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RT-11
Documentation Directory

Order No. AA-5285D-TC

digital

March 1979

This document describes the software manual set shipped
with RT-11 V03B. It gives a brief synopsis of each manual
and suggests a reading path for the various users of RT-11.
Read this document before using the RT-11 version.

RT-11
Documentation Directory

Order No. AA-5285D-TC

SUPERSESSION/UPDATE INFORMATION: This manual supersedes AA-5285C-TC.

OPERATING SYSTEM AND VERSION: RT-11 V03B

SOFTWARE VERSION: RT-11 FORTRAN IV V02.1
BASIC-11/RT-11 V02

digital equipment corporation · maynard, massachusetts

DIGITAL	DECsystem-10	MASSBUS
DEC	DECtape	OMNIBUS
PDP	DIBOL	OS/8
DECUS	EDUSYSTEM	PHA
UNIBUS	FLIP CHIP	RSTS
COMPUTER LABS	FOCAL	RSX
COMTEX	INDAC	TYPESET-8
DDT	LAB-8	TYPESET-11
DECCOMM	DECSYSTEM-20	TMS-11
ASSIST-11	RTS-8	ITPS-10
VAX	VMS	SBI
DECnet	IAS	PDT
DATATRIEVE	TRAX	

CONTENTS

1.0 INTRODUCTION

This directory describes the software documents associated with the RT-11 operating system. If you are unfamiliar with RT-11, read this document in its entirety to ascertain recommended reading; if you are familiar with RT-11, use this directory as a reference to the contents of individual manuals.

For the purpose of this directory, assume that the RT-11 operating system includes the FORTRAN and BASIC-11 languages in addition to the RT-11 system programs.

2.0 ORGANIZATION OF MANUALS

The RT-11 manuals come in six 3-ring binders labelled with spine inserts as Volumes 1A, 1B, and 2 through 5. Table 1 lists the documents in the set along with their DIGITAL order numbers. (Order numbers ending with DN1 are up-dates — that is, sets of change pages.)

The manuals are organized in volumes according to the type of information they contain and the actual physical location in which you need that information. These manuals, and the volumes in which they reside, fall into three categories: introductory or once-only manuals, computer manuals, and desk manuals.

Once-only manuals are intended to be used once and then stored away. You will have little use for them once your system is in operation and you are familiar with its use. Manuals in this category include all the manuals in Volumes 1A and 1B of the set, the language installation guides contained in Volumes 4 and 5, and the handbook, *Introduction to BASIC*.

Computer manuals are intended to be used at the computer. They tell you how to use the computer system, and they describe command usage and syntax, system messages, and general system operation. Use them for reference when you are using the system. Manuals in this category include the manuals in Volume 2 and the language user guides in Volumes 4 and 5.

Desk manuals are intended to be used at your desk. Use them for reference as you write your own application programs. They contain specific programming information for the RT-11 operating system and its associated programming languages. Manuals in this category include all the manuals in Volume 3 and the language reference manuals in Volumes 4 and 5.

Table 1   RT-11 Documentation Set

Volume	Document Title	Order Number
1A once-only manuals	RT-11 Documentation Directory RT-11 System Release Notes Updates to RT-11 System Release Notes RT-11 TECO Release Notes RT-11/DECtape II Installation Notes RT-11/PDT-11 Installation Notes RT-11 System Generation Manual	AA-5285D-TC AA-5286B-TC AD-5286B-T1, T2 DEC-11-ORTNA-A-D AA-H280A-TC AA-H281A-TC AA-5283B-TC
1B once-only manual	Introduction to RT-11	DEC-11-ORITA-A-D, -DN1
2 computer manuals	RT-11 System User's Guide PDP-11 TECO User's Guide RT-11 System Message Manual RT-11 Pocket Guide	DEC-11-ORGDA-A-D, -DN1 DEC-11-UTECA-A-D, -DN1 AA-5284B-TC AV-5287B-TC

Table 1 (Cont.) RT-11 Documentation Set

Volume	Document Title	Order Number
3 desk manuals	RT-11 Advanced Programmer's Guide Updates to RT-11 Advanced Programmer's Guide PDP-11 MACRO-11 Language Reference Manual	AA-5280B-TC AD-5280B-T1, T2, T3 AA-5075A-TC
4 FORTRAN manuals	RT-11 FORTRAN IV Installation Guide RT-11/RSTS/E FORTRAN IV User's Guide PDP-11 FORTRAN Language Reference Manual	AA-5240C-TC DEC-11-LRRUB-A-D DEC-11-LFLRA-C-D, -DN1
5 BASIC-11 Manuals	BASIC-11/RT-11 Installation Guide BASIC-11/RT-11 User's Guide BASIC-11 Language Reference Manual	DEC-11-LIBTA-A-D, -DN1 DEC-11-LIBUA-A-D, -DN1 DEC-11-LIBBB-A-D
BASIC Handbook	Introduction to BASIC	AA-0155A-TK

Figure 1 is a reading guide to the document set that serves two functions. It summarizes the intended audience for each manual according to experience-level categories, and it suggests the sequence in which to read those manuals appropriate to your experience-level.

The experience-level categories given in Figure 1 are defined as follows:

New User
New RT-11 user:
unfamiliar with RT-11 operating procedures; probably familiar with a higher-level programming language; may or may not be familiar with computers and software fundamentals.

Sys. Mgr.
System manager:
responsible for generating and maintaining RT-11 at the user site; familiar with RT-11 operating procedures.

Sys. Pgmr.
System-level programmer:
familiar with PDP-11 instruction set or an assembly language such as MACRO-11; may or may not be familiar with RT-11 operating procedures.

FORTRAN Pgmr.
FORTRAN programmer:
familiar with PDP-11 FORTRAN IV or other FORTRAN language; may or may not be familiar with RT-11 operating procedure.

BASIC Pgmr.
BASIC programmer:
familiar with BASIC-11 or other BASIC language; may or may not be familiar with RT-11 operating procedure.

Because RT-11 is a single-user system, a given user may fall into one or more of the preceding categories. For example, almost every system-level programmer also serves from time to time as system manager; the preceding categories are intended to serve only as a guide for locating information of a particular type.
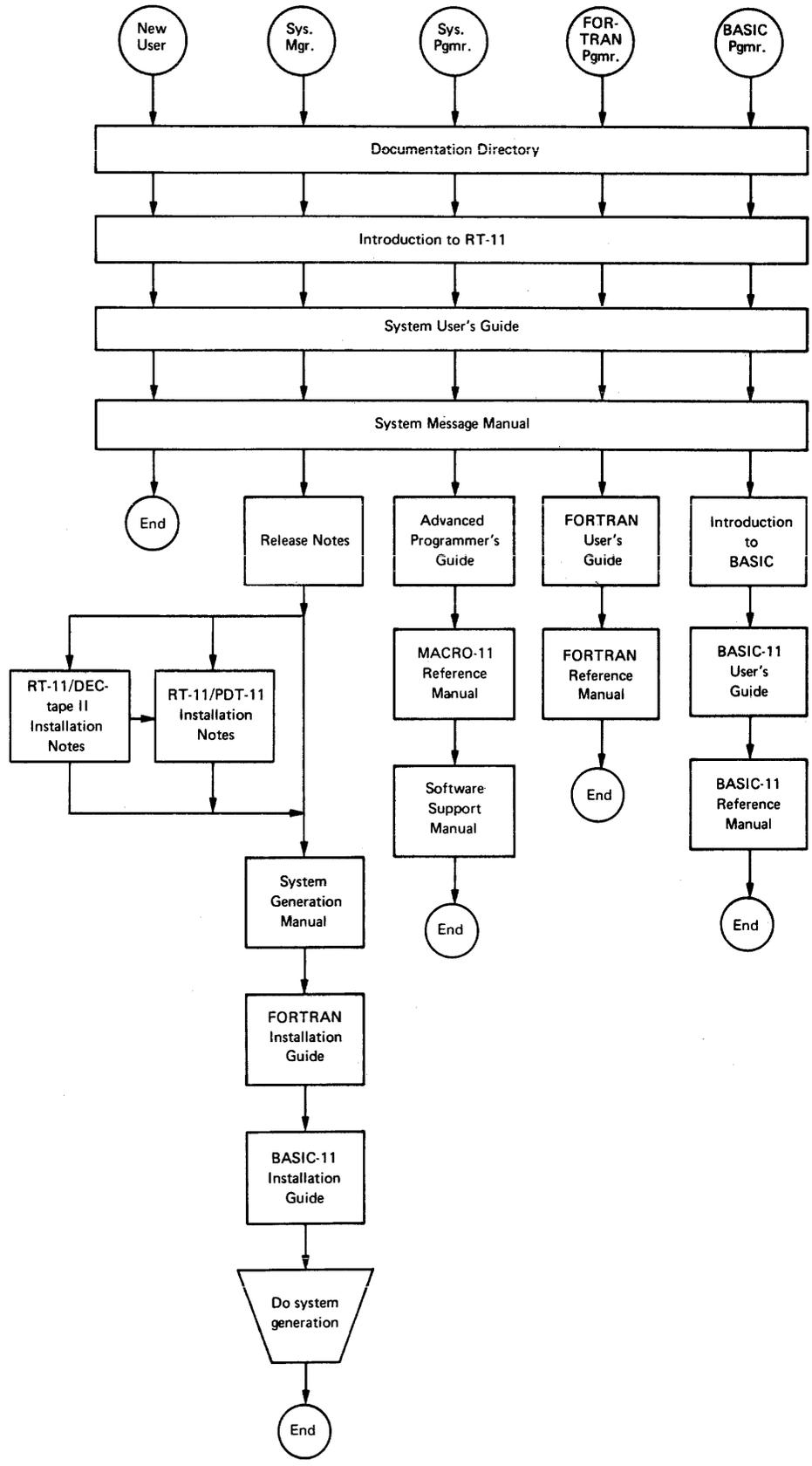
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     ┌──────┐          ┌──────┐          ┌──────┐          ┌──────┐          ┌──────┐
     │ New  │          │ Sys. │          │ Sys. │          │ FOR- │          │BASIC │
     │ User │          │ Mgr. │          │ Pgmr.│          │ TRAN │          │Pgmr. │
     └──────┘          └──────┘          └──────┘          │Pgmr. │          └──────┘
        │                 │                 │              └──────┘             │
        ▼                 ▼                 ▼                 ▼                  ▼
     ┌─────────────────────────────────────────────────────────────────────────────┐
     │                          Documentation Directory                             │
     └─────────────────────────────────────────────────────────────────────────────┘
        │                 │                 │                 │                  │
        ▼                 ▼                 ▼                 ▼                  ▼
     ┌─────────────────────────────────────────────────────────────────────────────┐
     │                            Introduction to RT-11                             │
     └─────────────────────────────────────────────────────────────────────────────┘
        │                 │                 │                 │                  │
        ▼                 ▼                 ▼                 ▼                  ▼
     ┌─────────────────────────────────────────────────────────────────────────────┐
     │                            System User's Guide                               │
     └─────────────────────────────────────────────────────────────────────────────┘
        │                 │                 │                 │                  │
        ▼                 ▼                 ▼                 ▼                  ▼
     ┌─────────────────────────────────────────────────────────────────────────────┐
     │                           System Message Manual                              │
     └─────────────────────────────────────────────────────────────────────────────┘
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Figure 1 Reading Guide to RT-11 Documentation Set

3

3.0 DESCRIPTIONS OF DOCUMENTS

The following sections describe the manuals listed in Table 1. Each description includes:

- title
- brief description
- intended audience
- contents by chapter

3.1 RT-11 System Release Notes, RT-11 FORTRAN IV Installation Guide, BASIC-11/RT-11 Installation Guide

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

Before you generate the RT-11 system, read thoroughly the release notes and the appropriate installation guide. During system generation, use these manuals in conjunction with the *RT-11 System Generation Manual* (see Section 3.4).

These manuals describe the current version of the software (RT-11, FORTRAN, or BASIC), the differences between the current version of the software and the previous release(s), known problems present in the distributed software, and corrective patches. The language installation guides describe how to customize, generate, and exercise the appropriate languages.

3.2 RT-11/DECtape II Installation Notes

The *RT-11/DECtape II Installation Notes* is intended for use by the system manager or system-level programmer responsible for installing the system at the user site. This document describes how to install:

1. RT-11 with DECtape II as the system device
2. RT-11 with disk as the system device and DECtape II as a storage device
3. DECtape II support in a previously installed RT-11 system

Used with the *RT-11 System Release Notes* and the *RT-11 System Generation Manual*, this document provides all the information necessary to install, customize, generate, and exercise the RT-11 monitors and system programs.

Chapter 1 describes DECtape II device characteristics, software kit contents, and configuration categories. It points to the specific chapter (2, 3, or 4) that contains the appropriate step-by-step procedures for each of these categories.

3.3 RT-11/PDT-11 Installation Notes

The *RT-11/PDT-11 Installation Notes* is intended for use by the system manager or system-level programmer responsible for installing the system at the user site. This document describes how to:

1. Install RT-11 on a PDT-11/130 or PDT-11/150 processor
2. Create, on a previously installed RT-11 system, an RT-11 system to run on a PDT-11/130 or PDT-11/150 processor

Used with the *RT-11 System Release Notes*, the *RT-11/DECtape II Installation Notes* (if appropriate), and the *RT-11 System Generation Manual*, this document provides all the information necessary to install, customize, generate, and exercise the RT-11 monitors and system programs.

Chapter 1 describes PDT-11/130 and PDT-11/150 device characteristics, software kit contents, and configuration categories. It points to the specific chapter (2 or 3) that contains the appropriate step-by-step procedures for each of these categories.

3.4 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 and installation guide documents (see Section 3.1), provides all information necessary to customize, generate, and exercise the RT-11 monitors and system programs.

Chapter 1 describes the contents of the RT-11 software kits. Chapter 2 provides step-by-step procedures for starting the system, building a working disk, customizing the system without doing a SYSGEN, and preserving the working system. Chapter 3 contains instructions on using SYSGEN to generate a customized RT-11 monitor. Chapter 4 describes assembling and linking the system programs.

3.5 Introduction to RT-11

The *Introduction to RT-11* is an introductory manual for the RT-11 operating system. Its purpose is to acquaint 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 that complement the text.

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 how to start the system. Chapter 3 demonstrates how to use the console terminal to control system operations. Chapters 4 through 7 describe important system operations, including using the monitor command language, creating and editing text files, comparing text files, and performing file maintenance operations.

Chapter 8 helps you decide which programming language to use. Chapters 9, 10, and 11, describe the FORTRAN IV, BASIC-11, and MACRO-11 languages, respectively. For FORTRAN and MACRO users, Chapter 12 describes linking object programs and Chapter 13 describes constructing library files.

Chapter 14 provides some suggestions for finding and fixing errors in user programs.

Chapter 15 provides users of the foreground/background monitor with an exercise of the foreground/background capability of the RT-11 system.

Chapter 16 describes using RT-11 indirect file support to perform operations unattended. Chapter 17 gives some advice to new users.

3.6 RT-11 System User's Guide

The *RT-11 System User's Guide* describes using the RT-11 system. It provides enough information for you to perform ordinary tasks such as program development, program execution, and file maintenance.

Part I, RT-11 Overview, describes the program development process in general. It lists the hardware and software components of the RT-11 system, and describes the monitors.

Part II, System Communication, describes system conventions, such as data formats, file naming conventions, and special function key commands. It also introduces the keyboard monitor commands, which you use interactively to communicate with the monitor and to perform system tasks.

Part III, Text Editing, describes the text editor and shows you how to create and modify files.

Part IV, Utility Programs, consists of nine chapters that describe the many programs provided with the RT-11 system. These programs include:

PIP	peripheral interchange program
DUP	device utility program
DIR	directory program

LINK	linker
LIBR	librarian
DUMP	dump program
FILEX	file exchange program
SRCCOM	source compare program
MACRO	MACRO-11 assembly language program

Part V, Altering Assembled Programs, describes the three utility programs that permit you to examine and change assembled programs. The three utilities are:

ODT	on-line debugging technique
PATCH	patch utility
PAT	object module patch utility

Appendix A describes BATCH processing. Appendix B contains a summary of the keyboard monitor commands, their abbreviations, and their system utility program equivalents. A third appendix describes the FORMAT utility program.

3.7 RT-11 System Message Manual

The *RT-11 System Message Manual* is for all RT-11 users. It lists every error message that is normally available from the different monitors, system utilities, FORTRAN IV compiler, BASIC-11 interpreter and MACRO-11 assembler. The three major sections are FORTRAN, BASIC, and system and MACRO-11 messages. Messages are alphabetized within each section.

Both abbreviated and full forms of messages are listed. For each one, a brief explanation covers the most likely causes and at least one practical remedy is suggested.

Several short sections at the beginning of the manual cover general RT-11 system conditions that can cause the system to send you messages. "Hard Error Conditions" summarizes procedures for turning on and enabling hardware on your system. "Increasing Storage and Memory Resources" offers guidelines to review when you have inadequate storage for a program's requirements or too large a program to run. "System Failures" describes procedures for both experienced system programmers and less experienced users to use if RT-11 seems to fail completely.

3.8 RT-11 Pocket Guide

The *RT-11 Pocket Guide* serves as a handy pocket-sized reference for all RT-11 users. The pocket guide contains the following information:

- SYSCOM (system communication area) locations
- Permanent device names
- Standard file types
- Special function key commands
- Keyboard monitor command syntax and command summary
- General CSI command string format
- Command summaries for:
    EDIT
    PIP
    DUP
    DIR
    LINK
    LIBR
    DUMP
    FILEX
    SRCCOM
    ODT

```
PATCH
PAT
BATCH
FORMAT
MACRO
BASIC
FORTRAN
```
- Format of programmed requests
- Bootstraps
- Format of system subroutine library calls
- Option summary for keyboard monitor commands

3.9 RT-11 Advanced Programmer's Guide

The *RT-11 Advanced Programmer's Guide* is for experienced assembly-language programmers and for FORTRAN programmers who include assembly-language routines in their FORTRAN programs. 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 describes multi-terminal support, error logging, device handlers, and escape sequence support. Chapter 2 describes the RT-11 programmed requests, system macros that allow you to invoke system monitor services from within assembly-language programs. Chapter 3 describes how to use the extended memory capabilities of RT-11. Chapter 4 describes SYSF4, the library of FORTRAN functions and subroutines that perform RT-11 programmed requests. The appendices provide a listing of the system macro library, a description of the display file handler, and software support information.

3.10 PDP-11 MACRO-11 Language Reference Manual

The *PDP-11 MACRO-11 Language Reference Manual* is intended to help you develop programs coded in the MACRO-11 assembly language. You need not have any prior knowledge of MACRO-11 to use this manual, but you should be familiar with the PDP-11 processors and instructions.

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.

3.11 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 3.12).

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., constants, 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 the use of extended memory through FORTRAN, character codes, a language summary, and coding examples.

3.12 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 3.11). 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.

3.13 BASIC-11 Language Reference Manual
The *BASIC-11 Language Reference Manual* describes the elements of the BASIC-11 language as implemented on several PDP-11 software systems. Because the manual contains no system-dependent information, it must be used with a system-specific user's guide; the RT-11 supplement is the *BASIC-11/RT-11 User's Guide* (see Section 3.14).

Chapter 1 of the manual provides an introduction to programming in BASIC. Chapter 2 describes the language data types. Chapter 3 describes terminal input/output. Chapters 4 through 9 describe program control statements, BASIC functions, file input/output, formatted output, program segmentation, and BASIC commands, respectively. The appendices provide BASIC-11 error messages and language summary.

3.14 BASIC-11/RT-11 User's Guide
This document is for the BASIC programmer familiar with the language elements described in the *BASIC-11 Language Reference Manual*. It provides the information necessary to use BASIC-11 on the RT-11 system.

Chapter 1 describes how to use BASIC. Chapter 2 describes system-dependent input/output information. Chapter 3 describes BASIC utility functions. Chapter 4 describes how to use assembly language routines with BASIC.

3.15 Introduction to BASIC
This handbook is a tutorial-style manual designed for the novice BASIC user. It provides the entry-level 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 describes how to interact with an executing BASIC program. Chapters 4 through 8 describe loops and arrays, subroutines, math and print functions, and files. The appendices provide a summary of the BASIC language, a description of error messages and recovery procedures, and some sample programs.

4.0 OPTIONAL SOFTWARE
The following sections describe some of the software that is optionally available to run under the RT-11 operating system.

4.1 FMS-11
FMS-11, DIGITAL's Form Management System, is a set of software tools for developing data entry and display applications with the RT-11 operating system. The main components of the FMS-11 software kit are:

- Form Editor (FRED)
- Form Utility (FRMUTL)
- Form Driver (FDV)
- Application Run-Time Supervisor (ARTS)
- RT-11 Keypad Editor (KED)

This FMS-11 software brings the speed, convenience, accuracy, and low cost of computerized processing to businesses and individuals who have been using printed forms.

The Form Editor is a system program for designing, modifying, and storing form descriptions for video display. The Form Utility is a system program that allows the user to create versions of form descriptions that are suitable for hard-copy listings, memory-only applications, and other uses. BASIC-11, FORTRAN IV, and MACRO-11 programs call

the form driver, a system subroutine, to display forms and collect the data that operators type in response to the forms. The Application Run-Time Supervisor is a set of modules that provide most of the interfaces between the form application and the RT-11 operating system.

The RT-11 Keypad Editor (KED) is a text file editor that DIGITAL has designed for use with the VT100 family of video terminals. KED is an RT-11 program and is distributed with FMS-11.

Most of KED's editing functions are controlled by keys on the VT100 special function keypad. For each function, KED immediately updates the text you see on the video screen.

The documents for FMS-11 are:

- *RT-11 Keypad Editor User's Guide*
- *RT-11 Keypad Editor Reference Card*
- *FMS-11 Software Reference Manual*
- *FMS-11 Software Pocket Guide*
- *FMS-11 Software Release Notes*

4.2 MU BASIC-11

MU BASIC-11 is a multi-user version of the BASIC-11 interpreter. It operates under control of the RT-11 monitor. BASIC-11 is an easy to learn programming language (a superset of the standard BASIC language developed at Dartmouth College) that allows the programmer to create and execute a program either in its entirety or a few lines at a time. MU BASIC-11 allows up to eight users to create and execute programs simultaneously.

MU BASIC-11 runs under the foreground/background monitor and the extended memory monitor but not the single-job monitor. Under the foreground/background monitor, MU BASIC-11 can run as either the foreground or the background job, although it can run only in the background under extended memory.

The documents for MU BASIC-11 are:

- *BASIC-11 Language Reference Manual*
- *MU BASIC-11/RT-11 Installation Guide*
- *MU BASIC-11/RT-11 User's Guide*

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.

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

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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
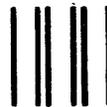☐ Other (please specify)_____

Name_____ Date _____

Organization_____

Street_____

City_____ State _____ Zip Code _____
                                                                    or
                                                                    Country

digital

digital equipment corporation