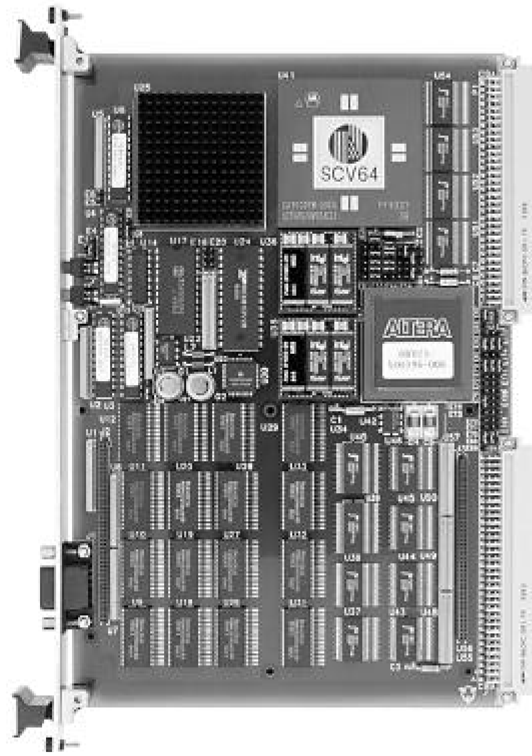
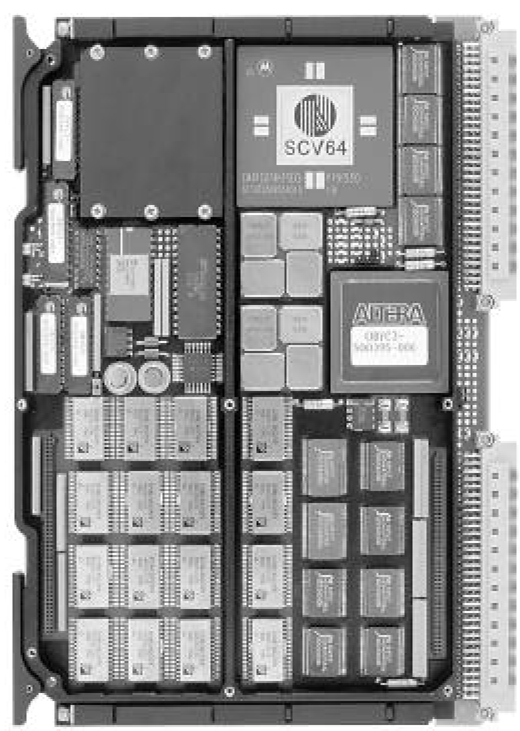
SVME/DMV-162

68040 Single Board Computer with MAXPack Interface





Features

- *68040 CPU at 25 or 33 MHz*
- *512K to 8M bytes SRAM*
- *512K bytes Flash™ EPROM, expandable to 8M bytes Flash™ EPROM, EEPROM*
- *Off-card battery back-up for SRAM*
- *Support for one MAXPack module, providing flexible I/O expansion*
- *512 byte serial EEPROM*
- *Advanced VME Interface Chip (SCV64)*
  - *A32:D32 VMEbus interface with A64:D64 MBLT support per ANSI/VITA 1-1994, VME64*
  - *Location monitor with FIFO buffer*
  - *Bus Isolation mode (BI-mode®)*
  - *Auto-ID and Auto-SYSCON*
  - *System controller functions*
- *One 16-bit counter/timer*
- *Two EIA-423 compatible serial channels*
- *Real-Time Calendar Clock (RTCC)*
- *Tick and watchdog timers*
- *Built-In-Test (BIT)*
- *Foundation firmware including:*
  - *Debug monitor*
  - *Diagnostics*
  - *Card Support Services*
  - *Execution Sequencer*
- *Conduction cooled per IEEE 1101.2 for MIL-E-5400/4158, and MIL-STD-2036*
- *Base card supports 0.65" pitch, base with MAXPack supports 0.8" pitch*
- *Optional levels of ruggedization available*

Description

The SVME/DMV-162 Single Board Computer, (SBC), built with state-of-the-art technology, combines a high-performance, 33 MHz 68040 processor and up to 8M bytes of SRAM on one circuit card. The card is equipped with DY 4's MAXPack interface, a standard mezzanine module approach to achieve additional expansion capability. This allows system designers to increase the SBC's functionality by incorporating one of several standard MAXPack modules, or developing their own custom module. This approach is particularly desirable in achieving with a single slot solution, specialized I/O needs which traditionally required multiple boards. Figure 1 shows a block diagram of the SVME/DMV-162 SBC.

The SVME/DMV-162's design features address mission-critical demands of military and aerospace systems integrators with increased computing performance, self-test coverage and functional density.

The card supports DY 4 Systems' common features including an AVICS-based VMEbus interface, Built-In-Test (BIT), BI-mode®, location monitor, and Auto ID. These features bring benefits in performance, logistics and maintenance.

DY 4's custom-designed SCV64 chip implements all VMEbus interface functions with software-programmable features. It combines low-latency access to the VMEbus with high sustained throughputs. Built-In-Test (BIT) hardware features verify all operational circuits on the module. Bus Isolation mode (BI-mode®) increases ease of testing and system fault location. The location monitor supports efficient interprocessor messaging, to minimize overhead in real-time software. Auto-ID allows boards to be self-configuring, based on slot location.

These features allow users to:

- build high-performance multi-processor systems
- detect and isolate faults during operation
- minimize field maintenance and sparing logistics.

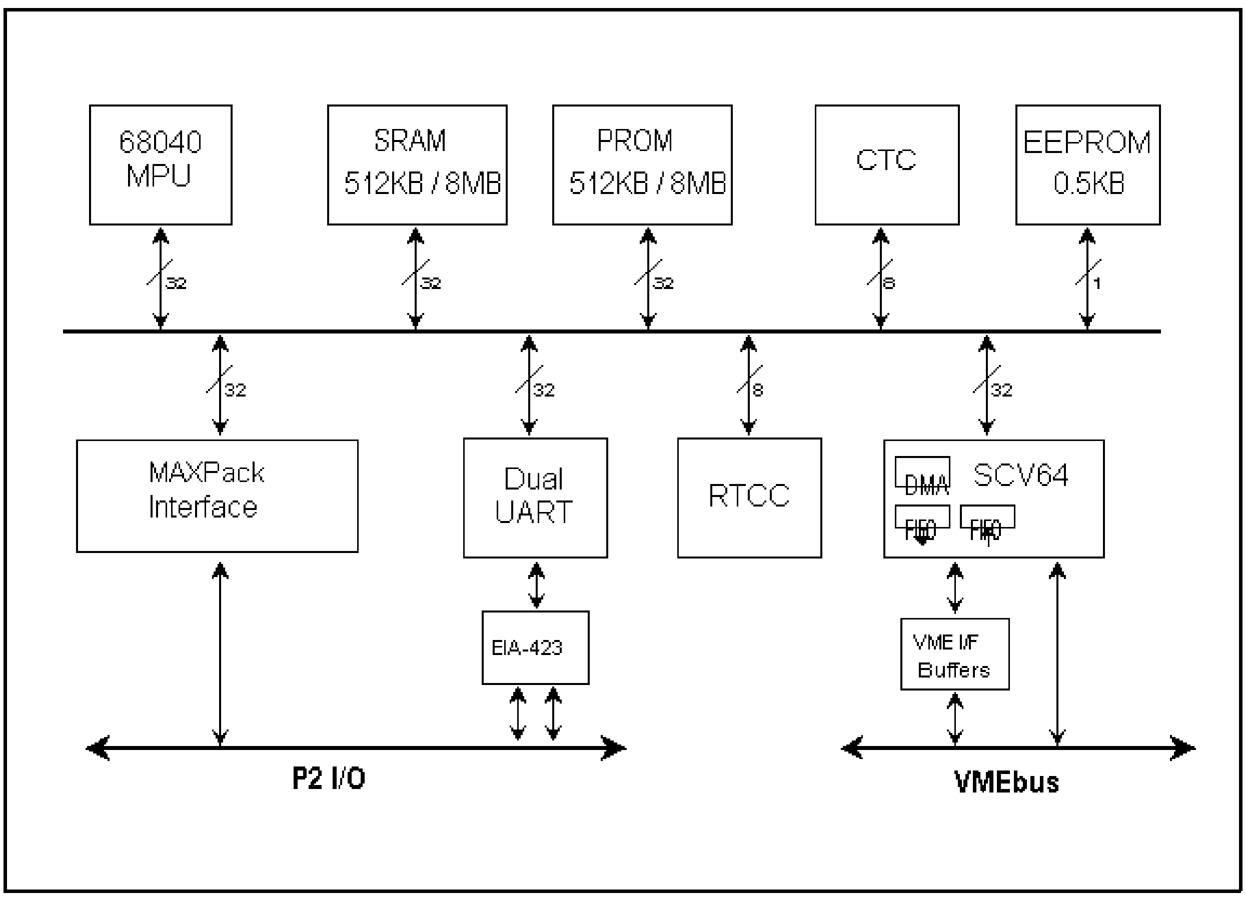


Figure 1: SVME/DMV-162 Block Diagram

All versions of the SVME/DMV-162 are functionally identical. SVME versions for use in air-cooled environments are available in DY 4 ruggedization levels 0, 1, 2 and 3.

The conduction-cooled DMV version is designed for airborne, land-mobile, and naval military applications where circuit cards are sealed in a chassis to prevent moisture, salt-fog, sand, and dust contamination. DY 4 Systems' conduction-cooled products are designed for severe environmental conditions defined by MIL-E-4158, MIL-E-5400, and MIL-STD-2036. A single-piece aluminum thermal plane bonded to the PWB conducts heat away from the electronics. Its integral stiffening ribs improve heat dissipation and vibration resistance. Standard wedgelock fasteners give a reliable thermal connection to the chassis.

CPU

The 68040 CPU is a high-performance, 32-bit microprocessor from Motorola's third generation of the M68000 family. It is a virtual memory microprocessor using multiple, concurrent execution units and a highly integrated architecture. The 68040 CPU integrates the following:

- 68030-compatible integer unit
- 68881/68882-compatible Floating Point Processor (FPP)
- dual independent demand-paged Memory Management Units (MMU) for instruction and data stream accesses
- 4K-byte instruction cache
- 4K-byte data cache.

Memory

The memory of the SVME/DMV-162 SBC can be configured to support from 512K bytes to 8M bytes of SRAM. There are a pair of 32-bit memory sites for non-volatile storage. The SRAM is accessible from the on-board CPU, the VMEbus, and the MAXPack interface. The memory interface design supports 68040 burst mode accesses, providing 3/2/2/2 burst performance. Random reads require three clock periods.

The SVME/DMV-162 SBC supports the use of the VMEbus +5V STDBY line to power the SRAM. This preserves the volatile memory contents during loss of main power.

The 32-bit memory sites support Flash™ EPROM, and EEPROM devices. Up to 8M bytes of storage is possible. Flash EPROM and EEPROM devices may be programmed on-board. Table 1 summarizes the memory configurations for the SVME/DMV-162 SBC.

The SVME/DMV-162 SBC also has a 512 byte serial EEPROM for storing configuration data.

MAXPack Interface

The SVME/DMV-162 SBC is equipped with a MAXPack mezzanine module interface. MAXPacks may be used to add a variety of I/O functions to the base board. MAXPack modules conform to an open specification that defines the electrical and mechanical interface, thus permitting customers to design special function modules. DY 4's RISC based SBCs carry the same MAXPacks, thus providing a performance growth path that preserves the software invested in the MAXPack.

The MAXPack mechanical design is suited to high shock and vibration environments. The modules are rigidly mounted to the base board along three stiffening ribs and also along a rib parallel to the card edge. This arrangement is structurally rigid, and it provides a low-resistance thermal path for heat removal.

All I/O connections of the MAXPack module are brought out to the P2 connector of the SVME/DMV-162 SBC. Figure 2 shows a conceptual view of the assembly.

SVME/DMV-162

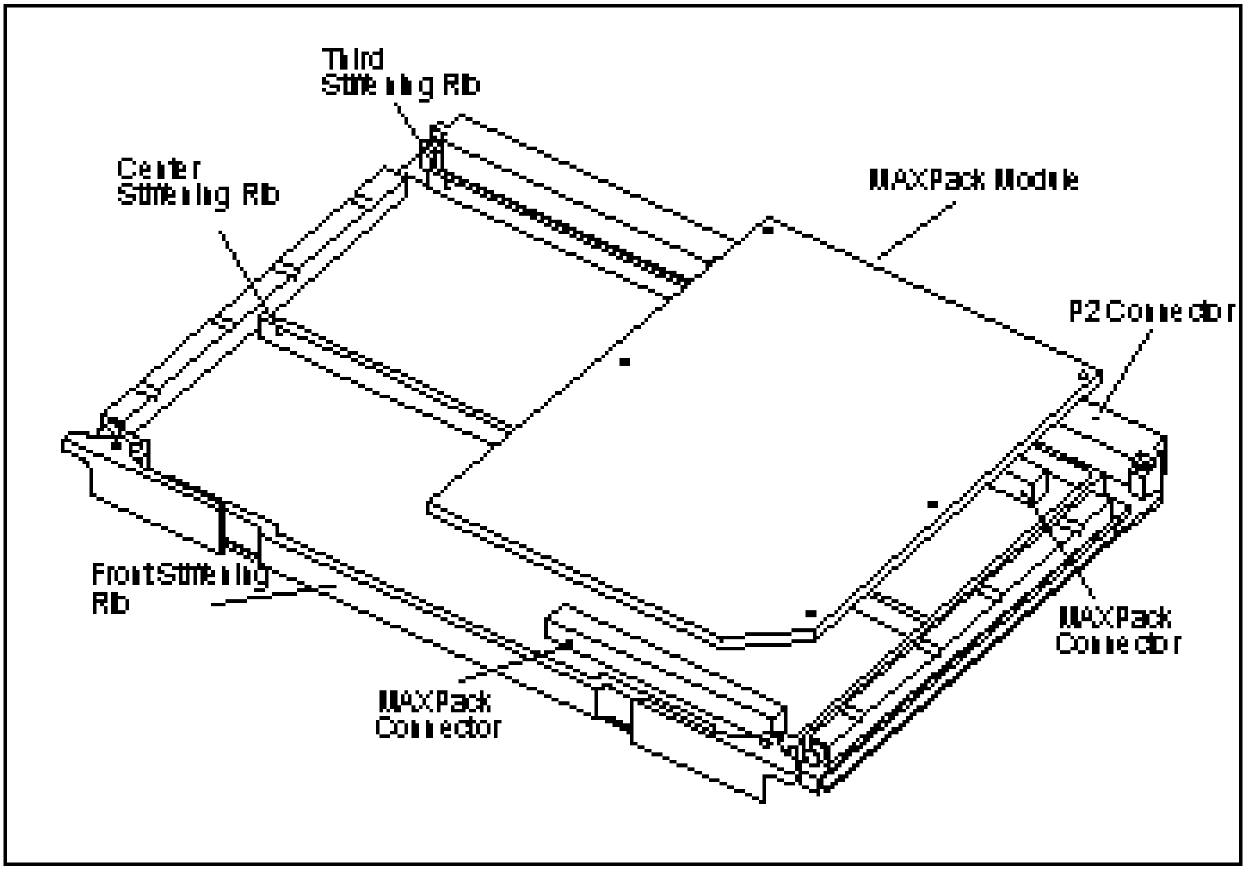


Figure 2: Base Board with MAXPack

VME Interface

The VMEbus interface of the SVME/DMV-162 SBC is implemented with DY 4's Single Chip VMEbus Interface, (SCV64), which provides all the elements of a complete VMEbus interface. The philosophy of the SCV64 design is to provide programmable features that eliminate the need for jumpers, thereby simplifying logistics and reducing sparing requirements. The SCV64 incorporates the following:

- System Controller
- Master/slave A64:D64 interface
- Tx and Rx FIFO's to decouple bus operations
- Location monitor with FIFO message queue
- Interrupter, interrupt handler
- Extensive Built-in-Test support

The SCV64 provides all VMEbus system controller and interrupt functions. It allows for full programmability of requester modes and levels, arbiter modes, bus timers, interrupt levels and vectors. The SCV64 also features extensive BIT features and BI-mode®

A primary function of the SCV64 is to allow the CPU to access the VMEbus, and to allow the VMEbus to access on-board memory. The SCV64 contains transmit and receive FIFO's which are used to implement a store-and-forward technique of bus decoupling. SCV64-equipped CPUs can write to VMEbus locations without incurring a delay while the VMEbus is requested, arbitrated, and the bus grant received.

For moving large blocks of data between on-board memory and the VMEbus, the SCV64 provides an integral DMAC. Bi-directional transfers can be configured to occur in discrete, block, or multiplexed block (D64) mode. Real throughput of up to 60M bytes/sec may be achieved.

Table 1 Memory Configurations			
Location / Type	**Flash EPROM**	**EEPROM**	**SRAM**
Boot PROM	512K/ 2M/ 4M		
Bank 1	512K/ 2M/ 4M	128K/512K	
Bank 2			512K/ 1M/ 2M/ 4M/ 8M
Note: Non-volatile memory sizes are representative of available devices at time of publication. Higher density devices may become available.			

To support inter-processor message passing, the SCV64 provides a location monitor (LM) with a built-in FIFO message queue. A write access to the LM results in capture of the data, and causes an interrupt to the CPU. The message queue is organized as a 32-bit wide FIFO with 31 entries.

Serial Interface

The SVME/DMV-162 is equipped with an 88C681 UART, which provides two asynchronous serial channels. The electrical interface of the serial channels is EIA-423, permitting communication with EIA-423, EIA-422, and EIA-232 interfaces. Baud rates are programmable from 75 to 38.4K baud. Interrupts are also programmable under software control. The serial channels are available at the P2 connector and at the front panel connector on the SVME version.

Real-Time Calendar Clock (RTCC)

The SVME/DMV-162 is equipped with a Harris 7170 RTCC chip to provide for time-of-day calculations. It contains registers for year, month, day, day-of-week, and seconds through to hundredths of seconds, and interrupt controls. Leap-year and days per month are automatically updated. The RTCC is capable of periodic or alarm/wake-up interrupts to the MPU.

The RTCC may be powered from the +5V STDBY line, therefore it can continue to maintain the time during loss of main power.

Timers

The SCV64 chip provides the user with two timers. A tick timer can be programmed to interrupt the CPU at regular intervals. A watchdog timer provides a fail indication and resets the CPU if it detects an execution failure.

An additional 16-bit timer provided by the 88C681 UART is available for use by the programmer.

System Status Signals

The SVME/DMV-162 SBC provides a status signal on the P2 connector. This signal asserts in the event of a card failure, and corresponds to the front panel indicator LED, permitting a test connector to be incorporated in a sealed conduction-cooled chassis.

MAXPacks

The capabilities of the SVME/DMV-162 SBC can be enhanced by adding a MAXPack module. MAXPack modules are available in all standard DY 4 ruggedization levels, for use with both air-cooled and conduction-cooled base boards. MAXPacks that are available include:

- MAX-220 SCSI/Ethernet/ serial/parallel Controller, provides SCSI (single-ended), Ethernet , four asynchronous RS-232/RS-422 or two synchronous RS-232/RS-422 serial channels, and a 14-bit parallel interface.
- MAX-651 Single 1553B, Utility Bus, serial I/O, parallel I/O and non-volatile memory.
- MAX-654 Dual 1553B Controller, provides two redundant 1553B interfaces. Support for 1553A, and 1553B Notice 2. Modes include BC, RT and BM

Foundation Firmware

The SVME/DMV-162 SBC is supplied with a foundation firmware package consisting of:

- General Purpose Monitor (GPM) - provides comprehensive monitoring and debug functions for the system integrator (refer to General Purpose Monitor, document number MS00053)
- Card Level Diagnostics (CLD) - provides diagnostic routines which perform a self-test function in conjunction with the Built-In-Test equipment (refer to Card Level Diagnostics, document number MS00050)
- Card Support Services (CSS) - provides a common software interface to the hardware features on the card, device independent I/O functions generic exception processing routines, and Auto-ID services (refer to Card Support Services, document number MS00180)
- Execution Sequencer (ES) - controls the invocation order of the Software Configuration Items on the card (refer to Execution Sequencer, document number MS00181).

Accessories/Variants

The SVME/DMV-162 SBC is available in varying configurations to match the features, performance and ruggedizaton required for the target application. Additional items to assist in software development and system integration are available. The SVME/DMV-162 SBC options and accessories consist of:

- SRAM capacity from 512K bytes to 8M bytes
- 68040 Processor clock frequency
- PROM memory type and size
- Factory installation of MAXPack modules.
- P2 I/O cable for development system use
- FlashProg Flash EPROM programming utility
- VxWorks Board Support Package

The SVME-162 cards are available in ruggedization levels 0 to 3, and the DMV-162 cards are available in levels 2 and 3.

Table 2
Specifications

ENVIRONMENTAL SPECIFICATIONS		
Temperature	**(Level 0)**	
Operating	0°C to 50°C	MIL-STD-810
Storage	-40°C to 85°C	Methods 501.3 & 502.3
Temperature	**(Level 1)**	
Operating	-40°C to 85°C	MIL-STD-810
Storage	-40°C to 85°C	Methods 501.3 & 502.3
Temperature	**(Levels 2, 3)**	
†Operating	-55°C to 85°C	MIL-STD-810
Storage	-62°C to 125°C	Methods 501.3 & 502.3
Humidity (DMV CCA and SVME CCA - Levels 1,3)		
Operating	0 to 95% non-condensing	MIL-STD-810
Non-Operating	0 to 100% condensing	Method 507.3
Vibration (DMV)		
Sine	5g at 15 to 2,000 Hz	MIL-STD-810
Random	$0.1g^2/Hz$	Method 514.4
Shock (DMV)	40g/11ms half sine	MIL-STD-810 Method 516.4, Proc 1
Altitude (DMV)	21,350m (70,000 ft)	MIL-STD-810 Method 500.3

DIMENSIONS	**DMV CCA**	**SVME CCA**
Height	233.4 mm (9.2 in.)	233.4 mm (9.2 in.)
Depth	160 mm (6.3 in.)	160 mm (6.3 in.)
Thickness (base)	16.5 mm (0.65 in.)	20.0 mm (0.8 in.)
(base+MAXPack)	20.0 mm (0.8 in.)	
Weight	<650g (<1.4 lb)	<540g (<1.2 lb)

POWER REQUIREMENTS		
+5v (+5%, -2.5%) (note 1)	3.0 A (maximum)	2.1 A (typical)
+5v STDBY (operating)	1.0 A (maximum)	0.7A (typical)
+5v STDBY (standby)	250 mA (maximum)	150 mA (typical)
+12v (+5%, -2.5%)	16 mA (maximum)	8 mA (typical)
-12v (+5%, -2.5%)	16 mA (maximum)	8 mA (typical)

Note1: This is the total current for the board. If +5V STDBY is used then the current drawn from +5v is reduced accordingly.

† As a general design objective, the junction temperature of all components on the DMV-162 SBC is limited to 110°C maximum (when the chassis cold-wall temperature is 85°C.) When reliability or performance factors permit, a component's junction temperature may exceed 110°C marginally.
SVME board operating temperature is based on air flow of 11 cfm.

SVME/DMV-162

DY 4 Systems Ltd.
98 Alexandria Pike
Suite 32
Warrenton, VA
20186-2849 USA

Virginia
Tel: (540) 341-2101
Fax: (540) 341-2103

New Jersey
Tel: (908) 362-5557
Fax: (908) 362-5821

California
Tel: (909) 783-0240
Fax: (909) 783-4590

Texas
Tel: (972) 680-5201
Fax: (972) 680-5203

DY 4 Asia Pacific
Level 15, Corporate Centre One
Cdr Bundall Rd & Slatyer Ave
Gold Coast QLD 4217
Australia
Tel: +61 7 5591 9546
Fax: +61 7 5591 9547

DY 4 Europe
15 Lambourne Crescent
Cardiff Business Park
Llanishen
Cardiff, CF4 5GG
Tel: +44 (0) 1222-747927
Fax: +44 (0) 1222 762060

DY 4 Canada
333 Palladium Dr. M/S 252
Kanata, Ontario
Canada
K2V 1A6
Tel: (613) 599-9191
Fax: (613) 599-7777

World-wide Internet Support Services
Sales Support e-mail: sales@dy4.com
Customer Support e-mail: support@dy4.com
Customer Support Tel: (613) 599-9199 ext. 418

World-wide Web
http://www.dy4.com