MICROPOLIS 1538 DISK DRIVE
SPECIFICATIONS

Unformatted Capacity:

Model Number

1538-15

Total Mbytes	———————————————————— 1043 ————————————————————
Disk Platters	———————————————————— 8 ————————————————————
Read/Write Heads	———————————————————— 15 ————————————————————
Cylinders	———————————————————— 1669 ————————————————————
Bytes per track	———————————————————— 41664 ————————————————————

Formatted Capacity (typical)

Total Mbytes	———————————————————— 910 ————————————————————
Bytes per Sector	———————————————————— 512 ————————————————————
Sectors per Track	———————————————————— 71 ————————————————————

PC Drive Types

If you are using third-party installation software or an on-board BIOS on the controller, follow the instructions included with the software or controller. Otherwise, examine the entries in your system drive table and find the type that most resembles the head and cylinder parameters of the drive without exceeding these parameters.

Performance Specifications

Seek Time (including settling time)	Track-to-Track	4 msec
	Average	14.5 msec
	Maximum	33 msec
Average Rotational Latency		8.33 msec
Rotational Speed		3600 rpm +/- 0.5%
Data Transfer Rate		23.33 Mbits/sec
MTBF		150,000 hours
Positioner		Fully balanced rotary voice coil
Parking		Automatic park and lock

General Functional Specifications

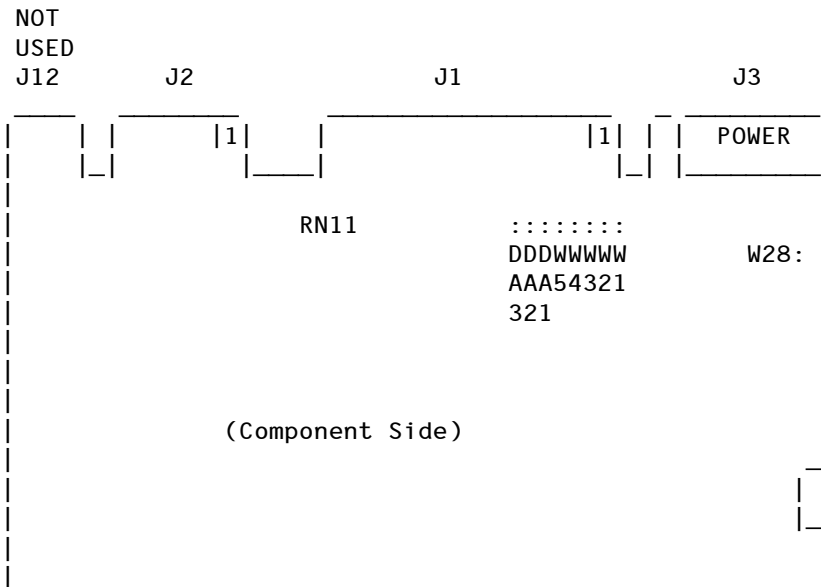|	
Interface	ESDI
Sectoring (see W1 description, below)	Hard or Soft
Write Precompensation Start Cylinder	1669*
Reduced Write Current Start Cylinder	1669*
Landing Zone	1669*
Mounting Plane	Any orientation

* These are effectively turned off by specifying a non-existent cylinder. Some systems accomplish this by using a value of "-1"

Power Requirements

+12V +/-5%	2.0A avg.
	(4.3A max during start-up)
+5V +/-5%	1.5A avg.
Heat dissipation, typical	24 Watts

1538-series drives require the use of an ESDI Controller capable of a data transfer rate of at least 23.33 Mbits/sec.

Drive Addressing and Interface Termination

```
   NOT
   USED
   J12       J2                    J1                    J3
   ____    _____     _____   _   _____
  |    | | |     |1|    |                |1| | | | POWER  |
  |    |_|       |_|____|                |_| |_| |_____|
  |                                                       |
  |              RN11         ::::::::                     |
  |                           DDDWWWWW       W28: |
  |                           AAA54321                     |
  |                           321                          |
  |                                                        |
  |                                                        |
  |                                                        |
  |              (Component Side)                          |
  |                                                     _|
  |                                                    |
  |                                                    |_
  |                                                        |
  |                                                        |
```

The Interface Terminator factory installed at RN11 will provide proper termination for
the interface lines. When daisy-chaining multiple drives, leave the terminator
installed only in the last physical drive on the daisy chain cable; remove the
terminator from each of the other drives. In most PC/AT installations, the C: drive is
actually at the end of the cable and should retain the terminator.

The drive address jumpers are identified as DA1,DA2 and DA3. Address selection is
binary, as shown in the table below. The ESDI controller's documentation will specify
the drive address to use.

Drive Address	Select Jumpers		
	DA3	DA2	DA1
1	out	out	in
2	out	in	out
3	out	in	in
4	in	out	out
5	in	out	in
6	in	in	out
7	in	in	in

"Drive address 0" (no jumper at DA1,DA2, or DA3) is a "deselect" (i.e., no drive
selected).

Drives are factory configured as Drive Address 1.

For many multiple drive installations, each drive must have a unique address. An
exception is that for every drive in a PC/AT installation, verify that only Drive
Address is at DA2; move the jumper if necessary (the special twisted interface cable
that is generally used takes care of assigning a unique address to each drive). PC/AT
controller can typically support a maximum of two drives.

Spindle Control Option

  Jumper W5 selects the spindle control option.

    When W5 is installed, the drive must wait for a start spindle command to start the
    spindle motor.

    When W5 is not installed (the factory default configuration), the drive

automatically starts the spindle motor at power on.

Sectoring Options

  * W1 is not used and must not be jumpered.

Frame ground Options

  W28 is to select the frame ground option.

  When a jumper is installed at W28, frame ground is connected to logic ground.
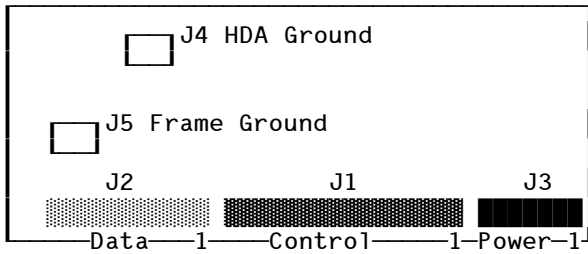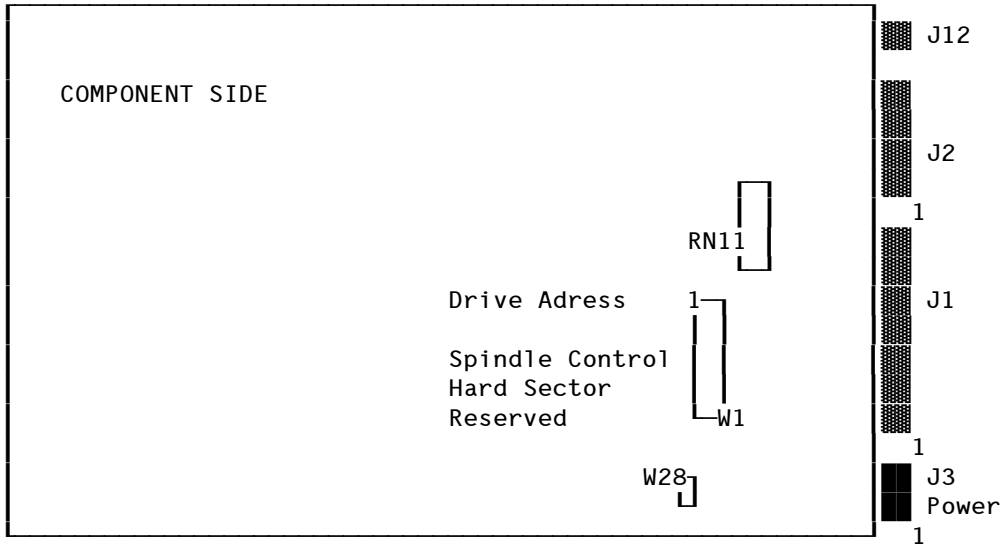
  When a jumper is NOT installed at W28(the factory default configuration), frame
  ground is not connected to logic ground.

Sectoring Options

  * The number of bytes per sector may be specified using the Set Bytes Per Sector
    command or by selecting a default sector configuration with jumpers W2, W3, and W4
    as follows:

```
        Jumpers              Sectors          Bytes/Sector
      W4    W3    W2        Per Track      Formatted    Unformatted
      ───   ───   ───       _____     _____   _____
      out   out   out        68(70)          520         612(595)
  ───────────────────────────────────────────────────────────────
| * out   out    in          71             512          582
  ───────────────────────────────────────────────────────────────
      out    in   out         38            1024         1096
      out    in    in         18            2244         2314
       in   out   out         10            4096         4166
       in   out    in        58(64)          768         839(651)
       in    in   out        121             272          342
       in    in    in          1           41594        41664
```
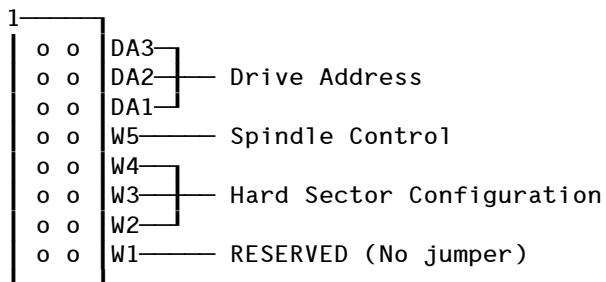
  * This is the default (factory installed) configuration and is recommended for PC/AT
    applications

COMPONENT SIDE

RN11

Drive Adress   1

Spindle Control
Hard Sector
Reserved   W1

W28

J12

J2
1

J1

1

J3
Power
1

J4 HDA Ground

J5 Frame Ground

J2   J1   J3

Data—1——Control——1-Power—1

Jumper setting

■ = Factory default configuration

Drive Address/Spindle Control/Hard Sector Configuration Jumper Block

1
o o DA3
o o DA2 —— Drive Address
o o DA1
o o W5 —— Spindle Control
o o W4
o o W3 —— Hard Sector Configuration
o o W2
o o W1 —— RESERVED (No jumper)

Drive Select DA3/DA2/DA1

Drive Address	Select Jumpers		
	DA3	DA2	DA1
■ 1	OPEN	OPEN	CLOSED
2	OPEN	CLOSED	OPEN
3	OPEN	CLOSED	CLOSED
4	CLOSED	OPEN	OPEN
5	CLOSED	OPEN	CLOSED
6	CLOSED	CLOSED	OPEN
7	CLOSED	CLOSED	CLOSED

Drive Address 0 is used as a "deselect" (i.e., no drive is selected).

The three Drive Select interface lines are decoded to select the correspondingly addressed drive to the host controller/formatter. In multiple-drive systems, each drive must have its own unique address.

Terminator Pack RN11 provides proper termination for the interface lines. When daisy-chaining multiple 1538 drives, the terminator is installed only in the last drive on the daisy chain.

Sectoring Options

The Sector/Address Mark Found signal is used to transmit sector pulsed to the host controller. Sector pulses are derived from the servo disk. The number of sector pulses generated is equal to:

$$INT \left[\frac{41,664}{n} \right]$$

Where 41,664 = byte clock derived from servo disk

INT = integer part of
n = the number of unformatted bytes/sector
(82 minimum)

W2/W3/W4 Hard Sector Configuration

Sectors	Bytes/Sector		Jumpers		
	Formatted	Unformatted	W4	W3	W2
68	520	612	OPEN	OPEN	OPEN
■ 71	512	582	OPEN	OPEN	CLOSED
38	1024	1096	OPEN	CLOSED	OPEN
18	2244	2314	OPEN	CLOSED	CLOSED
10	4096	4166	CLOSED	OPEN	OPEN
64	580	650	CLOSED	OPEN	CLOSED
121	272	342	CLOSED	CLOSED	OPEN
1	41594	41664	CLOSED	CLOSED	CLOSED

The number of bytes/sector may be specified using the Set Bytes Per Sector command or by selecting a default sector configuration with option jumpers W2, W3, and W4.

W5 Spindle Control Option

    CLOSED The drive must wait for a Start Spindle command to start the spindle
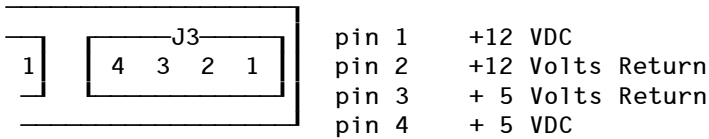   motor.
■ OPEN   The drive automatically starts the spindle motor at power-on.

W28 Frame Ground Option

    CLOSED Frame ground is connected to logic ground.
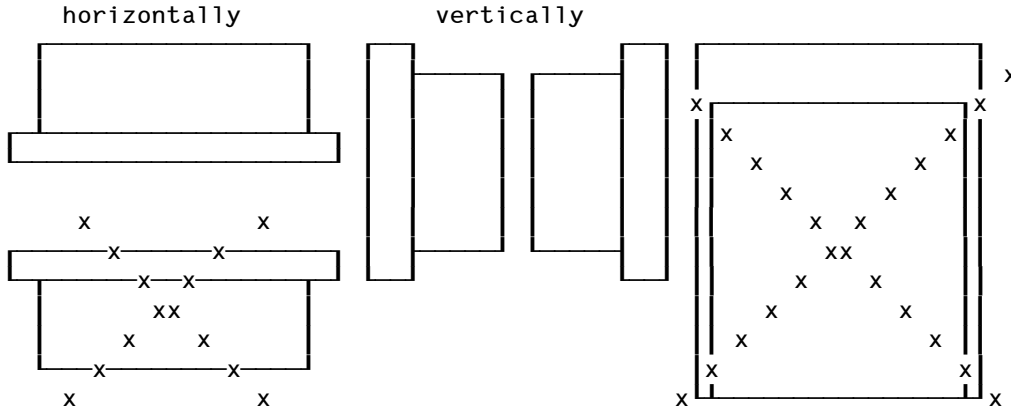■ OPEN   Frame ground is not connected to logic ground.

J3 DC Power and pin connector assignments

```
 ┌─────────────────┐
 │    ┌──J3──┐      │      pin 1     +12 VDC
┌──┐ │        │     │      pin 2     +12 Volts Return
│1 │ │ 4  3  2  1   │     pin 3     + 5 Volts Return
└──┘ │        │     │      pin 4     + 5 VDC
 └─────────────────┘
```

J12 RESERVED!

Notes on installation

Recomended Drive mounting

    horizontally   vertically

Dimensions and Mounting

The 1538 drive uses industry-standard mounting for 5¼-inch half-height Winchester
disk drives.

Recommended orientation is vertical on either side, or horizontal with the Device
Electronics board down; other mounting orientations may be used provided the ambient
air temperature around the drive is kept at or below 50°C (122°F).

The term "ambient" becomes imprecise when referencing a drive in a system, since it
is difficult to determine where the air temperature should be measured. To help
resolve this confusion, Micropolis specifies that the maximum HDA casting temperature
(regardless of the air temperature around the drive) is 60°C (140°F). Not exceeding

this temperature will ensure that the head—to—media interface never exceed its temperature limit.

Inasmuch as the drive frame acts as a heat sink to dissipate heat from the unit, the enclosure and mounting structure should be designed to allow natural convection of heat around the HDA and outer frame. If the enclosure is small or natural convention is limited, a fan may be required.

<u>Mounting Screws</u>

2 per side 6—32 UNC—2B x 0.156 max deep.
4 on bottom 6—32 UNC—2B x 0.20 max deep

Caution: To avoid restricting HDA sway space, the mounting screws must not penetrate the outer surface of the side mounting holes by more than 0.156 inches or the bottom mounting holes by more than 0.20 inches. Screws that are too long may short to PCBA components and/or prevent proper operation of the shock mount system.

<u>Control Signal Connector J1</u>

J1 is a 34—pin board—edge connector. The signals on this connector control the drive and transfer drive status to the host controller.

Recommended Cable: 3M Scotchflex 3365/34
Mating Connector: AMP 88373—3 (key slot between pins 4 and 6)

<u>Data Transfer Connector J2</u>

J2 is a 20—pin board—edge connector containing read or write data signals.

Recommended Cable: 3M Scotchflex 3365/20
Mating Connector: AMP 88373—6 (key slot between pins 4 and 6)

<u>DC Power Connector J3</u>

J3 is a 4—pin, keyed AMP MATE—N—LOK Connector. This connector supplies DC power (+5V and +12V) to the drive.

Mating Connector: AMP 1—480424—0
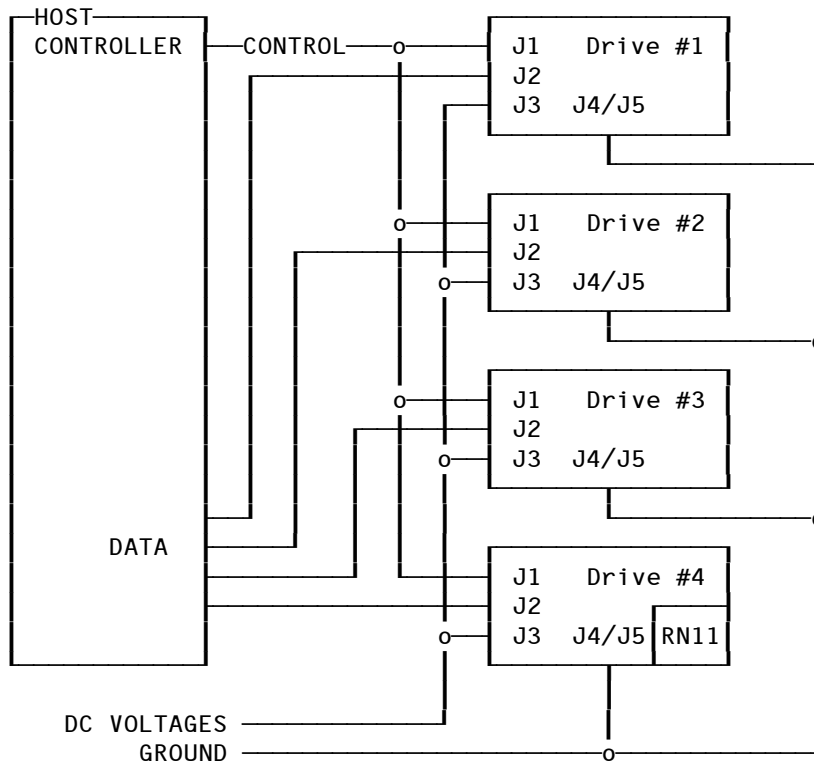   Pins: AMP 350078—4

Suggested Wire Size: 18 AWG

<u>Ground Connectors J4/J5</u>

3/16—inch spade lugs J4 and J5 are provided for grounding; system characteristics determine the proper ground connection.

Mating Connector: AMP 60972—2 or equivalent.

Daisy-Chaining the 1538 Drive

Interface Terminator RN11 is installed ONLY in the last physical drive in the control chain.

Connectors J4 and J5 are provided for grounding; system characteristics determine the proper ground connection.

Up to seven disk drives may be connected to a single host controller/formatter. The control signals at J1 are transmitted via the standard, daisy-chain interconnection. The data signals at J2 are transmitted via radially connected data-transfer lines.

Interface Electrical Characteristics

The signals at Control Signal Connector J1 control the drive and transfer drive status to the host controller. The signals control are low-true at the interface, high-true into drivers and out receivers, and have the following logic levels shown:

True = 0.0 VDC to 0.4 VDC @ I = -48 milliamps (maximum)
False = 2.5 VDC to 5.25 VDC @ I = +250 microamps (open collector)

All interface data transfer signals are differential in nature.

Up to seven drives can be connected to one host controller/formatter. Drive Select 1, 2 and 3 carry the binary-coded addres of the drive to be selected. The address of the drive is set with driveselection jumpers DA1, DA2, and DA3 as a binary combination. When the address is decoded and the decoded value matches the value specified by the three drive-selection jumpers, that drive is enabled to receive commands and transmit status. Drive Select 1 is the least significant bit.

Adjustments and Maintenance

The 1538 drive requires no adjustments or periodic maintenance. Additionally, no mechanical adjustments are required to prepare the drives for handling or shipment.

Field-Replaceable Components

The concept of repair by replacement of complete functional components is utilized in the 1538 drive, resulting in an MTTR of less than 15 minutes.

Micropolis 1538 high-performance, 5¼-inch Winchester Disk Drives provide OEMs with high-speed, high-capacity, random-access storage with a built-in intelligent controller.

The drives are fully compatible with the Serial mode of the Enhanced Small Device Interface (ESDI) standard and are designed to meet the needs of diverse applications environments.

Media Defects

Media defects are physical characteristics of the media which result in repetitive read errors when a functional drive is operated within specified operating conditions.

At the time of manufacture, a media test system evaluates every drive and identifies each media defect location. The defects are logged on a label affixed to the drive. The defective areas are identified by head (HD) address, cylinder (CYL) address, and number of Bytes from Index (BFI).

In addition to listing the defects on the label and the printout, the defects are also mapped in the drive. The defect list is written for each data surface. The list is written on the corresponding surface in Sector 0 at three cylinder locations:

1) The maximum cylinder (1668).
2) The maximum cylinder minus 8 (1660).
3) A special cylinder which is accessed as "Cylinder 4095 (FFFh).

NOTE: The cylinder at the address of 4095 is a drive-unique location. This is in compliance with the industry-standard ESDI specification.
Do not attempt to write to Cylinder 4095.

> Micropolis specifies that all 1538 disk drives shall no more than one defect per megabyte of unformatted capacity. Additionally, Cylinder 0 and the cylinder at 4095 shall be defect-free at the time of shipment.

Seek Time

			1538
Track-to-Track	msec.	typ.	4
Average	msec.	typ.	14.5
	msec.	max.	33
One-Third Stroke	msec.	max.	15.5
Latency	msec.	avg.	8.33
Nominal	msec.	max.	16.67

Data Transfer Signals

All data-transfer lines between the drive and the host system are differential and may not be multiplexed.

For pairs of balanced signals are used to transfer data: NRZ Write Data, NRZ Read Data, Write Clock, and Read/Reference Clock.