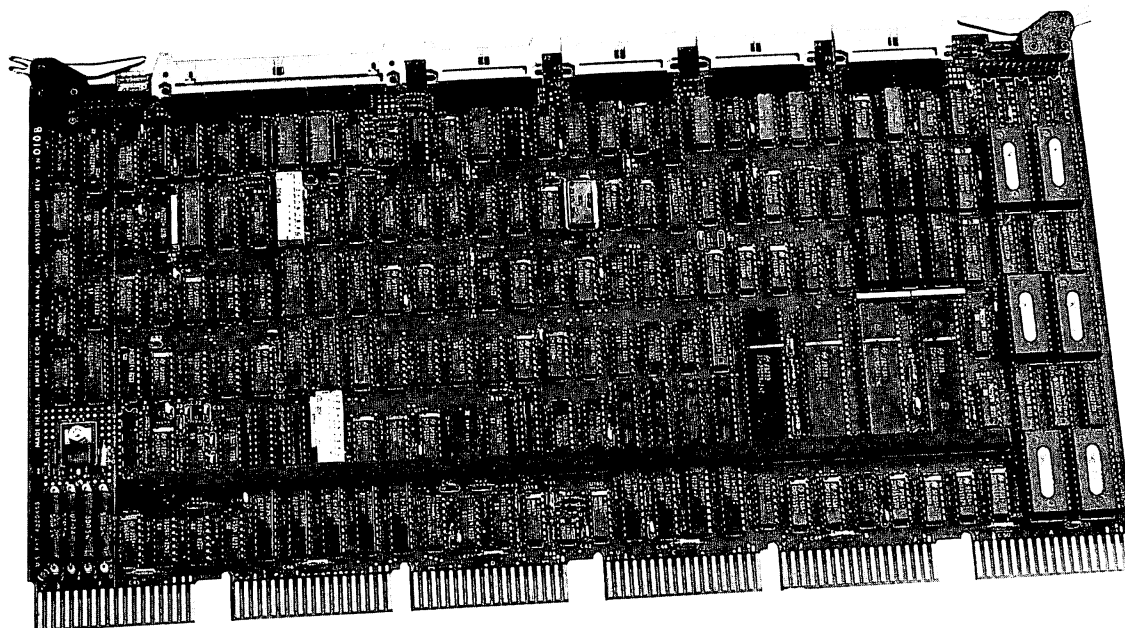




**THE GENUINE ALTERNATIVE
FOR PDP-11* AND VAX-11/730
DISK CONTROLLER TECHNOLOGY**

EMULEX SC31 SERIES



HANDLE THOSE SPEEDY, NEW HIGH-DENSITY DISK DRIVES WITH EASE!

PDP-11 and VAX-11/730 users have a lot going for them with the latest EMULEX achievement. The SC31 is optimum for use with the 1.8 MByte/second transfer rates of high-speed Winchester's like the

Fujitsu "Eagle." Enjoy increased performance and the flexibility and reliability you've come to expect — and get — from EMULEX. And it's all possible through a single "Universal Emulation."

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THIS LATEST EMULEX PDP-11 AND VAX-11 CONTROLLER GIVES YOU ALL THE ADVANTAGES OF...

INCORPORATING currently available large capacity Winchester or removable disk drives — including Fujitsu's new Eagle drive.

EMBEDDING the controller in only one existing hex-size slot of your standard PDP-11 or VAX-11 Unibus.

EMULATING the new Digital Storage Architecture (DSA) in the future, if desired.

PERFORMING a comprehensive set of self-test diagnostics.

WORKING properly when you plug it in and continuing to work reliably for thousands of hours.

YOU GET ALL THESE ADVANTAGES BECAUSE...

... the SC31 was designed specifically—and exclusively—to integrate large capacity, high performance disk drives with the DEC Unibus.

Incorporating a standard SMD interface, it is optimum for SMD class drives having capacities of 80 MBytes and above. Using advanced, modern microprocessor architecture, the SC31 has been configured, through a single "universal" firmware version, to emulate either DEC's RM02/RM03/RM05/RM80/RP06 disk subsystems on PDP-11 CPU's or the RM02/RM03/RM05/RP06/RM80 and expanded RM80 on VAX-11 computers.

The SC31 gives you the same performance and all the features of our large VAX controllers. And all on a single hex board that takes up minimum space and with low power consumption. Like our larger VAX controllers, the SC31 is designed to handle the new 1.8 MByte-per-second transfer rate drives—like the Eagle—*now*. And we've designed in the capability for quick conversion to emulate the new Digital Storage Architecture (DSA).

FOR PDP-11 UNIBUS APPLICATIONS...

The SC31 emulates applicable DEC disk subsystems using essentially any industry drive with a standard SMD interface. Naturally, all standard models for the PDP-11 Series are DEC diagnostic and operating system compatible. And the SC31 generates DEC-compatible media when the pack is identical to that of the equivalent DEC drive.

FOR VAX-11 APPLICATIONS...

The SC31 consists of a hardware/software package designed to add economical big disk storage to a VAX-11 system. Hardware is the SC31/BX programmable controller to optimize the controller for VAX-11 Unibus operation. Software is the EMULEX developed and supported VAX/UM software package which consists of four modules: Formatter, Driver, Boot, and Diagnostics. The software driver and diagnostic package is provided on TU58

cartridge or RX01 floppy and carries a 90-day warranty/update service.

The total package provides complete capability to install and operate the large capacity disk drives on the Unibus of any VAX-11 Series computer. It gives you the same or even greater storage capability than typical DEC Massbus installations at a fraction of the cost.

ONLY THE SC31 PROVIDES THIS COMPLETE LIST OF FEATURES AND BENEFITS...

ADVANCED MICROPROCESSOR ARCHITECTURE. A unique patented design incorporates high-speed bipolar technology to meet the performance demands of both conventional (1.2 MByte/sec.) and high performance (1.8 MByte/sec.) storage module and Winchester disks. The design also incorporates all facilities required to provide future emulations of the new Digital Storage Architecture, such as the UDA-50 controller.

COMPACT PACKAGING. Each unit is contained on only one stand-alone hex board which plugs into any standard Unibus SPC slot.

MIXED DISK DRIVE CAPACITIES. Disk drives having different configurations (i.e., number of heads and cylinders) may be operated together on the SC31 controller. Switch settings permit selection of any one of 64 different combinations of predefined drive configurations. Additionally, the SC31 offers the unique feature of being able to handle mixed drive types, i.e. RMXX and RPXX, on a single controller.

ADAPTIVE DMA THROTTLE. This SC31 feature was developed based on experience in a broad range of installations. During each DMA data transfer burst, the controller measures the waiting time for the other pending NPR requests and suspends its own DMA activity to permit other DMA transfers to occur. In addition, a programmable "deadband" time is provided between bursts to insure that CPU functions, including interrupt servicing, are not locked out for excessive periods of time by the high-speed disk transfers.

BUS EFFICIENCY. The SC31 has the most efficient implementation available in a microprocessor-based design and reduces bus delays on programmed I/O and DMA transfers to insignificant levels.

LOW POWER. Only 8 amps at +5V and 0.7 amps at -15V are required from the internal computer power supply.

RELIABILITY. Calculated MTBF is 30,000 hours; measured results show a much higher actual MTBF figure.

MEDIA COMPATIBILITY. Data packs are compatible/ interchangeable between DEC RM02/03 (80 MByte), and RM05 (300 MByte) drives and an SC31-based subsystem incorporating media-compatible disk drives.

INTERNAL SELF TEST. Automatic self-test executed by internal microcode with LED error status provided.

LARGE DISK I/O BUFFER. A 7168 byte RAM memory provides a full fourteen sector buffer to eliminate "data late" worries even when operated at low bus priorities. This facility, combined with the Adaptive DMA Throttle feature, permits a system to always operate at optimum rates regardless of Unibus configuration.

FOUR DRIVE SMD INTERFACE. Four disk ports are provided on the controller to eliminate auxiliary paddle boards or wiring panels for handling multi-drive installations. The standard SMD interface permits operation at cumulative daisy-chain A-cable lengths of 100 feet and radial B-cable distances of 50 feet.

UNIVERSAL DRIVE PORTS. Drive ports on the board are entirely transparent to drive number.

Therefore, any drive number can be set up on any port and changed at any time without reconfiguring the controller.

ECC/CRC HARDWARE. Thirty-two bit error correction code (ECC) capable of correcting single error bursts up to 11-bits and detecting burst of longer length. Employing 16-bit CRC for header error detection.

COMMON HARDWARE. Controller model/versions are implemented strictly through microcode and on-board operations switches using common hardware.

LOGICAL TO PHYSICAL MAPPING. Switch-selectable configurations to allow mapping of two logical drives per physical drive. Enables user to take advantage of the larger capacity disk drives and their lower cost-per-bit, plus the added advantage of complete operating system transparency.

GENERAL SPECIFICATIONS

The following specifications apply to all SC31 Series large disk controllers.

Characteristic	Specification	Characteristic	Specification
Functional Design	High-speed bipolar microprocessor based controller for integration of essentially any disk drive having an industry-standard SMD interface to host VAX-11 or PDP-11 computer.	Status Display	Two edge-mounted LED's for error and activity display.
Computer Interface	Standard Unibus via SPC interface. Memory data parity check performed on all transfers. Approved line drivers/receivers used exclusively; one unit load per bus signal line.	Option Switches	On-board slide switches provided for convenient selection of program controlled operating/configuration options.
Disk Interface	Storage Module Drive (SMD) interface standard; serial data rate up to 1.8 MBytes per second (15 Mhz.). Differential line drivers and receivers used on all signal lines. Daisy chain (A) and radial (B) cable lengths up to 100 and 50 feet, respectively.	Buffer Memory	8192 byte high-speed RAM buffer, accessible to the microprogram, for data buffering and internal storage operations. Typically 7168 bytes (14 sectors) used for data buffering.
Number of Drive Configurations	A different drive configuration (type, size, etc.) may be operated in each port, with switch selection of up to 64 combinations of drives on the 4 available ports.	DMA Transfers	16 word burst per controller DMA request, programmable 1-28. Burst is interruptable by other DMA requests. "Deadband" period between bursts is programmable/selectable.
DMA Address Range	0-128 K Words.	Physical Packaging	Single hex height circuit board. Standard SPC 6-connector interface. Extractor handles provided for easy insertion/removal. Unique board stiffener eliminates typical hex board warping problems and insures integrity of backplane or system unit.
Base Address	Four preprogrammed addresses, switch-selectable. Eight interrupt vectors.	Number of Drives	1-4.
Priority Level	BR5	Cable Connectors	One common 60-pin control (A) flat cable connector plus four 26-pin radial data (B) flat cable connectors.
Error Control	On-board 32-bit ECC and 16-bit CRC hardware for error detection/correction under microprogram control.	Power	+5V \pm 5%, 8 amps max; -15V \pm 5%, 0.7 amps max; standard SPC backplane/system unit pins used.
		Environmental	Exceeds all environmental ranges and conditions specified for commercial PDP-11.



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STANDARD MODELS

The SC31 is available in a single universal model which emulates standard DEC disk storage subsystems. Specific subsystem emulations are set by a switch on the board. Refer to the EMULEX "Controller Handbook" for detailed functional characteristics of DEC logical units.

• MODEL SC31/BX

For PDP-11 Series:

The SC31/BX emulates the DEC RH11 interface with RM02/RM03 (67.4 MByte), RM05 (256.2 MByte), or RP06 (174.4 MByte) logical units.

For the VAX-11:

The SC31/BX emulates the DEC RH11 interface with RM02/RM03 (67.4 MByte), RM05 (256.2 MByte), RM80 (124.6 MByte), or expanded RM80 (413.8 MByte) on Fujitsu's "Eagle."

Controller includes all standard functional features plus extended features such as command pack formatting and on-board ECC correction. Supports standard SMD and Winchester-type drives of 40-600 MByte capacity with a maximum data rate of 1.8 MBytes per second; packs are compatible with DEC Media and drives equivalent to DEC RM02, RM03, and RM05.

Emulates DEC RJM02, RJM05, RJM80, and RJP06 subsystems including dual-port.

DISK SUBSYSTEMS CHARACTERISTICS

CHARACTERISTIC	DEC SPECIFICATION				EMULEX SPECIFICATION					
	RJM03	RJP06	RJM05	RJM80	SMD-80	MMD-160	MMD-160	SMD-300	FMD-600	EAGLE
Drive Type—Capacity	RM02-80	RP06-200	RM05-300	RM80-158	SMD-80	MMD-160	MMD-160	SMD-300	FMD-600	EAGLE
Emulation	N/A	N/A	N/A	N/A	RM03	2XRM03	RM80	RM05	2XRM05	2XRP06
Mode	N/A	N/A	N/A	N/A	Std.	Std.	Std.	Std.	Std.	Std.
Platters/Drive	3	10	10	4	3	6	6	10	10	6
Tracks/Cylinder	5	19	19	14	5	10	10	19	40	20
Cylinders/Drive	823	815	823	561	823	823	823	823	842	842
Sectors/Track	32	22	32	32*	32	32	32*	32	32	44
Data Bytes/Sector	512	512	512	512	512	512	512	512	512	512
MBytes/Logical Unit	67.4	174.4	256.2	124.6	67.4	67.4	124.6	256.2	256.2	174.4
Logical Units/Drive	1	1	1	1	1	2	1	1	2	2
MBytes/Drive	67.4	174.4	256.2	124.6	67.4	134.8	124.6	256.2	512.4	348.8
Phys. Drives/Controller, Max	8	8	8	8	4	4	4	4	4	4
MBytes/Controller, Max	539.4	1395.5	2049.6	996.8	269.7	539.2	498.4	1024.8	2049.6	1395.2
Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600	3961
Bit Density, BPI	6060	4040	6060	6060	6060	6060	6060	6060	6060	12800
Data Rate (K Words/Sec)	491.5	337.9	491.5	491.5	491.5	491.5	491.5	491.5	491.5	743.6

*31+1 spare (skip) sector.