Guide to
RT–11 Documentation

AA–5285H–TC

software

Guide to
RT–11 Documentation

AA–5285H–TC

July 1984

This manual, which describes the software documentation set shipped with RT–11 Version 5.1, gives a brief synopsis of each document and suggests a reading path for the various users of RT–11. Read this manual before using RT–11 Version 5.1 software.

This manual supersedes the *Guide to RT–11 Documentation*, AA–5285G–TC.

Operating System: RT–11 Version 5.1

Software: FORTRAN IV Version 2.6
BASIC–11 Version 2.0
MACRO–11 Version 5.2

A postage-paid READER'S COMMENTS form is included on the last page of this document. Your comments will assist us in preparing future documentation.

The following are trademarks of Digital Equipment Corporation:

digital™

DEC	MASSBUS	RT–11
DECmate	PDP	UNIBUS
DECsystem–10	P/OS	VAX
DECSYSTEM–20	Professional	VMS
DECUS	Rainbow	VT
DECwriter	RSTS	Work Processor
DIBOL	RSX	

Contents

Figures

Tables

1.0 Introduction

This guide describes the software documents associated with the RT–11 operating system. If you are unfamiliar with RT–11, use this document as a guide to recommended reading. If you are familiar with RT–11, use it as a reference to the contents of individual manuals.

The FORTRAN IV and BASIC–11 languages are commonly chosen as options to run on the RT–11 operating system. For the purpose of this guide, assume that the RT–11 operating system includes these optional languages in addition to the standard RT–11 system programs.

2.0 Organization of the Documentation Set

Table 1 lists and categorizes the documents in the RT–11 Version 5 documentation set, and provides the DIGITAL order number for each. The documentation set includes manuals describing the RT–11 operating system and supported languages. The manuals distributed in 3-ring binders are organized in volumes according to the type of information they contain. Volumes 1A, 1B, 1C, 2A, 2B, 2C, 3A, and 3B consist of manuals that provide information about the operating system; the language manuals contain information about the programming languages FORTRAN IV and BASIC–11.

When you receive your RT–11 Version 5 documentation set, the *Guide to RT–11 Documentation* and the *RT–11 Automatic Installation Booklet* will not be in the 3-ring binders. The *RT–11 Mini-Reference Manual* is contained in a small looseleaf binder for portability and convenience. The *PDP–11 Keypad Editor Reference Card* is contained in the front pocket of the 3-ring binder labeled Volume 2C. Finally, the RT–11 documentation includes a paperback book, *Introduction to BASIC*.

The documentation set presents information in the form of introductory manuals for once-only use and reference manuals for use at your console, your desk, or both. You will have little need for introductory manuals once your system is in operation and you are familiar with its use. These once-only manuals include all the manuals in Volumes 1A, 1B, and 1C and the language installation guides.

Console manuals are intended to be used as references at the computer terminal while you are using the RT–11 system. They tell you how to use the RT–11 operating system: they describe command usage and syntax, system messages, and general system operations. The console manuals include all manuals in Volumes 2A, 2B, 2C, and the language user's guides.

The manuals intended for use at either your desk or computer terminal are for reference while you write your application programs. These manuals contain specific programming information for the RT–11 operating system and its associated programming languages. Manuals in this category include all manuals in Volumes 3A and 3B and the language reference manuals.

Table 1:   RT–11 Documentation Set

Volume	Type	Document Title	Order Number
OPERATING SYSTEM MANUALS			
1A	Once-only	Guide to RT–11 Documentation	AA–5285H–TC
		RT–11 System Release Notes	AA–5286F–TC
		RT–11 System Release Notes, Update 1	AD–5286F–T1
*		RT–11 Automatic Installation Booklet: RX02 Diskettes	AA–M235A–TC
*		RT–11 Automatic Installation Booklet: RL02 Disk	AA–M236A–TC
*		RT–11 Automatic Installation Booklet: RC25 Disk	AA–M237A–TC
*		RT–11 Automatic Installation Booklet: MICRO/PDP–11	AA–M238C–TC
*		RT–11 Automatic Installation Booklet: Professional 300 Series	AA–Y961B–TC
		Introduction to RT–11	AA–5281C–TC
		Introduction to RT–11, Update 1	AD–5281C–T1
1B	Once-only	RT–11 Installation Guide	AA–H376C–TC
1C	Once-only	RT–11 System Generation Guide	AA–M240B–TC
2A	Console	RT–11 System User's Guide	AA–5279C–TC
		RT–11 System User's Guide, Update 1	AD–5279C–T1
2B	Console	RT–11 System Utilities Manual	AA–M239B–TC
2C	Console	RT–11 System Message Manual	AA–5284D–TC
		RT–11 System Message Manual, Update 1	AD–5284D–T1
		PDP–11 Keypad Editor User's Guide	AA–H853A–TC
		PDP–11 Keypad Editor User's Guide, Update 1	AD–H853A–T1
		PDP–11 Keypad Editor User's Guide, Update 2	AD–H853A–T2
		PDP–11 Keypad Editor Reference Card	AV–H854A–TC
*	Console	RT–11 Mini-Reference Manual	AA–M241A–TC
		RT–11 Mini-Reference Manual, Update 1	AD–M241A–T1
		~~Introduction to RT-11, Update 1~~	~~AD–5281C–T1~~
1B	Once-only	RT–11 Installation Guide	AA–H376C–TC
1C	Once-only	RT–11 System Generation Guide	AA–M240B–TC
2A	Console	RT–11 System User's Guide	AA–5279C–TC
		RT–11 System User's Guide, Update 1	AD–5279C–T1
2B	Console	RT–11 System Utilities Manual	AA–M239B–TC
2C	Console	RT–11 System Message Manual	AA–5284D–TC
		RT–11 System Message Manual, Update 1	AD–5284D–T1
		PDP–11 Keypad Editor User's Guide	AA–H853A–TC
		PDP–11 Keypad Editor User's Guide, Update 1	AD–H853A–T1
		PDP–11 Keypad Editor User's Guide, Update 2	AD–H853A–T2
		PDP–11 Keypad Editor Reference Card	AV–H854A–TC
*	Console	RT–11 Mini-Reference Manual	AA–M241A–TC
		RT–11 Mini-Reference Manual, Update 1	AD–M241A–T1
		~~Introduction to RT-11, Update 1~~	~~AD–5281C–T1~~
1B	Once-only	RT–11 Installation Guide	AA–H376C–TC
1C	Once-only	RT–11 System Generation Guide	AA–M240B–TC
2A	Console	RT–11 System User's Guide	AA–5279C–TC
		RT–11 System User's Guide, Update 1	AD–5279C–T1
2B	Console	RT–11 System Utilities Manual	AA–M239B–TC
2C	Console	RT–11 System Message Manual	AA–5284D–TC
		RT–11 System Message Manual, Update 1	AD–5284D–T1

Note: In the table above, documents marked with an asterisk (*) in the volume column are not included in 3-ring binders.

Optional software products in addition to FORTRAN IV and BASIC–11 are available for RT–11 Version 5. Section 4.0 of this document describes these products and tells you how to buy them.
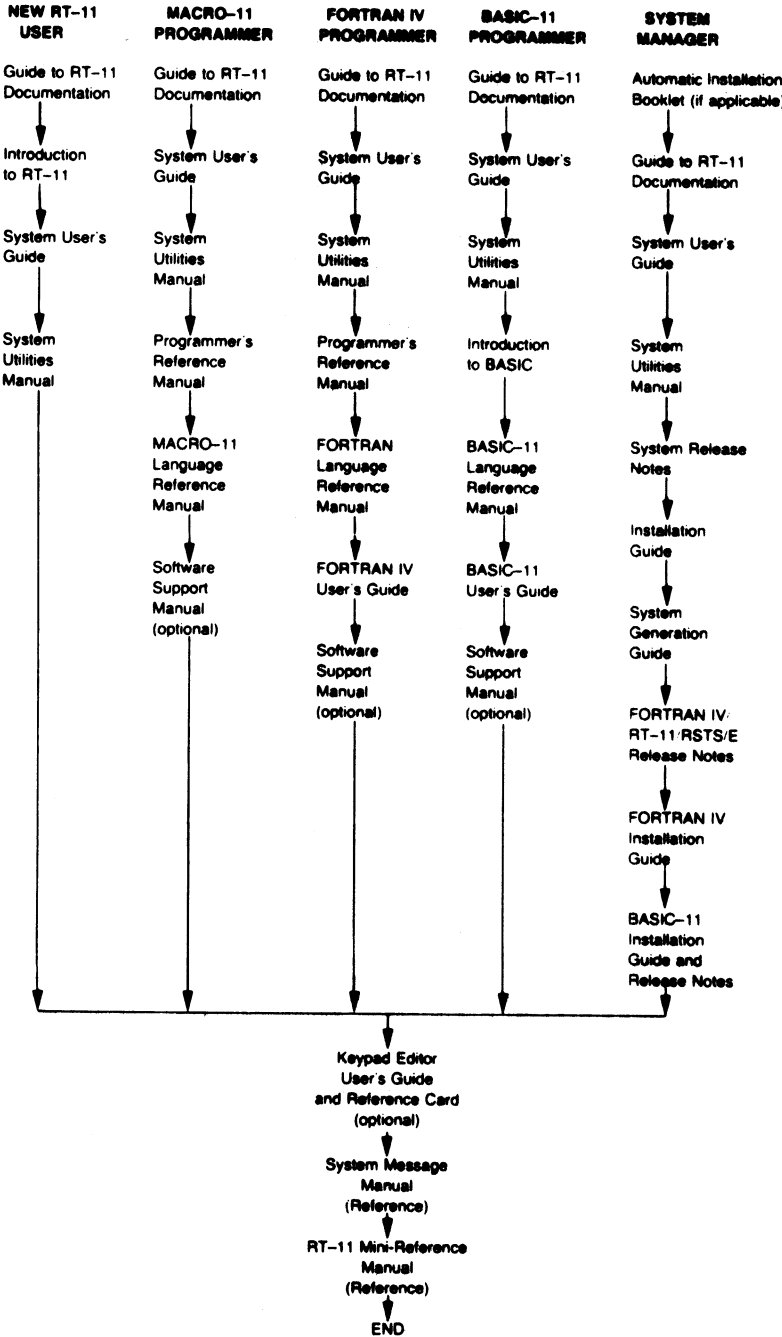
Figure 1 is a reading and reference guide to the documentation set. The figure both categorizes the intended audience for each manual and suggests reading paths appropriate for each type of user. The categories of users indicated in Figure 1 are described below:

New RT–11 User	Probably familiar with a higher-level programming language; may or may not be familiar with computers and software fundamentals. Unfamiliar with RT–11 operating procedures.
MACRO–11 Programmer	Familiar with the PDP–11 instruction set or an assembly language such as MACRO–11. Should be familiar with the RT–11 operating procedures described in the *Introduction to RT–11*.
FORTRAN IV Programmer	Familiar with PDP–11 FORTRAN IV or another FORTRAN language. Should be familiar with the RT–11 operating procedures described in the *Introduction to RT–11*.
BASIC–11 Programmer	Familiar with BASIC–11 or another BASIC language. Should be familiar with the RT–11 operating procedures described in the *Introduction to RT–11*.
System Manager	Familiar with RT–11 operating procedures. Responsible for generating and maintaining RT–11 and FORTRAN IV or BASIC–11, if present, at the user site.

Because RT–11 is a single-user system, an RT–11 user may fall into more than one of the above categories. For example, almost every MACRO–11 system programmer also serves from time to time as system manager. Therefore, the preceding categories are intended to serve only as guidelines rather than distinct descriptions of a particular user.

In Figure 1, documents labeled "reference" are intended for all users and are not designed to be read from beginning to end. Documents labeled "optional" are not required for efficient use of RT–11.

Figure 1:   Reading and Reference Guide to RT-11 Documentation

NEW RT-11 USER	MACRO-11 PROGRAMMER	FORTRAN IV PROGRAMMER	BASIC-11 PROGRAMMER	SYSTEM MANAGER
Guide to RT-11 Documentation	Guide to RT-11 Documentation	Guide to RT-11 Documentation	Guide to RT-11 Documentation	Automatic Installation Booklet (if applicable)
↓	↓	↓	↓	↓
Introduction to RT-11	System User's Guide	System User's Guide	System User's Guide	Guide to RT-11 Documentation
↓	↓	↓	↓	↓
System User's Guide	System Utilities Manual	System Utilities Manual	System Utilities Manual	System User's Guide
↓	↓	↓	↓	↓
System Utilities Manual	Programmer's Reference Manual	Programmer's Reference Manual	Introduction to BASIC	System Utilities Manual
	↓	↓	↓	↓
	MACRO-11 Language Reference Manual	FORTRAN Language Reference Manual	BASIC-11 Language Reference Manual	System Release Notes
	↓	↓	↓	↓
	Software Support Manual (optional)	FORTRAN IV User's Guide	BASIC-11 User's Guide	Installation Guide
		↓	↓	↓
		Software Support Manual (optional)	Software Support Manual (optional)	System Generation Guide
				↓
				FORTRAN IV/ RT-11/RSTS/E Release Notes
				↓
				FORTRAN IV Installation Guide
				↓
				BASIC-11 Installation Guide and Release Notes

Keypad Editor
User's Guide
and Reference Card
(optional)
↓
System Message
Manual
(Reference)
↓
RT-11 Mini-Reference
Manual
(Reference)
↓
END

3.0 Descriptions of Documents

The following sections describe the documents listed in Table 1. The descriptions are presented in an order that is parallel to the list of documents in the table. Each description includes the following information:

- the title of the manual

- the intended audience

- a summation of the manual's contents

3.1 RT–11 System Release Notes, FORTRAN IV/RT–11/RSTS/E Release Notes, RT–11/FORTRAN IV Installation Guide, BASIC–11/RT–11 Installation Guide and Release Notes

The release notes and language installation guides are intended for the system manager or programmer responsible for the installation of RT–11. These documents provide up-to-date information on the current releases of the RT–11 monitor and system programs, FORTRAN IV, and BASIC–11.

Before you install the RT–11 system, read the release notes and the appropriate language installation guides thoroughly. During system installation, use these manuals in conjunction with the appropriate *RT–11 Automatic Installation Booklet* or the *RT–11 Installation Guide* (refer to Sections 3.2 and 3.4).

The release notes describe the current version of the software, the differences between the current version of the software and the previous release, and known problems present in the distributed software. The language installation guides describe the procedures you need in order to customize, generate, and test the installation of the appropriate languages. If you are installing BASIC–11, you can use the RT–11 automatic installation process described in Section 3.2 to install this language.

3.2 RT–11 Automatic Installation Booklet

The *RT–11 Automatic Installation Booklet* is to be used by the system manager or programmer responsible for installing and maintaining RT–11. The booklet provides instructions necessary for the automatic installation and testing of the RT–11 monitors, system programs, and some languages. The automatic installation process is available in four distribution kits: RX02 diskettes, RL02 disk, RC25 disk, and RX50 diskettes. There is an installation booklet for each distribution medium and you will receive only the booklet that pertains to your configuration.

Each *RT–11 Automatic Installation Booklet* tells you how to turn on your terminal and processor; load and bootstrap the RT–11 system; and begin the installation procedure. Completion of the installation procedure then follows instructions that appear on your console terminal.

3.3 Introduction to RT–11

The *Introduction to RT–11* acquaints new users with the RT–11 commands that perform common system operations. This manual supplies the background material necessary to understand the system operations. It also contains a series of command examples and demonstration exercises.

Chapter 1 outlines general system concepts, introduces the roles of hardware and software in a computer system, and describes the specific hardware and software components of the RT–11 computer system. Chapter 2 shows you how to start the system. Chapter 3 introduces you to the console terminal functions that allow you to control system operations. Chapters 4 through 7 demonstrate the use of important system operations, including using the monitor command language, creating and editing text files, comparing text files, and performing file maintenance operations.

Chapter 8 briefly compares the RT–11 languages — BASIC–11, FORTRAN IV, and MACRO–11 — and provides guidelines for choosing the language that suits your needs. Chapters 9, 10, and 11 provide information and illustrations for the operations needed to run FORTRAN IV, BASIC–11, and MACRO–11 programs, respectively. For FORTRAN IV and MACRO–11 users, Chapter 12 describes linking object programs and Chapter 13 shows you how to construct library files.

Chapters 14 through 16 tell you how to use some system features that are more advanced. Chapter 14 provides some suggestions for finding and fixing errors in your programs. Chapter 15 provides an exercise of the foreground/background capability of the RT–11 system. Chapter 16 demonstrates the use of indirect files as the source of commands to RT–11 in place of the console terminal.

Chapter 17 contains general guidelines for using RT–11; these guidelines will help you avoid problems common to new users.

Appendix A shows you how to perform manual bootstrapping operations on computers that do not have the automatic installation capability. Appendix B supplements the instructions for performing examples and demonstrations in the manual.

This manual also contains a glossary.

3.4 RT–11 Installation Guide

The *RT–11 Installation Guide* is to be used by the system manager or programmer responsible for installing and maintaining RT–11 on configurations not supported by the automatic installation process. This guide provides all the information necessary for the manual installation, customization, and testing of the RT–11 monitors and system programs; it also introduces the concept of system generation. This manual's modular structure allows you to read only the chapters describing your particular hardware and software.

Before you attempt manual installation of RT–11, you should read the *RT–11 System User's Guide* and review the other RT–11 manuals. Once you have installed RT–11, refer to the appropriate language installation guide for instructions on manual installation of FORTRAN IV or BASIC–11, if required. If you must generate your own specific RT–11 monitor, refer to the *RT–11 System Generation Guide* (see Section 3.4).

Chapter 1 describes the contents of the RT–11 software kits and introduces installation and system generation concepts. In addition, this chapter is designed to help you define your system requirements and choose a reading path through the manual.

Chapters 2 through 8 cover installation planning activities and procedures. Chapter 2 prepares you for system installation by helping you choose the components you need in your working system, plan the arrangement of components on volumes (if appropriate), identify mandatory patches, and select customizations that you need to make. Chapters 3 through 8 describe installation procedures for specific configurations. You can choose the chapter that describes installation procedures for your configuration.

Appendix A contains a modification for the magtape utility program, enabling it to recognize a nonstandard device handler. Appendix B tells you how to load software bootstraps for various devices on systems that do not include hardware bootstraps.

3.5 RT–11 System Generation Guide

After you install RT–11 you may find that it is necessary or desirable to generate your own special RT–11 monitor. The *RT–11 System Generation Guide* describes the system generation process. Before you use this manual to create a special monitor, you should be familiar with the RT–11 operating system and the RT–11 documentation set.

Chapter 1 helps you prepare for system generation by describing how to gather the information you will need to answer the SYSGEN dialog questions. Chapter 2 tells you how to run the SYSGEN procedure, and how to assemble and link the monitors and handlers. Chapter 3 provides instructions needed to perform system generation with double-density diskettes.

Appendix A replicates the SYSGEN dialog questions and answers that duplicate the distributed monitors. Appendix B contains answers to the SYSGEN dialog questions that create certain typical systems (for example, a system with multi-terminal support). Appendix C lists the RT–11 conditionals. Appendix D contains customization patches for specially generated monitors.

3.6 RT–11 System User's Guide

The *RT–11 System User's Guide*, a manual for all RT–11 users, shows you how to use the RT–11 system to perform ordinary tasks such as program development, program execution, and maintenance of file and storage media.

Part I, RT–11 Overview, provides information about the RT–11 operating system in general terms. Chapter 1 lists the hardware and software components of the RT–11 system and describes the monitors. Chapter 2 describes the program development process with RT–11.

Part II, System Communication, contains information that will help you communicate with the RT–11 operating system. Chapter 3 describes system conventions, such as data formats, physical device names, file naming conventions, and special function key commands. Chapter 4 introduces the keyboard monitor commands that you use to communicate with the monitor and to perform system functions. Chapter 5 tells you how to create control files for use with the Indirect Control File Processor (IND).

Part III, Text Editing, shows you how to use the RT–11 text editor (EDIT) to create and modify files.

Part IV, Setting Hardware Characteristics (SETUP), shows you how to set hardware characteristics for your terminal, printer, and system clock.

Appendix A contains a summary of the keyboard monitor commands, their minimal abbreviations, and their system program command string equivalents.

3.7 RT–11 System Utilities Manual

The *RT–11 System Utilities Manual* provides all RT–11 users with detailed descriptions of how to use the RT–11 system utilities to develop and execute programs and to maintain file and storage media.

Part I, Utility Programs, consists of chapters that describe the utility programs provided with the RT–11 system. These programs include:

CSI	Command String Interpreter
BINCOM	Binary Comparison Program
BUP	Backup Utility Program
DIR	Directory Program
DUMP	Dump Program
DUP	Device Utility Program
FILEX	File Exchange Program
FORMAT	Device Formatting Program
LD	Logical Disk Subsetting Program
LIBR	Librarian Program
LINK	Linker Program
MACRO	MACRO–11 Assembler Language Program
PIP	Peripheral Interchange Program
RESORC	Resource Program
SRCCOM	Source Comparison Program

Part II, System Jobs, describes four utilities that can be run as system jobs or as foreground jobs: the Error Logger, the Queue Package, the SPOOL Package, and the VTCOM Communication Package.

Part III, Debugging and Patching Programs, contains descriptions of the five utility programs that permit you to examine and change programs in source, object, and executable forms. The four utilities are:

ODT   On-line Debugging Technique
PAT   Object Module Patch Utility
SIPP   Save Image Patch Program
SLP   Source Language Patch Program

Appendix A describes BATCH processing. Appendix B summarizes the system utility program options and their keyboard monitor command equivalents.

3.8 RT–11 System Message Manual

The *RT–11 System Message Manual* is a reference manual for all RT–11 users. The manual lists every diagnostic message that is displayed by the monitors, system utilities, editors, FORTRAN IV compiler and Object Time System, BASIC–11 interpreter, and MACRO–11 assembler. The five major sections are FORTRAN IV, BASIC–11, System, MACRO–11, and Editor messages. Messages are alphabetized within each section.

For each error condition, a brief explanation of the most likely causes is given and at least one corrective action is suggested.

Several short chapters at the beginning of the manual cover general RT–11 system conditions that can cause the system to send you messages. Chapter 1 explains how to use the manual. Chapter 2 summarizes procedures for recovering from error conditions reported by the hardware rather than by the software. Chapter 3 offers guidelines to review when you have inadequate storage for a program's requirements or too large a program to run. Chapter 4 describes procedures to use if RT–11 fails completely.

3.9 PDP–11 Keypad Editor User's Guide

The *PDP–11 Keypad Editor User's Guide* provides information about the text file editor used with the VT100 family of video terminals. The use of this guide is optional for all RT–11 users.

Chapter 1 suggests how you can learn to use the keypad editor and gives an example that demonstrates the most common keypad editor functions.

Chapter 2 tells you how to start and stop a keypad editor session, and how to create, inspect, and edit a file with the keypad editor.

Chapter 3 provides the main reference documentation for the keypad editor functions that are active when you are inspecting a file. The chapter covers all keypad editor functions that allow you to move forward and backward through a file.

Chapter 4 provides the main reference documentation for the keypad editor functions that are active while you edit an existing file or create a new file.

The chapter covers all keypad editor functions that allow you to add, delete, substitute, and move text.

Chapter 5 describes special keypad editor features: auxiliary file processing; using keypad editor macros; reformatting segments of a file; manipulating local symbols in MACRO-11 programs; and indenting source programs for structured languages.

The Appendix includes all keypad editor messages. Explanations about the cause of error conditions, and suggested remedies, follow each message.

3.10 PDP-11 Keypad Editor Reference Card

The *PDP-11 Keypad Editor Reference Card* summarizes the keypad editor features. The card is a reference document for users who have familiarized themselves with the keypad editor through the *PDP-11 Keypad Editor User's Guide*.

3.11 RT-11 Mini-Reference Manual

The *RT-11 Mini-Reference Manual* is a small, convenient reference for all RT-11 users. The Mini-Reference Manual contains the following information:

• Keyboard monitor command syntax, and command and option summary

• SET command summaries

• General CSI command string format

• Command options for:

BINCOM	ERROUT	LD	PIP	SLP
BUP	FILEX	LIBR	PAT	SRCCOM
DIR	FORMAT	LINK	QUEMAN	
DUMP	IND	MACRO-11	RESORC	
DUP	KED	ODT/VDT	SIPP	

• Programmed request summaries

• System subroutine library (SYSLIB) calls

• Control blocks

• Disk and file formats

• Fixed offsets and status words

• Queue formats

• ASCII and RAD50 character sets

• Permanent device names

- Standard file types

- Standard interrupt vectors

- Octal to K-word equivalents

3.12 RT–11 Programmer's Reference Manual

The *RT–11 Programmer's Reference Manual* is for experienced assembly language programmers and FORTRAN IV programmers who wish to use the services of the system subroutine libraries, SYSLIB (for FORTRAN IV calls), or SYSMAC (for MACRO–11 calls). This manual, along with the *PDP–11 MACRO–11 Language Reference Manual*, contains instructions on programming in the MACRO–11 assembly language under the RT–11 operating system.

Chapter 1 introduces the manual and provides an overview of programmed requests and FORTRAN IV-callable subroutines. Chapter 2 describes the RT–11 programmed requests available in the system macro library (SYSMAC.SML); these allow you to invoke system monitor services from assembly language programs. In addition, this chapter describes macros that are useful in implementing interrupt service routines and device handlers. Chapter 3 contains descriptions of the system subroutine library (SYSLIB.OBJ), a library of functions and subroutines that you can call from either FORTRAN IV or assembly language programs. Appendix A describes the display file handler. Appendix B is a listing of the system macro library.

3.13 PDP–11 MACRO–11 Language Reference Manual

The *PDP–11 MACRO–11 Language Reference Manual* is for the MACRO–11 programmer who is familiar with the PDP–11 family and the instruction set. This manual shows you how to develop MACRO–11 programs.

The manual has three parts. Part I lists the key features of MACRO–11, identifies programming standards and conventions, and describes the format that you use to code MACRO–11 source programs. Part II presents information essential to programming in MACRO–11, including elements of MACRO–11 instructions, MACRO–11 output, relocation and linking of object modules, and accessing and manipulating data stored in memory. Part III describes the MACRO–11 directives that control the processing of source statements during assembly. Appendixes include information on character sets, directives, error messages, coding standards, and virtual memory allocation.

Because this manual contains system-independent information, it must be used in conjunction with a system-specific user's guide. The RT–11 supplements are the *RT–11 System User's Guide* (see Section 3.6) and the *RT–11 System Utilities Manual* (see Section 3.7).

3.14 RT–11 Software Support Manual

The *RT–11 Software Support Manual* contains descriptions of RT–11 system design philosophy, programs, capabilities, and internal design. This manual is intended for experienced RT–11 programmers who fall into one of the following categories:

• RT–11 system programmers and experienced application programmers who need to understand RT–11 internal design

• RT–11 programmers who need to write device handlers

• RT–11 programmers who wish to increase their background knowledge

Chapter 1 introduces the manual and provides a historical overview of RT–11. Chapter 2 provides descriptions of RT–11 memory layouts and system components. Chapter 3 describes characteristics of the resident monitor, including foreground/background internals. Chapter 4 describes the extended memory system. Chapter 5 provides in-depth information about the multi-terminal system. Chapter 6 documents interrupt service routines. Chapter 7 describes device handlers and bootstraps. Chapter 8 details file structures and formats. Chapter 9 describes file storage and the device directory. Chapter 10 tells you how to program for specific devices. Chapter 11 contains information specific to Professional 300 series processors.

Appendix A contains device handler listings, with extensive comments. Appendix B provides a sample application program for data acquisition in a laboratory environment. The program illustrates the design of a foreground/background system with an in-line interrupt service routine.

3.15 RT–11/RSTS/E FORTRAN IV User's Guide

This document is for the FORTRAN IV programmer familiar with the language elements described in the *PDP–11 FORTRAN Language Reference Manual* (see Section 3.16). It provides the information necessary to compile, link, execute, and debug a FORTRAN IV program under RT–11.

Chapter 1 describes the operating procedures for compiling, linking, executing, and debugging a FORTRAN IV program. Chapter 2 provides information about the Object Time System (OTS), including register usage, the traceback feature, and memory organization. Chapter 3 describes FORTRAN IV characteristics specific to RT–11. Chapter 4 suggests ways to increase the efficiency of FORTRAN IV programs. The appendixes contain reference information such as data formats, library subroutine summaries, error diagnostics, and compatibility considerations.

3.16 PDP–11 FORTRAN Language Reference Manual

The *PDP–11 FORTRAN Language Reference Manual* is for the FORTRAN IV programmer. This manual describes the FORTRAN IV language as implemented on several PDP–11 software systems.

Chapter 1 of the manual is an overview defining the elements of the FORTRAN IV language and the structure of a FORTRAN IV program. Chapter 2 contains descriptions of the components of a FORTRAN IV statement, including constants, variables, arrays, and expressions. Chapters 3, 4, 5, 7, 8, and 9 describe assignment, control, input and output, format, specification, and auxiliary input/output statements. Chapter 6 describes subprograms, both those that you write and those provided in the FORTRAN IV library. The appendixes provide reference information, including the use of extended memory through FORTRAN IV, character codes, a language summary, and coding examples.

Because the manual contains system-independent information, it must be used in conjunction with a system-specific user's guide. The RT-11 supplement is the *RT-11/RSTS/E FORTRAN IV User's Guide* (see Section 3.15).

3.17 Introduction to BASIC

Introduction to BASIC is a tutorial-style handbook designed for the novice BASIC user. It provides the inexperienced BASIC programmer with a background in the syntax and vocabulary of the language.

Chapter 1 of the handbook introduces the concepts of statements, variables, numbers, and operators. Chapter 2 explains how to plan and organize a BASIC program. Chapter 3 shows you how to interact with an executing BASIC program. Chapters 4 through 8 describe loops and arrays, subroutines, math and print functions, and files. The appendixes provide a summary of the BASIC language, a description of error messages and recovery procedures, and sample programs.

3.18 BASIC-11/RT-11 User's Guide

This document is to be used by the BASIC-11 programmer familiar with the language elements described in the *BASIC-11 Language Reference Manual* (see Section 3.19). It provides the information necessary to use BASIC-11 on the RT-11 system.

Chapter 1 tells you how to use BASIC-11. Chapter 2 describes system-dependent input and output information. Chapter 3 describes BASIC-11 utility functions. Chapter 4 shows you how to use assembly language routines with BASIC-11.

3.19 BASIC-11 Language Reference Manual

The *BASIC-11 Language Reference Manual* is for the BASIC-11 programmer. This manual describes the BASIC-11 language as implemented on several PDP-11 software systems.

Chapter 1 of the manual provides an introduction to programming in BASIC-11. Chapter 2 describes BASIC-11 data types. Chapter 3 describes terminal input and output. Chapters 4 through 9 provide descriptions of program control statements, BASIC-11 functions, file input and output,

formatted output, program segmentation, and BASIC–11 commands. The appendixes provide BASIC–11 error messages and a language summary.

Because the manual contains system-independent information, it must be used with a system-specific user's guide. The RT–11 supplements are the *BASIC–11/RT–11 User's Guide* (see Section 3.18) and the *BASIC–11/RT–11 Installation Guide and Release Notes* (see Section 3.1).

4.0 Optional Software Products

A variety of products to support the diverse needs of RT–11 users are available. These products are sold singly or in combination and can be installed individually after you have installed RT–11. Contact your local sales office if you want to buy any of these products.

The software products described in this section, as well as FORTRAN IV and BASIC–11, are supported by RT–11 Version 5. The version numbers associated with product names refer to the optional software, not to the RT–11 operating system. Optional products that are supported only by specific versions of RT–11 are not listed here.

CTS–300, Version 7.0 — (Commercial Transaction System) A disk based, single-user/multiuser system designed to support commercial applications on small PDP–11 based DEC Datasystems or equivalent configurations.

CTS–300 RDCP (2780/3780), Version 2.0 — (Remote Data Communications Package) A hardware/software package that enables a Datasystem running CTS–300 to act as a Remote Job Entry terminal to a similar system, to a DIGITAL system running a 2780/3780 emulator, or to an appropriately configured IBM 360/370 Data Communication Terminal.

DECnet–RT, Version 2.0 — (RT–11 Network Software) A hardware/software package offering task-to-task communications, network file transfer, and network resource-sharing capabilities.

DIBS–11/CTS–300, Version 1.0 — A multiuser, wholesale distributor's accounting software package written in DIBOL to run under the CTS–300 Operating System.

FMS–11/RT–11, Version 2.0 — (Forms Management System) A set of software tools for developing video form applications for data entry and display with RT–11 and VT100 compatible terminals.

FORTRAN/RT–11 Laboratory Extensions, Version 1.0 — A software package that consists of the FORTRAN/RT–11 library of simple graphics subroutines supporting the VT11 display processor; a library of laboratory subroutines supporting the LPS11 Laboratory Peripheral System, the AR11 Analog Real-Time Subsystem, and a number of laboratory I/O modules; and a FORTRAN debugger.

GAMMA–11 F/B, Version 3.1 — A hardware/software system designed for nuclear medicine.

MACDBG–RT, Version 1.0 — (MACRO–11 Debugging Tool) A software development/debugging tool for dedicated microcomputer applications.

MACSYS–RT, Version 2.0 — (MACRO–11 Development System Software) A microcomputer software development environment packaged with 11MDS hardware for the MACRO–11 programmer.

MINC/AP2, Version 1.0 — A MINC application package designed to accept and analyze peak output from a variety of analog laboratory instruments.

MINC BASIC, Version 2.0 — An implementation of BASIC designed specially for the MINC system to operate as a computational, graphics, and laboratory data acquisition and control package for scientific and clinical applications.

MINC NFT, Version 1.0 — (Network File Transfer) A communications package for use on MINC and MiniMINC systems.

MiniMINC BASIC, Version 2.0 — A computational laboratory data acquisition and control package for analysis in scientific, engineering, and management applications.

MRRT–11, Version 1.0 — (Memory-Resident RT–11) A memory-resident run-time version of the RT–11 Operating System that is designed to operate on an SB11 microcomputer.

MU BASIC–11/RT–11, Version 2.1 — (Multi-User BASIC–11) A BASIC–11 interpreter that executes under the RT–11 operating system and supports up to eight users simultaneously.

PLXY–11/RT, Version 1.1 — A software package designed to provide the RT–11 user with access to the plotting capabilities of the LXY or LXV printer/plotter.

PROM/RT–11, Version 1.0 — (Programmable Read Only Memory) A software utility designed to control and operate a universal PROM programming hardware device.

RGL/FEP, Version 1.0 — (ReGIS Graphic Library/FORTRAN Enhancement Package) A FORTRAN callable graphics library for RT–11 Single Job (SJ) and Foreground/Background (FB) monitors.

RT–11 2780/3780 Protocol Emulator, Version 4.0 — A hardware/software package that emulates an IBM 2780 or 3780 Data Transmission Terminal. The emulation package operates under the RT–11 Foreground/Background (FB) monitor on a suitably configured RT–11 system.

RT–11/FORTRAN Enhancement Package, for MINC (FEP), Version 2.0 — A complete FORTRAN systems software package.

SPETS–11, Version 1.0 — (Single Photon Emission Tomography System) A software application that allows GMS Series GAMMA–11 systems users to perform emission-computed rotational tomography.

MACDBG–RT, Version 1.0 — (MACRO–11 Debugging Tool) A software development/debugging tool for dedicated microcomputer applications.

MACSYS–RT, Version 2.0 — (MACRO–11 Development System Software) A microcomputer software development environment packaged with 11MDS hardware for the MACRO–11 programmer.

MINC/AP2, Version 1.0 — A MINC application package designed to accept and analyze peak output from a variety of analog laboratory instruments.

MINC BASIC, Version 2.0 — An implementation of BASIC designed specially for the MINC system to operate as a computational, graphics, and laboratory data acquisition and control package for scientific and clinical applications.

MINC NFT, Version 1.0 — (Network File Transfer) A communications package for use on MINC and MiniMINC systems.

MiniMINC BASIC, Version 2.0 — A computational laboratory data acquisition and control package for analysis in scientific, engineering, and management applications.

MRRT–11, Version 1.0 — (Memory-Resident RT–11) A memory-resident run-time version of the RT–11 Operating System that is designed to operate on an SB11 microcomputer.

MU BASIC–11/RT–11, Version 2.1 — (Multi-User BASIC–11) A BASIC–11 interpreter that executes under the RT–11 operating system and supports up to eight users simultaneously.

PLXY–11/RT, Version 1.1 — A software package designed to provide the RT–11 user with access to the plotting capabilities of the LXY or LXV printer/plotter.

PROM/RT–11, Version 1.0 — (Programmable Read Only Memory) A software utility designed to control and operate a universal PROM programming hardware device.

RGL/FEP, Version 1.0 — (ReGIS Graphic Library/FORTRAN Enhancement Package) A FORTRAN callable graphics library for RT–11 Single Job (SJ) and Foreground/Background (FB) monitors.

RT–11 2780/3780 Protocol Emulator, Version 4.0 — A hardware/software package that emulates an IBM 2780 or 3780 Data Transmission Terminal. The emulation package operates under the RT–11 Foreground/Background (FB) monitor on a suitably configured RT–11 system.

RT–11/FORTRAN Enhancement Package, for MINC (FEP), Version 2.0 — A complete FORTRAN systems software package.

SPETS–11, Version 1.0 — (Single Photon Emission Tomography System) A software application that allows GMS Series GAMMA–11 systems users to perform emission-computed rotational tomography.

HOW TO ORDER
ADDITIONAL DOCUMENTATION

From	Call	Write
Chicago	312–640–5612 8:15 A.M. to 5:00 P.M. CT	Digital Equipment Corporation Accessories & Supplies Center 1050 East Remington Road Schaumburg, IL 60195
San Francisco	408–734–4915 8:15 A.M. to 5:00 P.M. PT	Digital Equipment Corporation Accessories & Supplies Center 632 Caribbean Drive Sunnyvale, CA 94086
Alaska, Hawaii	603–884–6660 8:30 A.M. to 6:00 P.M. ET or 408–734–4915 8:15 A.M. to 5:00 P.M. PT	
New Hampshire	603–884–6660 8:30 A.M. to 6:00 P.M. ET	Digital Equipment Corporation Accessories & Supplies Center P.O. Box CS2008 Nashua, NH 03061
Rest of U.S.A., Puerto Rico*	1–800–258–1710 8:30 A.M. to 6:00 P.M. ET	

*Prepaid orders from Puerto Rico must be placed with the local DIGITAL subsidiary (call 809–754–7575)

From	Call	Write
Canada British Columbia	1–800–267–6146 8:00 A.M. to 5:00 P.M. ET	Digital Equipment of Canada Ltd 940 Belfast Road Ottawa, Ontario K1G 4C2 Attn: A&SG Business Manager
Ottawa–Hull	613–234–7726 8:00 A.M. to 5:00 P.M. ET	
Elsewhere	112–800–267–6146 8:00 A.M. to 5:00 P.M. ET	
Elsewhere		Digital Equipment Corporation A&SG Business Manager*

*c/o DIGITAL's local subsidiary or approved distributor

READER'S COMMENTS

NOTE: This form is for document comments only. DIGITAL will use comments submitted on this form at the company's discretion. If you require a written reply and are eligible to receive one under Software Performance Report (SPR) service, submit your comments on an SPR form.

Did you find this manual understandable, usable, and well organized? Please make suggestions for improvement.

_____
_____
_____
_____
_____
_____
_____
_____

Did you find errors in this manual? If so, specify the error and the page number.

_____
_____
_____
_____
_____
_____
_____
_____
_____

Please indicate the type of user/reader that you most nearly represent.

— Assembly language programmer
— Higher-level language programmer
— Occasional programmer (experienced)
— User with little programming experience
— Student programmer
— Other (please specify) _____

Name _____ Date _____

Organization _____ Telephone _____

Street _____

City _____ State _____ Zip Code _____
                                                              or Country
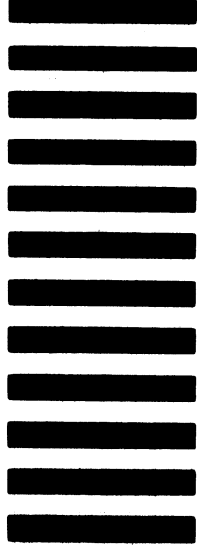
Printed in U.S.A.