

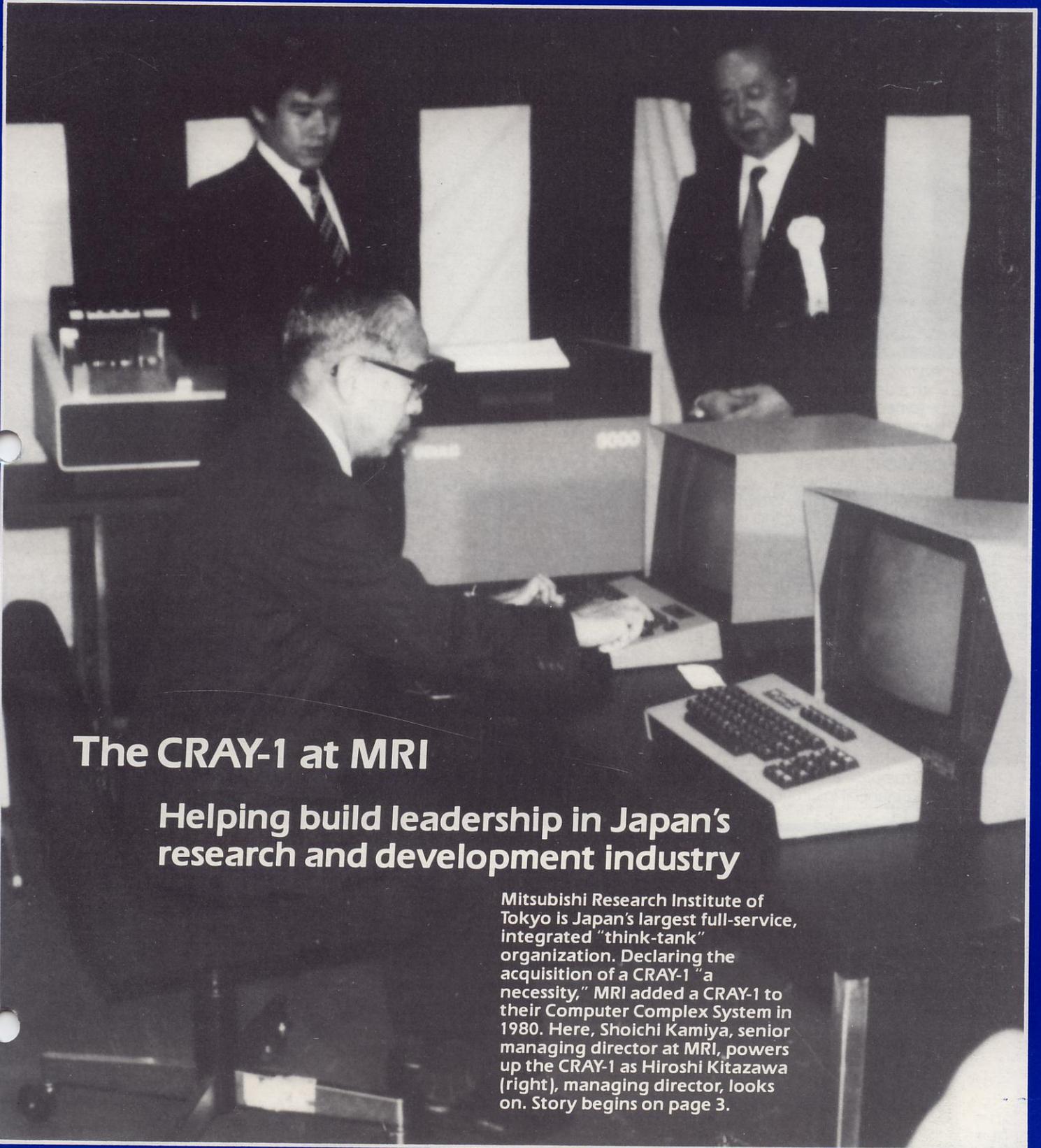
**Cray Research, Inc.
announces enhanced
I/O Subsystem with
expanded Buffer Memory**



A Publication of Cray Research, Inc.

CHANNELS

Vol. 2, No. 4



The CRAY-1 at MRI

**Helping build leadership in Japan's
research and development industry**

Mitsubishi Research Institute of Tokyo is Japan's largest full-service, integrated "think-tank" organization. Declaring the acquisition of a CRAY-1 "a necessity," MRI added a CRAY-1 to their Computer Complex System in 1980. Here, Shoichi Kamiya, senior managing director at MRI, powers up the CRAY-1 as Hiroshi Kitazawa (right), managing director, looks on. Story begins on page 3.

letter from the editor

This issue features Mitsubishi Research Institute, Inc., a CRAY-1 site since June of 1980. MRI is a full-service, integrated "think-tank" organization located in Tokyo, Japan. Its mission is to be the leader in research and development in Japan, a goal that it is well on the way to meeting, as you will see.

Also in this issue is an announcement of an enhanced version of the CRAY-1/S I/O Subsystem. This announcement is yet another indicator of Cray Research's commitment to enhancing the performance of its current products. The enhanced I/O Subsystem features

an expanded Buffer Memory of up to eight million words and an optional second high-performance channel for streaming data to Central Memory.

Our next issue of **Channels** promises to be an exciting one, with applications news, several articles written by CRAY-1 users like yourselves, a summary of the new Cray Research, Inc. software release, and more. See you in June!

—T.M.B.

input/output

Masaki Nakajima
Chairman, Mitsubishi Research Institute, Inc.

(Mr. Nakajima's career with Mitsubishi stretches back over fifty years. After graduating from the University of Tokyo in 1928 with a degree in economic history, he joined the Mitsubishi Bank, serving there for more than thirty years. Then, in the early sixties, he moved over to the Mitsubishi Steel Manufacturing Company, Ltd., becoming president in 1965. When the Mitsubishi Research Institute, Inc. was founded in 1970, he was asked to manage it as president while still retaining presidency of the steel company.)

Today, Mr. Nakajima is president of Japan Data Processing Association, a non-profit body that actively promotes Japan's computerization. Additionally, he remains in touch with Japan's economic and industrial development as a member of key government advisory councils such as MITI's Industrial Structure Council and MOF's Council on Financial Institutions.)



Through the years since its founding, Mitsubishi Research Institute has grown into Japan's largest full-service, integrated "think-tank" organization. With more than 500 fulltime staff researchers, MRI can perform a wide range of contract research projects in many fields of study.

MRI runs a full-dress Computer Complex System (CCS). The CCS includes duplex IBM 370/168s and a CRAY-1, all located at our central location in Tokyo. MRI can provide updated computer services for all kinds of clients and in all ranges of technical and scientific computation areas.

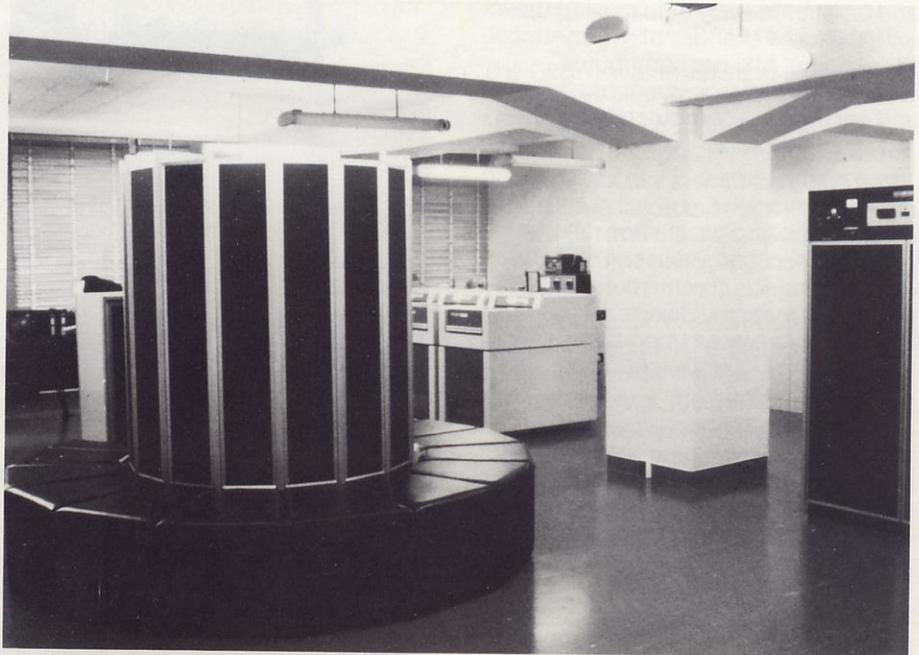
Looking ahead, MRI's mission as a leader of Japan's research and development industry will continue to grow in importance. Japan is rapidly moving into a full-fledged "information society" accelerated by advanced computer technologies and applications. MRI is contributing to Japan's informatization under its founding motto: "Better Information for a Brighter Future."

—M.N.

The CRAY-1 helping build leadership in Japan's research and development industry

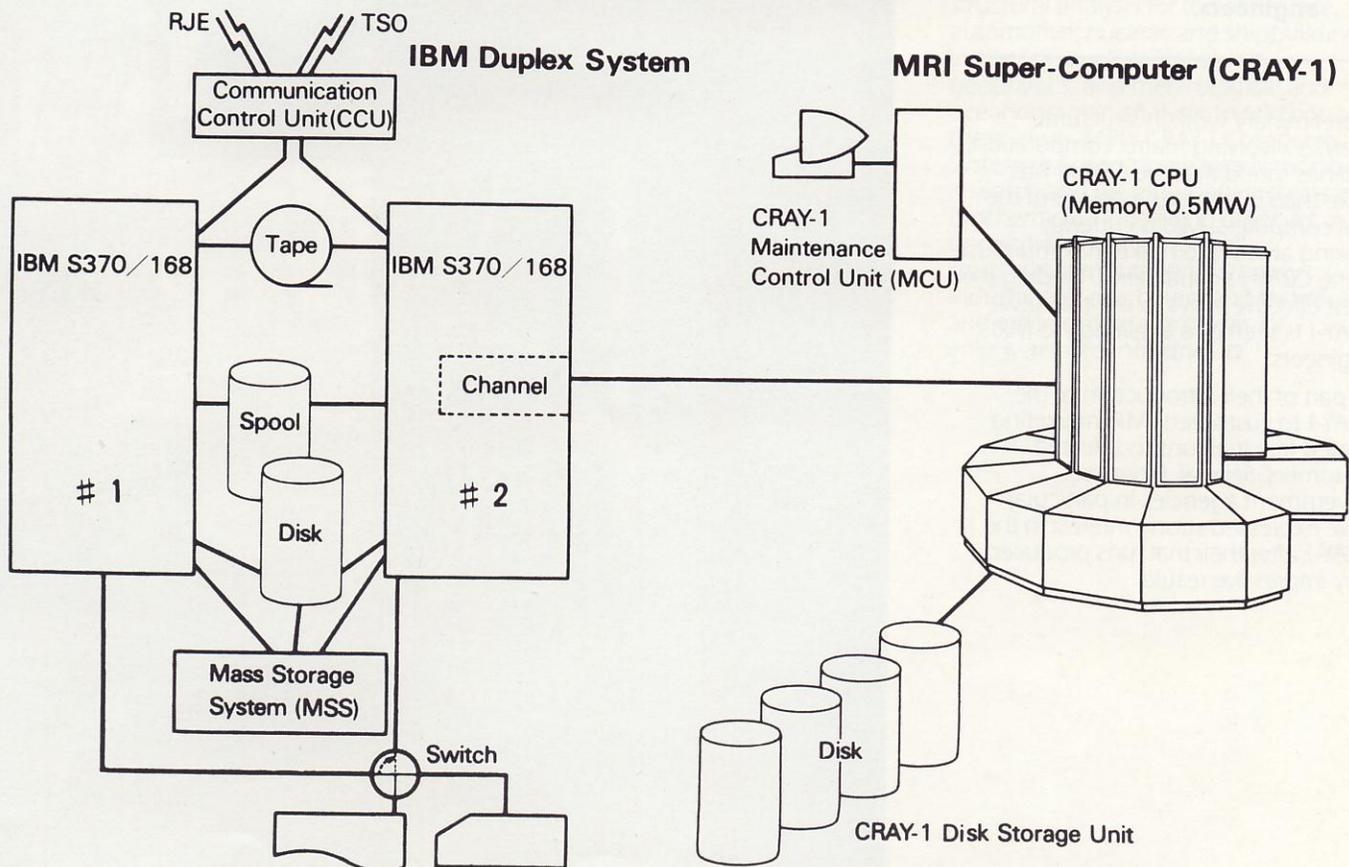
Mitsubishi Research Institute, Inc. (MRI) was formed in 1970 with the fusion of three entities: the Mitsubishi Economic Research Institute, a longtime leader in economic studies; the Computing Center of Mitsubishi Atomic Power Industries, Ltd., with a strong data processing capability; and the Advanced Techno-Economic Information Center, with outstanding experience in techno-economic studies. The founding mission of MRI was "responding to the need to resolve varied and increasingly complex social, economic, industrial and technological problems."

Since its founding, MRI has contributed greatly to the advancement of scientific and engineering computation in Japan.



MRI's CRAY-1 is installed at its central facility in Tokyo.

The MRI Computer Complex System (MRI-CCS)



In the years since then, the company has made every effort to gather the necessary specialized personnel and facilities. The nearly 500 members of MRI's research staff are constantly striving to improve research systems and facilities in every field to keep up with the rapid changes of society. Since its founding, MRI has contributed greatly to the advancement of scientific and engineering computation in Japan.

Today, MRI's customers include government agencies, local public corporations and private firms. There has also been a growing volume of research projects commissioned from abroad. To meet the diverse requirements placed upon them, MRI has mobilized its resources on an interdisciplinary basis.

MRI has also undertaken joint projects with research institutions overseas. Such collaboration has enabled them to provide customers with the latest information in an international perspective.

Finding the most effective ways to use the new CRAY-1 is seen as a challenge to MRI's engineers.

In preliminary work in structural analysis involving matrix computation, MRI has found that the CRAY-1 has more than 30 times the power of the IBM computers. MRI is currently looking at ways to make maximum use of the CRAY-1's capabilities. Finding the most effective ways to use the new CRAY-1 is seen as a challenge to MRI's engineers.

As part of their introduction of the CRAY-1 to customers, MRI marketing offered free trial runs to selected customers. Several Japanese government agencies in particular have expressed strong interest in the CRAY-1 after their trial runs produced very impressive results.



A container carrying MRI's CRAY-1 arrives at New Tokyo International Airport on June 2, 1980.



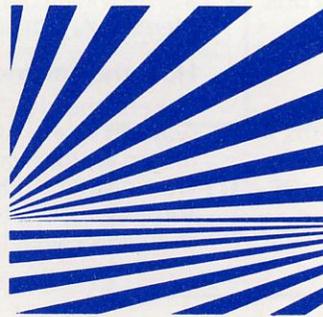
Hoisting the CRAY-1 to a third floor window at MRI's Tokyo facility.



Currently, about 40% of the available time for the IBM systems is used by outside customers. The remaining 60% is reserved for MRI internal use, mainly by the software development department and in consulting services. MRI would like to split the workload for the CRAY-1, about 50-50 between internal and customer use.

MRI has devoted significant time to educating its customers on how the CRAY-1 can be utilized most effectively. The company feels that this is necessary to ensure that customers realize the true merit of the CRAY-1 and that they understand how the CRAY differs in certain respects from scalar machines.

MRI installed an IBM System/370 Model 165 in December of 1971. Two and a half years later, an IBM System/370 Model 168 was added to



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The CRAY-1 is held at the window while its frame is attached to the receiving housing.

meet demand. For several years, the company considered enhancing the quality of their service by adding a supercomputer. Finally, the decision was made to order a CRAY-1. In making their recommendation, the investigative committee called the acquisition of the CRAY-1 "a necessity."

The CRAY-1 was installed in the tenth anniversary year of the founding of MRI. On June 22, 1980 the system was brought on site, and the system was handed over to the customers less than a month later, when a three-month acceptance testing period began. Actual CRAY-1 service began in October 1980.

MRI uses the CRAY-1 Computer System in a fully integrated configuration of computer complex systems. At MRI's computer center, the duplex system of IBM computers running under OS/MVS is positioned as the front-end processor (FEP) for the CRAY-1 Computer System. The integration of a CRAY-1 computer system with IBM large-scale computers, as at MRI, is the world's first. It has attracted a great deal of attention from users of IBM and IBM-compatible systems. These users, who have been closely watching this installation, have been impressed.

Some of the applications for which the CRAY-1 is being used at MRI include structural analysis for the aerospace, automotive, nuclear, and shipbuilding industries, nuclear research, geophysics, and meteorological and oceanographic analysis. In addition to these areas, MRI's CRAY-1 Computer System may contribute to advancing research and development projects in biochemical, optical and other yet undiscovered areas, as well as structural computations in heavy industry and machinery and technical and environmental analyses in energy-related industries. □

ANNOUNCING

The Cray Research I/O Subsystem with expanded Buffer Memory

Cray Research has announced an enhanced version of the I/O Subsystem—the next stage in the evolution of the CRAY-1 product line and a logical extension to the original design objectives. The company first introduced the I/O Subsystem in November 1979 with the CRAY-1 S Series of Computer Systems. An integral part of the CRAY-1/S, the I/O Subsystem complements the system's Central Processing Unit (CPU) and meets its high throughput demands.

Features of the I/O Subsystem

An I/O Subsystem is an integral part of Model S/1200 through S/4400 of the CRAY-1 S Series of Computer Systems. It is composed of:

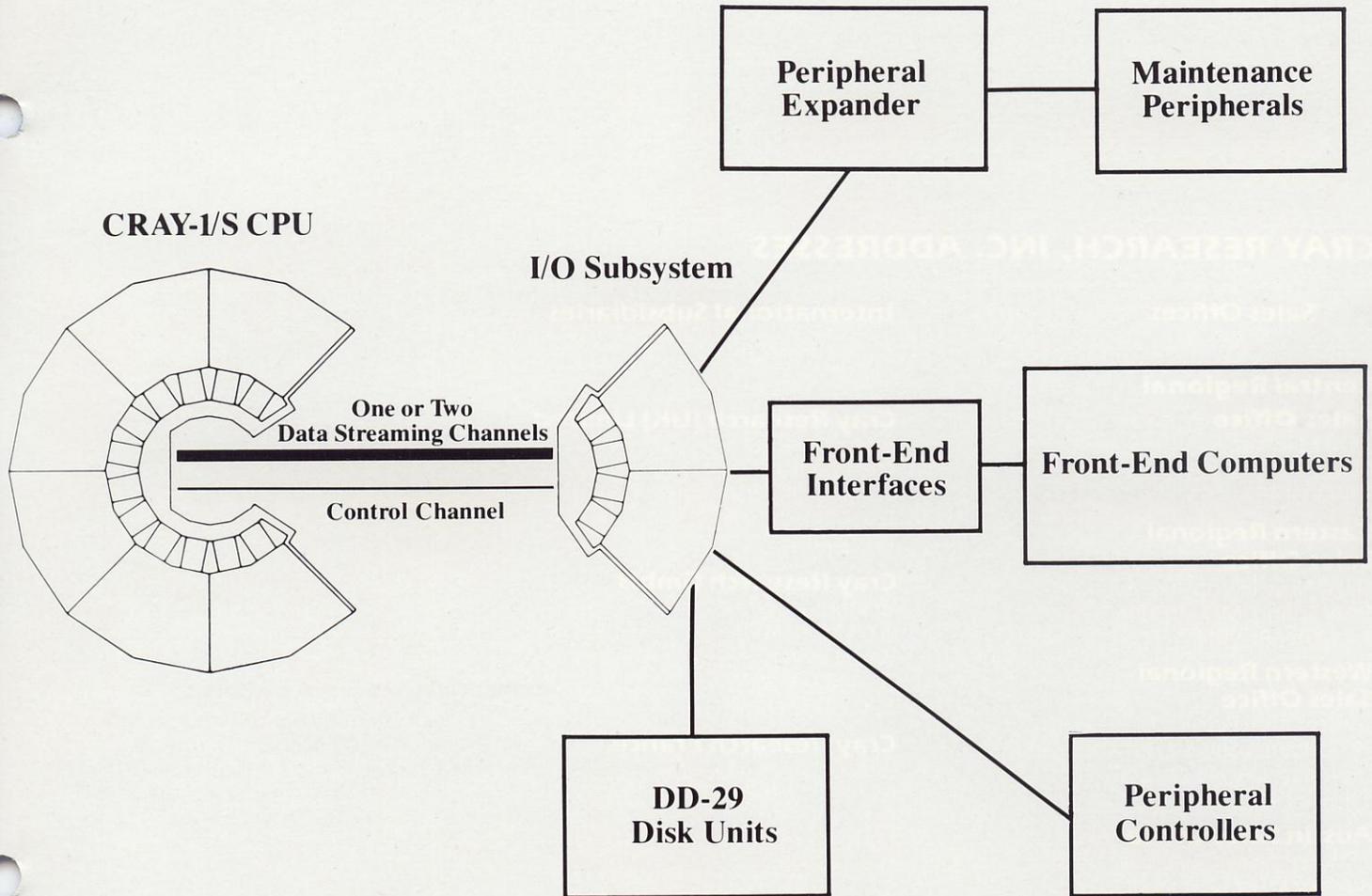
- Two to four I/O Processors
- Buffer Memory
- Control units for disks and channel linkages for front-end computers and peripheral devices
- Three CRT consoles
- A Peripheral Expander and maintenance peripherals

With its multiple I/O Processors, the I/O Subsystem acts as a data concentrator for input to the CRAY-1 CPU and distributes output from the CPU. In this role, it handles I/O for a variety of front-end computer systems (for which Cray Research has designed interfaces) and for peripheral devices such as disk units and user-supplied magnetic tapes. All I/O Processors in a system interconnect with each other and with Buffer Memory. At a minimum, two I/O Processors must be present.

How the enhanced I/O Subsystem is different

The enhanced I/O Subsystem differs from the original in two ways. First, an expanded Buffer Memory of up to eight million words is possible; previously, only one million words were offered. Additionally, the new version of the I/O Subsystem offers two rather than one high-performance channel for streaming data to Central Memory.





Expanded Buffer Memory

Buffer Memory is a solid-state secondary storage unit accessible to all of the I/O Processors in the I/O Subsystem. Now, the enhanced version of the I/O Subsystem allows Buffer Memory to consist of up to eight million words. Buffer Memory is equipped with single-error correction, double-error detection (SECDED) logic. A one million word system can be field upgraded to eight million words.

I/O Processors connect to the Buffer Memory through internal channels capable of transfer rates of over 800 Mbits per second. Bandwidths of approximately 1250 and 2500 million bits are possible between Buffer Memory and to up to four I/O Processors, depending on the number of banks in the Buffer Memory. The one million word memory is arranged in eight banks; the eight million word memory is arranged in sixteen banks.

In addition to accommodating more and larger I/O buffer areas (up to one million bytes each), the added capacity of Buffer Memory allows selected types of datasets to be memory resident, thus contributing to faster and more efficient data access and processing by the CPU. Thus, a user may consider Buffer Memory as a rapid access secondary storage unit.

Dual high-performance channels.

The enhanced I/O Subsystem also features dual high-performance channels for streaming data to Central Memory. One channel is standard and one is optional. These channels, which were designed by Cray Research, provide for data streaming at rates of over 800 million bits per second between CRAY-1 S Series Central Memory and Buffer Memory

via an I/O Processor. They are controlled by the I/O Subsystem and do not interrupt the CPU. Because the channels are controlled by the I/O Subsystem in a master/slave relationship, control communication with the CPU is handled over a standard I/O channel.

The two data streaming channels are connected between Central Memory of a CRAY-1 S Series Computer and any of the I/O Processors other than the one designated as the Master I/O Processor. One of these channels always connects to an I/O Processor controlling disk storage. A recommended application for the second (optional) channel is to connect it to a second I/O Processor supporting disks. Alternatively, it could be connected to an I/O Processor used for transferring data from other peripherals such as user-supplied magnetic tapes. □

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