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- J. Anderson
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- M. Jones (HO)
Thanks
from Judi

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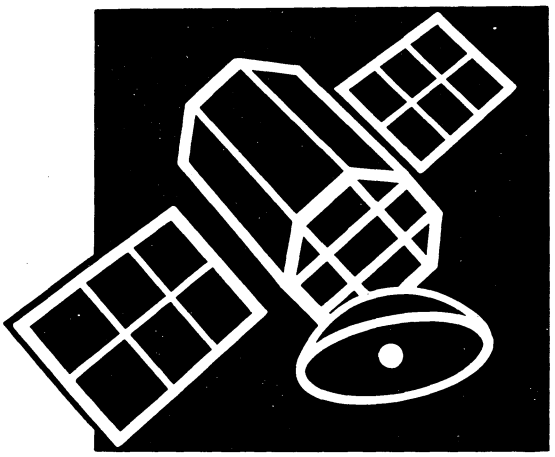
Release 1.0 October 1988



iPSC/2 Ada is a fully validated Ada environment, including compiler and runtime libraries, for the iPSC/2 Concurrent Supercomputer. Extended with iPSC/2 message-passing communications between Ada tasks on different iPSC/2 nodes, iPSC/2 Ada provides an unprecedented development environment for very large Ada-based supercomputer applications.

iPSC/2 Ada is a complete Ada development environment based on Verdix Corporation's VADS (Verdix Ada Development System). iPSC/2 Ada offers all of the VADS tools—compiler, linker, make, debugger, and disassembler—tailored for the iPSC/2 system. The standard Ada runtime system is extended with a library of iPSC/2 communication and system calls, allowing tasks on different nodes to exchange data messages and synchronize execution. As a member of the Concurrent Workbench™, iPSC/2 Ada tasks can exchange messages with C, Fortran, and Lisp programs on the iPSC/2 system.

COMPLETE

iPSC/2 Ada is a complete implementation of Ada, as defined in the Ada Reference Manual, and passes the 1.9 Validation Suite. All Chapter 13 I/O facilities are supported at each processor node, or by shared facilities on the System Resource Manager (SRM). Formal validation is planned for July, 1989.

PROGRAMMING MODEL

The iPSC/2 Ada programmer can create both host programs for execution on the SRM and node programs for execution on each of the iPSC/2 nodes. Large applications are typically divided into a number of tasks, and the tasks are distributed to different nodes of the iPSC/2 system. Full Ada tasking, with rendezvous, is supported within each iPSC/2 node; Ada tasks on separate iPSC/2 nodes communicate by passing iPSC/2 messages.

DEVELOPMENT CYCLE

The programmer writes code using an editor on the iPSC/2 SRM, a UNIX-based system that connects the iPSC/2 system to networks of workstations and other computer systems. A dependency compilation tool, *a.make,* is used to automatically determine the compilation order and to invoke the necessary compile and linking steps to produce an executable image.

When errors are discovered by the compiler, an error-handling program can be automatically invoked, inserting the error messages as comments within the source of the offending code. The users are then placed in their preferred editor, with the source file, and can then repair the code.

FEATURES

Compiler. The Ada compiler resident on the iPSC/2 SRM produces high-performance, efficient code for the Intel 80386 processor on the iPSC/2 node. Multiple levels of optimization, as well as automatic invocation of error handling, are all controlled by the user via switches.

Debugger. A symbolic debugger hosted on the SRM allows the programmer to debug code on individual iPSC/2 nodes in source language terms. The debugger is fully-featured, offering access and modification of variables, as well as controlling execution of code.

Library Maintenance. A variety of tools are supplied to manage runtime libraries, including: library initialization, creation and removal of library directories, specification of search list, installation, listing, and removal of the contents of a library, and determination of the location of a compilation unit in multiple libraries.

Linker. The linker combines Ada compilation units, and invokes the resident UNIX *ld* linker to produce an executable image for either the iPSC/2 node or the SRM.

Make. A dependency recompilation tool, called *a.make,* is provided to automatically determine the need for compilation, and correct order of compilation, of the user's code. The environment is flexible and can be configured to invoke compilation, linking, and loading from this tool.

Analysis. Development of code for nodes can sometimes demand more information than provided by the debugger, and for this purpose an object code disassembler, called *a.das,* is provided.

Listing. A separate tool for listing source code, with and without error messages, is provided for the user's convenience.

SPECIFICATIONS

Language Compatibility	iPSC/2 Ada is completely compatible with all other iPSC/2 languages via the iPSC/2 message-passing protocol. iPSC/2 Ada Release 1.0 is compatible with VADS for UNIX, Version 5.5.
Image Size	Approximately 500 KBytes for NX/2 and iPSC/2 Ada, at each node.
System Requirements	The NX/2 operating system for the iPSC/2, Release 2.3 or later. An iPSC/2 system with a minimum of 1 MByte memory on each iPSC/2 node for which iPSC/2 Ada will be mounted. An iPSC/2 system with at least eight nodes, each with 4 MBytes memory, is recommended; there is no limit on the maximum number of nodes loaded with iPSC/2 Ada.
Ordering Information	Contact your sales representative.

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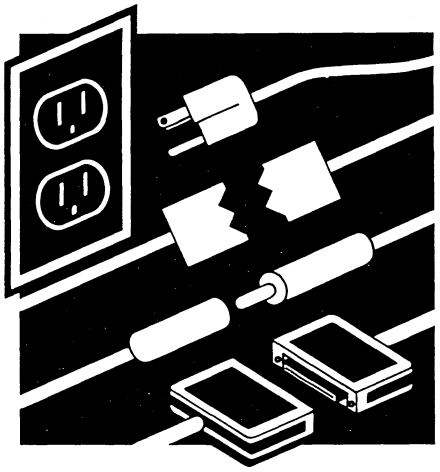

The iPSC®/2 offers an open I/O architecture, based on industry standards such as Multibus®II and VMEbus, that allows rapid development of custom Interfaces. The VME device interface works with off-the-shelf hardware to form low-cost interfaces to such devices as network controllers, bus repeaters, graphics systems and data acquisition systems.

STANDARD BUILDING BLOCKS FOR CUSTOM INTERFACES

VMEbus is an international standard for interfacing computer system components at the circuit board level. When an application needs an interface not available as a standard product for the iPSC/2, VME device interfaces can be used as I/O ports for user-supplied devices. For example, single-board VME-compatible I/O modules are available from many vendors and can be connected to an iPSC/2 I/O node via the VMEbus interface to form a customized data acquisition interface. Using standard, off-the-shelf modules cuts down interface development time and can lower the cost of hardware as well.

TYPICAL OPERATING MODES

The VME external interface connects standard VME devices to the iPSC/2 via I/O nodes. (See Figure 1) In operation, the I/O node acts as bus master for the local VME interface while the VME device acts as bus slave. The I/O node performs reads or writes across the VME bus at burst rates of up to 4 MBytes per second and uses common data word sizes up to 32 bits. The I/O node processor views VME address space directly through a 4 MByte window, and can reach all 32 bits of the VME address space with the use of a page register. The slave device can generate interrupts on any of seven VME interrupt lines for the I/O node.

EXPANDABLE, MODULAR DESIGN

The VME interface has three standard components: (1) the VME compatible device chosen by the user, (2) an I/O node, which is an 80386-based processor, and (3) a Bus Interface Adaptor (BIA). The BIA translates between the VME bus and a local bus that comes off the I/O node. Physically, the BIA is a small circuit board connected into a backplane card slot next to the I/O node (See Figure 2). The outside edge of the adaptor presents a standard VMEbus circuit board interface across two connectors. The adaptor also changes the card slot depth into a standard six-unit, double-high Eurocard form factor.

Additional I/O capacity can be employed by adding I/O nodes with BIA's, or by connecting BIA's to external multiple-board systems available from various vendors. Up to 127 I/O nodes can be added to a 128-node iPSC/2.

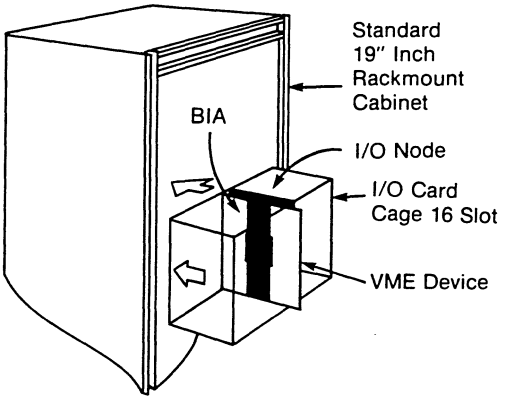

Figure 2

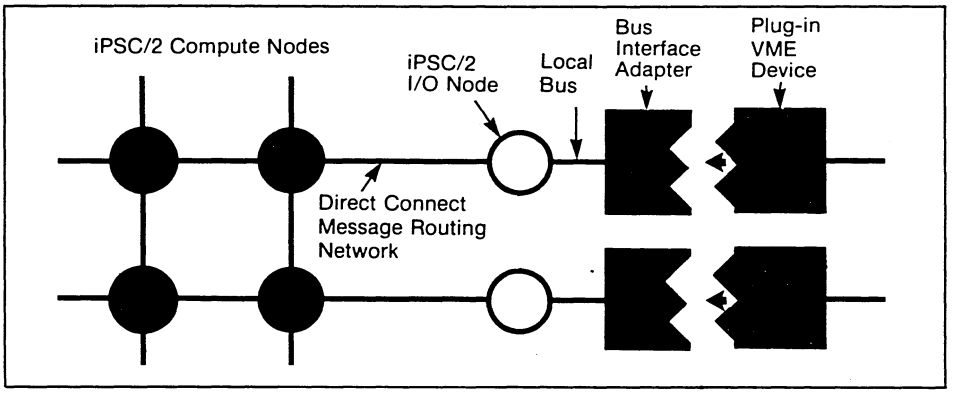

Figure 1

CONVENIENT SOFTWARE ENVIRONMENT

As shown in Figure 3, software interface drivers reside on the I/O node and run as applications under the NX/2 executive operating system. NX/2 handles the node's process control and the communication with the rest of the iPSC/2 system, presenting a simple, message-based interface to the driver. The drivers are typically written in C, using the standard iPSC/2 compilers and debuggers in a Unix development environment. A manual, complete with example drivers, describes all the steps in software interface development.

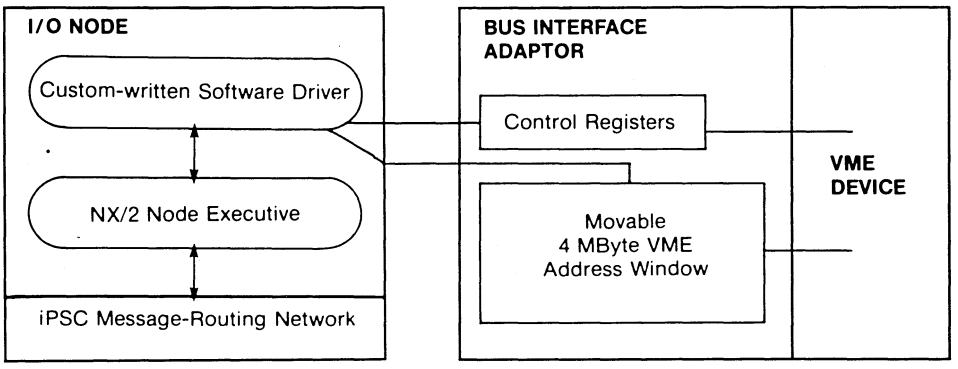

Figure 3 Software for VME Interface

A typical interface driver would program a slave device to interrupt the I/O node master when data (or output buffer) is ready. The I/O node would then read (or write) data across the VME interface using programmed I/O to a memory-mapped I/O address space. Special byte-swapping hardware on the BIA allows data reformatting during the transfers.

SPECIFICATIONS

VME INTERFACE

Physical

Form Factor	Accepts standard 6U VME Eurocard boards, 233 x 160 mm (9.187x 6.3 inches)
Number of Slots	One per I/O node, each I/O node on separate bus.
Card Cage	Requires 19-inch iPSC/2 card cage and full-size cabinet

Bus Specifications

Data Transfer Types	8,16, and 32-bit; word and long-word accesses; software-controlled byte swapping hardware provided for format conversion during transfers
Address Types	16, 24, and 32-bit
Address Space	4 MByte directly addressable VME address space; access to all 32 bits of VME address space via a 10-bit page register.
Operational Modes	Supports Slave Mode; I/O node is VME master Supports VME Block Mode transfers Supports Unaligned transfers (UAT)
Interrupts	Interrupt lines I(1) through I(7) available, software maskable.
VME Cycles Supported	standard, extended (address modifiers can be set to any value via a 6-bit register)
Short (I/O)	supervisory/nonpriviledged block interrupt acknowledge
VME bus Signals Included:	SYSCLK 16 MHz system clock SYSRESET- system reset SYSFAIL system fail BERR- bus error

Electrical Power

DC Power	+5 V, +12V and -12V DC power provided to VME device
Power Consumption	20 Watts at +5V

Environmental

Temperature	10 to 35° C
Humidity	10-90% relative humidity, non-condensing
Safety and Emissions Standards	Designed to Meet: UL478, CSA C22.2 No. 154, VDE 0806, VDE 0871 Class A, IEC 380, and FCC 15 CFRJ Class A when mounted in specified cabinet.

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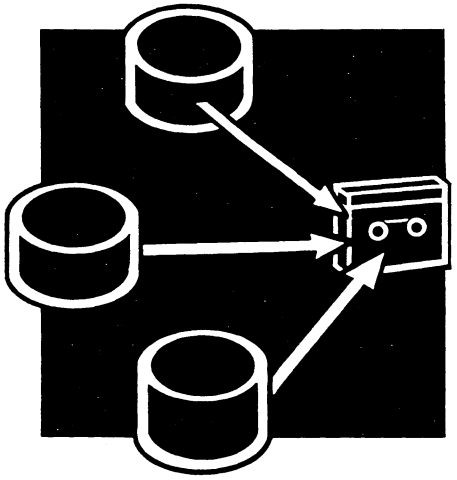


File backup and retrieval demands a low-cost, high-capacity storage medium that can handle multi-gigabyte files with a minimum of operator intervention. The iPSC®/2 8mm backup tape option meets these requirements with a low-cost 8mm tape cartridge holding 2.3 GBytes of data . It is an excellent solution for overnight backups of large files.

UNLIMITED BACKUP CAPACITY

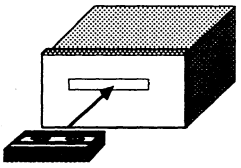
Users of the iPSC/2 Concurrent File System (CFS) may need to backup or archive very large file systems of up to 40 GBytes or more. This can take literally hundreds of nine-track tape reels; one CFS disk alone may need six large reels of tape. The 8mm cartridge tape drive, on the other hand, can store up to 2.3 GBytes in one small cartridge - the equivalent of more than three, 760 MByte disk drives.

LOW-COST OPERATION

The 8mm tape provides the high storage capacity at a low cost per unit since it uses the same cartridges used in commercial video recorders. The tape drives themselves are so compact and economical that multiple drives can be employed instead of just one. This can reduce labor costs, for example, by allowing a file system to be backed up overnight without an operator to change cartridges every few hours. Training costs are also low because users call familiar Unix tape control commands to access their tapes.

RELIABLE

The 8mm tape combines the proven helical scan recording technology used in consumer video recorders with the rugged and reliable controller techniques needed for reliable data processing. The cartridges use ultra-fine metal particle recording medium for less dropouts and more reliability. The drive mechanism is designed for gentle tape motion (0.5 ips) for long media life. Powerful error-detection and correction techniques are built in. For example, a read-back check after write ensures data integrity without software intervention or time-consuming tape repositioning, and on-board error correction facilities handle burst errors of up to 264 Bytes. Finally, a proprietary track-following servo ensures proper head-to-track alignment without costly manual adjustments.



iPSC®/2 Backup Tape uses a standard 8 mm tape cartridge and fits in a 5 1/4-inch form factor.

Figure 1

EASY TO CONFIGURE

The drive fits in the same compact 5.25-inch form factor used for the Concurrent I/O disk drives. This makes it easy to configure disks and backup tapes together in standard Concurrent I/O modules.

INDUSTRY STANDARD

Since its introduction in 1987, the 8mm Exabyte® 8200 tape drive has seen widespread use with leading workstations and minicomputers with over 35,000 units installed. It is the basis for a new standard recording format proposed jointly by Exabyte and Sony Corporation.

8 mm backup tape integrated into a typical Concurrent I/O facility for the iPSC/2. I/O node (lower bay) controls disks (right, upper bay) and tape drive via SCSI bus.

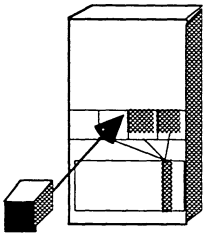


Figure 2

SPECIFICATIONS

Cartridges

type	Standard 8mm tape cartridge
size	(3.7x2.5x0.6 inches)

formatted capacity

Cartridge Size	Length (ft.)	Maximum Formatted Capacity (MBytes)
256	45	291
512	90	583
1024	180	1166
1536	270	1750
2048	360	2332

Tape Drive

Manufacturer/Model	Exabyte model EXB-8200
Type	Helical Scan Digital Computer Tape format
Error Handling/ Recovery:	on-board Error Correction Code (ECC - Reed Solomon) and Error Recovery Procedures (ERP)
On-Board Data Buffer	256 KByte buffer
Dimensions	5 1/4-inch form factor, mounted in standard iPSC/2 Concurrent I/O Peripheral Modules.
Interface	SCSI

Controller

Uses iPSC/2 I/O Node	4 MByte on-board memory, SCSI controller Direct-Connect™ Interface to iPSC/2 system
Software	Interfaced to Concurrent File System™ Supports standard Unix-compatible tape control commands

Performance

Tape Speed	.429 ips (10.89 mm/sec) 150 ips effective head-to-tape speed
max rewind	75 times nominal
file search speed	10 times nominal
data transfer rate	246 KB/sec sustained 1.5 MB/sec burst
Reliability (tape drive)	20,000 hrs MTBF at typical usage
Non-recoverable error rate	Less than one non-recoverable bit error in 10^{13} bits read

Environmental

Operating Temperature	+5° C to +40° C (+41° to +104° F)
Relative Humidity	20% to 80 % non condensing

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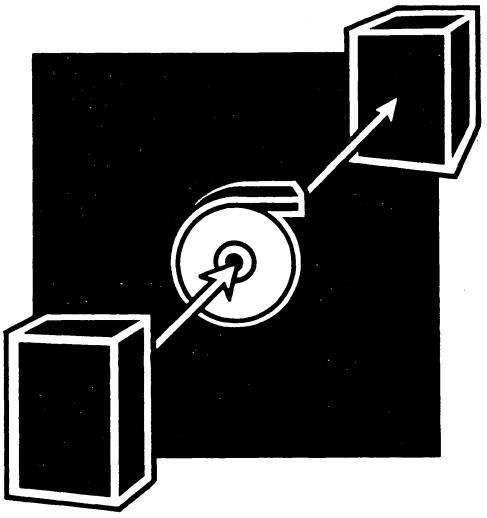


Data Interchange – moving data and programs quickly between a supercomputer and other systems – is an important part of many computing applications. Magnetic tape is often the preferred medium for moving data between systems or between sites, and can also be used for backup and restore of small file systems. The nine-track tape option gives iPSC®/2 users an answer to these needs that is fast, flexible, reliable and easy to operate.

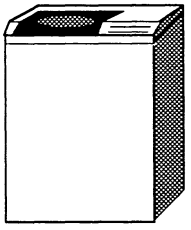
PERFORMANCE

The iPSC/2 nine-track tape drive is designed to move data quickly - up to 100 inches per second (ips) in streaming mode. It sustains streaming reads or writes of up to 625 KByte/sec and a 256 KByte cache memory supports burst transfers of up to 1,250 KByte/sec. over the SCSI interface to the iPSC/2 I/O node. That means a 100 MByte file can be transferred in as little as 2.7 minutes.

For applications requiring start/stop access mode, the nine-track drive can operate at 50 ips and up to 312.5 KByte/sec. with a very short access time of only 5 msec. The drive's mechanism handles the demanding task of starting and stopping the tape so that it never misses a tape record. Thus, time-consuming tape repositioning between records never impacts performance.

FLEXIBILITY

Data exchange with a variety of sites and formats requires both flexibility and support of multiple standards. The iPSC/2 nine-track tape supports the most popular tape formats, including1600 bits per inch (bpi) and 6250 bpi tape formats. Two common operating modes give the drive the flexibility to handle many roles. Start/stop mode is used for traditional variable record data access, and streaming mode is used for high-speed backups and fixed-length records. A powerful I/O node used as controller and the expandable iPSC/2 I/O architecture ensure enough processing and I/O power can be brought to bear on any application.



The high-speed nine-track tape comes in a free-standing cabinet with an auto-threading, top-loading, open reel mechanism that can handle up to a 2400-ft., 10.5-inch diameter tape reel.

Figure 1

EASY TO USE

Ease of use is designed into this tape drive in several ways, beginning with its convenient floor-mounted cabinet and auto-threading features. Troublesome tape drive adjustments are eliminated because the tape drive monitors and adjusts itself automatically. Diagnostics run both on the I/O node and on the drive itself. Finally, the iPSC/2 user accesses the tape with familiar Unix tape commands - no special user training or program commands are needed.

RELIABLE

Reliability is built into the tape drive as well, with on-the-fly error correction/detection and read-after-write tape verification to make sure what is sent to the tape is what is written there. Even the cache memory uses CRC error checking to prevent data loss. As a result, the drive has demonstrated up to 11,000 hours MTBF.

Up to two, nine-track tape drives can be configured with a controller on a 4 MByte/sec. SCSI bus. To add drives, simply add more controllers.

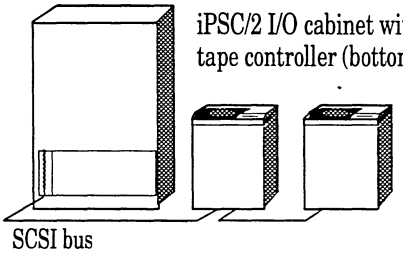


Figure 2

SPECIFICATIONS

Drive Type

Storage Technologies Corp. (STC) model 2925S
1/2-inch nine-track reel-reel
auto threading or semi-auto thread
start/stop and streaming modes

Performance

Tape speed	50 ips start/stop mode 100 ips streaming mode
Transfer Rate	80 KByte/sec. start/stop mode at 1600 bpi 312.5 KByte/sec. start/stop mode at 6250 bpi selectable from 100 to 1250 KByte/sec in streaming mode
Rewind Time	2.5 minutes (2400 ft. reel)

Formats 1600 bpi and 6250 bpi

Tape size/type	1/2-inch Magnetic Tape (ANSI x 3.40-1983)
Reel sizes	7.0, 8.5, and 10.5 inch open reels
Capacity	up to 180 MB on 2400 ft (10.5 in) reel.

Interface SCSI interface to iPSC/2 I/O node tape controller

Physical floor mount package

Height	41 1/4 in (105 cm) floor mount package
Width	23 in (58.5 cm)
Depth	31 1/8 in (79 cm)
Weight	125 lbs. (57 kg)

Power Requirements

Frequency	AC Voltage	Current	Nominal Power
60 Hz	100/120 VAC +/- 10%	5 Amperes ,	300 watts
50 Hz	200/220/240 VAC	3 Amperes	300 Watts
50 Hz	100 VAC	5 Amperes	300 Watts

Environmental

Operating Temperature	60° to 90° F (16° to 32° C)
Non-Operating Temperature	-40° to 158° F (-40° to 70° C)
Humidity (operating)	20% to 80% non-condensing
Altitude (operating)	0 to 10,000 ft. (0 to 3,050 m)
Altitude (shipping)	0 to 50,000 ft. (0 to 15,240m)

MTBF 11,000 hours (25% duty cycle)

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