d i g i t a l

Detail of RD54 head disk assembly.

Performance with Flexibility for All Your Small-System Storage Needs

The RD family of 5.25-inch Winchester fixed-disk drives offers you a uniquely flexible desk and office area storage environment. With a range of sizes, capacities, access speeds, and enclosures, your system configurations are unlimited. By investing in a Digital disk drive, you invest in proven technology that will be supported and enhanced in the future.

Currently, the RD family includes two full-height drives and two half-height drives. The 159-megabyte RD54 and the 71-megabyte RD53 disk drives are full-height drives typically used in pedestal and cabinet systems. The 42-megabyte RD32 and the 20-megabyte RD31 disk drives are half-height drives typically used in desktop systems. A single controller, the RQDX3, connects all RD family drives to Q-bus systems.

Constantly evolving and expanding, RD disk drives conform to the Digital Storage Architecture (DSA). Their design is based on an architecture that promotes compatibility with our other storage products, while supporting evolving technology. And equally important, RD disk drives are thoroughly tested to Digital's specifications and standards, which are among the toughest in the industry. They take advantage of the latest proven storage technologies to provide you with the reliability, performance, and capacity needed for today's business solutions. With low cost of ownership, proven investment protection, and highly flexible growth and expansion, the RD family offers the right storage solutions for all your small system needs.

Highlights
RD Family

- Conforms to DSA, ensuring investment protection and compatibility with all of Digital's hardware and software.

- Offers a variety of storage capacities and operating speeds for a broad range of systems.

- Available in two standard 5.25-inch disk sizes; full-height and half-height.

- One controller (the RQDX3) serves the entire family of RD Winchester disks, plus the RX50 and RX33 flexible disk drives.

- Tested to meet Digital's demanding specifications and standards. Stringent quality control results in high system availability.

- Uses the latest, proven technology to provide high reliability and low cost of ownership. No preventive maintenance is required.

- Virtually eliminates head crashes with an assembly that is sealed from external contaminants.

RD Family of Storage Solutions Offer Proven Investment Protection

The RD family of disk drives, and all of Digital's storage solutions, protect your computing investments by conforming to the proven Digital Storage Architecture. A carefully designed framework for current and future storage growth, the Digital Storage Architecture allows you to migrate across Digital's system offerings as your hardware needs change – without investing in new application software and training. The architecture makes it easy to incorporate newly developed storage peripherals into existing system configurations, while preserving your software and training investments.

By selecting an RD family storage solution to complement your Digital system, you are choosing a rapidly evolving program that joins state-of-the-art storage design with the best computing capabilities the industry has to offer. You also gain the advantages of easy, incremental system growth, superior I/O performance and data integrity, and single-vendor service and support. These factors can make the difference between a storage decision that limits your computing opportunities – and one that helps you create them.

RD Family Evolution
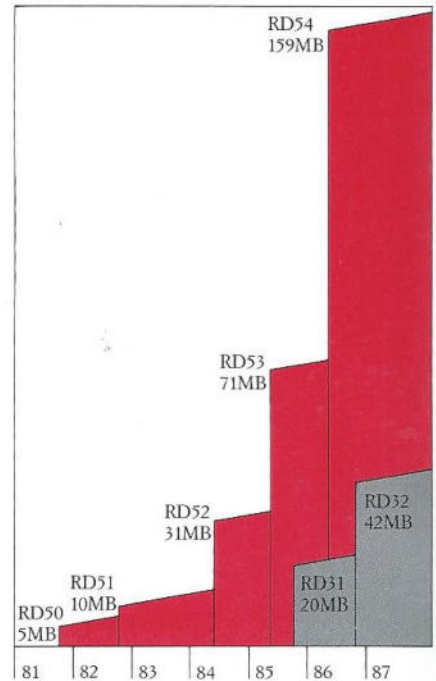
Calendar Year, First Subsystem Shipment

The chart shows how the capacity of the 5.25-inch disks has grown. These disks are interchangeable. By designing for interchangeability, Digital has protected our customer's investment and will continue to protect that investment in the future.

Highlights
RQDX3

- Overlapped seeking – Seeks can be initiated on several drives simultaneously.

- 32-bit Error Correction Code (ECC) – Detects and corrects 11-bit error bursts in a 512-byte block. Errors greater than 11 bits are detected and reported.

- Automatic bad block replacement – During normal operation, transparently replaces a block that goes bad with a spare block.

- Elevator seek algorithm – To maximize throughput and minimize delays, a special algorithm efficiently reorders seek requests.

- Buffered seeks – The step pulses that control the actuator arm are sent faster to the drive so the actuator arm can travel more quickly. This enhances the average seek rate.
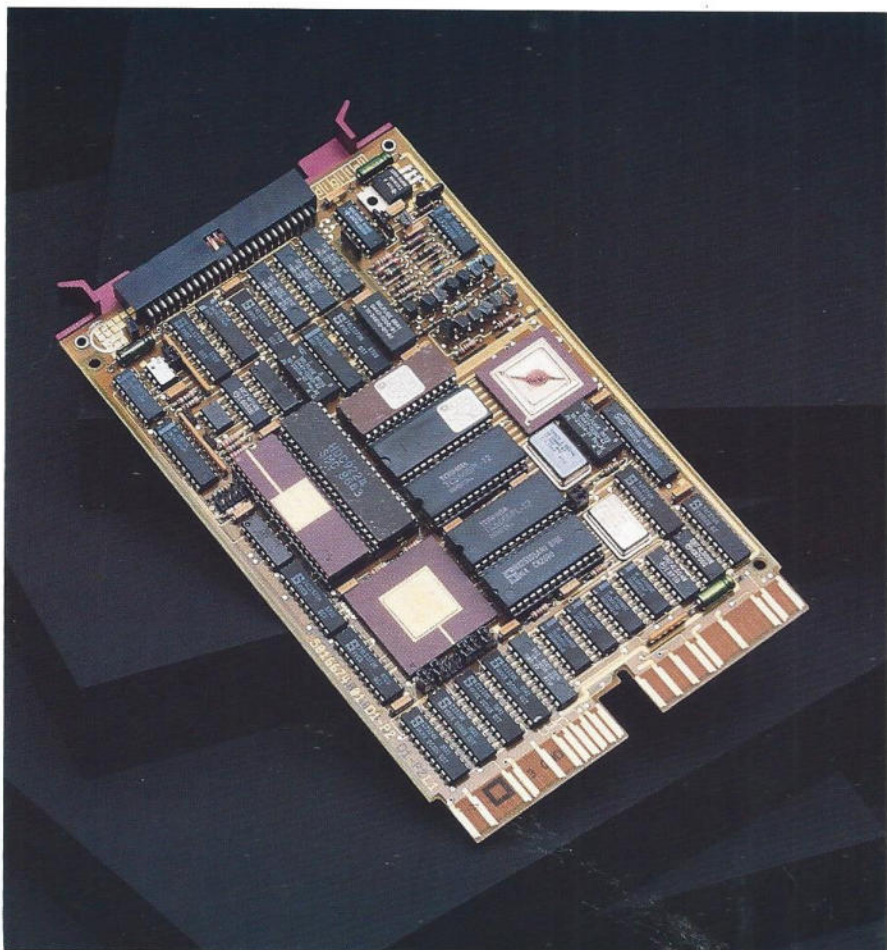
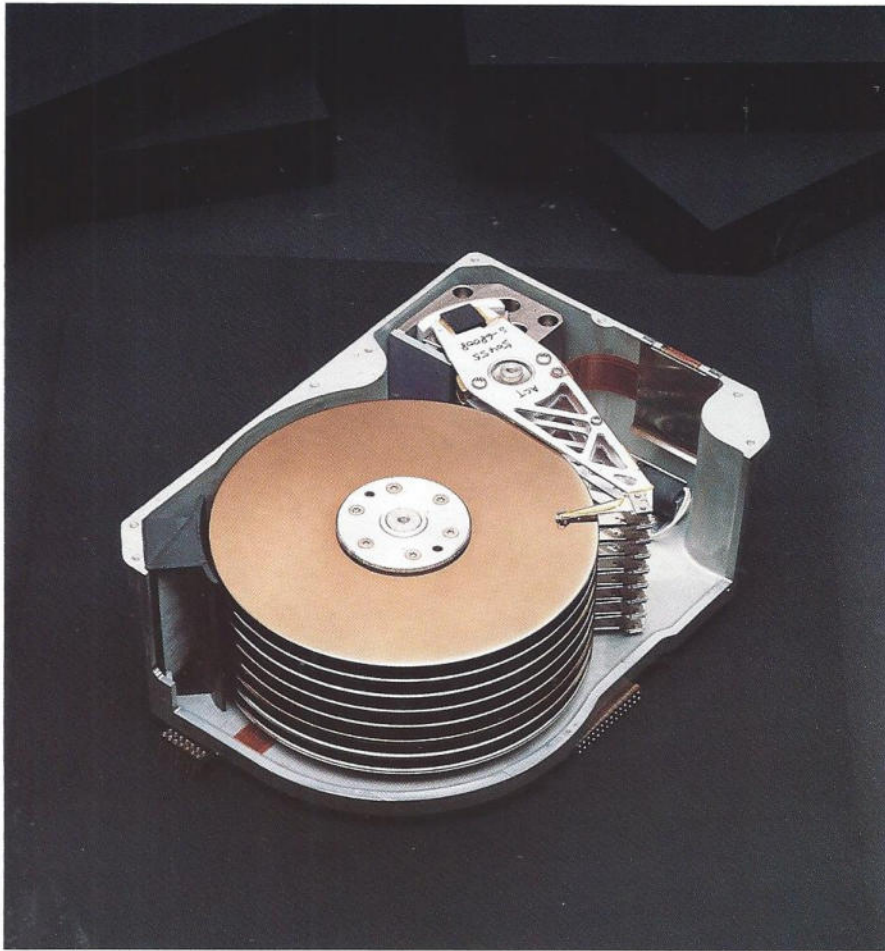### RQDX3 Controller – The Q-bus Connection for the RD Family

The RQDX3 Controller provides the connection for the RD family to Digital's Q-bus systems. It relieves the host processor of low-level control and realtime response requirements of disks attached to the system. System software communicates with the controller and the drives using Digital Storage Architecture's Mass Storage Control Protocol, or MSCP. The RQDX3 controller provides the interface for as many as four peripheral devices, including floppy diskette drives. In addition, this controller enhances system throughput and ensures excellent data integrity.

The RQDX3 dual-width controller has three major components: a microprocessor, a direct memory access (DMA) controller, and a hierarchical disk controller. The microprocessor communicates with the host, provides commands to the disk controller and the direct memory access controller, and implements protocols. The DMA controller transfers data from the drives to the host memory. The disk controller handles all disk communication, including Error Correction Code (ECC) and Cyclic Redundancy Check (CRC) procedures.

The RQDX3 controller maximizes seeking and error correction performance. Overlapped seeking allows several drives to initiate seeks simultaneously, while the buffered seek function improves the seek rate. A special elevator seek algorithm reorders transfers for maximum throughput. And your data transfer is secure with a 32-bit error correction code and automatic bad block replacement.
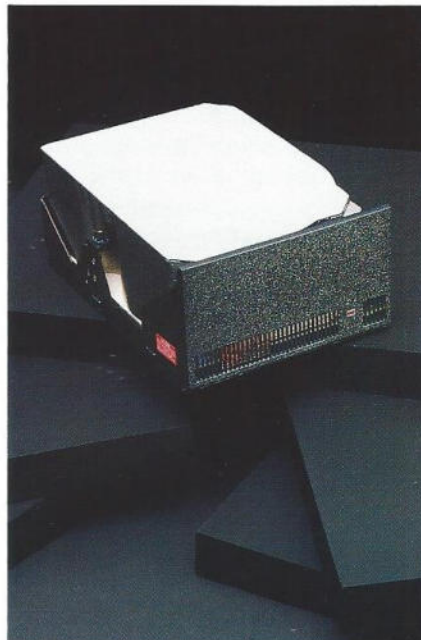
RD53 and RD54 – Full-Height Disk Drives for High-Capacity Applications

High performance and capacity make the RD53 and RD54 disk drives ideal storage solutions for compact deskside systems. With an average access time of 38.3 milliseconds and a maximum transfer rate of 5 megabits per second, the RD53 and RD54 disk drives enhance both single-user and multi-user system performance.
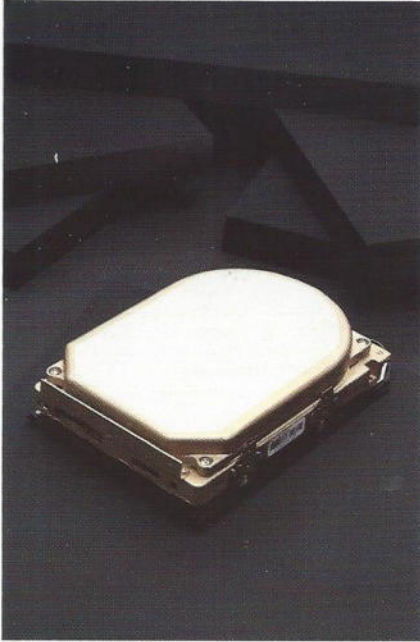
These full-height (3.25 inch) Winchester disks compress a large amount of storage into a compact, space-saving package. The RD53 disk drive has a formatted capacity of 71 Mbytes and the RD54 disk drive has a formatted capacity of 159 Mbytes, both in a small 5.25-inch form factor enclosure. And in flexible configurations of as many as three disks per system, your larger applications can have access to storage capacity of up to 477 Mbytes.

Innovative technology has provided the RD53 and RD54 disk drives with increased capacity, high performance, improved reliability, and low cost of ownership. The RD54 disk drive's sealed head/disk assembly protects the drive from external contamination, eliminating preventive maintenance and field adjustments. Whitney-type flexures and sliders, rotary voice coil actuator, closed-loop servo system, and space-saving surface-mounted components provide an excellent solution for your small-to-midrange office or workstation needs.

Highlights
RD53 and RD54

- The RD53 disk drive has 71 Mbytes of formatted storage capacity; the RD54 disk drive has 159 Mbytes of formatted storage capacity.

- 38.3 millisecond average access time; 5 megabits per second maximum transfer rate.

- The closed-loop servo system ensures fast, accurate head positioning and on-track stability.

- Neither drive requires preventive maintenance or routine field adjustments.

RD53 Disk Drive

RD32 Half-Height Disk Drive with cover removed.

RD31 Disk Drive

Highlights
RD31 and RD32

- The RD31 disk drive has 20 Mbytes of formatted storage capacity; the RD32 disk drive has 42 Mbytes of formatted storage capacity.

- The RD31 disk drive has an average access time of 73.3 milliseconds; the RD32 disk drive has an average access time of 48.3 milliseconds.

- The half-height form factor complements desktop systems and is the perfect mate to the RX33 half-height flexible disk drive.

- Neither drive requires preventive maintenance or routine field adjustments.

RD31 and RD32 – High-Performance and Capacity at Half the Height of Our Larger Disk Drives

For extra flexibility and affordability, with high performance and capacity, the RD31 and RD32 disk drives provide an excellent storage solution in open office and laboratory environments. Both are half the height (1.62 inch) of our larger disk drives, which allows flexible configuration (two drives can be configured in the same space as a full-height drive), and an affordable entry to fixed-disk storage systems.

The RD31 disk drive has a formatted capacity of 20 Mbytes, which allows storage equal to 20 RX33 floppy diskettes. The RD32 disk drive has a formatted capacity of 42 Mbytes, operates 33 percent faster than the RD31 disk drive, and uses 20 percent less power. Both drives give you the benefits of RD family membership including low cost of ownership, full DSA conformance, capacity, and performance – all this at a very affordable price.

The high performance, reliability, and energy-efficient operation of the RD32 disk drive are the result of the combination of thin-film rigid media, Winchester technology, and improved track density. The sealed head/disk assembly increases drive reliability and ensures data integrity.

Conformance to Mass Storage Control Protocol (MSCP) and DSA makes the RD31 and RD32 disk drives compatible with a broad range of existing storage devices, as well as future devices developed under the same

architecture. That protects your valuable investment in storage equipment and software. And it gives you the flexible growth and expansion capability you need to meet your future needs.

Digital Protects Your Storage Investments

With RD family disk drives, Digital offers you a major advantage in lowering your cost of ownership. Because our systems and storage products are designed under an architecture to complement one another, you can be sure that equipment you buy today will remain a good investment tomorrow. You will have a convenient, reliable way to keep up with change. And you can start with the processing and storage capabilities you need now and then expand either aspect of the system as your needs evolve.

If You Would Like to Know More about RD Family Disk Drives…

Call your local Digital Sales Office or authorized Digital distributor for an in-depth discussion of the storage solutions Digital can offer you today.

Specifications

	RD54	RD53	RD32	RD31
Performance				
Peak transfer rate	5.0 Mb/s	5.0 Mb/s	5.0 Mb/s	5.0 Mb/s
Seek times (includes settling):				
Average	30.0 ms	30.0 ms	40.0 ms	65.0 ms
Track-to-track	7.0 ms	7.0 ms	8.0 ms	20.0 ms
Maximum	60.0 ms	60.0 ms	95.0 ms	145.0 ms
Rotational latency	8.3 ms	8.3 ms	8.3 ms	8.3 ms
Access (average)	38.3 ms	38.3 ms	48.3 ms	73.3 ms
Formatted capacity				
Per drive	159 MB	71 MB	42 MB	20 MB
Data Organization				
Bytes per sector	512	512	512	512
Sectors per track	17	17	17	17
Operation				
Start time	25 s	25 s	24 s	24 s
Stop time	30 s	30 s	30 s	30 s
Rotational speed	3,600 rpm	3,600 rpm	3,600 rpm	3,600 rpm
Power Requirements (dc only)				
Typical (@ 5 Vdc)	1.29 A	0.9 A	0.95 A	0.6 A
Typical (@ 12 Vdc)	1.34 A	2.5 A	0.65 A	1.1 A
Heat dissipation: (maximum seeking)	95.2 Btu/hr	122.0 Btu/hr	44.9 Btu/hr	49.3 Btu/hr
Power consumption:				
Maximum seeking	28.0 W	36.0 W	13.0 W	16.3 W
Maximum startup	66.0 W	64.0 W	32.0 W	39.0 W

Specifications (continued)

	RD54	RD53	RD32	RD31
Physical Characteristics				
Form factor	Full Height	Full Height	Half Height	Half Height
Height	8.25 cm (3.25 in)	8.25 cm (3.25 in)	4.14 cm (1.62 in)	4.14 cm (1.62 in)
Width	14.61 cm (5.75 in)	14.61 cm (5.75 in)	14.61 cm (5.75 in)	14.61 cm (5.75 in)
Depth	20.32 cm (8.00 in)	20.32 cm (8.00 in)	20.96 cm (8.00 in)	20.32 cm (8.00 in)
Weight	3.30 kg (7.30 lb)	3.18 kg (7.00 lb)	1.36 kg (3.00 lb)	1.59 kg (3.5 lb)

Operational Environment	**All Models**			
Temperature range (sea level)	10-50°C (50-122°F)			
Relative humidity	20%-80%			
Maximum wet bulb	25°C (78°F)			
Maximum altitude	3.0 km (10,000 ft)			
Mechanical shock	10 G operating, 10 ms half-sine			
Vibration (sine)	5 to 22 Hz, 0.01 in DA, 22 to 500 Hz, 0.25 Gpk			
Average acoustic noise: (ISO 7779 LNPE)	5.3 bels	5.7 bels	4.6 bels	4.6 bels

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