

# Charles River Data Systems' FD-311 RX-02 Equivalent Floppy Disk System for PDP-11 and LSI-11 Series

Dataram Corporation has acquired  
Charles River Data Systems' (CRDS)  
DEC-compatible product line  
and is now marketing it throughout the world.  
The products described in this brochure  
are offered by Dataram and not CRDS.  
Please contact Dataram directly  
for further information on these products.

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**DATARAM**

Princeton Road, Cranbury, NJ 08512

**CRDS**

**Charles River Data Systems, Inc.**



# FD-311—Compact, Economical, Compatible

The FD311 Dual Floppy System is the perfect plug replacement for your RX02, in half the space, and at up to 30% savings. It is totally software, media, hardware, and instruction set compatible with Digital Equipment's RX02 Floppy Disk System, and is used with both PDP11 and LSI series processors. The handsome newly designed 5¼" enclosure houses two floppy disk drives, each providing up to 512K bytes of formatted storage for single sided applications, and one megabyte per drive for double-sided applications. All controller and interface electronics are contained on a single plug-in card using only a half quad slot for Q-Bus systems and a full quad slot for Unibus systems. Built-in bootstrap loader is provided with each FD311 hence eliminating the need for the DEC BDV-11AA or REV11 Bootstrap Loader Cards. Added features include formatter and self-tester. The all-purpose diagnostic diskette included with each FD311 provides the user with comprehensive system test and error detection capability.

## DEC Comparison Table

|                                  | FD311 | RX02 |
|----------------------------------|-------|------|
| Media interchangeability         | Yes   | Yes  |
| Diskette formatter               | Yes   | No   |
| Built-in bootstrap loader        | Yes   | No   |
| Write protect                    | Yes   | No   |
| Built-in self-tester             | Yes   | No   |
| Optional, double-sided operation | Yes   | No   |
| 5¼" chassis height               | Yes   | No   |
| Single card controller interface | Yes   | No   |
| Diagnostic diskette supplied     | Yes   | No   |
| Easy module replacement          | Yes   | No   |
| Off-the-shelf availability       | Yes   | No   |

## Controller Features

**RX02 Emulation**—The FD311 operates with any software written for the RX02 with no modifications. Emulating RX02 operation, data is transferred via direct memory access (DMA). Up to 128K of memory is addressable under the controller's 18 bit address scheme. Standard DEC double density format is used for recording data.

**RX01 Emulation**—The FD311 can be easily converted to RX01 operation, thus allowing use of software which supports only the RX01. This versatile feature allows use of the FD311 with software which was developed prior

to introduction of the RX02, and also allows use of all current and future developed software.

## Automatic Single or Double Density Operation

It is important to note that under RX02 operation, data is automatically read or written in either single or double density, depending on the type of sector header data marks formatted on the diskette being used. The FD311 can format your diskette for either single density or double density operation.

## Comprehensive Test Procedures

Each FD311 System is subjected to comprehensive testing prior to shipment. Using the TESTLINE 4000PCB unit with bed-of-nails fixture, each controller card receives automated in-circuit diagnosis down to the individual device level. After test for shorts, opens, drive performance and total controller performance, the controller is subjected to 48 hours of temperature cycling from 10° F to 165° F.

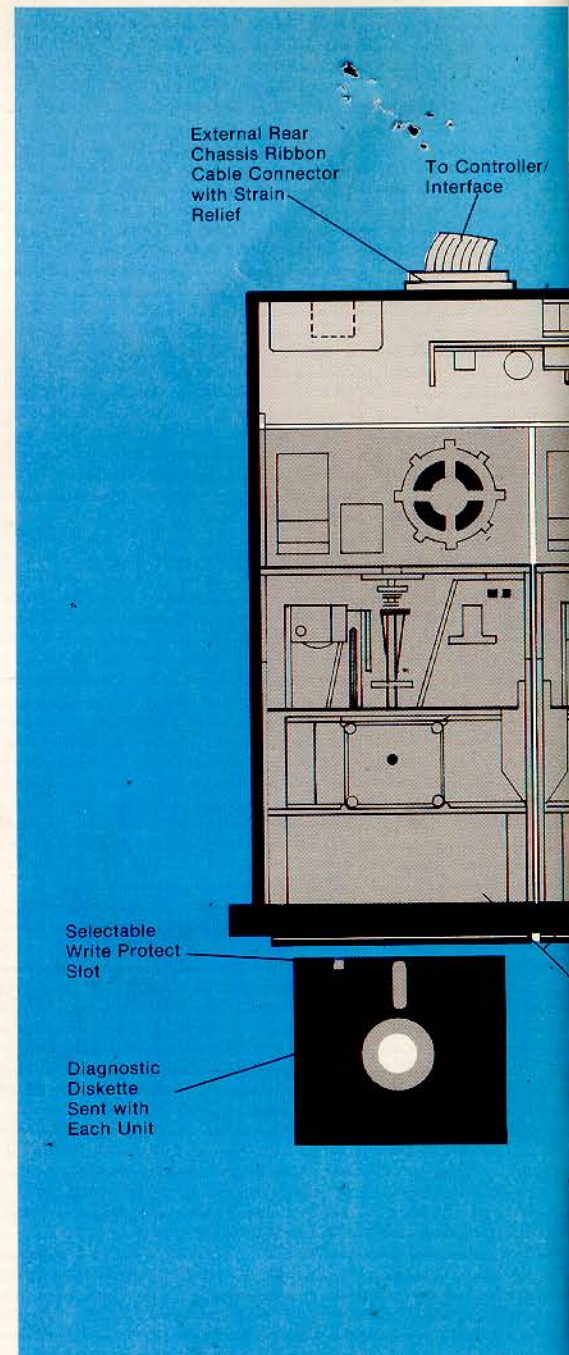
DEC LSI-11 System Diagnostics provide final test for the completely assembled system.

## Test Diagnostic Diskette

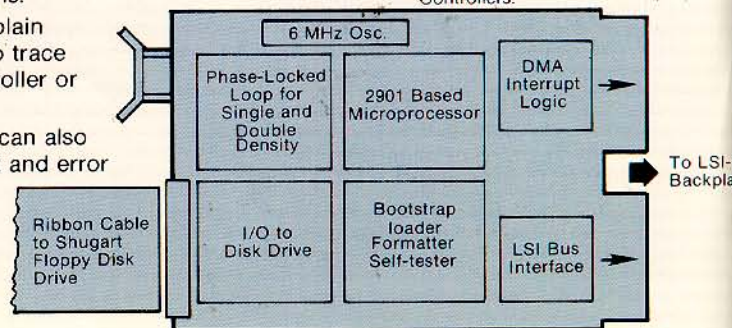
A diagnostic diskette with programs for testing and exercising the FD-311/511 is included with each shipment. This capability allows the user to assure proper system operation and also to assist in detecting and isolating problems in any sector of the floppy subsystem. Only 16K of processor memory is required to test any PDP11/LSI-f1 series processors. Tests include 1) Random Exerciser which simulates actual system operation, 2) DMA test which exercises the computer/floppy interface, and 3) Seek Test which exercises disk drive operations.

Test errors are displayed in plain English with enough detail to trace error to the single card controller or to either of the drives.

Applicable DEC diagnostics can also be used for system checkout and error detection.



The compactness of this Controller/Interface Card is achieved by using 2901 microprocessors as part of a high speed processor designed specifically to handle the special requirements of Floppy Disk Controllers.



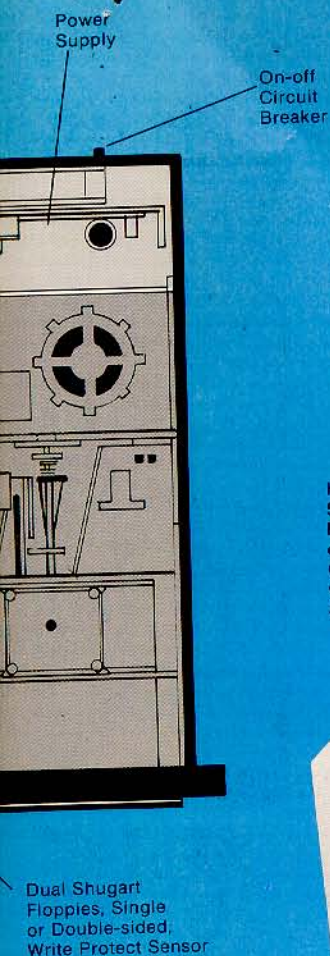
Controller Interface Card



## ENCLOSURE FEATURE

The FD-311 Enclosure offers the perfect floppy disk addition to your DEC11 processor system. Efficiently packaged in an attractive 5 1/4" rack mountable chassis, each FD-311 is provided with the following features:

- Handsome newly designed 5 1/4" chassis for table top or rack mount.
- Write protect feature.
- Modular construction for easy replacement of drives or power supply.
- Rear chassis cable connector and strain relief fixture for 10' cable.
- 110V or 220V, 60Hz or 50Hz options.



Handsome 5 1/4" Enclosure, Rack Mountable or Table Top, Compatible Design with Associated System Units



## Double Sided Floppy Disc Option

When larger capacity floppy disk storage is desired, the FD-511 using Shugart SA850 double-sided drives is available as an option. The FD-511 provides 2 megabytes of total storage and is software compatible with DEC's LSI-11 and PDP-11 series processors. This system is completely transparent for single-sided media operation. A simple SYSGEN of RT11

allows double-sided operation. A diskette with a modified RT11 handler is supplied with the FD-511, and allows each of the 2 drives to be a one megabyte device when a double-sided diskette is in the drive. When a single-sided diskette is inserted, the drive will appear as a 500K byte device.

## Double Sided Features

- Hardware, software, media, and instruction set compatible with LSI 11/PDP11 series processors.
- One megabyte capacity per drive.
- Bootstrap loader, formatter, self-diagnostic, RT11 handler and system diagnostics provided with each system.
- 3 ms. track-to-track access.



## System Specifications

|  | SINGLE-SIDED DRIVES | DOUBLE-SIDED DRIVES |                           |                                       |
|--|---------------------|---------------------|---------------------------|---------------------------------------|
| <b>CAPACITY</b>  |                     |                     |                           |                                       |
| Bytes per sector:                                      | 256                 | 256                 | <b>RELIABILITY</b>        |                                       |
| Sectors per track:                                     | 26                  | 26                  | Seek error rate:          | 1 in 10 <sup>8</sup> seeks            |
| Tracks per diskette:                                   | 77                  | 154                 | Soft read error rate:     | 1 in 10 <sup>9</sup> seeks            |
| Total bytes per diskette:                              | 512,512             | 1,025,024           | Hard read error rate:     | 1 in 10 <sup>12</sup> seeks           |
| Transfer Technique                                     | DMA                 | DMA                 | <b>ENVIRONMENTAL</b>      |                                       |
| Device Address/Interrupt                               | 777170/264          | 777170/264          | Operating range:          | 50 to 100 degrees F                   |
| Bootstrap Address                                      | 773000              | 773000              | Storage range:            | 32 to 150 degrees F                   |
| <b>ACCESS TIME AND RATES</b>                           |                     |                     | Diskette storage range:   | 50 to 125 degrees F                   |
| Diskette to controller buffer:                         | 16 us/byte          | 16 us/byte          | Humidity constraint:      | 10 to 80 percent without condensation |
| Buffer to CPU:   | 16 us/byte          | 16 us/byte          | <b>POWER REQUIREMENTS</b> |                                       |
| Track-to-Track   | 8 ms.               | 3 ms.               | 100-120 VAC               | 2 amps (MAX) at 60Hz                  |
| Seek settle time:                                      | 8 ms.               | 15 ms.              | 200-240 VAC               | 1 amp (Max) at 60 Hz                  |
| Head load time:  | 35 ms.              | 50 ms.              | 5VDC (For Controller)     | 2.1 amps (TYP)                        |
| Rotational speed:                                      | 360 rpm+2%          | 360 rpm+2%          | <b>DIMENSIONS</b>         |                                       |
| Average access (25 track seek and rotational latency): | 300 ms.             | 180 ms.             | Enclosure                 | 17.3"W x 5.25"H x 22"D                |
| <b>RECORDING TECHNIQUE</b>                             |                     |                     | Controller                |                                       |
| Method:  | FM or MFM           | FM or MFM           | Q-Bus                     | Dual Height                           |
| Maximum bit density:                                   | 6600 BPI            | 6600 BPI            | Unibus                    | Quad Height                           |
| Track density:   | 48 TPI              | 48 TPI              | <b>Weight in pounds</b>   |                                       |
| Surfaces:  | 1                   | 2                   | Unpacked                  | —58                                   |
|  |                     |                     | Packed                    | —70                                   |

## About CRDS

Charles River Data Systems, Inc. was incorporated in 1973 with its primary thrust in the field of sophisticated controller technology. Initial products included controllers for such systems as DEC's System 10 and PDP15. In 1976, CRDS offered its RX01 equivalent floppy disk controller for the PDP11 series leading the field in its single card controller/interface concept. Since that period, the company has experienced continuous and dramatic growth, both in revenues and in profitability. The RX02 version of DEC's floppy disk system was introduced in February, 1979, featuring CRDS's single card dual-height controller interface. This special capability was offered 1½ years earlier than that of any competitor.

In March 1980, CRDS made its entry into the Winchester Technology marketplace, offering its HD11 20.8 megabytes Winchester Disk system which emulate 4 DEC RL01 disk systems. This product was the first in the marketplace to combine Winchester Technology with complete LSI-11 software compatibility and cartridge tape back-up.

Many thousands of CRDS systems are currently in use throughout the US, Western Europe, and the Far East.

During the past few years CRDS has experienced an annual doubling of its sales. Anticipated new products are expected to continue this rate of growth over the next years. CRDS has established its position as a leading supplier of superior controller technology.

## Warranty and Maintenance

90-day warranty is provided with each purchased floppy disk system. A detailed diagnostic diskette, included with each system, assures proper system operation and allows for immediate detection and isolation of system failure. In the event of malfunction, the defective submodule is normally found within minutes. After verification with the CRDS Maintenance Department, a replacement for your defective module will be promptly forwarded.

# CRDS

## Charles River Data Systems, Inc.

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