

# FFD™ 3.5" Ultra-Narrow SCSI

## High-Performance, High-Density Solid-State Flash Disk



### Technology Overview

M-Systems' Fast Flash Disk (FFD) 3.5" Ultra-Narrow SCSI is a state-of-the-art, solid-state disk based on NAND flash technology, with no moving parts.

The outstanding performance of FFD Ultra-Narrow SCSI is based on M-Systems' TrueFFS® technology that provides full disk emulation, enhanced endurance by dynamic wear-leveling and bad-block mapping flash management.

Due to its unique design, FFD 3.5" Ultra-Narrow SCSI eliminates seek time, latency and other electro-mechanical delays inherent in conventional disk drives. FFD 3.5" Ultra-Narrow SCSI provides superior performance with a 20.0 MByte/sec burst rate, a 17.0 MByte/sec sustained read rate and a 11.5 MByte/sec sustained write rate.

FFD 3.5" Ultra-Narrow SCSI is fully compatible with SCSI-2 and SCSI-3 interfaces with mechanical dimensions identical to those of rotating hard disks, making it as a true drop-in replacement for rotating disks where top reliability and endurance is required.

### Applications

FFD 3.5" Ultra-Narrow SCSI provides an ideal storage solution for mission-critical applications that must operate under harsh environmental conditions.

M-Systems' family of FFDs has been used since 1997 as mass storage solutions for data recorders, moving maps, sonar, radar, fire control systems, black boxes, telemetry and data acquisition systems, C4ISR, rugged laptops and servers in air force, navy and army installations worldwide.

Due to its high performance, reliability, high MTBF and maintenance-free solution, FFD 3.5" Ultra-Narrow SCSI is designed into a wide range of applications. In video and audio servers, it performs as file caching to accelerate "hot files" in databases. In telecommunication systems, it is used within optical and ATM switches, IP gateways, wireless base stations and core routers, providing NEBS Level-3 compliance.

FFD 3.5" Ultra-Narrow SCSI is also an optimal solution in Factory Automation (FA) systems, Point Of Sale (POS) systems, assembly and robots controllers, and within manufacturing and medical systems.

### IDE/SCSI Product Line

M-Systems' IDE/SCSI product line offers complete solutions for customers who require rugged and high-performance solid-state flash disks. FFD product offering includes IDE/ATA, Narrow SCSI and Ultra-Narrow SCSI interfaces in 1.8", 2.5" and 3.5" form factors. Solutions available include:

- FFD 2.5" IDE
- FFD 2.5" IDE Plus
- IDE 3000 2.5"
- IDE 3000 3.5"
- IDE 3000 1.8"
- FFD 2.5" SCSI
- FFD 3.5" SCSI
- FFD 3.5" Ultra-Narrow SCSI
- FFD 3.5" Ultra-Wide SCSI
- 6U VME, 3U and 6U Compact PCI and PMC flash disks



### Main Features

- 512MB to 34.8GB disk capacity
- 3.5" standard form factor
- SCSI-2 and SCSI-3 interfaces
- SCSI-1 available upon request
- 20.0 MByte/sec burst read/write
- 17.0 MByte/sec sustained read
- 11.5 MByte/sec sustained write
- Standard 50-pin connector
- Less than 20 micro sec access time
- Quick Security Erase in 10 sec (typical)
- Sanitize confidential data, complies with NISPOM DoD 5220.22-M, NSA 130-2, Air Force AFSSI 5020, Army 380-19 and Navy NAVSO P-5239-26
- TrueFFS® technology
- More than 5,000,000 write/erase cycles
- Enhanced endurance by dynamic wear-leveling algorithm
- Bad-block mapping algorithm
- Ensures data integrity under unstable power conditions
- No moving parts
- MIL-STD 810F compliant
- NEBS Level-3 compliant
- Sun Microsystems™ Solaris™ Ready
- 1500 G operating shock
- 16.3 G RMS operating random vibration
- -40°C to +85°C operating temperature
- -55°C to +95°C storage temperature
- 80,000 ft operating altitude
- 5-year warranty

## FFD 3.5" Ultra-Narrow SCSI Specifications

### Disk Capacity

Unformatted (MByte): 512, 1024, 1536, 2048, 2560, 3072, 4096, 5120, 6144, 7168, 8192, 9216, 10240, 12288, 14336, 16384, 18432, 20480, 22528, 24576, 26624, 28672, 30720, 32768, 34826

### SCSI Compatibility

Industry Standard SCSI-2, SCSI-3 & CCS; ANSI X3.131-1994; ANSI X3T9.2/85-82; ANSI X3.302-1998; ANSI X3.301-1997; ANSI NCITS 306-1998. *SCSI-I available upon customer request.*

### Performance

Burst Read/Write: 20.0 MByte/sec  
Sustained Read: 17.0 MByte/sec  
Sustained Write: 11.5 MByte/sec  
Access time: <20 micro seconds

### Physical

Connector type: 50-pin  
Form factor: 3.5"  
Mounting: Industry standard  
Dimensions (mm)  
Up to 21GB: 146.1(L) X 101.5(W) X 25.4(H)  
Over 21GB: 146.1(L) X 101.5(W) X 40.6(H)

### Weight

1GB: 0.34 kg; 20.4GB: 0.60 kg; 34.8GB: 0.95 kg

### Environmental

#### Operating temperature

Commercial: 0°C to +70°C  
Enhanced: -25°C to +75°C  
Extended: -40°C to +85°C

#### Storage temperature: -55°C to +95°C

Humidity: 5% to 95% relative, non-condensing

Operating altitude: Up to 80,000 feet

Operating shock: 1,500G, MIL-STD-810F

Operating vibration: 16.3G RMS, MIL-STD-810F  
(random, 20Hz to 2000Hz; 3 vibration axes)

### Power

Input voltage: 5VDC  $\pm$ 5%

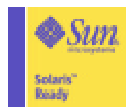
Power consumption (1GB unit)

Bus Free/Idle: 335mA (1.675 Watt)

Read/Write: 540mA (2.700 Watt)

### Compliance

CE, UL, EN 55022 Class B, CISPR 22 Class B, AS/NZS 3548 Class B, BSMI CNS 13438 Class B, CAN/CSA-V-3/2001.04 (VCCI), FCC Part 15 Class B, EN 61000-3-2, EN 61000-3-3, IEC 61000-4-2/3/4/5/6/8/11, MIL-STD-810F,  
Sun Microsystems™ Solaris™ Ready



### Reliability

MTBF: 971,130 hours MTBF for 512MB  
952,925 hours MTBF for 2.0GB  
Based on Telcordia SR-332, GB, 25°C  
EDC/ECC: On-the-fly hardware and software-embedded  
EDC/ECC based on 48-bit Reed Solomon algorithm

BER (Bit Error Rate) <10<sup>-20</sup>

#### Reliability features:

Built-in power-up self-test (BIT)  
Manual and automatic self-diagnostics  
TrueFFS® Bad Block Mapping (BBM) management  
Data integrity under power-cycling

#### Endurance:

Read unlimited  
>5,000,000 write/erase cycles  
TrueFFS® dynamic wear-leveling  
Garbage collection process  
>10 years data retention

### Enhanced Security Erase

Entire disk Security Erase: 10-40 sec (depending on capacity)

Software interrupt, hardware interrupt upon request

Partial Security Erase

LED indicator for Security Erases

Auto-resume Security Erase on power interrupt

Sanitize complies with NISPOM DoD 5220.22-M, NSA 130-2,

Air Force AFSSI 5020, Army 380-19, Navy NAVSO P-5239-26

### User Interface & Configuration

#### DIP switch configuration:

SCSI ID 0-7  
Termination  
Termination power  
Force single-ended

Busy/Activity (LED)

Firmware upgrade: Field upgrade capability

Electrical interface: 8-bit interface, SE (Single-Ended) or  
LVD (Low-Voltage Differential)

Busy (Access) LED: Green

Format: Factory low-level format

Drivers: None required

### Warranty

5 years (a longer warranty period can be supported)

### Customization

PCB conformal coating

Slimmer case dimensions

Higher disk capacities upon request

SCSI-I support

Write protection

Hardware interrupt for security erase

Manufactured available in the USA & for FMF

### Contact Us

USA: +1-510-494-2090  
Taiwan: +886-2-8770-6226  
China: +86-755-2519-4732  
Japan: +81-3-5423-8101  
Europe: +972-9-764-5000  
E-mail: [ffd@m-sys.com](mailto:ffd@m-sys.com)  
Web: <http://www.m-sys.com>

### Ordering Information

**FFD35US-CCCCC-T-P50**

CCCCC: Unformatted capacity (MB), 512 to 34826

T: Temperature range

Blank – Commercial: 0°C to +70°C

N – Enhanced: -25°C to +75°C

X – Extended: -40°C to +85°C



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