BOOT11
PDP–11 Bootstrap from DECsystem–10 over a DL10

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1.0 INTRODUCTION

BOOT11 is a bootstrap program designed to load or dump programs from the DECsystem-10 into a PDP-11 through the DECsystem-10/PDP-11 Data Link (DL10). The two main functions of BOOT11 are:

1. Loading a program into PDP-11 memory from a DECsystem-10 disk file or the DECsystem-10 paper tape reader.

NOTE
BOOT11 reads ONLY formatted binary PDP-11 files.

2. Dumping the contents of PDP-11 memory to a DECsystem-10 disk file as a formatted ASCII file suitable for listing on a line printer.

BOOT11 runs in user mode under the DECsystem-10 time sharing system, TOPS-10. It requires a minimum of 2K of memory but expands for I/O buffers and for the common memory area the DL10 provides to the PDP-11. BOOT11 "locks" itself in DECsystem-10 memory and does I/O instructions direct to the DL10 hardware. To run BOOT11, you must be logged in as [1,2] and have privileges for the TRPSET and LOCK functions of TOPS-10.

2.0 OPERATION AND COMMAND STRING FORMAT

The program BOOT11 normally resides in the system SYS: area. When you enter R BOOT11, the program responds by typing

FILE:

and waits for some typed input, which must be terminated by a carriage return. The expected input is a standard DECsystem-10 file descriptor followed by switches telling BOOT11 what to do.

2.1 Loading the PDP-11

/LOAD:S — Load the PDP-11 from the specified DECsystem-10 file and set the starting address to the octal value S (do not START). If :S is omitted, the starting address of the input file is used.

/START:S — Load the PDP-11 from the specified DECsystem-10 file and start the -11 at octal location S. If :S is not present, the default :S is the starting address from the file loaded. If the starting address from the file or from :S is odd, do /LOAD and do not start. This is the default if no switches are used.

/CLEAR:C — Zero PDP-11 memory from location 0 to C-1. /CLEAR can be used with /LOAD or /START to zero -11 memory before loading. If :C is omitted, clear all memory.

/IMAGE — Read the PDP-11 load file in /IMAGE mode. The PDP-11 assemblers can write binary files into the DECsystem-10 file system in either a "packed" or an "unpacked" format. The /IMAGE switch tells BOOT11 to assume "unpacked" form. Reading from the paper tape reader automatically sets the /IMAGE switch so the file is read in "unpacked" format.

/PORTNO:P — Do the specified operation for PDP-11 number P. (PDP-11's 0-3 are on DL10#0; 4-7 are on DL10#1.) BOOT11 requires that the port number be explicitly given when there is more than one PDP-11 on all the DL10's on the system.

/CLEAR, /IMAGE and /PORTNO can be used with /LOAD or /START. /LOAD and /START cannot be used together. Any switch can be abbreviated but the abbreviation must be unique.

For example, to load the file DN8703 over port number 2, respond to the "File:" prompt with:

```
File: SYS:DN8703/PORT:2
```

To clear the PDP-11 on port number 3, respond to the "File:" prompt with:

```
File: /CLEAR/PORT:3
```

2.2 Dumping the PDP-11

/DUMP:M — Dump PDP-11 memory starting at octal location M into the specified DECsystem-10 file. If :M is omitted, 0 is assumed.

/END:N — N-1 is the last address of the dump. If :N is omitted, the highest available address is assumed.

/PORTNO:P — Do the specified operation for PDP-11 number P. (PDP-11's 0-3 are on DL10#0; 4-7 are on DL10#1.) BOOT11 requires that the port number be explicitly given when there is more than one PDP-11 on all system DL10's.

These three switches can be used together. /DUMP is required for dumping.

For example to dump the memory of the PDP-11 on port number 0 onto the file called DN2X, respond to the "File:" prompt with:

```
File: DN2X/DUMP/PORT:0
```

2.3 Getting Help

/HELP — Read and type the help text from file SYS:BOOT11.HLP.

2.4 Defaults

Defaults are assumed for any parts of the file descriptor or switch values not explicitly specified. They are:

Item	Default
DEVICE:	DSK:
FILENAME	PDPXIp "p" represents the PDP-11 number from /PORTNO:P.
.EXTENSION	.BIN for loading, or .LSD for dumping (A blank extension may be specified by typing a dot with no extension following it.)
[PROJ,PROG]	the user's logged in ppn
:C	First UNIBUS trap
:M	0
:N	First UNIBUS trap
:S	starting address in input file
:P	0[1]

If no switches are specified, BOOT11 defaults to /START. If the entire input command is omitted and only a carriage return is typed, the default action is:

DSK:PDPXI0.BIN/START/PORTNO:0[1]

The simplest dump is /D. The defaults expand to:

DSK:PDPXI0.LSD/DUMP:0/END:first UNIBUS trap/PORTNO:0[1]

The switches can be abbreviated so long as the abbreviation is unique.

3.0 PDP-11 FORMATTED (ABSOLUTE) BINARY FILES

BOOT11 reads only PDP-11 formatted binary files. These files may be produced by:

1. MACRO-11 (which runs on the PDP-11). The .ENABL ABS pseudo-instruction or the /EN:ABS switch in the command string produces the binary output in formatted binary form.

2. MACDLX (which runs on the DECsystem-10). The .ABS pseudo-instruction gives formatted binary output. The output can be directed to the file system or to paper tape. The /I switch in the command string gives "unpacked" formatted binary.

3. MACY11 (which runs on the DECsystem-10). The .ENABL ABS pseudo-instruction, the .ABS pseudo-instruction (not preferred), and the /EN:ABS switch in the command string can be used to give formatted binary output. The /I command string switch gives "unpacked" binary output.

---

[1] BOOT11 requires that the port number be explicitly given when there is more than one PDP-11 on all DL10's on the system.

4. LINK (running on the PDP-11) loads relocatable binary files and produces formatted binary output.

5. LNKX11, the DECsystem-10 executable version of LINK, reads relocatable binary files for the PDP-11 and produces formatted binary output. The /I command string switch gives "unpacked" binary output.

There are two versions of formatted binary output produced by MACDLX, MACY11 and LNKX11: packed and unpacked. The packed variation is the normal default and consists of four 8-bit frames of formatted binary output packed into one DECsystem-10 word. (The packed binary files are very conveniently stored in the DECsystem-10 file system.) The packed format cannot be punched onto paper tape directly with any current program other than the paper tape spooler. QUEUE's /TAPE:ELEVEN switch tells the spooler to unpack the packed data for the paper tape punch.

The unpacked variation consists of one 8-bit frame per DECsystem-10 word and is produced by using the /I command string switch. The "unpacked" variation is the required form of the binary data if it is to be punched onto paper tape either directly or with PIP. (If PIP is used, PIP's /I switch is required.)

BOOT11 reads either "packed" or "unpacked" binary data. For "unpacked" data, the /IMAGE switch is required. If BOOT11 reads an "unpacked" file from the file system without the /IMAGE switch, it detects an error and prints a warning message, sets the /IMAGE switch and starts the loading operation over again. When reading from the paper tape reader, BOOT11 always sets the /IMAGE switch itself, so no /IMAGE switch is required in the command string.

PDP-11 paper tapes in formatted binary may be transferred to the -10 file system for future use. The tape should be placed in the DECsystem-10 paper tape reader with the read head in the blank tape area after the punched title, if any, and before the binary data. (The start of the binary data is indicated by a frame of 1 followed by a frame of 0.) PIP, with the /I switch, copies the tape into the file system. Files transferred this way are in the "unpacked" format. Use the /IMAGE switch in BOOT11.

4.0 GENERAL INTERNAL OPERATION

BOOT11 uses the DL10 hardware to load, clear, or dump PDP-11 memory and to start or stop the PDP-11 processor itself.

The PDP-11 console panel has a "remote control cable" that plugs into the DL10. This cable enables the DL10 to toggle the PDP-11 HALT and START switches remotely, to examine the state of PDP-11 power, and to determine if the PDP-11 is running or is stopped. When the DL10 starts the PDP-11, the DL10 sends the starting address to the PDP-11 over the UNIBUS. The starting address (100002) is an area of -11 memory to which the DL10 responds and supplies data from DECsystem-10 memory cores. In effect, a PDP-11 program is started which executes out of DECsystem-10 memory. This PDP-11 program is part of BOOT11 and has the major function of transferring data from the -10 to the -11 for loading and clearing operations, or from the -11 to the -10 for the dumping operation. BOOT11 either supplies data to the -11 from the formatted binary input file, or takes the PDP-11 core image and writes an -11 dump file on some -10 device.

As it executes, BOOT11 issues status messages (see below). Error messages are generated for certain malfunctions. These messages are listed in the next section.

5.0 BOOT11 PROGRESS MESSAGES AND WARNINGS

" PDP-11 loading from file: DSK:DN8727.BIN[1,4]
The PDP-11 is being loaded with the formatted binary input file data.

" PDP-11 loaded

" PDP-11 started
Loading is complete and the PDP-11 is now executing code in its own memory.

" PDP-11 dumping to file: DSKP:ABCD.LSD[35,5135,WORK]
PDP-11 memory is being dumped into a DECsystem-10 file.

" PDP-11 dumped

" CLEARING PDP-11
PDP-11 memory is being zeroed.

% File zero byte count--trying again in /IMAGE mode
This warning message indicates that the formatted binary input file is not in "packed" form and probably is really "unpacked" data. BOOT11 sets the /IMAGE switch and tries to load the file again in the "unpacked" format.

%DAEMON UUO error while trying to append to ERROR.SYS.
%Reason: Program does not have privileges required.
You must be logged in as [1,2] to run BOOT11.

?Error While trying to append to ERROR.SYS you do not have the privileges required to run BOOT11.

5.1 Command String Error Messages

? Can't /CLEAR and /DUMP at the same time
PDP-11 memory cannot be cleared and dumped at the same time because /CLEAR zeroes memory. Thus these two switches cannot be used together.

? Can't /LOAD and /DUMP at the same time
These two switches have contradictory effects and cannot be used together.

? Can't do both /LOAD and /START
/START automatically /LOADs the PDP-11 from the specified DECsystem-10 file. Used together, these two switches are redundant.

? Port number must be 0-7
When the total number of PDP-11's which exist on all DL10's on the system is greater than one, BOOT11 requires that the user give an explicit port number in the range 0-7 (0-3 denote ports on the first DL10, 4-7 denote ports on the second DL10 if it exists).

? AMBIGUOUS SWITCH--TYPE /H FOR HELP
The user has typed a switch abbreviation which is not unique. /H will print out the HELP file of defined commands and switches.

? UNKNOWN SWITCH--TYPE /H FOR HELP
The user has typed a switch that BOOTll does not recognize. /H will print out the HELP file.

? COMMAND ERROR--TYPE /H FOR HELP
The command string is incorrect. /H will print out the HELP file.

5.2 Formatted Binary File Input Error Messages

? CAN'T OPEN THE INPUT DEVICE
The input device does not exist or is in use. (Also refer to the DECsystem-10 Monitor Calls Manual.)

? LOOKUP FAILED
The input file is not found, is read protected, or the input device cannot do input. (Also refer to the DECsystem-10 Monitor Calls Manual.)

? EOF AT START OF FILE GROUP
This and the next five EOF failures occur when the end of the input file is reached and more data are required for the binary format.

? EOF AFTER FILE CONSTANT 1
? EOF DURING DATA IN FILE GROUP
? EOF FOUND WHEN LOOKING FOR CHECKSUM
? EOF DURING FIRST BYTE OF A WORD
? EOF DURING SECOND BYTE OF A WORD
? INPUT FILE READ ERROR

? FILE GROUP HAS JUNK INSTEAD OF CONSTANT 0
This and the next five messages indicate that the input binary file is not in the correct data format.

? FILE GROUP HAS JUNK INSTEAD OF CONSTANT 1
? FILE GROUP BYTE COUNT LESS THAN 6
? JUNK BITS IN INPUT FILE

? JUNK IN INPUT FILE--MAY NOT BE /IMAGE MODE
Reading a "packed" formatted input file with the /IMAGE switch will normally produce this message. Try again without the /IMAGE switch.

? JUNK AFTER START GROUP
Not enough zero 8-bit frames are on the end of the file. A paper tape torn too close to the end of the binary data will give this message. Leave at least ten zero frames on the tape end (at least one inch or 2.5cm).

? CHECKSUM FAILURE
The data check in the binary file is wrong.

5.3 Dump File Output Error Messages

? CAN'T OPEN THE OUTPUT DEVICE
The output device does not exist or is in use. (Also refer to the DECsystem-10 Monitor Calls Manual.)

? ENTER FAILED
The output file is being modified or the file or the UFD is write protected. (Also see the DECsystem-10 Monitor Calls Manual.)

? OUTPUT DEVICE ERROR
Insufficient room exists on the output device for the dump file. (Refer to the DECsystem-10 Monitor Calls Manual.)

? FILE CANNOT BE WRITTEN
Error from -10 on output file. Hardware may be the cause.

5.4 Miscellaneous Failure Messages

? LOCK FAILURE n
The notation n represents one of the following error codes:

Code	Condition
0	Either the LOCK monitor call does not exist in the system, or the requested LOCK function has not been implemented (the function may not have been defined in MONGEN or the appropriate feature test switch may be turned off.)
1	The job has no LOCK privileges.
2	Doing the LOCK monitor call would make it impossible to run the largest existing nonlocked job.
3	Locking the job would cause the amount of unlocked memory to be less than CORMIN. (Ask the operator to SET CORMIN n to a smaller value.)
4	The mode of locking requested exec virtual memory but the allowable amount of exec mapping has been exhausted.
5	An illegal subfunction argument has been supplied.
6	The specified page is unavailable.

For further description of these error conditions, see the section on error codes for the LOCK monitor call in the Decsystem-10 Monitor Calls Manual.

? PORT SWITCH REQUIRED

BOOT11 requires that the port number be explicitly given when the total number of PDP-11's existing on all DL10's on the system is greater than one. If BOOT11 is not given a port switch and determines that one is required (e.g., PDP-11's exist on ports 0, 1, and 2), it responds with

```
PDP11'S EXIST ON PORTS
0 1 2
?  PORT SWITCH REQUIRED
FILE:
```

to which the user should re-enter the command string and include the appropriate port number.

? NXM IN -11 MEMORY
The PDP-11 had a bus trap failure. This usually results from trying to load or dump more PDP-11 memory than exists.

? PDP-11 WON'T STOP
The DL10 cannot stop the PDP-11. The problem is likely the control cable from the DL10 to the PDP-11.

? GETTAB 100 TO FIND UPMP FAILED
This GETTAB is used by BOOT11 to tell the DL10 where BOOT11 got LOCKed in core. This failure indicates that the GETTAB is not defined in the user's monitor.

? PDP-11 ABSENT OR POWER OFF
Either a DL10 is not connected to the DECsystem-10, or the specified PDP-11 or its DL10 has its power turned off, or there is no PDP-11 on the specified port.

? PDP-11 TOOK TOO LONG IN TRANSFER LOOP
BOOT11 has counters in each wait loop for the PDP-11. The counter counted out too long before the PDP-11 completed a step in a DECsystem-10/PDP-11 transfer operation for /LOAD, /DUMP, or /CLEAR.

? TRPSET FAILED
The job does not have the privileges for TRPSET, or TRPSET is not built into this version of the monitor.

? INSUFFICIENT CORE
BOOT11 needs more memory and cannot obtain it from the monitor.

? NXM OR PARITY ERROR IN -10 MEMORY
The DL10 has referenced nonexistent DECsystem-10 memory or has discovered a memory problem.

? PDP-11 WON'T START--CHECK HALT SWITCH
The DL10 cannot start the PDP-11 within the preset time interval (a few seconds). The usual reason is that the PDP-11 HALT switch is depressed. Check the HALT switch and try again. (Another infrequent cause is a timing problem between the DL10 and PDP-11; another try usually succeeds.)

? ADDRESS CHECK OCCURRED DURING UUO PROCESS
You are probably using the wrong monitor. You must bring up a current monitor that supports networks to proceed.

? COULDN'T READ SYSTEM'S NAME
You are probably using the wrong monitor.

? DL10 NO. X NON-EXISTENT
You have either entered the wrong DL10 number, or there is a hardware failure.

? ERROR IN -10 MEMORY
A hardware error has occurred; contact Field Service.

? ILLEGAL FUNCTION CODE WAS SPECIFIED
This is a DAEMON logging error caused by a software failure.

? IMPOSSIBLE ERROR NUMBER 4
Error caused by software failure.

? INCORRECT NUMBER OF ARGUMENTS FOR UUO
Error caused by software failure.

? INVALID FACT ENTRY FORMAT
Error caused by software failure during DAEMON logging.

? INVALID PATH SPECIFICATION FOR UUO
You may be using the wrong monitor.

? NO PDP-11s EXIST ON DL10 NO. X
You may have a hardware failure or there may be an invalid specification of your hardware configuration. Contact Field Service, and check your MONGEN procedure.

? NXM AT Y
A hardware failure has occurred. Contact Field Service.

? PATH. UUO TO READ DUMP FILE-SPEC FAILED
A software error has occurred. You may be using the wrong or noncurrent software.

? PATH. UUO TO READ INPUT FILE FAILED
A software error has occurred. You may be using the wrong software for your current system or configuration.

? PDP-11 ONLY EXISTS ON PORT P
You cannot specify a port number where no PDP-11 is connected.

? UNKNOWN DAEMON UUO ERROR CODE
This is a DAEMON logging error caused by a software failure. Use a more up-to-date version of the software.

? UNKNOWN ERROR...
This usually indicates a software failure. Verify that you are using the correct version of the software.

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