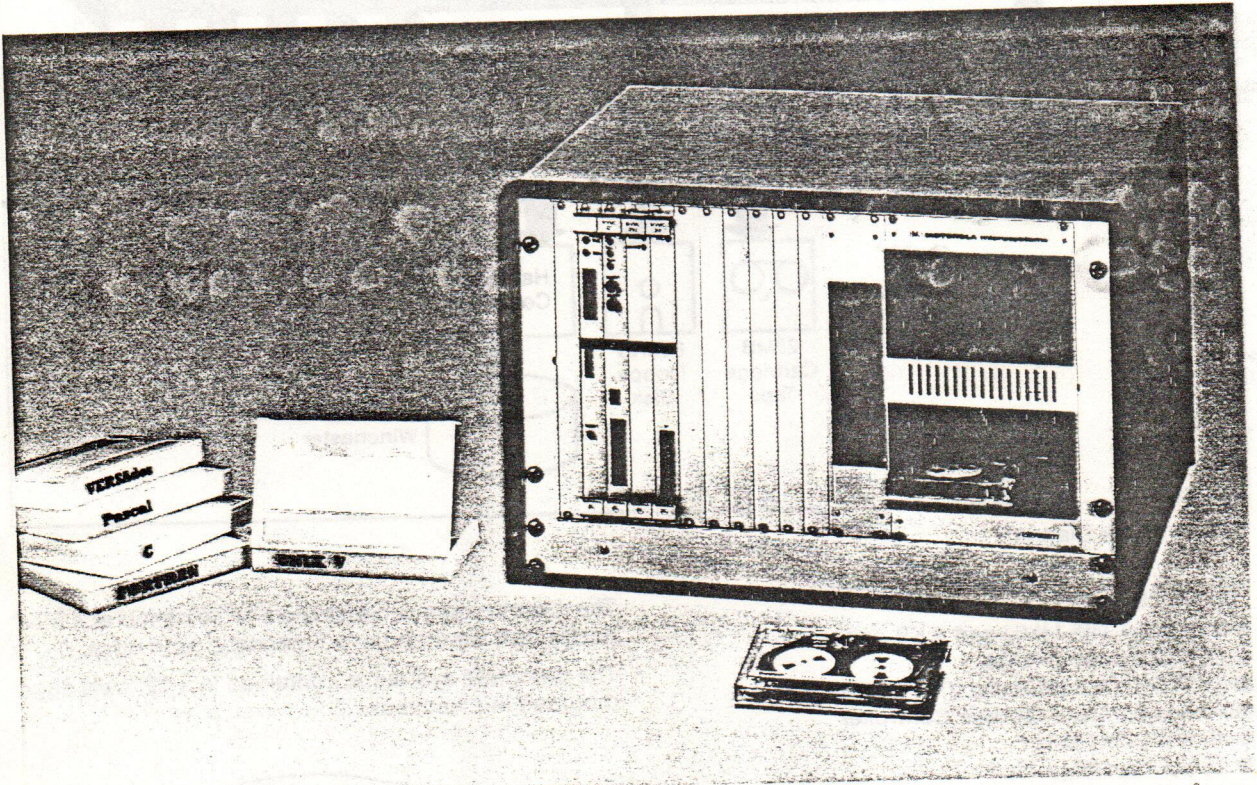




MOTOROLA

MVMESYS121

MVME121 System for UNIX or VERSAdos Applications



The MVME121 System is a powerful multiuser UNIX or VERSAdos environment for software development and hardware integration. Fast execution speeds are achieved using an MC68010 microprocessor, large onboard memory and cache. The intelligent mass-storage controller allows the operating system to make enhanced use of system resources.

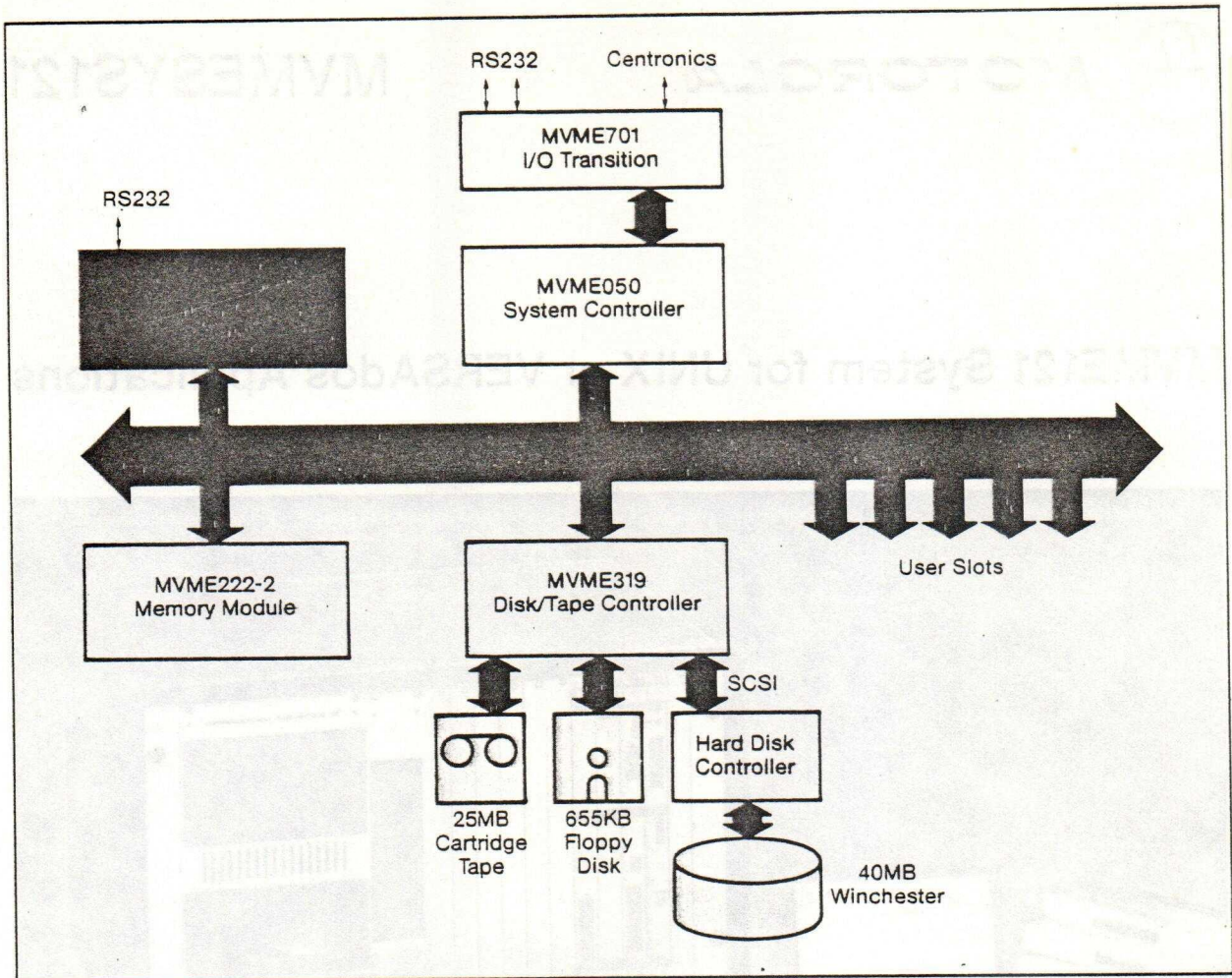
The SYSTEM V/68 Operating System is the standard M68000 implementation of UNIX System V, jointly developed by Motorola and A. T. & T.

VERSAdos is a realtime, multitasking operating system developed by Motorola for the M68000 processor family.

The hardware is configured using standard components for easy customization by the user to adapt it to specific applications.

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VERSAdos and SYSTEM V/68 are trademarks of MOTOROLA Inc.

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Issue B.



System Block Diagram

Features

- MC68010 with MMU and 4 KB cache
- 2.5 MB dynamic RAM
- SYSTEM V/68 (Release 2) or VERSAdos
- Intelligent Mass Storage Controller
- 40 MB Winchester
- 25 MB Cartridge Tape
- 655 KB Floppy Disk
- 3 x RS232C ports
- 1 x Centronics Printer Interface
- 5 x VMEbus expansion slots

The mass storage consists of a 5 1/4" Winchester, a 5 1/4" floppy disk drive and a 1/4" magnetic tape drive.

The complete system is contained in a 19" card cage mounted in a minirack.

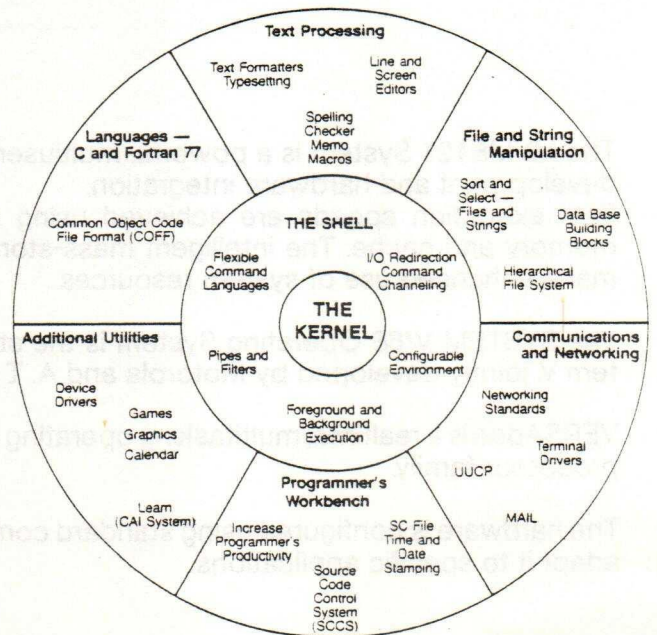
System Description

Four VMEbus modules make up the basic system architecture:

1. A system controller with I/O and memory (MVME050);
2. A high performance processor module (MVME121);
3. A memory module (MVME222-2); and
4. An intelligent disk/tape controller (MVME319).

The boards are mounted in the front of the chassis on a 9-slot VMEbus backplane. Five slots are free for user-supplied VMEbus modules.

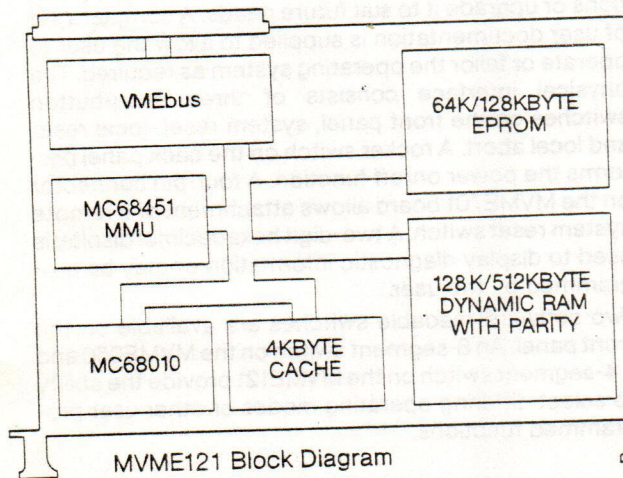
The connectors for user I/O are mounted on a separate transition board. This allows the connection to be mounted either on the front or the rear of the rack, as best suits the user's requirements. The transition board can be mounted vertically on the front panel, or horizontally on the recesses provided on the back panel.



Features of SYSTEM V/68

Central Processing Unit

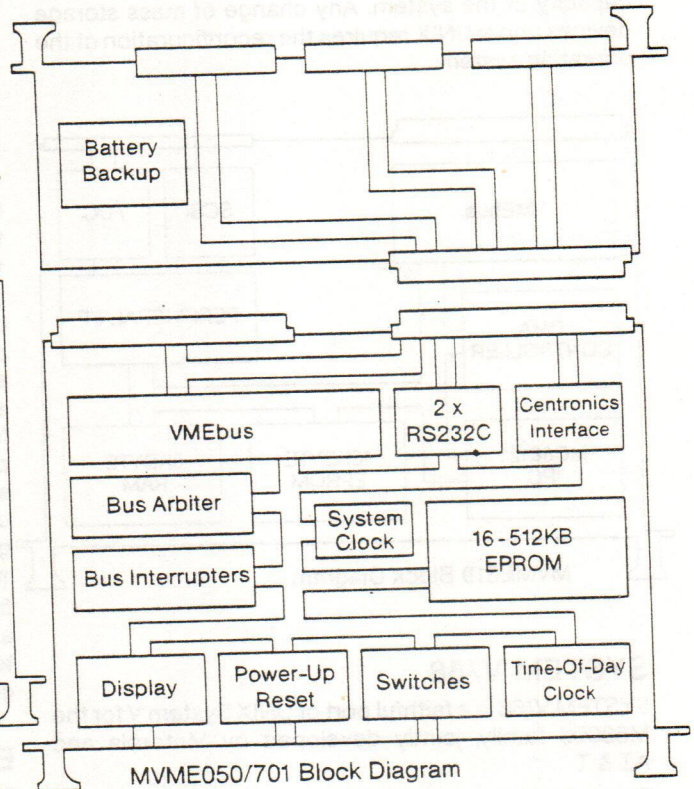
The central processor module is an MVME121, a high-performance MC68010 processor module with memory management unit, 4 Kbytes cache and 512 Kbytes of RAM. The on-board memory is sufficiently large to allow the SYSTEM V/68 kernel to be continuously resident during run-time providing significantly improved performance overall. The speed of execution is also improved by the cache feature. The cache is a small very fast memory situated between the MPU and its regular memory. As each instruction is fetched from memory, it is stored in the cache on its way to the MPU. If this same instruction is needed again, the next fetch will be a cache "hit". Depending on the type of program, overall performance of the system can be improved by 30-40% when the cache is enabled. The MMU is an MC68451, it maps the logical memory addresses into the physical memory, handles the virtual memory operation and manages the supervisor and user memory segmentation.



MVME121 Block Diagram

System Controller / I/O Interfaces

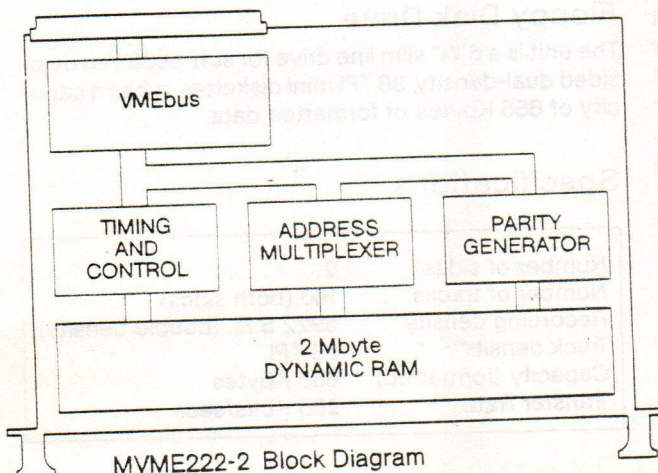
The MVME050 is a combination system controller, system utility and debug/diagnostic board. It is designed to implement functions that are only required once in a multi-processing system, such as bus arbitration, bus timeout, system clock generation and time-of-day clock. This capability frees up space on the processor modules, avoiding the waste of having functions duplicated on every processor.



MVME050/701 Block Diagram

Main Memory

As described in the previous paragraph, the processor module MVME121 contains 512 Kbytes of dynamic RAM. This together with a 2 Mbytes RAM module MVME222-2 gives a total of 2.5 Mbytes for the system. The MVME222-2 has an on-board parity check which verifies data integrity and indicates any error condition on the LED mounted on the front panel. Additional modules can be added up to a total of 16 Mbytes of system memory.



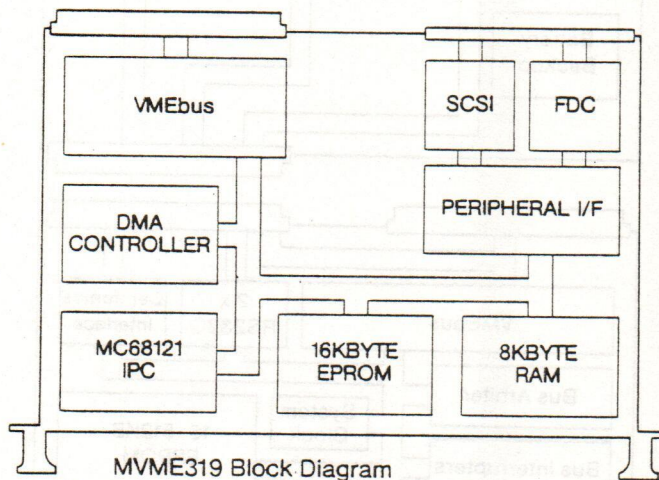
MVME222-2 Block Diagram

The MVME050 is connected at P2 via ribbon cable to an I/O transition module MVME701. This board provides the connectors for the MVME050's serial and parallel ports, and optionally, batteries for back-up of the MVME050's time-of-day clock. The transition board is one of a family of similar boards designed to allow the I/O connectors to be attached either at the front or the back of the rack as best suits the user's requirements.

Two RS232 serial ports are mounted permanently on the front panel. One of these is for diagnostic purposes only (on MVME319). Two RS232C serial ports for connection of user peripherals are on the MVME701 transition board. This module also contains a parallel port for connection of a Centronics-compatible printer. A third RS232C port is available on the MVME121.

Mass Storage Controller

The MVME319 Intelligent SASI/SCSI Interface and Floppy Disk/Tape Controller is connected to a 40 MB 5¹/₄" Winchester Drive via an Adaptec SCSI Controller. Backup storage is provided by a 5¹/₄" slim-line Floppy Drive 655 Kbytes and a 25 MB Cartridge Tape Drive. The MVME319 performs data transfers from the mass storage devices to the system memory using a DMA controller. The user can add another hard disk drive to the controller and an additional 5¹/₄" floppy disk drive. Up to 7 additional Adaptec SCSI controllers can be supported by the MVME319. This gives a large measure of freedom to the user when expanding the mass storage capacity of the system. Any change of mass storage devices under UNIX requires the reconfiguration of the operating system.



MVME319 Block Diagram

SYSTEM V/68

SYSTEM V/68 is a faithful port of UNIX System V for the M68000 family, jointly developed by Motorola and AT & T

The system is multi-user and multi-tasking. It contains an unequalled repertoire of capabilities that include the shell command language, C compiler, FORTRAN 77 compiler, and the Programmers Workbench including SCCS (Source Code Control System).

VERSAdos

VERSAdos was developed by Motorola in 1979 as a real time multi-tasking, multi-user Disk Operating System for the MC68000 family of 16/32 bit microprocessors. Today more than 10,000 users are working with VERSAdos. Just as the MC68000 microprocessor family provides a consistent upgrade path from 8- to 32-bit processors VERSAdos gives a consistent software environment to the user from revision to revision. VERSAdos is available for all members of the MC68000 family: this does not only include the different processor types, but also drivers for all peripheral chips within the MC68000 family.

VME and VERSAdos

VERSAdos is now becoming the standard Operating System for VME. Beside Motorola, several other vendors of VME equipment support VERSAdos. Motorola has ported VERSAdos to all its different VME-Processor boards and supplies drivers for all I/O boards.

One of the major advantages of VERSAdos is the fact that it can be used for a target environment running specific application software as well as in a development environment.

The MVME121 System provides a complete software development environment (including editors, assemblers, linkers etc.) but can be used at the same time as a target system, leaving out all development utilities. The software will then be optimized to run the target application specific software.

User Interface

The MVME121 System is simple to operate and is constructed with standardized modules throughout so that the user can adapt it to serve a wide variety of applications or upgrade it to suit future needs. A complete set of user documentation is supplied to allow the user to operate or tailor the operating system as required. The physical interface consists of three push-button switches on the front panel, system reset, local reset and local abort. A rocker switch on the back panel performs the power on/off function. A four-pin connector on the MVME701 board allows attachment of a remote system reset switch. A two-digit hexadecimal display is used to display diagnostic information or may be programmed by the user.

Two software-readable switches are available on the front panel. An 8-segment switch on the MVME050 and a 4-segment switch on the MVME121 provide the ability to select differing operating modes or other user programmed functions.

Expansion Slots

By removing a portion of the front panel, the user has access to the VMEbus expansion slots. The space in the chassis can accommodate 5 double-high VMEbus compatible boards.

Mass Storage Devices

The hard disk, cartridge tape and hard disk controller are mounted in a 3HE removable cassette on the front panel. The floppy disk drive is mounted vertically in the adjacent slot.

Floppy Disk Drive

The unit is a 5¹/₄" slim line drive for soft-sectored dual-sided dual-density, 96 TPI mini diskettes. It has a capacity of 655 Kbytes of formatted data.

Specifications

Number of sides	2
Number of tracks	160 (both sides)
Recording density	5922 B.P.I. (double density)
Track density	96 T.P.I.
Capacity (formatted)	655 Kbytes
Transfer Rate	250 Kbits/sec.

Hard Disk Drive

The slim-line fixed disk features 40.8 MB formatted capacity and highly reliable Winchester technology.

Specifications

Disks	4
Sector per track	32
Capacity (Formatted):	
- per drive	40.8 Mbytes
- per surface	6.8 Mbytes
- per track	8.2 Kbytes
- per sector	256 bytes
Transfer Rate	5 Mbits/sec.

The hard disk is controlled by a SCSIbus compatible controller Adaptec ACB4000.

Tape Drive

The tape drive is a Cipher CT525 quasi start/stop cartridge drive. The removable media has a capacity of 25 Mbytes. The unit is connected to the 8" floppy disk interface of the MVME319.

Specifications

Capacity (unformatted)	32 Mbytes
(formatted)	25 Mbytes
Sector Size	256 bytes
Format	Floppy-Disk-Like (Similar to IBM34)
No. of Tracks	6
Media	1/4" Tape Cartridge (3M DC600A)

SYSTEM V/68

SYSTEM V is the latest version of UNIX available from A.T. & T. Overall, it is 26% faster than its predecessor System III. Changes have been made in the kernel, in the C language and libraries. The version supplied with the MVME121 System is Release 2 or higher.

The Kernel

The kernel support a multi-tasking, multi-user environment whose size is approx. 180 Kbytes. The kernel is of the swapping variety. Processes are scheduled using an aged priority scheme.

File and I/O System

The file system comprises a uniform set of files and directories organized as a hierarchical, tree-like system of arbitrary size. Each physical I/O device is treated like a file, thus allowing for uniform file and device I/O.

Languages

Provided as an integral part of SYSTEM V/68 is the C language compiler "cc". This compiler is based on the Software Generation System (SGS) and supports the Common Object File Format (COFF). Also included is the FORTRAN 77 Compiler, M68000/M68010 assembler.

A symbolic debugger is provided for C, FORTRAN and assembly modules. There is also a series of specialized languages SNOBOL, BS (a small BASIC-like compiler/interpreter), AWK, a pattern scanning and processing language, BC a desk calculator language, YACC, a compiler and LEX, a logical analysis language.

VERSAdos

In the same way the user selects VMEboards to construct modular systems, VERSAdos provides a modular software environment. The ROMable kernel of VERSAdos is called RMS68K and has a minimum size of 16 Kbytes. The size of VERSAdos itself, including file management, is about 100 Kbytes.

The complete VERSAdos package including development utilities and drivers for all Motorola VME boards is about 7 Mbyte in size. This is the package supplied with the MVME121 System.

The user can easily configure VERSAdos according to his specific VME board configuration. All the tools to do this are included in the standard VERSAdos package. Writing one's own driver software for 3rd party products is also an easy task thanks to the well-defined and documented interfaces in the VERSAdos I/O system.

VERSAdos General Construction

The VERSAdos Operating System permits programs to execute in dynamically-assigned, variable-length memory segments with read/write privileges. Instructions and data are located in separate memory areas, which enable sharing of program code and re-entrant coding practices. A process-to-process facility permits communication between independent programs or nodes of a distributed system.

The heart of the operating system is a real-time executive which provides task services and supports memory allocation. It also allows inter-task communication, provides exception monitor facilities, and handles system interrupts.

The input/output subsystem supports device independence, logical input/output and overlapped computation during physical input/output. New device drivers can be added without impacting the central core portion of the Operating System. Both sequential and random record access are supported by the VERSAdos Operating System.

A powerful file management system supports three types - contiguous, sequential and indexed sequential. Other features include volume and file protection, shared file access, dynamic file allocation and fixed or active protection.

Editing

Screen-oriented file editing is supported by a terminal-independent editor and an EXORterm-compatible editor. This uses cursor movement and other function keys for fast, easy-to-use text and source file input and maintenance.

Assembly

Source code programs written in the M68000 assembly language (EXORmacs and VME/10 compatible) can be converted into machine code using the assembler included with the operating system. Macro instructions and structured control statements (while .. do, etc.) are supported by the assembler. Code for the MC68010 can also be generated.

Linkage Editor

Using this utility, relocatable modules can be linked together to form a load module ready to execute in the system memory.

A software package is available that outputs code via one of the RS232C ports to a Data I/O PROM programmer.

This package is ordered separately (see ordering information).

High Level Languages (Options)

Motorola Pascal

This compiler is a category 1 software product and is fully maintained and supported by Motorola. Software updating is available on an annual subscription basis. The language is standard Pascal, as defined by Wirth, with Motorola extensions:

- Non-decimal integers
- Address specifications for variables
- Alphanumeric labels for GO TO statements
- EXIT statement
- HALT statement
- OTHERWISE clause for case statements
- String data type
- Structured function values
- External procedures and functions
- Runtime file assignment

The compiler may consist of two or three phases. Phase 1 processes a source program and produces a compilation listing and error messages, as well as an intermediate code file. Optionally, Phase 1.5 may be invoked in order to optimize the intermediate code, i.e. to reduce the size of the code file. Phase 2 creates a relocatable object file and a listing.

Alcyon C

This third party software product can be ordered through Motorola. Support and maintenance are provided by:

Alcyon Corporation
San Diego, California
U.S.A.

According to Alcyon, C68 is compatible with the Kernigham and Richie language definition. The compiler generates compact, efficient, executable object code.

Utilities include an S-record generator.

The runtime library is provided in source code.

Absoft FORTRAN

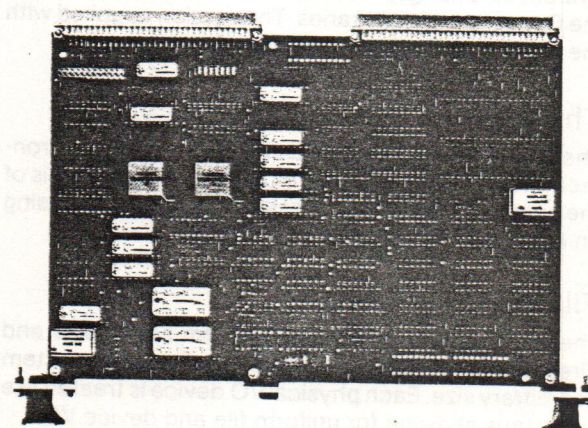
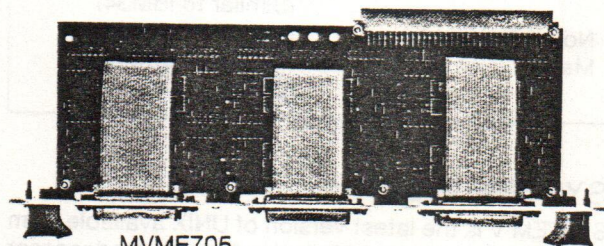
This third party software product can be ordered from Motorola. Support and maintenance are provided by Absoft Corporation, Royal Oak, Minnesota, U.S.A. According to Absoft, the compiler speed is in excess of 1000 lines/min, the language adheres to ANSI 77 standard and many features of the new proposed standard (block structures) generate relocatable and reentrant object code. An intrinsic function library is available for user assembler programs. Includes symbolic debugger with single step capability, dynamic runtime loader and linker, supports external procedures written in assembler and provides for incremental compilation of subprogram libraries.

Expansion for Additional Users

In addition to the three RS232C interfaces supported by the MVME121 system, the user can add an additional 6 serial I/O channels for terminals or other serial devices using the MVME331 and MVME705 modules.

The MVME331 is a high performance intelligent communications controller with an on-board MC68010 processor. Its six serial ports can individually operate at speeds up to 78.8K baud. Simultaneous operation of all six channels is possible at up to 9.6K baud (full duplex). The MVME705 transition board supports RS232C or RS422B standards and can be mounted in the slots provided in the system back panel.

Additional memory can be added in increments of 0.5, 1 or 2 Mbytes using the MVME202, MVME222-1 and MVME222-2 modules.



Specifications

Processor	MC68010 (MVME121 Module)
Cache	4 Kbyte
Memory	1 Mbyte dynamic RAM (MVME121 + MVME222-2)
Disk/Tape Controller	MVME319 Intelligent Mass Storage Controller with Adaptec ACB4000
Mass Storage	40 Mbyte Winchester Disk (5 1/4") 655 Kbyte Floppy Disk (5 1/4") 25 Mbyte Cartridge Tape Drive (Cipher CT525)
I/O Interfaces	2 x RS232C (programmable up to 19.2 Kbaud) 1 x RS232C (terminal mode only) (programmable up to 9600 baud) 1 x parallel printer interface (Centronics type) (Connectors on MVME701 I/O transition board for front or rear mounting)
Expansion Slots	9 x VMEbus (5 free for user)
Power Supply	360W (187-264V or 99-132V)
Operating Temp.	5-40 °C
Operating Humidity	20-80% (non-condensing)


Ordering Information

MVMESYS121N02	MVME121 System with SYSTEM V/68 (220-240 V)
MVMESYS121N01	MVME121 System with SYSTEM V/68 (100-110 V)
MVMESYS121V02	MVME121 System with VERSAAdos (220-240 V)
MVMESYS121V01	MVME121 System with VERSAAdos (100-110 V)
MVME202	512K Dynamic RAM Module
MVME215-1/-2/-3	256 Kbyte/512 Kbyte/ 1 Mbyte CMOS RAM with battery backup
MVME222-1	1MB Dynamic RAM Module
MVME222-2	2 MB Dynamic RAM Module
MVME300	Intelligent IEEE488 (GPIB) Interface
MVME330-UX	Ethernet Board with XNS Software (System V/68)
MVME330-VX	Ethernet Board with XNS Software (VERSAAdos 4.5)
MVME331	6-Channel Intelligent Communications Controller
MVME705	I/O Transition Board for MVME331
MVME332	8-Channel Intelligent Communications Controller
M68VXBPASCAL	Pascal Compiler on VDOS 5 1/4" Floppy
M68VKXBCALCY	Alcyon C on VDOS 5 1/4" Floppy
M68VXBABSFTN	Absoft FORTRAN on VDOS 5 1/4" Floppy
M68K1XBDIOPP	Data I/O PROM Pro- grammer interface (VDOS)

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Product	Description
MVME210	1.5Mbyte dynamic RAM
MVME210	2Mbyte dynamic RAM
MVME210	3Mbyte dynamic RAM
MVME210	4Mbyte dynamic RAM
MVME210	5Mbyte dynamic RAM
MVME210	6Mbyte dynamic RAM
MVME210	7Mbyte dynamic RAM
MVME210	8Mbyte dynamic RAM
MVME210	9Mbyte dynamic RAM
MVME210	10Mbyte dynamic RAM
MVME210	11Mbyte dynamic RAM
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Product	Description
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MVME210	96Mbyte dynamic RAM
MVME210	97Mbyte dynamic RAM
MVME210	98Mbyte dynamic RAM
MVME210	99Mbyte dynamic RAM
MVME210	100Mbyte dynamic RAM

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