F7	0 1 1 1	7
HTS	210 136 88		230 152 98	¤	250 168 A8		270 184 B8	È	310 200 C8	Ø	330 216 D8	è	350 232 E8	ø	370 248 F8	1 0 0 0	8
HTJ	211 137 89		231 153 99	©	251 169 A9	1	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9	1 0 0 1	9
VTS	212 138 8A		232 154 9A	ª	252 170 AA	º	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA	1 0 1 0	10
PLD	213 139 8B	CSI	233 155 9B	«	253 171 AB	»	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB	1 0 1 1	11
PLU	214 140 8C	ST	234 156 9C		254 172 AC	¼	274 188 BC	Ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC	1 1 0 0	12
RI	215 141 8D	OSC	235 157 9D		255 173 AD	½	275 189 BD	Í	315 205 CD	Ý	335 221 DD	í	355 237 ED	ý	375 253 FD	1 1 0 1	13
SS2	216 142 8E	PM	236 158 9E		256 174 AE		276 190 BE	Î	316 206 CE		336 222 DE	î	356 238 EE		376 254 FE	1 1 1 0	14
SS3	217 143 8F	APC	237 159 9F		257 175 AF	¿	277 191 BF	Ï	317 207 CF	ß	337 223 DF	ï	357 239 EF		377 255 FF	1 1 1 1	15

C1 CODES — GR CODES (DEC SUPPLEMENTAL GRAPHICS)

KEY

CHARACTER **ESC** 306 OCTAL, 198 DECIMAL, C6 HEX

APPENDIX C

FONT FILE FORMAT

This Appendix describes the memory-resident format of a font file. A LOAD_BY_NAME font must have this format. GIDIS requires the data in a font file to be ordered as follows:

- header
- pointer table
- glyphs

C.1 HEADER

Header information (word wide) starts at the beginning of the font file. For example, Word 0 in the font is AL$MAG. Table C-1 shows the format of the header.

Table C-1: Header Format

Name	Offset	Description
AL$MAG	0	Magic number--must be 16473.
AL$STR	2	Structure version number--102.
AL$SIZ	4	Size of header in bytes--30.
AL$TOT	6	Total size of font file in bytes--may be up to 64KB.

HEADER

Name	Offset	Description
AL$FLG	8	Flags--see CREATE_ALPHABET.
AL$RS0	10	Reserved for future.
AL$WID	12	Width of glyphs in this font--1 to 64 bits.
AL$HGT	14	Height of glyph--1 to 64 bits.
AL$FST	16	Index of first character represented in this font file--0 or greater.
AL$EXT	18	Extent of font file--number of glyph pointers you want in the font file. There is no specific limit if AL$TOT is less than 8KB; otherwise, AL$EXT must not be greater than 512.
AL$PTR	20	Offset from start of font file to pointer table. Pointer table must be present and on a word boundary. See Section C.2.
AL$RS1	22	Reserved for future use.
AL$FNT	24	Offset from start of font file to start of glyphs. See Section C.3.
AL$ORP	26	Offset from start of glyphs to out-of-range glyph, or -1. If -1, PRO/GIDIS will use its default out-of-range character.
AL$RS2	28	Reserved for future use.

C.2 POINTER TABLE

The pointer table contains AL$EXT words. Note that multiple table entries may point to the same glyph. If a table entry contains -1, GIDIS treats the character as if it were out of range. Table C-2 shows the format of the pointer table.

Table C-2: Pointer Table Format

Name	Description
1st entry	Offset from start of glyphs to the font information for the character with index AL$FST.
2nd entry	Offset from start of glyphs to the font information for the character with index (AL$FST + 1).
.	
.	
.	
Last entry	Offset from start of glyphs to the font information for the character with index (AL$FST + (n-1)).

C.3 GLYPHS

If AL$WID is 9 to 16, each glyph must start on a word boundary. Otherwise, glyphs may start on byte boundaries. There are no wasted bytes in a glyph. For example, if AL$WID is 22 (3 bytes per row of a glyph) and the glyph starts at offset x, then the second row starts at x + 3, the third row starts at x + 6, etc.

The leftmost pixel of a glyph is the low order bit of a row's first byte. Conversely, the rightmost pixel of a glyph is the first used bit of the row's last byte. For example, let AL$WID be 14, and examine the first row of a glyph. The leftmost pixel is bit 0 of byte 0 and the rightmost pixel is bit 5 of byte 1.

If the proportional flag is set, an extra word precedes other glyph data. The first byte of this extra word is the glyph's ave-width; the second byte is its left-offset.

APPENDIX D

MANAGING FONTS

D.1 MAKING A FONT AVAILABLE TO GIDIS

The .FDF files on LB:[ZZFONT] are files that tell the font server about the font files available on your system. When you boot your system, the font server is spawned and reads each .FDF file on [ZZFONT]. To make your fonts available in an application and for printing GIDIS files, have the application's installation file (.INS or .INB) copy the application's name with an .FDF extension (for example, APPname.FDF) to [ZZFONT].

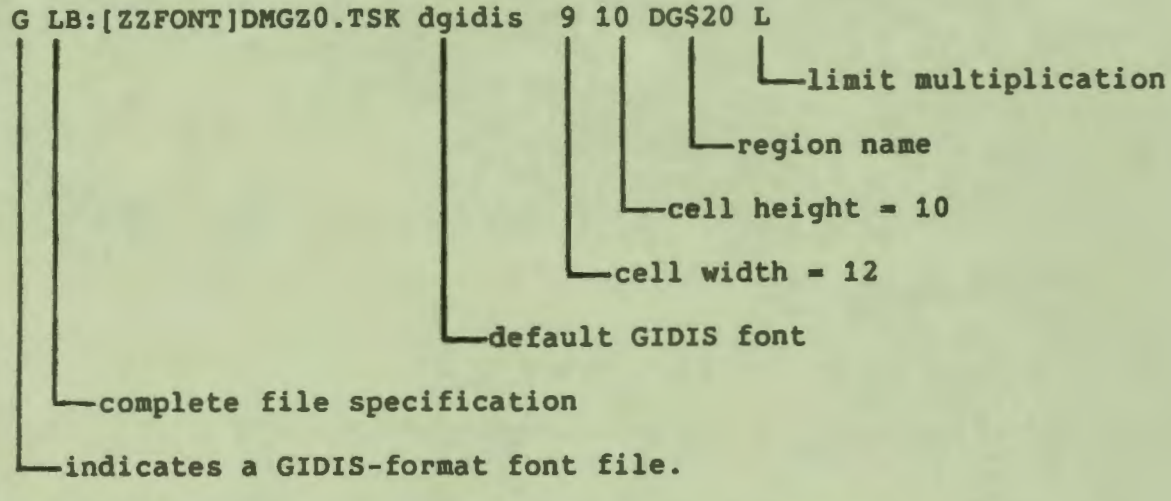
An .FDF file contains one line per font file. Each line contains several fields. The fields are separated by spaces, but there may *not* be spaces before the first field in the line. You may use tabs in place of spaces. The order of fields is fixed. The fields must appear in the following order:

File type	A one-character field. It should be G for a GIDIS font file, and S for a DEC standard font file. S fonts are used only on the LN03.
File spec	The full file specification of the font file. There may be no embedded spaces.
Family ID	The font style. Note that a number of fonts are called DGIDIS, the family ID for the default GIDIS fonts.
Ave-width	For proportionally spaced fonts, the average width (number of horizontal pixels) of glyphs in a font file. For monospaced fonts, use the actual width (in pixels) of glyphs in this field. For example, the initial font on Video GIDIS has an ave-width of 12.

MAKING A FONT AVAILABLE TO GIDIS

Character cell height	The height (number of vertical pixels) of glyphs in a font file. For example, the initial font on Video GIDIS has a height of 10.
Region name	The region name defined for the font when its .TSK file was built by calling GIFONT.
Rendition flags	Zero or more one-character fields. Each field defines the rendition built into the font. The defined options are I for italics, B for bold, P for proportional, and L for limit multiplication. Use L to prevent a heavily multiplied low detail font from being selected over a better font.

The following is a sample line in an .FDF file:



You may put blank lines in an .FDF file, but no comments.

D.2 FONT NAMING CONVENTIONS

A potentially large number of font files must coexist. For GIDIS fonts, this means their region names must coexist. Because region names are limited to six Radix-50 characters, not much name space exists. We suggest that you name fonts and regions as follows:

```
ffcwha
```

where

ff Indicates the family ID of the font. For default GIDIS fonts, ff is DG.

c Identifies the character set. The reserved values are $ for DEC Multinational (in file spec $ is replaced by M), P for patterns, and S for symbols.

wh Specifies the ave-width and height of the font. The encoding for each is as follows:

X	means 7
Y	means 8
Z	means 9
0-9	means 10-19
A-K	means 20-30
L	means 32
M	means 34
N	means 36
.	
.	
.	
Z	means 60

NOTE

Because of the limitations of the Radix-50 naming space, some problems occur with this naming convention. You'll note that YZ can mean a character that is 8 x 9 or 58 x 60. In such cases, distinguish between the two by giving each size a unique family ID. Note also that you cannot create characters with odd numbered ave-widths or heights greater than 30, unless you create your own naming convention.

a indicates font rendition attributes. The following are reserved values:

B	for bold
C	for bold + italics
D	for bold + proportional
I	for italics
J	for italics + proportional
P	for proportional
Z	for bold + italics + proportional

For example the file name DGMFF.TSK and region name DG$FF indicate Default GIDIS, DEC Multinational, 20 x 20, and no rendition attributes.

D.3 FONTS SUPPLIED WITH GIDIS

Three different groups of fonts are supplied with GIDIS.

- Monospaced default GIDIS fonts that are automatically installed.
- Optional monospaced fonts that you can install.
- Optional proportionally spaced fonts that you can install.

Because font files require disk and system resources, only five font files from the default font family (DG) are loaded automatically. You may choose to load other monospaced and proportionally spaced font families as needed.

The following sections describe the font families and show an example of each. Each font family contains several font files. These font files contain several sizes of raster fonts and one stroke font.

D.3.1 Default GIDIS Fonts Loaded Automatically

Five default GIDIS (DG) fonts files are automatically installed. These fonts are monospaced, sans serif fonts that use the DEC Multinational Character Set.

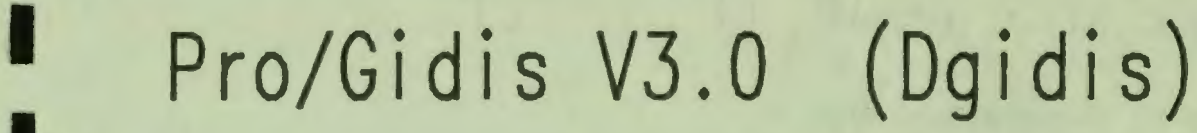


Figure D-1: Default GIDIS Monospaced Fonts

D.3.2 Rest of DGIDIS Monospaced Font Files

Installing the application "Rest of DGIDIS Monospaced Font Files" loads twelve additional font files from the default GIDIS font family. These files provide additional sizes of the same style font.

D.3.3 Proportionally Spaced Fonts

You can also install several proportionally spaced fonts.

When you install the application "Hershey Sans Serif Font," you load twelve sans serif font files that use the DEC Multinational Character Set.

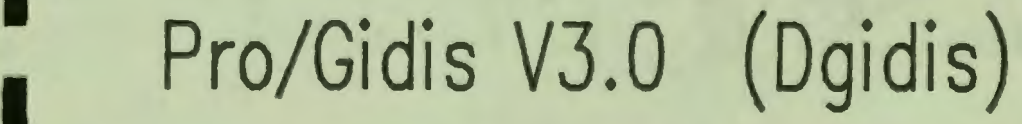


Figure D-2: Hershey Sans Serif Font

When you install the application "Hershey Serif Font," you load twelve serif font files that use the DEC Multinational Character Set.

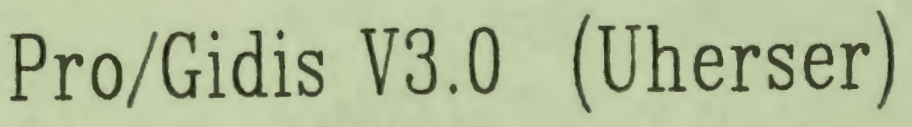


Figure D-3: Hershey Serif Font

When you install the application "Hershey Italicized Serif Font," you load twelve italicized serif font files that use the ASCII Character Set.

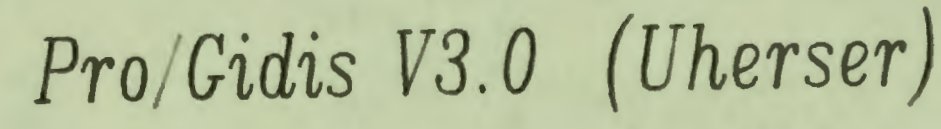


Figure D-4: Hershey Italicized Serif Font

When you install the application "Hershey Script Font," you load seven script font files that use the ASCII Character Set.

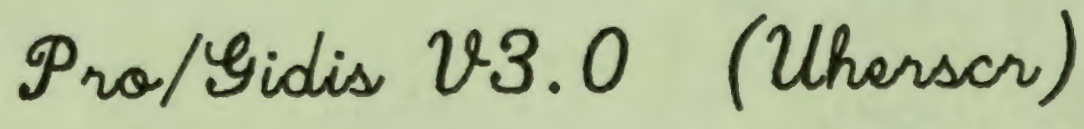


Figure D-5: Hershey Script Font

When you install the application "Hershey Gothic Font," you load five gothic font files that use the ASCII Character Set.

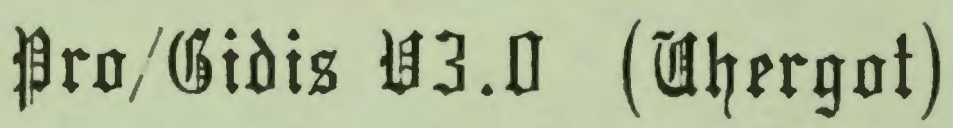


Figure D-6: Hershey Gothic Font

D.4 EDITING .FDF FILES

If you want to save resources, you can delete individual font files from .FDF files. For example, if you do not need certain sizes or do not need a stroke font, you can delete them from your .FDF files.

APPENDIX E

AREA TEXTURE AND COLOR ON THE PLOTTER

This appendix provides information on how the Hewlett-Packard HP7470A and HP7475A Plotters process GIDIS instructions differently from other supported devices. If an instruction is not mentioned, it performs as described in Chapter 4.

E.1 AREA TEXTURE

The plotter cannot handle bit patterned textures. Instead, area textures used for fill are mapped to a special set of hatch patterns. The mapping depends on the arguments supplied with SET_AREA_TEXTURE. There are three cases:

- Where alphabet = -1 and char-index = 0, the plotter draws horizontal hatch lines about .04 inches apart using the current linestyle.
- Where alphabet = 0 through 15 and char-index = 0, the plotter draws a true solid fill.
- Where alphabet = 0 through 15 and char-index is greater than 0, the plotter draws one of the hatch patterns shown in Table E-1.

Table E-1: Hatch Patterns for Char-Index 1 to 48

Solid Lines	Dashes	Long Dashes	Long/Short Dashes
Line Separation .06 inches			
1 plus sign	13 plus sign	25 plus sign	37 plus sign
2 slash	14 slash	26 slash	38 slash
3 horiz. line	15 horiz. line	27 horiz. line	39 horiz. line
4 backslash	16 backslash	28 backslash	40 backslash
5 vert. line	17 vert. line	29 vert. line	41 vert. line
6 X	18 X	30 X	42 X
Line Separation .11 inches			
7 plus sign	19 plus sign	31 plus sign	43 plus sign
8 slash	20 slash	32 slash	44 slash
9 horiz. line	21 horiz. line	33 horiz. line	45 horiz. line
10 backslash	22 backslash	34 backslash	46 backslash
11 vert. line	23 vert. line	35 vert. line	47 vert. line
12 X	24 X	36 X	48 X

The entire hatch pattern set repeats with codes 49 through 96. The basic 12 patterns are shown in Figure E-1.

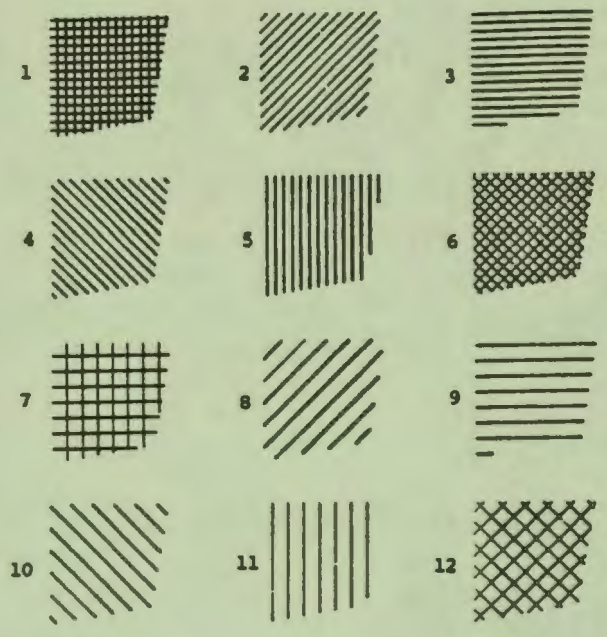


Figure E-1: Hatch Patterns 1 through 12

E.2 COLORS

You control the colors in a picture by placing pens in the carousel as desired. You can set up any pens you like. However, the recommended setting for the 6-pen plotter is:

Pen 1 - Red
Pen 2 - Green
Pen 3 - Blue
Pen 4 - Yellow
Pen 5 - Cyan
Pen 6 - Black

Because you control the colors, Plotter GIDIS ignores SET_COLOR_MAP_ENTRY. The 2-pen plotter handles colors as follows:

Color 0	background (no pen)
Color 1/5/7	left pen
Color 2/6	right pen
Color 3	left pen slowed down
Color 4	right pen slowed down

COLORS

The 6-pen plotter handles colors as follows:

Color 0	background (no pen)
Color 1	Pen 1
Color 2	Pen 2
Color 3	Pen 3
Color 4	Pen 4
Color 5	Pen 1 slowed down slightly
Color 6	Pen 5
Color 7	Pen 6

APPENDIX F

QUEUE I/O INTERFACE TO PRO/GIDIS FOR P/OS

Earlier versions of PRO/GIDIS used the P/OS Terminal Driver to access Video GIDIS through Queue I/O Request (QIO) and Queue I/O Request and Wait (QIOW) system directives. This appendix contains descriptions of the directive formats. QIO error messages are listed at the end of each description.

Figure F-1 depicts the instruction and parameter data path between your program and PRO/GIDIS.

You can use PRO/GIDIS from MACRO-11 or any supported Tool Kit high-level language that supports external MACRO-11 routines. The recommended method is to write callable MACRO-11 routines that issue QIO and QIOW directives. Tool Kit FORTRAN-77 provides its own callable QIO and WTQIO routines in SYSLIB.

For information on calling a MACRO-11 routine from one of the Tool Kit high-level languages, refer to the documentation for your programming language.

F.1 THE PRO/GIDIS INTERFACE

PRO/GIDIS instructions are sent to the graphics device with a QIO system directive that specifies the Write Special Data (IO.WSD) I/O function code. For low-overhead, high-speed, device interaction, a number of PRO/GIDIS instructions can be passed to the graphics device at one time. Status information returns with the Read Special Data (IO.RSD) I/O function call. P/OS transfers the instruction data to and from the graphics device according to the request priority and device availability.

Programs that use PRO/GIDIS also can use the Professional VT102 terminal emulator. Normal QIO directives (IO.WLB, IO.WVB, and so forth) are passed to the VT102 emulator. For more information, refer to the description of the Terminal Driver in the *P/OS System Reference Manual*.

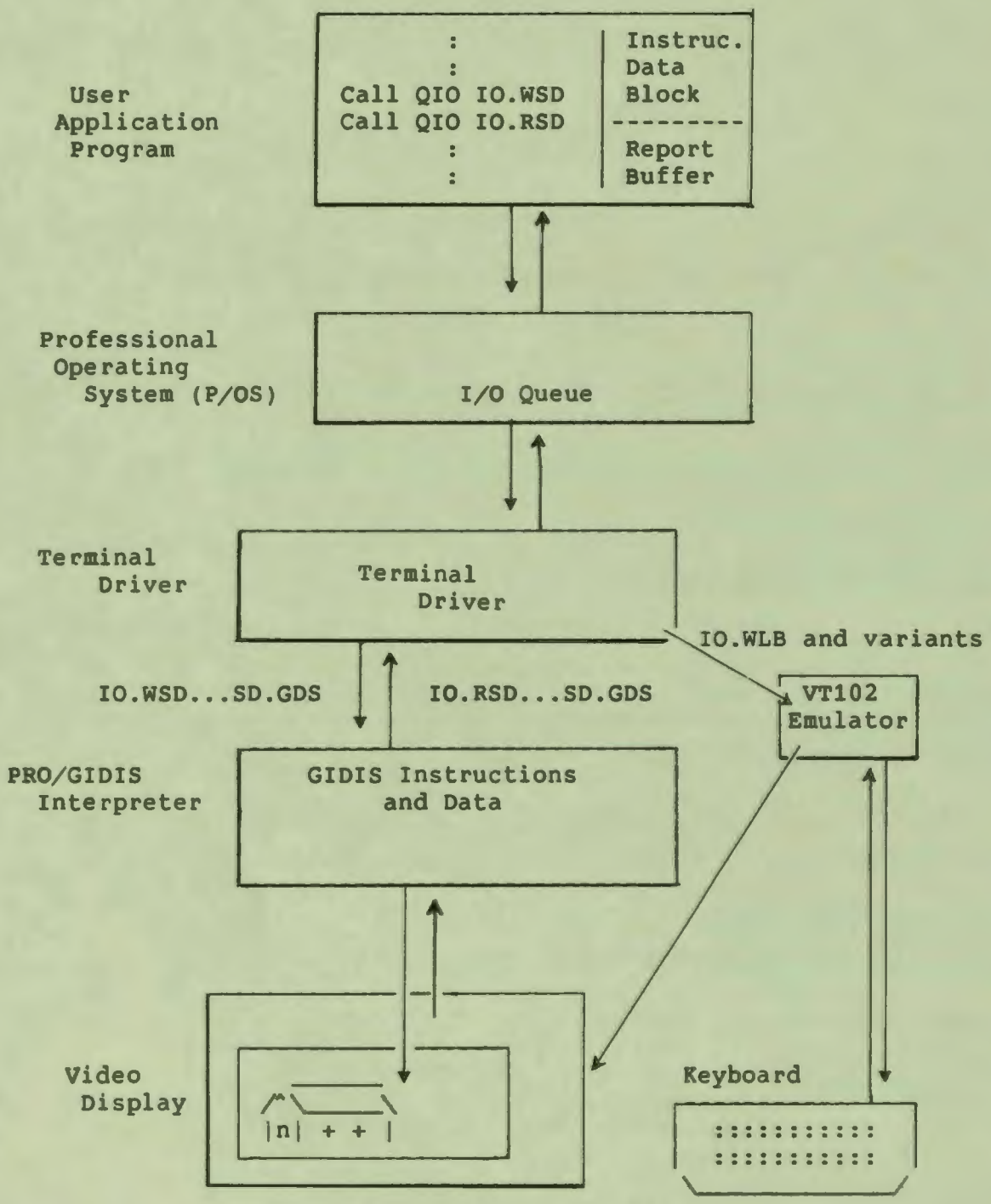


Figure F-1: PRO/GIDIS Data Path

On a single-plane system, both GIDIS and the VT102 emulator draw on the same plane and overwrite each other's data. On a three-plane system, the VT102 emulator only draws on plane three.

Thus, if PRO/GIDIS modifies only planes one and two, there will be minimal interference. The SET_PLANE_MASK instruction specifies which planes PRO/GIDIS can modify.

The VT102 emulator scrolls all three planes when the scrolling region is set to the entire screen. Any graphics information in any plane scrolls with the text. If the scrolling region is smaller than the entire screen, the VT102 emulator redraws the characters in their new positions. This does not scroll or otherwise affect graphics information in planes one and two but it erases graphics information in plane three.

You can send an RIS (Reset to Initial State - <ESC>c) escape sequence to the VT102 emulator in order to reset both the VT102 emulator and PRO/GIDIS to their initial states. PRO/GIDIS immediately performs an "INITIALIZE -1" instruction, clears the bitmap, and expects an opcode as the next word in the instruction/data stream. Thus, you can use RIS to ensure that your program and PRO/GIDIS are "in synch" when your program starts up. You cannot use it arbitrarily in the middle of picture generation because of the global initialization effect.

The QIO and QIOW directives are described in detail in the *P/OS System Reference Manual*. The examples in this appendix show the $S forms for clarity. The $C and $ forms can be used as well.

IO.WSD and IO.RSD are resolved in the normal manner for system symbols: the Application Builder gets them from module QIOSYM in SYSLIB.OLB. This works correctly in MACRO-11 but may not work with languages that have symbol naming restrictions. For example, FORTRAN-77 does not permit periods in symbol names.

F.1.1 Write Special Data (IO.WSD)

The write-special-data QIO function directs one or more instructions to PRO/GIDIS. The instructions and their associated parameter values are passed in a buffer that must have an even address.

The MACRO-11 format for the Write Special Data QIO (or QIOW) call is shown below.

NOTE

The punctuation marks and the items in bold are mandatory; nonbold items are optional. Items in uppercase letters must be used exactly as shown. Items in lowercase letters must be replaced as described.

QIOW$S #IO.WSD,LUN,efn,pri,isb,ast,<buffer,length,,#SD.GDS>

LUN Is a logical unit number assigned to the terminal.

efn Is an event flag number (required with the synchronous wait form QIOW).

pri Is the priority (ignored but must be present).

isb Is the address of the I/O status block.

ast Is the address of the AST service routine entry point.

buffer Is the address of the buffer containing PRO/GIDIS instructions and parameters.

length Is the length of the PRO/GIDIS instruction/parameter buffer (specified as an even number of bytes in the range 2 to 8128).

SD.GDS Is a data type parameter that indicates PRO/GIDIS output.

The QIO system directive returns status in a special global variable called $DSW. Some possible values are:

IS.SUC	Successful completion
IE.ILU	Invalid logical unit number
IE.IEF	Invalid event flag number

For a full list of error codes, refer to the QIO directive description and the terminal driver section of the *P/OS System Reference Manual*.

When the QIO directive is successful, it can return the following status codes in the I/O status block.

IO.SUC	Successful completion
IS.PND	I/O request pending
IE.ABO	Operation aborted
IE.DNR	Device not ready

F.1.2 Read Special Data (IO.RSD)

The read-special-data QIO function reads reports placed in the report queue by the following PRO/GIDIS report-request instructions:

- REQUEST_CURRENT_POSITION
- REQUEST_STATUS
- REQUEST_CELL_STANDARD

These instructions are detailed in Chapter 6.

The MACRO-11 format for the Read Special Data QIO or QIOW call is shown below.

NOTE

The punctuation marks and the items in bold are mandatory. Nonbold items are optional. Items in uppercase letters must be used exactly as shown. Items in lowercase letters must be replaced as described.

QIOW$S #IO.RSD,LUN,efn,pri**,**isb**,**ast**,<buffer,length,,#SD.GDS>**

LUN Is a logical unit number assigned to the terminal.

efn Is an event flag number (required with the synchronous wait form QIOW).

pri Is the priority (ignored but must be present).

isb Is the address of the I/O status block.

ast Is the address of the AST service routine entry point.

buffer Is the address of the buffer to contain PRO/GIDIS report data.

length Is the length of the PRO/GIDIS report buffer (specified as an even number of bytes in the range 2 to 8128).

SD.GDS Is a data type parameter that indicates PRO/GIDIS output.

If there is no data available, the QIO waits until enough data to fill the buffer becomes available. During this wait, no IO.WSD (write special data) is performed, even if the no-wait form was used. To avoid deadlock, the preferred method is to issue a QIO$W for the exact number of bytes expected after the request instruction is sent to PRO/GIDIS.

The QIO system directive returns status in a special global variable called $DSW. Some possible values are:

IS.SUC	Successful completion
IE.ILU	Invalid logical unit number
IE.IEF	Invalid event flag number

For a full list of error codes, refer to the QIO directive description and the terminal driver section of the *P/OS System Reference Manual*.

When the QIO directive is successful, it can return the following status codes in the I/O status block.

IO.SUC	Successful completion
IS.PND	I/O request pending
IE.ABO	Operation aborted
IE.DNR	Device not ready

F.2 PRO/GIDIS INSTRUCTION SYNTAX

The instructions syntax remains the same whether GIDCAL or QIO system directives are used to access PRO/GIDIS. See Chapter 3 for details.

F.3 SAMPLE MACRO-11 PROGRAM

```
IOSB:   .BLKW   2.
OBUF:   .BYTE   0.,55.  ;Length=0 REQUEST_CURRENT_POSITION
RBUF:   .BLKW   3.
                        ;SEND INSTRUCTION TO PRO/GIDIS
        QIOW$S #IO.WSD,#5,#1,,#IOSB,,<#OBUF,#2,,#SD.GDS>
        BCS     ERROR   ; DIRECTIVE FAILED
        TSTB    IOSB
        BLE     ERROR   ;OPERATION FAILED
                        ;READ THE REPORT
        QIOW$S #IO.RSD,#5,#1,,#IOSB,,<#RBUF,#6,,#SD.GDS>
        BCS     ERROR   ;BRANCH IF DIRECTIVE FAILED
        TSTB    IOSB
        BLE     ERROR   ;BRANCH IF OPERATION FAILED
                        ;
                        ; NEW CONTENTS OF RBUF:
                        ; BYTE AT RBUF    2.  (LENGTH)
                        ; BYTE AT RBUF+1  1.
                        ;   (CURRENT POSITION REPORT TAG)
                        ; RBUF+2:  CURRENT X POSITION
                        ; RBUF+4:  CURRENT Y POSITION
ERROR:                  ; Error handling routine
```

F.4 SAMPLE FORTRAN PROGRAM

```
      INTEGER*2   SDGDS, IOWSD, IORSD, ISSUC
      PARAMETER  (SDGDS=1), (IOWSD="5410), (IORSD="6030), (ISSUC=1)
      INTEGER*2  IOSB(2), IDS, OBUF
      INTEGER*2  RBUF(3),PARLST(6)

      OBUF = 55*256+0    !OPCODE 55=REQUEST_CURRENT_POSITION
                         !LENGTH=0


      CALL GETADR(PARLST(1),OBUF)          ! ADDRESS

      PARLST(2) = 2                        !LENGTH=2 BYTES
      PARLST(4) = SDGDS

      CALL WTQIO(IOWSD,5,1,0,IOSB,PARLST,IDS)
      IF (IDS.NE.ISSUC) GO TO 999          !DIRECTIVE FAILED
      IF (IOSB(1).NE.ISSUC) GO TO 999      !I/O REQUEST FAILED

      CALL GETADR(PARLST(1),RBUF)

      PARLST(2) = 6                  !EXPECTED LENGTH OF REPORT IN BYTES

      CALL WTQIO(IORSD,5,1,0,IOSB,PARLST,IDS)
      IF (IDS.NE.ISSUC) GO TO 999          !DIRECTIVE FAILED
      IF (IOSB(1).NE.ISSUC) GO TO 999      !I/O REQUEST FAILED

            ! NEW CONTENTS OF RBUF:
            ! RBUF(1):  258
            ! REPORT TAG = 1*256+2
            ! 1 = THE REPORT TAG AND 2 = LENGTH OF DATA FOLLOWING
            ! RBUF(2):  CURRENT X POSITION IN GIDIS OUTPUT SPACE
            ! RBUF(3):  CURRENT Y POSITION IN GIDIS OUTPUT SPACE

999         ! ERROR FOUND
```

APPENDIX G

GLOSSARY

The words in this glossary are used throughout this manual. These definitions are not absolute and might differ somewhat in other contexts. Where possible, the most common computer industry usage is the basis of the definition.

alphabet
A collection of characters. The character indexes are numbered 0,1,...n-1, where n is the extent of the alphabet.

anisotropic
An uneven ratio of width to height. In an anisotropic coordinate space, one unit in the X direction is not equal in size to one unit in the Y direction.

area texture
The two-dimensional binary pattern that you select to shade filled figures.

aspect ratio
The ratio of the width of an object to its height. Objects whose aspect ratio are important in graphics include video displays, pixels, and address spaces.

attribute
A property that tells GIDIS something about how to do the specified drawing operation. For example, when you tell GIDIS to draw a line, one of the attributes used in drawing the line is current primary color.

bitmap
The rectangular array of pixels (picture elements) that constitutes the view surface of a dot-oriented device. Also known as a raster or frame buffer. The Professional 350 has a bitmap 960 pixels wide by 240 pixels high.

character
A graphic symbol, such as a letter, number, or other typewritten symbol. In GIDIS, characters are elements in an alphabet. A character is uniquely identified by specifying its alphabet number and its index within the alphabet.

character cell
(See display cell or unit cell.)

clipping
Clipping means displaying only part of what is drawn. In GIDIS, you can select a clipping rectangle. What you draw inside the rectangle is displayed; what you draw outside the rectangle is not displayed.

color
In GIDIS the term has a double meaning. It has its usual "real world" meaning, and it also means an index into the GIDIS color map.

color map
A table whose entries contain a description of how to generate a particular color. In GIDIS this description is in terms of red, green and blue intensities. For example, bright yellow results from a maximum intensity of red, a maximum intensity of green, and a zero intensity of blue.

complement
The writing mode in which the foreground and background colors are reversed.

current position
The position in relation to which lines, arcs, and characters are drawn by GIDIS.

cursor
The marker displayed by GIDIS at the current position.

display cell
In GIDIS text processing, the display cell is that area of the view surface in which a unit cell is drawn. The top left corner of the unit cell is always placed at the top left corner of the display cell. Any portion of the display cell not covered by the unit cell is treated as though the unit cell is OFF for that area. If the unit cell is larger than the display cell, the unit cell is clipped at the display cell borders.

filled figure
To GIDIS, a figure is any sequence of connected lines and arcs. A filled figure is just a figure whose interior has been painted with the area texture of your choice.

font family
Loosely speaking, the style in which an alphabet is drawn, for example, Courier.

font file
The collection of glyphs and attribute information used by GIDIS to draw characters for a particular font.

GIDIS Output Space (GOS)
The isotropic coordinate space you set up for GIDIS to use in all drawing and report operations. A location within GOS maps to a location within your viewport.

global symmetry
Preservation of GIDIS Output Space relationships at the expense of Hardware Address Space relationships. For example, assume a ten-unit distance in GIDIS output space maps to 7.5 hardware pixels. With global symmetry, repeatedly moving ten GIDIS output space units results in a move of seven hardware pixels, then eight hardware pixels, then seven, and so forth. With local symmetry, repeatedly moving 10 GIDIS Output Space units always results in a move of 7 hardware pixels.

glyph
The data in a font file that tells GIDIS how to draw a particular character. In other words, it is the internal representation of a character.

Hardware Address Space (HAS)
The coordinate space (possibly anisotropic) used by a graphic output device. GIDIS hides this space from your program, and addresses the device's view surface through an isotropic Imposed Device Space.

image
A figure as defined in Imposed Device Space. In GIDIS you can display an image on a variety of output devices.

Imposed Device Space (IDS)
The isotropic coordinate space imposed on the device's view surface. You use IDS only to set the viewport. All other coordinates are in GIDIS Output Space (GOS).

isotropic
A 1:1 ratio of width to height. In an isotropic coordinate space one unit in the X direction is equal in size to one unit in the Y direction.

line texture
A linear pattern used to draw lines. Examples are solid, dashed, dotted, and so forth. PRO/GIDIS enables you to define any two-color pattern up to 16 units in length.

local symmetry
Preservation of Hardware Address Space relationships at the expense of GIDIS Output Space relationships. For example, assume a ten-unit distance in GIDIS output space maps to 7.5 hardware pixels. With local symmetry, repeatedly moving 10 GIDIS Output Space units always results in a move of 7 hardware pixels. With global symmetry, repeatedly moving ten GIDIS output space units results in a move of seven hardware pixels, then eight hardware pixels, then seven, and so forth.

origin
The origin of an address space is the point [0,0]. In PRO/GIDIS, the origin of IDS is always the upper left corner of the device's view surface. The origin of GIDIS output space is set by your program.

The origin of a character cell (either display cell or unit cell) is the point in the cell placed over the current position. This is also the point about which the cell rotates.

picture
A figure as defined in GIDIS Output Space. Once defined, you can store it in a file or map it to a viewport for display on a view surface.

pixel (picture element)
The smallest element of a view surface that can be assigned a color or intensity. In a single plane device, it is one bit in the bitmap.

pixel aspect ratio
The ratio of the width of a pixel to its height. The width is the horizontal distance between adjacent pixels, and the height is the vertical distance. Pixel aspect ratio is normally expressed as two small numbers, for example, 1:2. The pixel aspect ratio on the Professional 350 monitor is 2:5.

plane
A view surface that has N bits per pixel (that is, a pixel can be one of 2**N colors) is said to have N planes. A plane is a slice of a bitmap that contains one bit for each pixel.

primary color
The color index used to draw on-bits in area textures, line textures, and glyphs. GIDIS enables you to set the current primary color.

rubber band
A rubber band is a marker that shows the current position relative to a point of your choice, called the origin. There are two types of rubber bands available in PRO/GIDIS: the rubber band line and the rubber band rectangle. The line stretches from the rubber band origin to the current position. The rectangle has one corner at the rubber band origin and the opposite corner at the current position. The rectangle will degenerate to a line or point if the current position and rubber band origin are the same in one or both coordinates.

secondary color
The color index that indicates the absence of the drawing color. Thus its main function is to serve as the background color of a picture. In replace mode, it is also used to draw off-bits in area textures, line textures, and glyphs. GIDIS enables you to set the current secondary color.

standard display size
The standard display size is normally equal to the standard unit size. However, for alphabet 0 the standard display size is slightly smaller (horizontally) than the standard unit size. This is for increased compatibility with the VT125.

standard unit size
The size in GIDIS Output Space of a character such that 80 characters would fit horizontally and 24 characters would fit vertically, when IDS width/height is 8/5.

stroke device
A device whose view surface is written to with pen strokes, in contrast to a bitmap device, whose surface is written to with a sequence of dots.

text rendition
The variations of character appearance. For example, bolding and italics are renditions.

unit cell
In GIDIS, a character is viewed as a rectangular field of ON and OFF bits. ON bits form a character pattern; OFF bits form the background.

viewport
A rectangle within Imposed Device Space. You place this rectangle where you want the image to be displayed.

view surface
The part of the device upon which drawing can occur. For example, the screen is the view surface of the Professional Video monitor.

viewing transformation
The process of mapping graphic data from user coordinate space to display coordinate space.

window
A rectangle you define within GIDIS Output Space to control which part of your picture to map to a viewport.

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