

Cray Assembly Language (CAL) symbolically expresses all hardware functions of Cray Research parallel vector processing (PVP) systems. This detailed and precise level of programming is especially helpful for tailoring programs to the architecture of a Cray PVP system and for writing programs that require code that is optimized to the hardware.

In addition to the instruction set, CAL also includes a versatile set of pseudo instructions that provides a variety of options for generating macro instructions, controlling listing output, organizing programs, and so on.

With the release of CAL 9.1, IEEE floating-point hardware is supported on CRAY T90 systems.

Related publications

This manual is written for experienced programmers. The following documents contain additional information that may be helpful:

- *Cray Assembly Language (CAL) for Cray PVP Systems Ready Reference*, publication SQ-3110
- *Symbolic Machine Instructions Reference Manual*, publication SR-0085
- *UNICOS User Commands Reference Manual*, publication SR-2011
- *UNICOS Macros and Opdefs Reference Manual*, publication SR-2403
- *CF90 Commands and Directives Reference Manual*, publication SR-3901
- *CF90 Fortran Language Reference Manual, Volume 1*, publication SR-3902

- *CF90 Fortran Language Reference Manual, Volume 2*, publication SR-3903
- *CF90 Fortran Language Reference Manual, Volume 3*, publication SR-3905

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Customers who subscribe to the CRInform program can order software release packages electronically by using the Order Cray Software option.

Customers outside of the United States and Canada should contact their local service organization for ordering and documentation information.

Conventions

The following conventions are used throughout this document:

<u>Convention</u>	<u>Meaning</u>
<code>command</code>	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
<code>manpage(x)</code>	<p>Man page section identifiers appear in parentheses after man page names. The following list describes the identifiers:</p> <ul style="list-style-type: none"> 1 User commands 1B User commands ported from BSD 2 System calls 3 Library routines, macros, and opdefs 4 Devices (special files) 4P Protocols 5 File formats 7 Miscellaneous topics 7D DWB-related information 8 Administrator commands <p>Some internal routines (for example, the <code>ddcntl()</code> routine) do not have man pages associated with them.</p>
<i>variable</i>	Italic typeface denotes variable entries and words or concepts being defined.
user input	This bold fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.
.	A vertical ellipsis indicate a continued sequence of code in the sample program.
[]	Brackets enclose optional portions of a command line.

The following machine naming conventions may be used throughout this document:

<u>Term</u>	<u>Definition</u>
Cray PVP systems	<p>All configurations of Cray parallel vector processing (PVP) systems, including the following:</p> <p>CRAY C90 series (CRAY C916, CRAY C92A, CRAY C94, CRAY C94A, and CRAY C98 systems)</p> <p>CRAY C90D series (CRAY C92AD, CRAY C94D, and CRAY C98D systems)</p> <p>CRAY J90 series (CRAY J916 and CRAY J932 systems)</p> <p>CRAY T90 series (CRAY T94, CRAY T916, and CRAY T932 systems)</p>
All Cray Research systems	All configurations of Cray PVP and Cray MPP systems that support this release

The default shell in the UNICOS operating system, referred to in Cray Research documentation as the standard shell, is a version of the Korn shell that conforms to the following standards:

- Institute of Electrical and Electronics Engineers (IEEE) Portable Operating System Interface (POSIX) Standard 1003.2–1992
- X/Open Portability Guide, Issue 4 (XPG4)

The UNICOS operating system also supports the optional use of the C shell.

Cray UNICOS Version 9.0 is an X/Open Base 95 branded product.

The POSIX standard uses *utilities* to refer to executable programs that Cray Research documentation usually refers to as *commands*. Both terms may appear in this document.

Online information

The following types of online information products are available to Cray Research customers:

- CrayDoc online documentation reader, which lets you see the text and graphics of a document online. The CrayDoc reader is available on workstations. To start the CrayDoc reader at your workstation, use the `cdoc(1)` command.
- Man pages, which describe a particular element of the UNICOS operating system or a compatible product. To see a detailed description of a particular command or routine, use the `man(1)` command.
- UNICOS message system, which provides explanations of error messages. To see an explanation of a message, use the `explain(1)` command.
- Cray Research online glossary, which explains the terms used in a document. To get a definition, use the `define(1)` command.
- `xhelp` help facility. This online help system is available within tools such as the Program Browser (`xbrowse`) and the MPP Apprentice tool.

For detailed information on these topics, see the *User's Guide to Online Information*, publication SG-2143.

Reader comments

If you have comments about the technical accuracy, content, or organization of this document, please tell us. You can contact us in any of the following ways:

- Send us electronic mail from a UNICOS or UNIX system, using the following UUCP address:

```
uunet!cray!publications
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- Send us electronic mail from any system connected to the Internet, using the following Internet address:

```
publications@timbuk.cray.com
```

- Contact your Cray Research representative and ask that a Software Problem Report (SPR) be filed. Use PUBLICATIONS for the group name, PUBS for the command, and NO-LICENSE for the release name.
- Call our Software Publications Group in Eagan, Minnesota, through the Customer Service Call Center, using either of the following numbers:
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