

DB(VI)

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NAME

db - debug

SYNOPSIS

dba.outcore

DESCRIPTION

*Unlike many debugging packages (including the Digital Equipment Corporation's ODT, on which db is loosely based), db is not loaded as part of the core image which it is used to examine; instead it examines files. Typically, the file will be either a core image produced after a fault or the binary output of the assembler. Core is the file being debugged; if omitted **core** is assumed. **Namelist** is a file containing a symbol table. If it is omitted, the symbol table is obtained from the file being debugged, or if not there from **a.out**. If no appropriate name list file can be found, db can still be used but some of its symbolic facilities become unavailable.*

For the meaning of the optional third argument, see the last paragraph below.

The format for most *db* requests is an address followed by a one character command. Addresses are expressions built up as follows:

1. A name has the value assigned to it when the input file was assembled. It may be relocatable or not depending on the use of the name during the assembly.
2. An octal number is an absolute quantity with the appropriate value.
3. A decimal number immediately followed by '.' is an absolute quantity with the appropriate value.
4. An octal number immediately followed by **r** is a relocatable quantity with the appropriate value.
5. The symbol **.** indicates the current pointer of *db*. The current pointer is set by many *db* requests.
6. A ***** before an expression forms an expression whose value is the number in the word addressed by the first expression. A ***** alone is equivalent to ***.'**
7. Expressions separated by **+** or blank are expressions with value equal to the sum of the components. At most one of the components may be relocatable.
8. Expressions separated by **-** form an expression with value equal to the difference to the components. If the right component is relocatable, the left component must be relocatable.
9. Expressions are evaluated left to right.

Names for registers are built in:

r0 ... r5
sp
pc
fr0 ... fr5

These may be examined. Their values are deduced from the contents of the stack in a core image file. They are meaningless in a file that is not a core image.

If no address is given for a command, the current address (also specified by **.'**) is assumed. In general, **.'** points to the last word or byte printed by *db*.

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There are *db* commands for examining locations interpreted as numbers, machine instructions, ASCII characters, and addresses. For numbers and characters, either bytes or words may be examined. The following commands are used to examine the specified file.

- / The addressed word is printed in octal.
- \ The addressed byte is printed in octal.
- " The addressed word is printed as two ASCII characters.
- ' The addressed byte is printed as an ASCII character.
- ` The addressed word is printed in decimal.
- ? The addressed word is interpreted as a machine instruction and a symbolic form of the instruction, including symbolic addresses, is printed. Often, the result will appear exactly as it was written in the source program.
- & The addressed word is interpreted as a symbolic address and is printed as the name of the symbol whose value is closest to the addressed word, possibly followed by a signed offset.
- <nl> (i. e., the character "new line") This command advances the current location counter "." and prints the resulting location in the mode last specified by one of the above requests.
- ^ This character decrements "." and prints the resulting location in the mode last selected one of the above requests. It is a converse to <nl>.
- % Exit.

Odd addresses to word-oriented commands are rounded down. The incrementing and decrementing of "." done by the <nl> and ^ requests is by one or two depending on whether the last command was word or byte oriented.

The address portion of any of the above commands may be followed by a comma and then by an expression. In this case that number of sequential words or bytes specified by the expression is printed. "." is advanced so that it points at the last thing printed.

There are two commands to interpret the value of expressions.

- = When preceded by an expression, the value of the expression is typed in octal. When not preceded by an expression, the value of "." is indicated. This command does not change the value of ".".

An attempt is made to print the given expression as a symbolic address. If the expression is relocatable, that symbol is found whose value is nearest that of the expression, and the symbol is typed, followed by a sign and the appropriate offset. If the value of the expression is absolute, a symbol with exactly the indicated value is sought and printed if found; if no matching symbol is discovered, the octal value of the expression is given.

The following command may be used to patch the file being debugged.

- ! This command must be preceded by an expression. The value of the expression is stored at the location addressed by the current value of ".". The opcodes do not appear in the symbol table, so the user must assemble them by hand.

The following command is used after a fault has caused a core image file to be produced.

- \$ causes the fault type and the contents of the general registers and several other registers to be printed both in octal and symbolic format. The values are as they were at the time of the fault.

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For some purposes, it is important to know how addresses typed by the user correspond with locations in the file being debugged. The mapping algorithm employed by *db* is non-trivial for two reasons: First, in an **a.out** file, there is a 20(8) byte header which will not appear when the file is loaded into core for execution. Therefore, apparent location 0 should correspond with actual file offset 20. Second, addresses in core images do not correspond with the addresses used by the program because in a core image there is a header containing the system's per-process data for the dumped process, and also because the stack is stored contiguously with the text and data part of the core image rather than at the highest possible locations. *Db* obeys the following rules:

If exactly one argument is given, and if it appears to be an **a.out** file, the 20-byte header is skipped during addressing, i.e., 20 is added to all addresses typed. As a consequence, the header can be examined beginning at location -20.

If exactly one argument is given and if the file does not appear to be an **a.out** file, no mapping is done.

If zero or two arguments are given, the mapping appropriate to a core image file is employed. This means that locations above the program break and below the stack effectively do not exist (and are not, in fact, recorded in the core file). Locations above the user's stack pointer are mapped, in looking at the core file, to the place where they are really stored. The per-process data kept by the system, which is stored in the first part of the core file, cannot currently be examined (except by \$).

If one wants to examine a file which has an associated name list, but is not a core image file, the last argument "-" can be used (actually the only purpose of the last argument is to make the number of arguments not equal to two). This feature is used most frequently in examining the memory file /dev/mem.

SEE ALSO

as(I), core(V), a.out(V), od(I)

DIAGNOSTICS

"File not found" if the first argument cannot be read; otherwise "?".

BUGS

There should be some way to examine the registers and other per-process data in a core image; also there should be some way of specifying double-precision addresses. It does not know yet about shared text segments.