

**CalComp**  
**Memory Products**

*Trident Disk Drives*  
*Hunter Disk Drives*  
*Marksman Disk Drive*  
*Floppy Disk Drives*  
*Disk Subsystems*  
*Floppy Disk Storage System*



## Trident Disk Drives

CalComp's family of removable disk pack drives has become a best-seller with system builders throughout the world.

CalComp, a disk drive specialist, is a single-source supplier that offers not only compatibility, remarkable price/performance ratios, and fast delivery, but quality service and support as well. The next step: complete, plug-in disk memory system solutions for those with more comprehensive needs.

CalComp has created new controllers and software to

go along with our outstanding disk drives and comprehensive service/support network.

Trident is one of the broadest lines of removable disk pack drives available from any source, which means you can buy disk drives or a complete disk memory system from CalComp that comes closer to matching your specific needs.

Trident disk drives offer the industry's widest choice of drive capacities — 25,

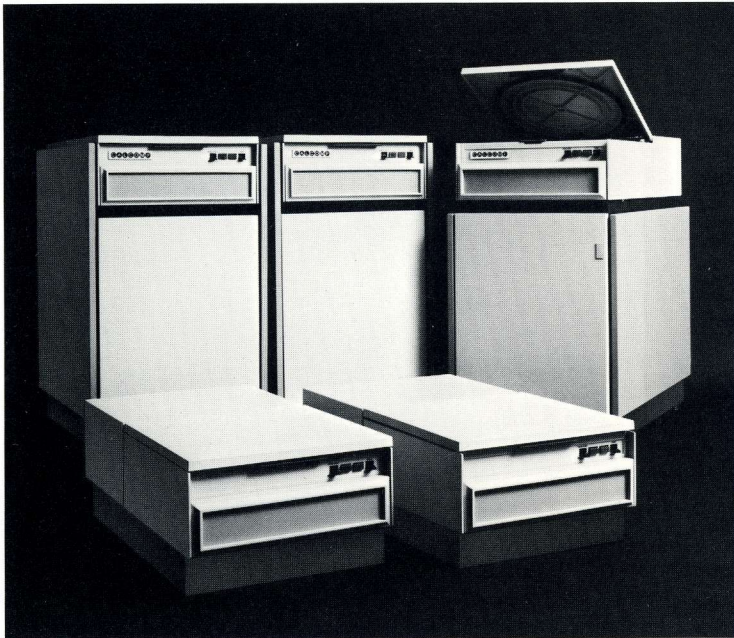
50, 80, 200 and 300 megabytes. There is flexibility to grow — up or down — depending upon the needs of your system.

The Trident disk drive features state-of-the-art technology, superior MTBF, a totally enclosed contamination control system, and has become the standard of comparison in disk drive maintainability.

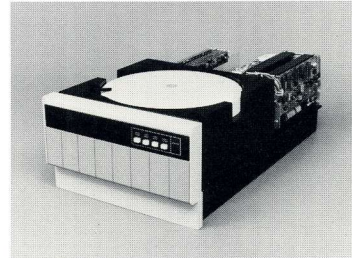
Trident's contamination control system features an absolute filter with positive filtration for air circulating within the disk pack. Even during maintenance, the air system remains enclosed.

This feature is unique to Trident disk drives, and reduces read/write errors caused by contaminants. As a result, thousands of Tridents are operating reliably in non-computer room environments.

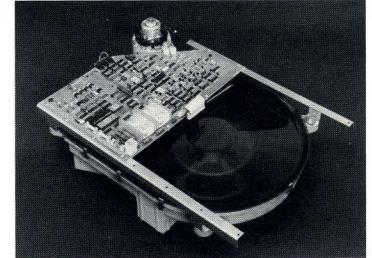
Quite simply, it is a better designed disk drive with proven advantages in cost of ownership.



Five Trident disk drive models mean unmatched flexibility.



Hunter



Marksman



## Hunter Disk Drives

This new addition to the CalComp family of disk drives offers both removable and fixed disk storage in the same drive.

The Hunter family satisfies the need for larger capacity, higher reliability cartridge disk drives by combining the advantages of micro-processor control with the benefits of 3330 technology. The track following servo system improves the head positioning accuracy to the point of completely eliminating the need for thermal compensation found in 5440/2315 style drives.

A 5440 type cartridge with a 3330-11 disk provides for 16 MB of removable storage without sacrificing the field proven reliability of existing top loading cartridges. One to three fixed disks provide up to 83 MB of non-removable storage. Hunter brings large disk drive performance to the cartridge drive user.

- **Enclosed Contamination Control System** provides superior operation in non-computer room environments.

- **Diagnostic Aids** include detailed error reporting and interface availability of internal control signals.

- **Front Panel Display** indicates operator or program errors as well as drive malfunctions, thus minimizing service calls.

- **Maintenance Cylinders** provide scratch area for maintenance.

Added features of the Hunter family include compatibility with all members of the Trident family of disk drives and SMD's as well, allowing users to mix the two types of drives on a single controller. Additional system flexibility is afforded by the unit's dual access capability.

## Marksman Disk Drive

Marksman is CalComp's new 20MB fixed media disk drive.

Key to the drive's enhanced price/performance ratio is the combination of Winchester-type technology for high performance with floppy disk techniques for low cost.

The Marksman design provides for significant benefits in terms of service life and reliability. No preventative maintenance is required, and the drive is designed to exceed 8000 hours MTBF.

The drive's low cost is made possible by the use of a stepper motor driven band positioner. The integral microprocessor allows the motor to slew at high speed with controlled acceleration/deceleration, providing a significant increase in stepper motor performance.

Marksman has been designed to enable the

systems manufacturer to achieve a high degree of flexibility and the largest practical percentage of added value in the memory subsystem.

In essence, Marksman serves that portion of the systems market requiring the lowest cost entry into the rigid disk performance areas. The new drive offers a data transfer rate 15 times that of a double density floppy drive and access to over 15 times the storage capacity in less than one-half the access time.

Marksman includes a VFO data separator as a standard feature. It is power supply compatible with floppy disk systems and has provision for the mounting of customer designed formatters and controllers.

### Specifications & Characteristics

	Trident								Hunter			Marksman
	T-25	T-50	T-80	T-82	T-200	T-202	T-300	T-302	H-32	H-64	H-96	M-20
<b>Capacity</b>												
Removable	27.4	54.7	82.1	82.1	208.1	208.1	312	312	16.6	16.6	16.6	
Fixed									16.6	49.8	83	20.1
<b>Densities</b>												
Track Density (TPI)	185	370	370	370	370	370	370	370	370	370	370	180
Recording Density (BPI)	4040	4040	6060	6060	4040	4040	6060	6060	6060	6060	6060	7545
Transfer Rate (KBPS)	806	806	1209	1209	806	806	1209	1209	1209	1209	1209	960
<b>Access Time</b>												
Track-to-track (ms)	6	6	6	6	6	6	6	6	6	6	6	20
Average (ms)	30	30	30	30	30	30	30	30	30	30	30	60
Max (ms)	55	55	55	55	55	55	55	55	55	55	55	130
Average Latency (ms)	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	12.5
<b>Error Rate</b>												
Recoverable	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>	<1 in 10 <sup>10</sup>
Non-Recoverable	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>	<1 in 10 <sup>13</sup>
Positioning	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>	<1 in 10 <sup>6</sup>
MTBF—Designed to exceed (in hours)	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	8000
MTTR—Designed to be less than (in hours)	1	1	1	1	1	1	1	1	1	1	1	½
Interface — (T = Trident)	T	T	T	SMD	T	SMD	T	SMD	T, SMD	T, SMD	T, SMD	Micro



# Floppy Disk Drives

The inherent advantages of the floppy disk over previously available storage media are higher transfer rates, higher capacities, random access and, most significantly, higher reliability. While maintaining a low storage cost, these advantages make it an ideal choice over such media as paper tape, punched cards, magnetic tape cartridges or cassettes and magnetic cards.

Employing simplified design for reliability and easy maintenance, the CalComp drives use proven hardware to take advantage of the experience gained in delivering over 60,000 Floppy disk drives.

The latest model drives, 142M and 143M, use state-of-the-art technology to ease the system designer's task by providing increased capability, higher performance and lower system cost. As an example, a unique monolithic LSI chip has been specially designed to provide the following benefits:

- High reliability inherent in LSI
- Low MTTR with one replaceable element
- Reduced spares inventory
- Maximum capability by eliminating chargeable options

- More features in less circuit board area
- More capabilities per drive
- Inherent noise immunity
- High speed coupled with design simplicity

CalComp's concern for the OEM system designer and system user is reflected in the following high-value features:

- Digital time delay buffer circuit improves data recovery margins.
- Two DC voltage requirements as opposed to the three required in many other floppy disk drives.
- Wide timing margins eliminate the need for write precompensation.

- Superior read recovery system provides a typical read margin in the MFM mode of 1/2 bit cell time.
- Mounts in all three planes, and two units installed horizontally require only 5 1/4 inches of a standard 19-inch RETMA rack.

CalComp has established an organization that specializes in small disk products to provide you with the kind of responsiveness, service and backup you need. CalComp is fully committed to meet the OEM's needs as the floppy disk market expands, while maintaining our commitment as a total support organization.

## Floppy Disk Drive Specifications & Characteristics

	142M	143M	142M & 143M
Unformatted Capacity (Double Density) Per Flexible Disk: Per track:	6.4 Mbits/802 Kbytes	12.8 Mbits/1.6 Mbytes	83 Kbits/10 Kbytes
Unformatted Capacity (Single Density) Per Flexible Disk: Per Track:			3.2 Mbits/401 Kbytes 20.8 Kbits/2.6 Kbytes
Hard Sector Format Capacity (Double Density) Per Flexible Diskette: Per Track: Per Sector:	5.2 Mbits/650 Kbytes	10.4 Mbits/1300 Kbytes	67.6 Kbits/8.4 Kbytes 2112 bits (32 sectors/264 bytes)
IBM 3740 Format Capacity Per Flexible Disk: Per Track: Per Sector:	2.0 Mbits/243 Kbytes	4.0 Mbits/512 Kbytes	26.6 Kbits/3.3 Kbytes 1 Kbit/128 bytes
Other Soft Sector Formats	Supported as defined by Controller		
Data Transfer Rate Double Density Single Density	500 Kbits per second 250 Kbits per second		
Number of Recording Tracks	77		
Number of Read/Write Heads	1	2	
Recommended Coding Technique	Modified Frequency Modulation (MFM) Double Frequency Modulation (FM)		
Densities Bit Density (inside track) Track Density	6.5 Kbits per inch 48 tracks per inch (0.013"/0.308mm data track width)		
MTBF	Exceeds 7000 hrs. for heavy duty applications*		
MTTR	Less than 30 minutes		
Power Ranges (Domestic & Foreign)	90 to 127 vac. 60 Hz, 1.7 amps 187 to 253 vac. 60 Hz, 0.9 amps 90 to 110 vac. 50 Hz, 1.7 amps 187 to 264 vac. 50 Hz, 0.9 amps DC; + 24v, 1.5 amps, + 5v, 1.0 amp.		

\*Field failure data indicates an MTBF of over 20,000 hours in heavy duty applications.



## 142M Floppy Disk Drive

CalComp's 142M Floppy Disk Drive offers the OEM designer a single-sided, single or double density drive with an unformatted capacity of up to 802 kilobytes. Field failure data received by CalComp indicates an MTBF of over 20,000 hours in heavy duty applications.

Featuring 6400 bits-per-inch and 48 tracks-per-inch technologies, the 142M has a transfer rate of 500,000 bits per second. The media is a standard 8-inch diskette which is readily available from a number of vendors. The 142M accommodates both hard and soft sectored diskette formats.

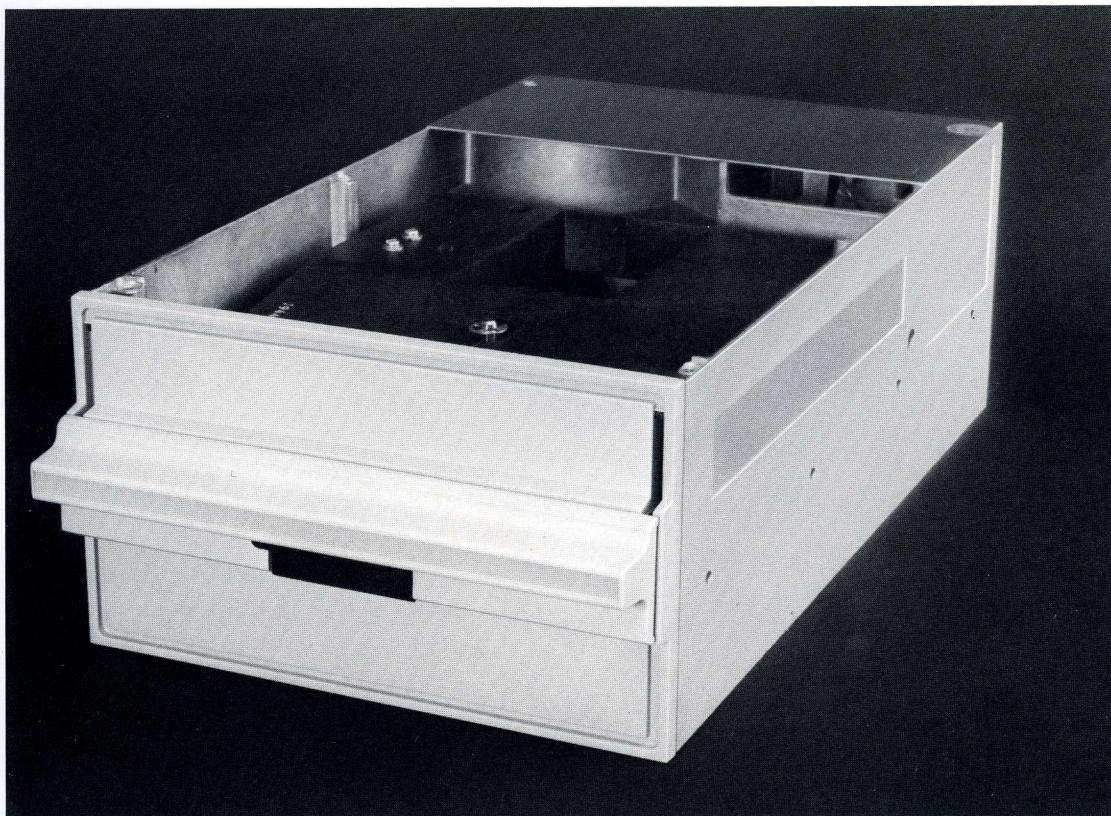
Recording methods can be Modified Frequency Modulation (double density) or Double Frequency Modulation (single density) which allows the 142M to be compatible with a wide range of applications.

Employing CalComp's unique approach to floppy disk systems, the 142M provides a wide range of multifunction capabilities; some are built-in, and some are switch or jumper selectable. Added features include user selection of four internal drive addresses and one of four independent head load addresses.

## 143M Floppy Disk Drive

CalComp's 143M Floppy Disk Drive records and recovers data from both sides of the diskette via a dual read/write button-head assembly. The 143M has a total storage capacity capability of up to 12.8 megabits of unformatted data and can also be media and format compatible with IBM 3740/3600/Series 1 units. The 143M can use both hard or soft sectored standard 8-inch diskettes, which are readily available from a number of vendors. Recording methods can be Modified Frequency Modulation (double density) or Double Frequency Modula-

tion (single density) which allows the 143M drive to be compatible with a broad range of floppy disk applications. The 143M employs the same multifunction approach successfully used in the 142M drive, and offers the same reliability. Additional system flexibility is provided by a 50-pin interface to the controller. Activity Light and Write Protect options are offered.



Floppy Disk Drive



## Disk Subsystems

CalComp offers the mini/micro computer user a significant breakthrough in disk subsystem cost/performance with its line of state-of-the-art disk controllers for the CalComp family of drives. Based on a sophisticated microprocessor based architecture and a high level descriptor based instruction protocol, CalComp's disk subsystems cover a wide spectrum of performance environments, from a single board S-100 BUS compatible disk subsystem through the most popular mini computers, eg., PDP-11, NOVA, Series 1, all the way up to such high performance "midi" computers as the HP 3000.

For those who have "special" applications, CalComp offers two versions of its disk subsystems which allow the user to design his own interface in order to easily adapt his

disks to his unique CPU. The CalComp model 1150 provides an excellent hardware solution for real time environments. Its straightforward 16 bit interface helps make subsystem adaptation to almost any imaginable CPU quick and easy.

Your second alternative is our 1151, a formatter based on a high level "descriptor-based" I/O concept quite similar to that used in large mainframe I/O channel architectures. In many applications, this "descriptor" intelligence will significantly improve overall system performance while minimizing software overhead at the systems level.

Whatever your particular disk requirements may be, CalComp's family of Trident disk subsystems offers you the following features:

**Family Compatibility** — Gives you tremendous flexibility while eliminating the need to "overbuy" in terms of capacity, because of the widest choice of capacities in the industry: 25, 50, 80, 200 and 300 megabyte models. Pick drive(s) that more accurately meet your needs.

**Automatic Error Detection and Correction (ECC)** — Ensures ultimate data integrity without imposing additional overhead on your operating system.

**Overlapping Seeks** — Minimizes system "dead time" — even in smaller minicomputer-based systems.

**Dual-Access Support** — Allows fail-safe, redundant path configurations to your data base.

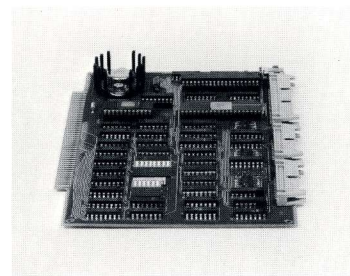
**Built-in Diagnostics** — Comprehensive, resident microdiagnostic routines minimize system troubleshooting time and make it virtually self-diagnosing.

**Dynamic Data Buffer** — Eliminates disk/CPU data rate incompatibility and is expandable to fit your specific needs.

As you can see, CalComp can offer the complete solution to your disk subsystem requirements, not only with all the technical features you will probably ever need, but also with the added benefits of a large corporation which will stand behind its product with the service and support you expect from your disk supplier.



300MB Series 1 Disk Subsystem



S-100 BUS Disk Controller



# Floppy Disk Storage System

## 1143M Floppy Disk Drive Controller

CalComp's Model 1143M Controller is an intelligent firmware driven microprocessing unit capable of controlling up to four CalComp Model 142M (single-sided) or Model 143M (double-sided) floppy disk drives. Contained on a single printed circuit board, the 1143M standard features include a programmable microprocessor and 1K buffer memory for data preprocessing, as well as a phase-lock oscillator (PLO) for precise data recovery. In addition, the 1143M Controller can accommodate two host adaptors simultaneously.

### Key Features

- Single Printed Circuit Board Controller
- Firmware Controlled
- IBM 3740, 3600, or Series/1 Compatible Formats
- Micro Processing Unit (MPU)
- Controls up to four drives
- 1K Buffer Memory

### Interface Connectors

One 50-pin drive connector  
Two 40-pin drive connectors  
One 12-pin power connector  
One 50-host adaptor I/O connector

**Host Adapter Interface**  
RS-232-C (currently available)

Additional Host Adaptors will be available soon.

**Buffer Transfer Rate**  
400 Kbytes per sec

## RS-232-C Host Adaptor for 1143M

The RS-232-C Host Adaptor allows Data Terminal Computer and Data Communications equipment to be interfaced with CalComp's high performance 1143M Controller and up to four floppy disk drives.

As a result, the software demands of the host system are minimal. Accommodating data transfer rates up to 9600 baud, this host adaptor can be attached to a wide variety of host systems with RS-232-C ports.

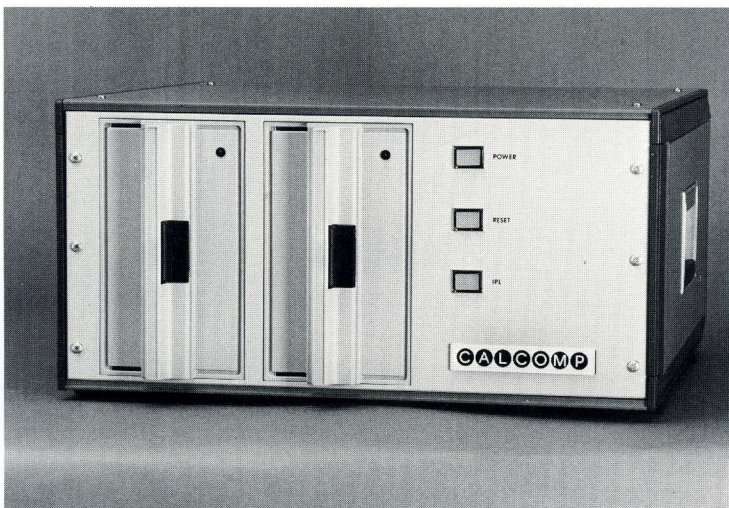
In the tradition of CalComp's multifunction floppy disk concept, many RS-232-C Host Adaptor features are switch or jumper selectable. These features provide flexibility for a wide variety of applications.

Five addressable registers in the RS-232-C Host Adaptor provide data, status and con-

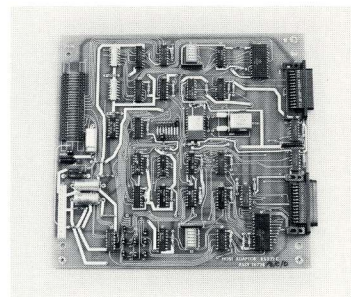
trol functions between the host system and the 1143M controller and associated floppy disk drives.

Basic Operating Software consists of functions that are stored in EPROM's on the 1143M Controller and activated by host unit commands issued through the RS-232-C Host Adaptor. Other functions will be provided as part of a File Management Software capability, which is added to the controller; still other functions may be added to the controller by the user.

CalComp's RS-232-C Host Adaptor provides a link between a broad range of host systems and CalComp's multifunction controller and floppy disk drives.



Floppy Disk Storage System



RS-232-C

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