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RT-11
Documentation Directory
Order No. DEC-11-ORDDA-A-D

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RT-11

Documentation Directory

Order No. DEC-11-ORDDA-A-D

ABSTRACT

This document lists and describes
the software manuals for the RT-11
Operating System, Version 2C (V2C),
including the Monitor, system pro-
grams, FORTRAN, and BASIC.

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CONTENTS

TABLES

1.0 INTRODUCTION

This directory describes the software documents associated with the
RT-11 Operating System, Version 2C (V2C). The user unfamiliar with
RT-11 should read this document in its entirety to ascertain recom-
mended reading; those familiar with RT-11 can use this directory as a
reference to the contents of individual manuals.

For the purpose of this directory, the RT-11 Operating System is
assumed to include the FORTRAN and BASIC languages in addition to the
RT-11 Monitor and system programs. A list of manuals describing
optional RT-11 software is included at the end of this directory
(Section 2.10).

The following documents are described in this directory:

Document	V2C Order Number
RT-11 System Release Notes	DEC-11-ORNRA-A-D
RT-11 FORTRAN Release Notes	DEC-11-LFRNA-A-D
BASIC/RT-11 Release Notes	DEC-11-LBRNA-A-D
RT-11 System Generation Manual	DEC-11-ORGMA-A-D
RT-11 System Reference Manual	DEC-11-ORUGA-C-D, DN1, DN2
RT-11 System Message Manual	DEC-11-ORMEA-A-D
RT-11 System Reference Card	DEC-11-ORRCA-C-D
RT-11 Software Support Manual	DEC-11-ORPGA-B-D, DN1
PDP-11 FORTRAN Language Reference Manual	DEC-11-LFLRA-C-D
RT-11/RSTS/E FORTRAN IV User's Guide	DEC-11-LRRUA-A-D
BASIC/RT-11 Language Reference Manual	DEC-11-LBACA-D-D, DN1, DN2

Table 1 lists the RT-11 manuals and indicates the intended audience
for each manual according to the following categories:

Beginning RT-11 user	Knows computers and software fundamentals; probably familiar with a higher-level language; may or may not be familiar with PDP-11 assembly language; unfamiliar with RT-11 operating procedures.
System manager	Responsible for generating and maintaining RT-11 at the user site; familiar with RT-11 operating procedures.
Assembly-language programmer	Familiar with PDP-11 instruction set or an assembly language such as MACRO; may or may not be familiar with RT-11 operating procedures.

FORTRAN programmer   Familiar with PDP-11 FORTRAN or
                                                  other FORTRAN language; may or
                                                  may not be familiar with RT-11
                                                  operating procedures.

            BASIC programmer   Familiar with PDP-11 BASIC or
                                                  other BASIC language; may or may
                                                  not be familiar with RT-11 oper-
                                                  ating procedures.

Because RT-11 is a small single-user system, a given user may fall into
one or more of the above categories. For example, almost every assem-
bly-language programmer also serves from time to time as system man-
ager; the above categories are intended only to serve as a guide for
locating information of a particular type.

Table 1
RT-11 Documentation

Document	Beginning RT-11 User	System Manager	Assembly Language Programmer	FORTRAN Programmer	BASIC Programmer
RT-11 System Release Notes		X	X	X	X
RT-11 FORTRAN Release Notes		X		X	
BASIC/RT-11 Release Notes		X			X
RT-11 System Generation Manual		X	X		
RT-11 System Reference Manual					
Chapters 1, 2	X				
Chapters 3, 4	X	X	X	X	X
Chapter 5			X		
Chapters 6, 7			X	X	
Chapters 8-11			X		
Chapter 12	X	X	X	X	X
Appendix A		X	X		
Appendix B	X	X	X	X	X
Appendices C-E			X		
Appendix F					X
Appendix G				X	

Table 1 (Cont.)
RT-11 Documentation

Document	Beginning RT-11 User	System Manager	Assembly Language Programmer	FORTRAN Programmer	BASIC Programmer
RT-11 System Reference Manual (Cont.)					
Appendix H			X		
Appendix I		X	X	X	X
Appendices J, K	X	X	X	X	X
Appendix L		X	X		
Appendix M		X	X	X	
Appendix N		X	X		
Appendix O			X	X	
RT-11 System Message Manual	X	X	X	X	X
RT-11 System Reference Card	X	X	X	X	X
RT-11 Software Support Manual		X	X		
PDP-11 FORTRAN Language Reference Manual	X			X	
RT-11/RSTS/E FORTRAN User's Guide	X			X	
BASIC/RT-11 Language Reference Manual	X	X			X

2.0 DESCRIPTIONS OF DOCUMENTS

The following sections describe the manuals listed in Table 1 at the end of Section 1.0. For each manual, the following information is provided:

- title

- brief description

- intended audience

- contents by chapter

2.1 RT-11 System Release Notes, RT-11 FORTRAN Release Notes and BASIC/RT-11 Release Notes

Written for the system manager or system-level programmer responsible for the generation and installation of RT-11, the Release Notes provide up-to-date information on the current releases of the RT-11 Monitor and system programs, FORTRAN, and BASIC.

The appropriate Release Notes should be read completely before generating the RT-11 system to be used. During system generation, the Notes should be used in conjunction with the *RT-11 System Generation Manual* (see Section 2.2).

The first section of each Release Notes document describes the differences between the current version of the software (RT-11, FORTRAN, or BASIC) and the previous release(s). Subsequent sections describe known problems present in the distributed software, with corrective patches supplied where known.

2.2 RT-11 System Generation Manual

The *RT-11 System Generation Manual* is intended for use by the system manager or system-level programmer responsible for generating and installing RT-11 at the user site. The manual, used with the appropriate Release Notes document(s) (see Section 2.1), provides all information necessary to customize, generate, and exercise the RT-11 Monitor, system programs, FORTRAN, and BASIC.

Chapter 1 describes the contents of the RT-11 software kits. Chapter 2 provides step-by-step procedures for building the Monitor, system programs, FORTRAN, and BASIC from the kits. Chapter 3 describes simple demonstration programs that can be run after the generation process is complete. Chapter 4 provides software customizing information for users with nonstandard hardware configurations. Chapter 5 contains instructions for assembling (or compiling) and linking RT-11 source files.

2.3 RT-11 System Reference Manual

The largest and most comprehensive manual in the RT-11 set, the *RT-11 System Reference Manual* describes the features and operation of the RT-11 Monitor and system programs for all RT-11 users, from beginners to assembly-language system programmers.

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Chapter 1 discusses system hardware and software requirements. It describes general system operations, and lists specific components available under RT-11.

Chapter 2 introduces system conventions and monitor/memory layout. It describes in detail the keyboard commands for controlling jobs and implementing user programs.

Chapters 3 through 8 describe the following system utility programs, respectively:

     EDIT   text editor

     PIP   file transfer program

     MACRO   assembler

     LINK   linker

     LIBR   librarian

     ODT   debugging program

These programs enable the user to create text files and produce executable programs.

Chapter 9 is of particular interest to the experienced RT-11 assembly-language programmer. It describes programmed requests, system macros that allow the user to invoke system monitor services from within assembly-language programs.

Chapters 10 and 11 describe the 8K Assembler and EXPAND programs. These programs are useful at installations with minimum memory configurations.

Chapter 12 describes the RT-11 BATCH command language. In BATCH mode, the RT-11 system can be left to run unattended for long periods of time.

The appendices summarize the contents of the manual and describe additional system utility programs and routines that can be used for extended system operations. These programs include:

     SRCCOM   source and text file comparison program

     FILEX   file translation program (RT-11 to/from other DIGITAL operating systems)

     PATCH   patch program for memory image files

     PATCHO   patch program for object modules

     DUMP   file dump program

     SYSLIB   library of FORTRAN functions and subroutines that perform RT-11 programmed requests

2.4 RT-11 System Message Manual

The *RT-11 System Message Manual*, aimed at all RT-11 users, describes error diagnostics and informational messages issued by the RT-11 Monitor, system programs, FORTRAN, and BASIC.

The first section of the manual describes "hard errors" (those caused by write-locked or otherwise unusable hardware), and discusses the probable causes of those errors.

Next, system failures are described. Specific locations where the monitors may halt, and the reasons for the halts, are mentioned, along with a discussion of system and program looping.

The third section provides information on how to increase both memory and device storage space when insufficient room presents a problem for a particular operation.

The final section of the manual lists all messages issuable by system software. Messages are listed in alphabetical order; associated with each message is the issuing software component, the probable cause, and the recommended remedial action (if any) to rectify the error.

It is suggested that the System Message Manual be placed in a handy location near the computer for quick reference.

2.5 RT-11 System Reference Card

The *RT-11 System Reference Card* provides a handy pocket-sized reference for all RT-11 users. It summarizes selected error messages, as well as the command format and syntax for all RT-11 software components.

The Reference Card contains (in the order listed) the following information:

- SYSCOM (system communication area) Locations

- Permanent Device Names

- Assumed File Extensions

- Special Function Key Commands

- Keyboard Monitor Commands and Error Messages

- General Command String Format

- Commands and Selected Error Messages for:

    EDIT

    PIP

    LINK

    ODT

    LIBR

    DUMP

SRCCOM

MACRO/CREF

BASIC

FORTRAN (including SYSLIB)

FOCAL

BATCH

● Bootstraps for Devices Supported by RT-11

2.6 RT-11 Software Support Manual

The *RT-11 Software Support Manual* is for experienced PDP-11 program-
mers; it provides detailed information on the internal structure of
RT-11. The user completely familiar with the *RT-11 System Reference
Manual* (see Section 2.3) can use the Software Support Manual to gain
a more intimate knowledge of the system software.

Chapter 1 gives an overview of the internal workings of RT-11. Chapter
2 describes monitor structure and table layout. Chapter 3 provides a
complete description of RT-11 file structures. Chapter 4 is a detailed
discussion of the structure and contents of the system device. Chapter
5 describes the input/output system, I/O queues, and device handlers
(including information on writing and installing new handlers).
Chapter 6 describes the Foreground/Background (F/B) Monitor. Chapter
7 provides details of BATCH operation. The appendices contain listings
and examples of device handlers and other system components, as well
as complete flowcharts of the Single-Job and Foreground/Background
monitors.

2.7 PDP-11 FORTRAN Language Reference Manual

The *PDP-11 FORTRAN Language Reference Manual* describes the elements of
the FORTRAN language as implemented on several PDP-11 software systems.
Because the manual contains no system-dependent 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
2.8).

Chapter 1 of the manual provides a language overview defining the
elements of the FORTRAN language and the structure of a FORTRAN program.
Chapter 2 describes the components of a FORTRAN statement (e.g., con-
stants, variables, arrays, and expressions). Chapters 3 through 7
describe assignment, control, input/output, format, and specification
statements, respectively. Chapter 8 describes subprograms, both those
that are user-written and those provided in the FORTRAN library. The
appendices provide reference information, including character codes,
a language summary, and coding examples.

2.8 RT-11/RSTS/E FORTRAN IV User's Guide

This document is for the FORTRAN programmer familiar with the language elements described in the *PDP-11 FORTRAN Language Reference Manual* (see Section 2.7). It provides the information necessary to compile, link, execute, and debug a FORTRAN program under RT-11.

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

2.9 BASIC/RT-11 Language Reference Manual

The *BASIC/RT-11 Language Reference Manual* is aimed at users who wish to write a BASIC program to execute under RT-11. The manual serves two purposes: it describes the elements of the BASIC language as implemented under RT-11, and it explains operating procedures for running a BASIC program under RT-11.

Chapter 1 is an introduction that describes briefly how to load and run a BASIC program. Chapters 2 through 7 constitute a description of the BASIC language, as follows: Chapter 2 describes BASIC arithmetic, including numbers, variables, subscripting, expressions, and arithmetic operations. Chapter 3 discusses BASIC strings, string variables, and string operations. Chapter 4 describes Immediate Mode operations. Chapter 5 describes the BASIC language statements. Chapter 6 discusses arithmetic functions, string functions, and user-defined functions. Chapter 7 describes the editing commands available with BASIC. Chapter 8 provides instructions for using assembly-language routines with a BASIC program. Chapter 9 lists error messages. Chapter 10 illustrates sample BASIC/RT-11 demonstration programs. The appendices provide reference information such as bootstrap procedures, the ASCII character set, command summaries, a memory map, and sample listings.

2.10 Optional RT-11 Software Documentation

The following documents describe optional RT-11 software components; the documents are provided as part of the software kit for each component.

FORTRAN/RT-11 Extensions Manual (Order No. DEC-11-LRTEA-B-D) -- describes extensions to RT-11 FORTRAN that allow the use of the VT11 Graphics Processor, LV11 Plotting Printer, LPS11 Laboratory Peripheral System, AR11 Laboratory Support System, and DR11K Digital I/O.

RT-11 FORTRAN Scientific Subroutines Package Reference Manual (Order No. DEC-11-ARSMA-A-D) -- describes use of the Scientific Subroutines Package, a set of mathematical and statistical FORTRAN subroutines.

MU BASIC/RT-11 User's Manual (Order No. DEC-11-LIBRA-A-D) and *MU BASIC/RT-11 System Installation Guide* (Order No. DEC-11-LIBMA-A-D) -- describe the features, operation, and installation of a MU (Multi-User) BASIC RT-11 system.

FOCAL-11 User's Manual (Order No. DEC-11-LFOCA-F-D) -- describes the language features and usage of the FOCAL-11 language under RT-11.

2780 Remote Computer Systems Operator's Guide (Order No. DEC-11-CRCSA-A-D) and *2780 Remote Computer Systems Installation Notes* (Order No. DEC-11-CCDNA-A-D) -- describe operation and installation of the 2780 Remote Computer System software package.

PDL Operator's Guide (Order No. DEC-11-OPUGA-B-D) and *PDL-11 Installation Manual* (Order No. EK-PDL11-IN-001) -- describe the operation and installation of the PDL (Programmable Data Logger) hardware/software system. The PDL system acquires data from clinical laboratory instruments, makes mathematical calculations, and produces reports.

GAMMA-11 Foreground/Background System Reference Manual (Order No. DEC-11-MGFBA-A-D) and *Command Summary for GAMMA-11 F/B* (Order No. DEC-11-MGCSA-A-D) -- describe the operation, use, and installation of the GAMMA-11 F/B system, designed for acquisition and analysis of gamma camera data.

Lab Applications-11 Program Manual (Order No. DEC-11-ALPMA-A-D), *Lab Applications-11 Module Manual* (Order No. DEC-11-ALMMA-A-D), and *Lab Applications-11 Program Reference Card* (Order No. DEC-11-ALRCA-C-D) -- describe operation, installation, and use of the Lab Applications-11 system, a set of applications programs to help solve scientific laboratory problems.

READER'S COMMENTS

NOTE: This form is for document comments only.   Problems
        with software should be reported on a Software
        Problem Repcrt (SPR) form.

Did you find errors in this manual?   If so, specify by page.

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

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Is there sufficient documentation on associated system programs
required for use of the software described in this manual?   If not,
what material is missing and where should it be placed?

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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
☐ Non-programmer interested in computer concepts and capabilities

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Organization_____

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