Computing Surface

CS-2 Hardware Overview

S1002–10M141.00

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Contents

Hardware Overview *1*

The CS-2 consists of the following key hardware components:

- The Bay.
- The Modules.
- Processor Boards.
- Network Switch Boards.
- I/O Devices
- The CS-2 data network.
- The CS-2 control and diagnostic network.

This document provides a brief overview of these components and includes pointers to more detailed information in your CS-2 documentation set.

CS-2 Bays

The Bay provides the physical infrastructure for the modules; it provides the power distribution, cabling for the data and control networks, ducting to maximise the flow of cooling air through the modules, and a firm and level securing point for the modules.

The Bay is a scalable tubular structure which can be adapted to suit a number of machine configurations, from the 4 module Half Bay system to the 24 module 3-Bay system. Larger systems are configured as a number of interconnected bays.

Figure 1-1 A Half Bay System

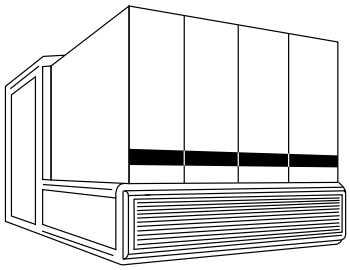


Figure 1-2 A Single Bay System

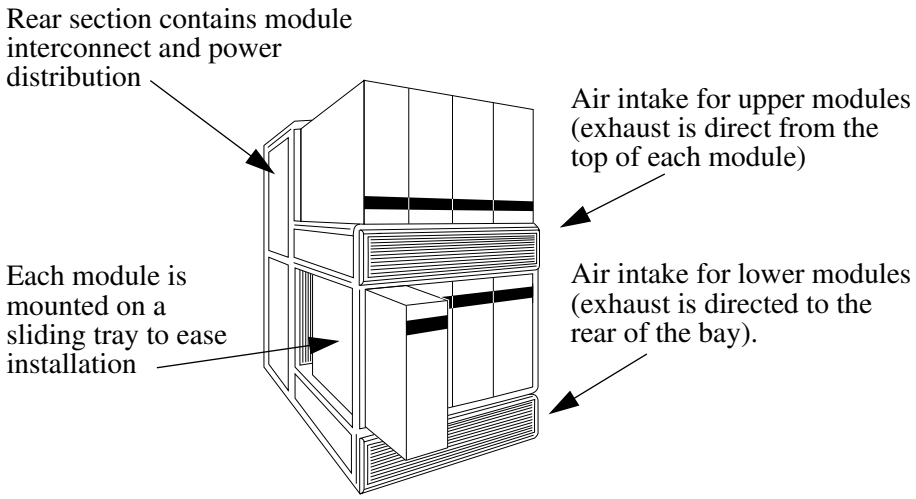
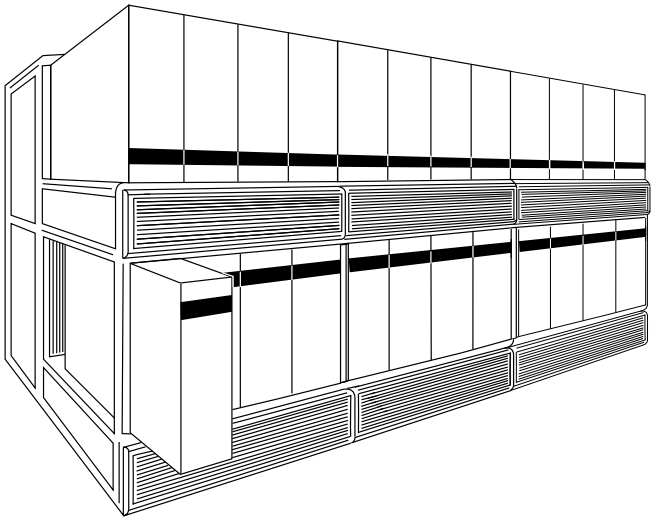


Figure 1-3 A Three Bay System (also referred to as a Cluster)



CS-2 Modules

There are currently three types of module that can be fitted into a Bay: the Processor Module, containing processor boards and a number of SCSI disk devices, the Switch Module, containing switching components for the CS-2 data network, and the Peripheral Module, which contains an array of SCSI disk devices.

All modules include cooling fans, power supplies, and a dedicated module controller processor which is the module's interface to the CS-2 control and diagnostics network. A printed circuit board within each module — the module's backplane board — distributes the power and control signals to the module's contents, and also carries the data buses to the module's rear connectors. Most connections from the module to the Bay are via Beta Flex connections which are fixed to the Bay at each module's mounting position; these are zero insertion force connectors that open and close (thus gripping the module's connections) under the control of an electric current.

More information about the modules can be found in:

- *The CS-2 Processor Module*, Meiko document S1002–10M128.
- *The CS-2 Switch Module*, Meiko document S1002–10M132.

- *The CS-2 Peripheral Module*. Meiko document S1002–10M142.

Processor Boards

Three types of processor board are currently available:

- The SPARC/IO board.
- The multi-SPARC/Compute board.
- The VPU board.

Each board includes one or more SPARC processors, each running a full port of the Solaris operating system. All SPARC processors have an associated Elan Communications Processor (ECP) sharing a cache coherent M-Bus memory interface; the ECP is the SPARCs interface to the CS-2 data network. In addition all boards include a board control processor which is the boards interface to the CS-2 control and diagnostics network.

The SPARC/IO board includes all the functionality of a high performance Unix workstation, with up to 2 SPARC M-Bus processor modules, memory, a range of standard I/O interfaces (including SCSI, Ethernet, and serial), and 3 standard S-Bus peripheral interfaces.

The multi-SPARC/compute board consists of up to 4 SPARC processors each with a dedicated cache coherent M-Bus interface to the memory system and an Elan Communications Processor. The SPARC processors on this board have no additional I/O capabilities and must be configured as diskless Unix clients serving via the CS-2 data network from one or more of the single SPARC boards.

The VPU board has a single SPARC processor, Elan Communications Processor, memory system, and some I/O capabilities (including standard SBus slots). In addition this board includes 2 Fujitsu micro vector co-processors which cooperate with the SPARC processors via a cache coherent M-Bus interface.

More information about the processor boards can be found in:

- *SPARC/IO Processing Element User's Guide*, document S1002–10M137.
- *Quad SPARC/Compute Processing Elements User's Guide*, S1002–10M138.
- *Vector Processing Element User's Guide*, document S1002–10M139.

Network Switch Boards

There are two types of network switch card, both built from one or more Elite Network Switches (ENS).

- Backplane switch cards.
- Module switch cards.

The backplane switch cards are fitted into the rear of the Processor Module directly to the module's backplane; they offer the first level of switching between the processors in the module. Up to 8 backplane switch cards may be fitted to offer full interconnection, on two independent network layers, of 4 multi-SPARC boards (up to 16 SPARC processors).

The module switch cards must be installed in a Switch Module. They provide network switching for higher levels of the network. Three variants are available which may be used in combination to build a switch network for any size of system.

More information about the Meiko Switch boards can be found in:

- *The CS-2 Processor Module*, Meiko document S1002–10M128
- *The CS-2 Switch Module*, Meiko document S1002–10M132.

I/O Devices

The use of standard interfaces on the processor boards (such as SCSI and S-Bus) allows a large range of I/O devices to be connected to your CS-2. These devices will fall into one of the following categories:

- System Console.
- SCSI disk devices.
- Other I/O devices.

The System Console must be a colour graphics workstation connected to one of the processor boards via an S-Bus graphics cards.

SCSI disk devices will typically be fitted into the Processor Module alongside their host processor, or in a dedicated Peripheral Module which may be configured either as a RAID device or as an array of disks.

Other I/O devices will be mounted externally to the CS-2. Cables taken from a processor board's front panel are routed to the rear of the Bay and then via underfloor cable ducts to a dedicated Peripheral Box. In most systems a Peripheral Box containing CD-ROM, QITC, and Exabyte will be located near the system console.

The CS-2 Data Network

The data network is built upon the Elan Communications Processors (ECP), of which there is one for each processing element in your system, and Elite Network Switches (ENS). Interconnection of the Elan and Elite devices is currently by 50-way ribbon cables which are housed in the cable ducts at the rear of the Bay.

The Elan Communications Processor shares a cache coherent M-Bus interface with its host SPARC processor. It offers two independent byte-wide data links onto the network, each capable of bidirectional operation at 50Mbytes/s (100Mbytes/s total). The ECP supports remote read, write, and synchronisation operations, with virtual processor addressing and virtual address translation all handled in hardware. All communications between parallel applications are routed via this device, as well as NFS mounting of filesystems.

The data network is built upon the Elite Network Switches. These are 4x4 cross point switches with byte-wide bidirectional data paths. Switching is byte steered, with the first byte of an incoming message identifying the link used for the outgoing message; route bytes are pre-pended to network packets by the ECP. Broadcasts over a contiguous range of links are supported, with hardware support for the recombination of acknowledge or not-acknowledge tokens from the broadcast destinations. The number of network switches increases logarithmically with the number of processing elements to provide full point to point connectivity and increased network bandwidth for any size of machine with minimal increases in component counts and cabling.

The ECP and ENS are described in more detail in the following Meiko manuals:

- *The Communications Processor Overview*, document S1002–10M100.

- *The Communications Network Overview*, document S1002–10M105.

The Control and Diagnostics Network

The control and diagnostic network is a hierarchical, low bandwidth serial network that runs throughout the system. All modules, boards, and processors have an interface to this network.

The control network carries heartbeat signals from all components (to signal continued operation) and is also used by system software, such as the machine manager and Pandora, to query the operating status of system components, and to reset or reconfigure those components. Remote console connections to the SPARC processors can also be carried over the control network.

The control network is independent of the data network and does not impact on its performance.

The control network is described in the following Meiko document:

- *An Overview of the Control Area Network (CAN)*, document S1002–10M140.

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