
# SERIES 5500
# HIGH-CAPACITY STORAGE MODULE DRIVE

FEATURES

- 300M Byte Capacity
- Removable Disk Pack
- High Transfer Rate
- Acoustic Cabinet

HARRIS
COMPUTER SYSTEMS

## HIGH CAPACITY STORAGE MODULE DRIVE

These high-capacity discs are the latest additions to the Harris Series 5500 Storage Module Drive systems. With storage capacities to 600M Bytes per controller and an average access time of only 38 milliseconds; these large disc systems provide high-performance, high-capacity, random-access disc storage for Harris Computer System users having large data base requirements. Configurations up to 1.8G Bytes per computer system are practical with these devices.

The Series 5500 High-Capacity Storage Module Drive (HCSMD) systems are available in two sizes: Model 554X with 150M Bytes and Model 555X with 300M Bytes per drive. Since these HCSMD systems are practically identical, most of the information in this product bulletin pertains to both. However, where specification differences exist; the data presented first refers to the 150M Byte unit, followed by data [in brackets] pertinent to the 300M Byte unit.

### STORAGE MODULE DRIVE

The HCSMD consists of a disc pack spindle and associated drive motor, flying heads and servo positioning mechanism, speed and position sensing devices, an air supply and filtration system and the electronic circuitry necessary for reading, writing, positioning, control and interface. A shroud cover on the drive allows access to the spindle for disc pack installation or removal. During operation, this cover seals the disc shroud area so the air filtration system can maintain clean airflow past the disc pack. A separate enclosure cover provides access to the read/write electronics, heads and servo mechanism for maintenance purposes. Front and rear cabinet doors provide access to the power supplies, servo electronics and air filtration system. The controller electronics is housed in a (optional) peripheral cabinet.

The read/write heads, attached to a carriage assembly, are driven by a voice-coil linear actuator. Position feedback information is provided by the pre-recorded servo tracks on the installed disc pack. Data is recorded by the write-compensated, modified frequency modulated (MFM) method. A phase-locked oscillator provides read data recovery.

### DISC PACK

The model 5555 Disc Pack consists of twelve discs stacked vertically on a common hub. The disc pack is stored and transported in a protective container when not in use. The container handle is used to lift, load and lock the disc pack onto the HCSMD spindle. The top and bottom discs provide physical protection for the ten magnetic oxide-coated center discs. Nineteen of the 20 surfaces provided are used for data storage. The twentieth surface contains 411 [823] pre-recorded servo tracks that define the recording track positions and also provide timing signals. Each recording Head, when correctly positioned, defines a Track. The nineteen vertical recording Tracks define a Cylinder. The primary tracks are located on Cylinders 0 through 403 [807]. There are seven [fifteen] spare tracks on each surface that may be used as an alternate for any primary track that is defective. Each track is addressed by a cylinder and head address number; which is pre-recorded (during pack initialization) in the Header Address Word of each sector.

### CONTROLLER

The Extended Disc Controller (EDC) performs all functions required to operate the HCSMD on-line with Harris CPUs. In operation, the EDC communicates with the computer through a Chain Block Channel (CBC) or a Universal Block Channel (UBC) Input/Output Channel (IOC). Commands establish the operation mode, special conditions and also specify the Drive, Cylinder, Head and Sector addresses.

In the Write mode, 24-bit parallel output data words are converted to a bit-serial data stream and transmitted to the drive. The EDC automatically formats this data into sectors and generates a preamble and postamble for each sector. A checksum technique is used for error detection.

In the Read mode, the bit-serial data received from the disc is stripped of the preamble and postamble information and converted into parallel 24-bit data words for transfer to the I/O Channel. All read/write transfers are of the Direct Memory Access (DMA), block mode category. Sector, Head and Cylinder address "spills" are automatically implemented by the controller during read, write or search operations.

One additional Model 5541 [5551] HCSMD may be operated by the controller supplied with the Model 5540 [5550] HCSMD. Status information from the HCSMD and EDC is transferred to the CPU upon command. An interrupt request is generated by the controller logic in response to error conditions or at the end of read, write or motion-type commands.

### SOFTWARE

A diagnostic program is supplied with each HCSMD system to verify the operation of the controller and exercise the drive. The Harris HCSMD system is supported by the Series 100/200 Virtual Memory Manager (VULCAN) operating system.

# SPECIFICATIONS

## HIGH-CAPACITY STORAGE MODULE DRIVE (HCSMD)

**MODELS 5540/5541 [MODELS 5550/5551]**

**Positional Access**

| | |
|---|---|
| Single Seek | 6 m sec (maximum) between adjacent tracks |
| Average Seek | 30 m sec (average) for all possible combinations |
| Maximum Seek | 55 m sec (maximum) from track 0 to 410 [0 to 822] |
| Spindle Speed | 3600 RPM; +2.5% −3.5% |

**Rotational Access**

| | |
|---|---|
| Average Latency | 8.33 m sec at 3600 RPM, nominal |
| Maximum Latency | 17.3 m sec at 3474 RPM (3600 RPM −3.5%) |
| Number of Heads | 19 recording and 1 servo |
| Recording Method | Modified Frequency Modulation (MFM) |

**Data Transfer Rates**

| | |
|---|---|
| Serial Bit Stream | 9.677 MHz, nominal |
| 8-bit Bytes | 1.2 M Byte/second |
| 24-bit Words | 403,200 words/second, burst rate within a Sector<br>342,720 words/second, formatted rate within a Cylinder |

## DISC PACK

**MODEL 5555**

| | |
|---|---|
| Number of Discs | 10 recording and 2 cover plates |
| Recording Surfaces | 19 data and 1 servo |

**Recording Density**

| | |
|---|---|
| Outer Track | 4038 BPI, nominal |
| Inner Track | 6038 BPI, nominal |
| Track Spacing | 192 Tracks/inch [384 Tracks/inch] |
| Tracks/Surface | 404 plus 7 spares [808 plus 15 spares] |
| Bits/track | 161,280, nominal (unformatted) |

**Dimensions**

| | |
|---|---|
| Diameter | 14.0 in (35.6 cm) |
| Height | 7.0 in (17.8 cm) |
| Weight | 16.0 lb (7.3 kg) |

**Formatted Data Capacity**

e.g.; 3 bytes/word
112 words/sector
51 sectors/track

| | | | | | 150 MB HCSMD | [300 MB HCSMD] |
|---|---|---|---|---|---|---|
| BYTE | 3 | 336 | 17,136 | 325,584 | 131,535,936 | 263,071,872 |
| WORD | | 112 | 5,712 | 108,528 | 43,845,312 | 87,690,624 |
| SECTOR | | | 51 | 969 | 391,476 | 782,952 |
| TRACK | | | | 19 | 7,676 | 15,352 |
| CYLINDER | | | | | 404 | 808 |

## CONTROLLER

**MODELS 5540 and 5550**

| | |
|---|---|
| Logic | TTL Integrated Circuits |

**Interface**

| | |
|---|---|
| Controller to HCSMD | Differential line drivers/receivers |
| Controller to IOC | Single-ended line drivers/receivers |
| Operating Control | On-line with Harris Computer Systems via DMA I/O Channel (IOC) |

**IOC Requirements**

| | |
|---|---|
| Series 100/200 | CBC/SE/24-IOC or UBC/SE/24-IOC |
| Configuration | Model 5540/5550 includes the controller.<br>One additional HCSMD may be connected to this controller. |
| Formatting | The controller formats the data into the standard 112 words/Sector and 51 Sectors/Track. A Sector is comprised of a Preamble, 112 24-bit data Words and a Postamble (including the Checksum). |
| Interrupt | An interrupt is generated at the end of Read, Write and motion-type commands or if an error condition is detected. |

## ELECTRICAL REQUIREMENTS

**HCSMD (all Models)**

| | Domestic | Export |
|---|---|---|
| Voltage (nominal) | 208 VAC (230 VAC, optional) | 220 VAC (240 VAC, optional) |
| Voltage Tolerance | 198-246 VAC (179-222 VAC, optional) | 195-235 VAC (213-257 VAC, optional) |
| Frequency | 59.0 to 60.6 Hz | 49.0 to 50.5 Hz |
| **Current** | | |
| @208VAC/60Hz | 8.0A RMS, run (38A, surge) | |
| @230VAC/60Hz | 7.2A RMS, run (39A, surge) | |
| @220VAC/50Hz | | 9.5A RMS, run (40A, surge) |
| @240VAC/50Hz | | 8.7A RMS, run (41A, surge) |
| Phase | Single phase, 3-wire, polarized connector type L6-20P | |
| **Power** | | |
| @60Hz | PF=0.70; 1200 Watts, nominal | |
| @50Hz | PF=0.59; 1300 Watts, nominal | |

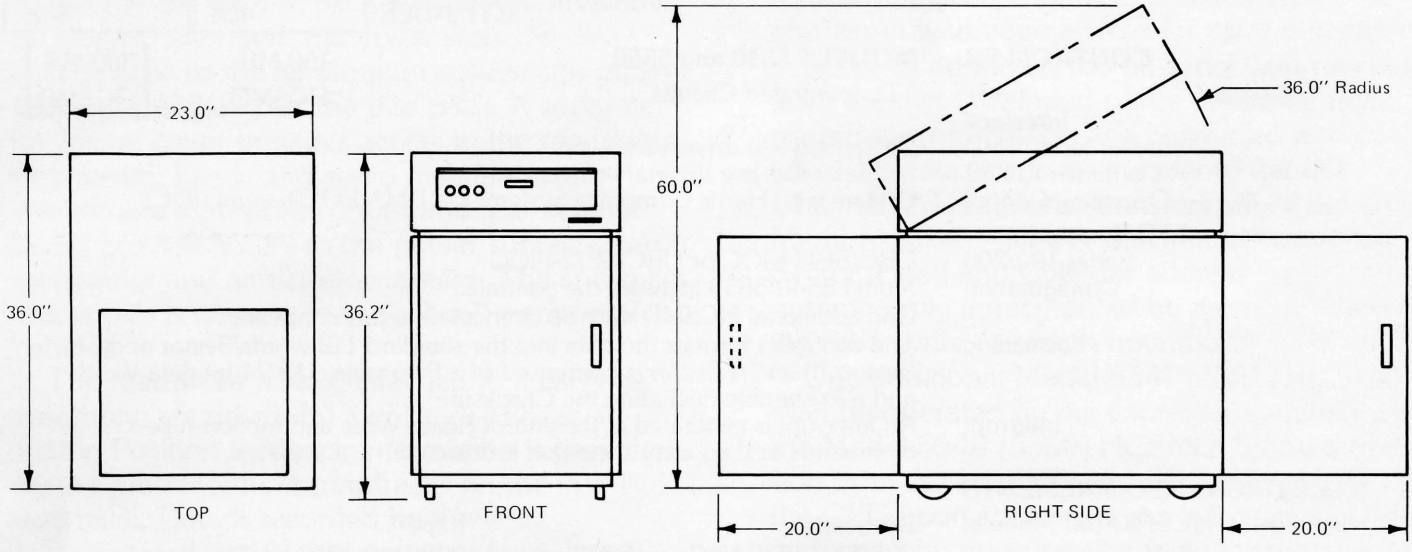
| Controller (Models 5540/5550) | Domestic | Export |
|---|---|---|
| Voltage (nominal) | 115VAC (230VAC, optional) | 220VAC |
| Voltage Tolerance | 105-125VAC (210-250VAC, optional) | 210-250 VAC |
| Frequency | 47 to 400 Hz | 47 to 400 Hz |
| **Current** | | |
| @115VAC/60Hz | 2.0A RMS | |
| @230VAC/60Hz | 1.0A RMS | |
| @220VAC/50Hz | | 2.0A RMS |
| Phase | Single phase, 3-wire, polarized connector | |
| **Power** | | |
| @60Hz | 230 Watts, nominal | |
| @50Hz | 240 Watts, nominal | |

## ENVIRONMENTAL REQUIREMENTS

| | |
|---|---|
| **Temperature** | |
| Operating | 60°F to 90°F (16°C to 32°C), ambient air |
| Storage | −30°F to 150°F (−34°C to 65°C), ambient air |
| **Humidity** | |
| Operating | 20% to 80%, relative (non-condensing) |
| Storage | 5% to 95%, relative (non-condensing) |
| **Thermal Shock** | |
| Operating | 12°F/hour (7°C/hour), maximum |
| Storage | 36°F/hour (20°C/hour), maximum |
| **Altitude** | |
| Operating | −1000 ft to 6500 ft (−305m to 2000m) |
| Storage | −1000 ft to 15,000 ft (−305m to 4572m) |
| **Heat Dissipation** | |
| Domestic | 4200 BTU/hour (1000 kg-cal/hour), nominal |
| Export | 4500 BTU/hour (1100 kg-cal/hour), nominal |
| Cooling | Centrifugal fan, approximately 200 CFM |

## DIMENSIONS

| | |
|---|---|
| Height | 36.2 in (91.9 cm) |
| Width | 23.0 in (58.4 cm) |
| Depth | 36.0 in (91.4 cm) |
| Weight | 550 lb (250 kg) |
| Installation and Access | See Below. |




**High Capacity Storage Module Drive**

Specifications are subject to change without written notice.

HARRIS COMMUNICATION AND INFORMATION PROCESSING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