

# MACRO-11

Administrator Guide

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## Administrator Guide

Course Number  
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(J1341)

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of  
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# MACRO-11 ADMINISTRATOR GUIDE

## COURSE DESCRIPTION

### Content

MACRO-11 teaches students familiar with the organization and instruction set of the PDP-11, the PDP-11 MACRO-11 assembler and assembly language. The course is for students who will be involved in MACRO-11 program development using the following operating systems:

- RT-11
- RSX-11
- IAS

NOTE: Students using RSTS/E systems for MACRO-11 program development must use the RT-11 and RSX-11 run-time systems available under RSTS/E. MACRO-11 does not teach these facilities. Chapter 9 of the PDP-11 MACRO-11 Language Reference Manual provides information on running the MACRO-11 assembler under either of these run-time systems. For further information, check RSTS/E documentation and the RSTS/E HELP facility.

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In addition to teaching the assembler directives available under MACRO-11, the course provides instruction in modern techniques of programming and debugging, stressing modular, top-down program design.

### COURSE GOALS

1. Create MACRO-11 programs using all the major features of the MACRO-11 programming language and assembler.
2. Take a problem description and program the solution in easily manipulated modules using:
  - subroutines
  - macros
  - coroutines
  - reentrant code
3. Write MACRO-11 programs that use terminal I/O.
4. Debug MACRO-11 programs.

### NON-GOALS

This course does not teach any operating system, associated utilities, or system services.

### TARGET STUDENTS AND PREREQUISITES

#### Target Students

The target student will be doing MACRO-11 program development on one of the operating systems listed above.

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### Prerequisites

The student should have the following prerequisites:

1. Knowledge of minicomputer organization and programming as provided in the DIGITAL course, Introduction to Minicomputers
2. Knowledge of PDP-11 organization and programming as provided in the DIGITAL courses, Introduction to the PDP-11 or PDP-11 Assembly Language Programming
3. Familiarity with the operating system he/she will use in his work environment, gained from taking the DIGITAL user-level course for that operating system. The student should be able to perform the following activities:
  - Gain access to his system (login or system bootstrap)
  - Edit text files using a DIGITAL-supplied text editor
  - Obtain listings of text files
  - Run the MACRO-11 assembler, and the system task builder or linker program
  - Run task images

Prior to distributing student materials, determine if each student meets the prerequisites. Suggest remedial work in the case of minor deficiencies. A student should demonstrate proficiency beforehand, as suggested course completion times are based on adequate preparation.

### COURSE ORGANIZATION

#### Length and Format

This course is presented over a five day period in a lecture/lab setting. In a self-paced (SPI) setting, five days is the minimal time for the average student. If possible, the student should be allowed more time to complete all of the TEST exercises. Additional time and experience will produce a more proficient MACRO-11 programmer. Individual students who have never taken a SPI course may need more time to adjust to its format.



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Alert the students to take frequent breaks. The SPI experience can be intense, since the student proceeds at his own pace. The over-zealous student runs the risk of over-saturation; alert students who are working too long at a stretch. A recommended study period is thirty to forty-five minutes.

### Student Workbook Organization

In a SPI setting, the student workbook and system documentation are primary sources of information, and the course administrator a secondary resource. The course administrator may need a technical expert if he does not have the required background to answer specific questions.

Before administering the course, read the student workbook. Each module introduction contains an overview of included topics.

By understanding the workbook, you can help the student make effective use of it. It is essential to convince the students that the workbook and tests facilitate learning. The tests are for personal reinforcement, not for student comparison. They can be taken as often as necessary. Tests challenge the students to apply what they have learned. Stress that the goal is to gain as much information as possible, not to complete the course as quickly as possible.

The student workbook is divided into modules. These modules and their logical relationships are shown in the Course Map that follows. All module titles with arrows leading out of them are prerequisites to the modules into which the arrows lead. Modules appearing at the same level may be studied in any order. Otherwise, the learning path shown is the one suggested.

The modules are divided into two groups:

1. Modules that teach the mechanics of a MACRO-11 directive specification and its function
2. Modules that teach essential programming techniques in MACRO-11 while including material from the first group. This group includes the modules on macros, subroutines, reentrant code, traps, and position-independent code.

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## COURSE MAP



TK-6149

## Module Organization

Each module consists of three major divisions:

1. INTRODUCTORY MATERIAL

This section contains an introduction to the module and the module objectives. These items describe what the module is about. This section also contains a list of resources for the module.

2. MODULE TEXT

This is the largest portion of the module. It contains the text; figures, tables, and examples; and reading references for specific topics. It also includes suggested LEARNING ACTIVITIES that may involve studying a specific reference document or performing a lab exercise.

3. MODULE TEST

The module test is to be taken after the student has completed study of a module. The test includes questions requiring brief written answers or multiple-choice selection, as well as exercises requiring interaction with a computer system supporting MACRO-11.

The tests reinforce the module content and provide the student feedback on how well he understands the material. You can require the student to complete all the test questions, or make some questions optional. Recommendations for individual modules are given below.

## COURSE RESOURCES

The following materials should be distributed to each student:

1. PDP-11 MACRO-11 Language Reference Manual
2. PDP-11 Programming Card
3. PDP-11 Processor Handbook
4. IAS/RSX ODT Reference Manual (IAS and RSX-11 system users only)

The materials listed below should be available for classroom and/or lab reference.

## ADMINISTRATOR GUIDE

### All Users

Minicomputer Systems, Organization, Programming, and Applications. (PDP-11) by Richard H. Eckhouse, Jr. and .L Robert Morris. 2nd edition, Prentice-Hall: Englewood Cliffs, 1979.

This is an excellent text offering working examples of MACRO-11 applications code in many technical areas. It is recommended as a follow-up reference.

All system disks and/or individual student accounts should contain the following files:

1. Source code for the EAS macros in the module, "Macros". This material must be copied into a text file (EAS.MAC) by the course administrator.
2. The RT-11 or RSX/IAS read/write macros from the module, "Basic I/O". The filename should be IO.MAC. The choice of macros depends on the operating system used.

Because these files are required for numerous lab exercises, they are an integral part of the course resource list.

### RT-11 Users

1. Introduction to RT-11
2. RT-11 System User's Guide

### RSX-11 Users

1. RSX-11M/M-PLUS Guide to Program Development
2. RSX-11M/M-PLUS Task Builder Reference Manual

### IAS Users

1. IAS Task Builder Reference Manual

## **COURSE ADMINISTRATOR RESPONSIBILITIES**

### **Introducing Course Goals and Organization**

It is your responsibility to introduce this material clearly and positively to prepare students for a rewarding experience. Your first session should include a discussion of each course resource, including the student workbook, instructions on module tests, and relevant reference manuals.

A computer system running the needed operating system is an essential part of the course. At the first study session:

1. inform the students of the computer terminal(s) location.
2. inform the students of EAS.MAC and I/O macros in their directories
3. assign user UICs for multiuser systems.

### **Creating a Suitable Study Environment**

The study environment is important. Students should be provided a quiet, well-lit area with ample table space, close to the computer terminals. The room should allow quiet study, but include an additional space for student discussions. Experience shows that fellow students are an important resource. Students working together can help reduce administrator/technical expert involvement.

### **Assisting Students**

This course is self-paced, but students will occasionally have technical questions. A knowledgeable person should be accessible should a question arise. Students should be encouraged, however, to find answers themselves, turning to the technical expert only when diligent research fails.

## Monitoring Student Progress

As course administrator, you must monitor the progress of each student using the Master Progress Plotter contained in the Appendix. Note the time that each module is assigned as well as the time the module is completed. Also initial the Personal Progress Plotter in the student workbook, after evaluating TEST results. How you handle test administration is up to you. You can score tests yourself, or allow students to do this on their own using the provided TEST SOLUTIONS package. Discuss your method of test administration at the first class session.

## Keeping Students Involved

The SPI format encourages individual learning. The student need not study material with which he is already familiar. If he can immediately meet the objectives of a module, he should take the TEST. If he completes this successfully, he should go on to the next module.

Some students may find the SPI format of individual study difficult. This can create anxiety, hindering success. Stress your availability to students having apparent difficulties. If a student is lagging behind, you may need to provide considerable help. The following guidelines will help you gauge student progress. These guidelines assume that five full days are allotted to complete the course.

1. Students should complete the first nine or ten modules by the end of the second day. Many of these modules do not require test exercises.
2. The remaining modules contain the most substantive material, including that on macros and subroutines. The students must have enough time to complete this material. If a student is falling behind, you can have him skip selected module test questions. The module, "Macros", is a good example of this. The module, "Reentrant Code", is intended only for those writing shareable code. If a student is lagging far behind, he can skip the module, "Posititon-Independent Code."

If several students are having difficulty with a given subject, you, or the technical expert can give a brief lecture on the material. Periodically check to determine if there is collective difficulty on a specific topic.

## APPENDIX MASTER PROGRESS PLOTTER

	Program Development Process		MACRO-11 Functions		Listing Control Directives	
NAME	DATE		DATE		DATE	
	ASSIGN	COMPLETE	ASSIGN	COMPLETE	ASSIGN	COMPLETE

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NAME	Linking Object Modules		Program Debugging		ODT	
	DATE		DATE		DATE	
	ASSIGN	COMPLETE	ASSIGN	COMPLETE	ASSIGN	COMPLETE















