

# SSD/FLASH MEASURES OF QUALITY

OVER **25 YEARS** OF  
MEMORY, TEST &  
MANUFACTURING  
EXPERTISE.

Environmental Reliability	Reliability & Error Handling	Compliances
Hardware Verification Procedure	Security Sets	Long Term Endurance

- ▶ ITAR Certified
- ▶ Environmental awareness with ISO 14000
- ▶ Corporate CSR
- ▶ Certified to ISO 9000, TL 9000 & AS 9100
- ▶ In-house reliability tools & thermal-cycle, shock chambers

- ▶ MTBF calculation using the Belco remodeling method
- ▶ Real-time monitoring of field DPPM
- ▶ Weekly reviews of MRB with closed loop feedback action
- ▶ Weekly monitoring of First pass yield, RTY, scrap, in process defects
- ▶ Bi-annual CSI monitoring of all suppliers

- ▶ Local MIL 810 testing & certification available
- ▶ In-house Failure Analysis
- ▶ All inspectors IPC CERTIFIED
- ▶ All QE's have ASQ certifications
- ▶ In-house designed test programs
- ▶ Long product life cycles through PCN/ECN, LTB & LTS processes

## ENVIRONMENTAL/RELIABILITY

Mil-Std-810F Test Suite

- ▶ Altitude
- ▶ Low temp operating
- ▶ Thermal Shock
- ▶ Vibration
- ▶ Acceleration
- ▶ High temp operating
- ▶ Humidity
- ▶ Thermal cycling
- ▶ Mechanical shock
- ▶ Explosive atmosphere

# SSD TEST & VALIDATION SUPPORT

## SMART/SECURITY FEATURE SET

### SMART Command Set

- ▶ Return status
- ▶ Threshold not exceeded bit
- ▶ Read attribute data
- ▶ SMART logging

### SMART Command Transport Functionality

### SMART Attributes

- ▶ Drive health notification
- ▶ Performance monitoring
- ▶ Program/erase cycle count to predict life
- ▶ Runtime bad blocks

### ATA Security Feature Set

- ▶ Test each security mode
- ▶ Test transactions between modes
- ▶ Test each mode across power cycles

### ATA Security Erase

- Instant Erase
- Military Security Erase
- 256-bit AES Encryption

## LONG TERM ENDURANCE

### Long Term Endurance Test

- ▶ Verify bad blocks increasing after extensive number of program/erase cycles
- ▶ Verify spare blocks are being remapped to replace bad blocks
- ▶ Verify data integrity is maintained across all data (user & static)
- ▶ Verify no read/write errors reported to host
- ▶ Monitor SMART attributes for accuracy

### Power Cycling During Write Operations

- ▶ Verify firmware and metadata integrity
- ▶ Verify write performance maintained over multiple cycles
- ▶ Verify static data integrity
- ▶ If supercap supported, verify integrity of "in flight" writes
- ▶ Vary timing of power down event relative to when write commands are issued
- ▶ Vary command type, sectors transferred, data pattern each cycle

## HARDWARE VERIFICATION PROCEDURE

### Power Consumption, Component Temps

- ▶ Supply currents measure under varying load & operating modes
- ▶ Component case temps measured under worst case loads

### AC Timing

- ▶ Setup time, hold time, output enable access time
- ▶ All interface modes
- ▶ NAND timing verified for each NAND configuration supported
- ▶ Reset to ready



### Global Locations

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