Hard Drive: MINISCRIBE: M3425 20MB 5.25"/HH MFM ST506

```
M 3 4 2 5    MINISCRIBE
NO MORE PRODUCED                              Native|  Translation
                                        ------+-----+-----+-----
Form                 5.25"/HH     Cylinders     615|     |     |
Capacity form/unform   20/   25 MB Heads          4|     |     |
Seek time   / track  85.0/15.0 ms Sector/track   17|     |     |
Controller         MFM / ST506    Precompensation   128
Cache/Buffer            KB        Landing Zone
Data transfer rate    0.625 MB/S int  Bytes/Sector      512
                      0.625 MB/S ext
Recording method     MFM                    operating  | non-operating
                                        -------------+--------------
Supply voltage     5/12 V    Temperature *C      4 50  |    -40 57
Power: sleep            W    Humidity    %       8 80  |     8 80
       standby          W    Altitude    km   -0.061  3.048|     12.192
       idle       14.5 W    Shock        g        4    |    40
       seek            W    Rotation    RPM    3600
       read/write      W    Acoustic    dBA      50
       spin-up         W    ECC         Bit
                            MTBF         h     20000
                            Warranty Month
Lift/Lock/Park     NO       Certificates    CSA,FCC,UL478
```

Layout

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```
     +--------------------------------------------------------+
     |                                                  |XX Power
     |                                                  |XX
     |                                                  |
     |                                                  |XX
     |                                                  |XX Control
```

```
  |                                               |XX Cable
  |                                               |XX J1
  |                                               |XX
  |                                               |XX
  |                                             TERMXX
  |                                        +-8 ++|
  |                                    DIP| | |||XX
  |                                       | | |||XX
  |                                       | | |||XX
  |                                       | | |||XX Data
  |                                       | | |||XX Cable
  |                                       +-1 RP1XX J2
     +---------------------------------------------------+
```

Jumpers

Jumper Setting
==============

Drive Selection Configuration

```
         Drive Select No.              1 2 3 4 5 6 7 8
     |  1  |  2  |  3  |  4          +---------------+
 ----+------+------+------+------   ON |x x x x x x x x|
 SW8 |CLOSED|OPEN  |OPEN  |OPEN     OFF+---------------+
 SW7 |OPEN  |CLOSED|OPEN  |OPEN        xxxxxxxxxxxxxx RP1
 SW6 |OPEN  |OPEN  |CLOSED|OPEN                   Terminator
 SW5 |OPEN  |OPEN  |OPEN  |CLOSED
```

As shipped, the DIP switch has Drive 1 selected (SW8 CLOSED).

Drive Exercise Options

As shipped, the DIP switch has SW2, SW3, and SW4 closed. These switches are for factory test modes and must remain closed for normal operation.

Actuator Exerciser Modes

The microprocessor performs "wake up" diagnostics upon application of power. If an error is detected, the processor will flash a warning by blinking the Activity LED. Some errors are fatal that they do not

return to the program until power is cycled.

If no errors are detected, the processor tests the shunt block to determine the state of SW2, SW3, and SW4 (Drive Exercise Options).

Actuator Exerciser Modes:

SW2 SW3 SW4
CLOSED CLOSED X Normal Operation
CLOSED OPEN X Factory Use Only
OPEN CLOSED OPEN Random Seek (burn-in mode)
OPEN CLOSED CLOSED Random Seek
OPEN OPEN OPEN Cresendo Seek (burn-in mode)
OPEN OPEN CLOSED Cresendo Seek

Terminators

Each drive is shipped with a terminator pack providing the 220/330 ohm termination for the Control Input Signals. If multiple drives are configured in a daisy chain configuration, the terminator pack must be removed from all drives except the last unit on the daisy chain.

Install

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Notes on Installation
=====================

Drive mounting

```
     horizontally              vertically
  +----------------+   +--+              +--+ +----------------+
  |                |   |  | +-----+ +-----+ | |                | x
  |                |   |  | |     | |     | | | x+--------------+x
 +-+--------------+-+ |  | |     | |     | | | ||x          x||
 +----------------+ |  | |     | |     | | | ||  x          x ||
  |                |   |  | |     | |     | | | ||   x      x   ||
  |    x        x      |  | |     | |     | | | ||    x  x      ||
 +------x------x-------+ |  +-----+ +-----+ | ||     xx       ||
 +-+-------x--x-------+-+ +--+              +--+ ||    x      x   ||
  |      xx         |                         || x          x ||
  |    x   x       |                         || x          x ||
   +---x--------x----+                        |x          x|
```
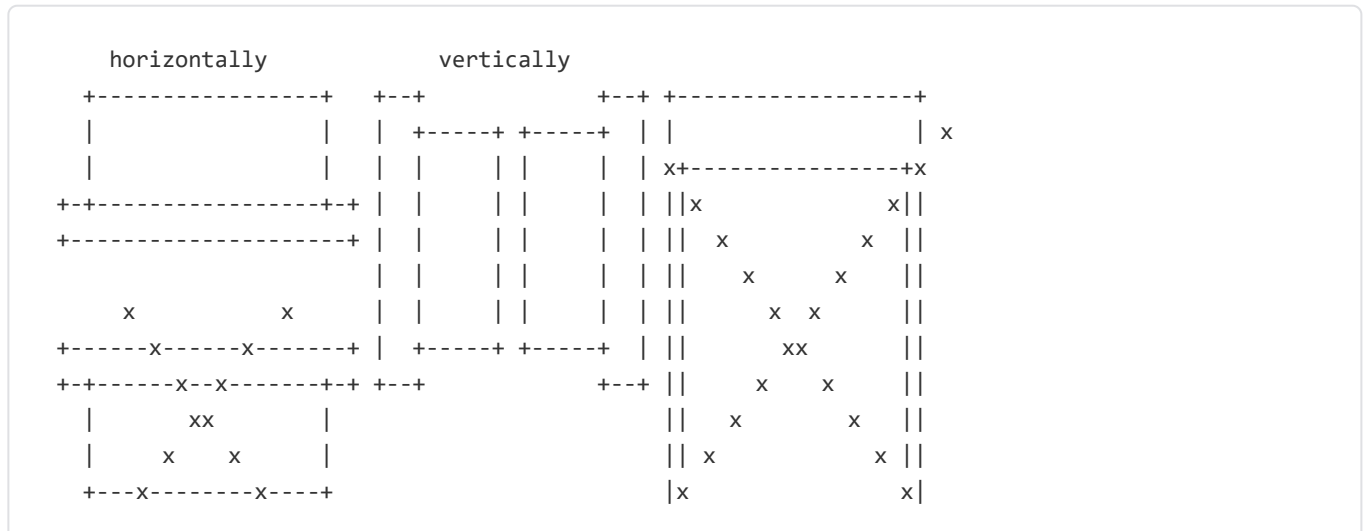
```
     x              x                    x++----------------++x
        UNACCEPTABLE!                          UNACCEPTABLE!
```

Recommended Mounting Configuration

The MiniScribe 3425/3212P half height drive is designed to be used in applications where the unit may experience shock and vibrations at greater levels than larger and heavier disk drives.

Two features which allow greater shock tolerances are the use of rugged media and shock mounts. To take full advantage of the shock mounts, however, it is necessary to provide a 0.1 inch clearance on both the top and bottom of the drive. This clearance allows for move-ment of the drive during acceleration. This implies that if the drive is mounted by the bottom mounting holes on a flat surface, stands-off are needed under the mounting holes. No special considerations are required if the drive is mounted using the side mounts except for the clearance on top and bottom. The drive may be mounted in any attitude except upside down.

The drive is mounted using 6-32 UNC screws, 1/4 inch maximum penetration. The customer should allow adequate ventilation to the drive to insure reliable drive operation over the operating temperature range.

Screws: 6-32 UNC

Mechanically Isolated Mounting Points

Four side mounting and four base mounting points are provided to the customer. Each mounting point is mechanically isolated from the drive. Additionally, four side mounting points are provided that are compatible with a half height floppy disk drive.

Cabling

Connect interface cables with connectors P1, P2, P3, and P4 to J1, J2, J3, and J4 respectively. Insure that connectors P1 and P2 have keys installed. If multiple drives are be interconnected, remove the terminator packs in all but the last drive in the daisy chain.

Magnetic Field

The externally induced magnetic flux density may not exceed 3 Gauss as measured at the disk surface.

Drive Mechanism

A brushless DC direct drive motor rotates the spindle at 3600 rpm. The motor/spindle assembly is dynamically balanced to provide minimal mechanical runout to the disks. A dynamic brake is used to provide a fast stop to the spindle motor when power is removed.

Air Filtration System

Within the sealed enclosure, a 0.3 micron filter coupled with a breather filter provides over the drive life a clean environment to the heads and disks.

Head Positioning Mechanism

Two or four read/write heads are supported by a carriage mechaism coupled to the stepper motor through a rack-and-pinion motion translator. The rack-and-pinion translator allows for the increased number of data tracks while retaining the full step holding torque and positioning repeatability characteristics of the stepper motor.

```
Power Sequencing
----------------
+5 volts DC and +12 volts DC may be applied in any order.
```

```
+12 VDC powers the spindle drive motor. The microprocessor verifies
that the disks are spinning at 3600 rpm and then activates the
automatic Track Zero positioning. -TRACK ZERO, -SEEK COMPLETE, and
-READY will beome true upon completion of the Track Zero positioning
sequence.
```

Electrical Interface

The interface to the MiniScribe 3425/3212P can be divided into three categories, each of which are physically separated: Comtrol Signals, Data Signals and DC Power.

All Control Signals are digital in nature (open collector TTL) and either provide signals to the drive (input) or signals to the

controller (output). The Data Signals are differential in nature and provide data either to (write) or from (read) the drive.
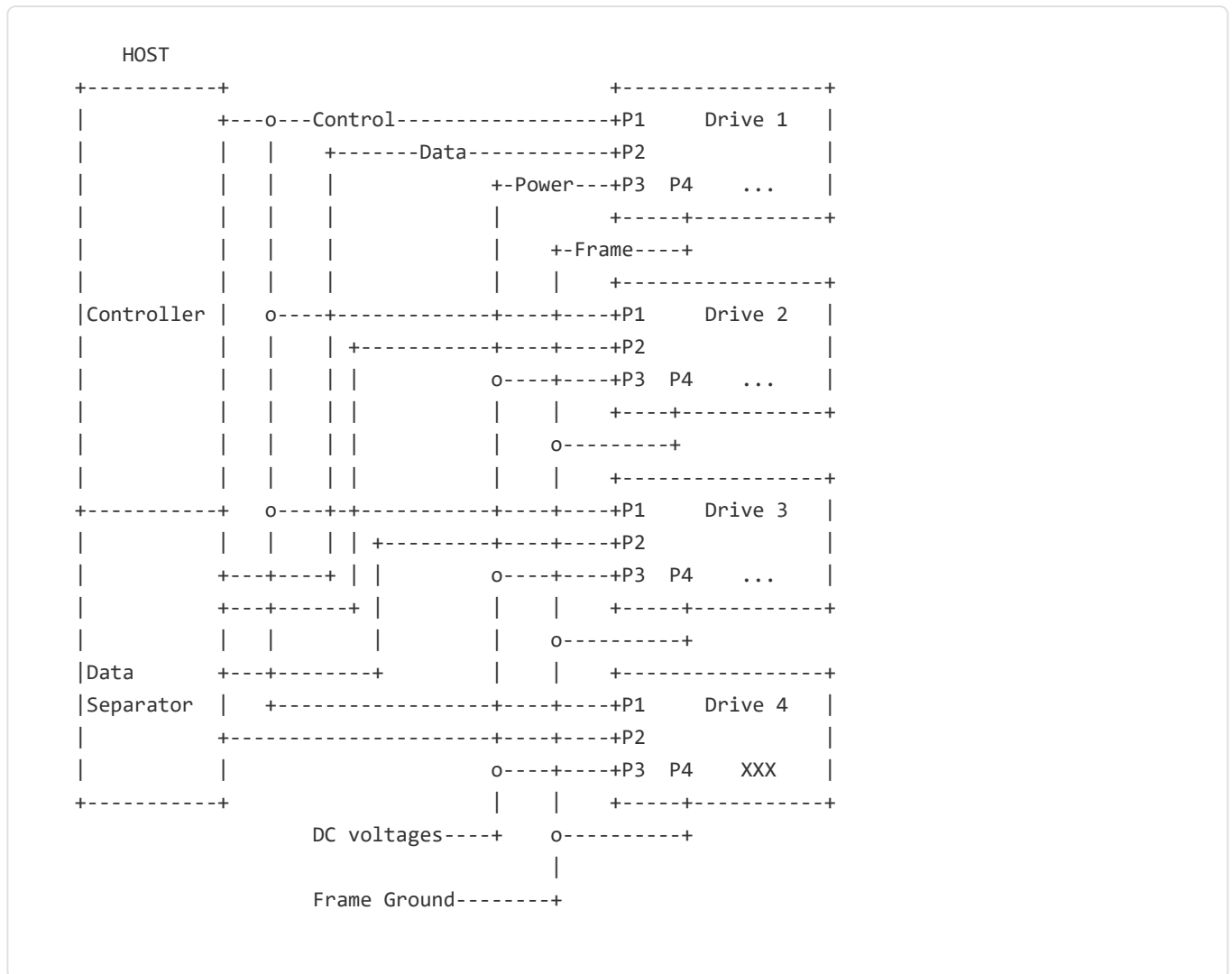
The interconnect cable between the drive and controller may be flat ribbon or twisted pairs of a length not to exceed 20 feet. The signal return lines and ground lines for P1 and P2 should be grounded at the controller.

The voltage return lines of P3 should only be grounded at the power supply.

Connector P4 is a spade lug connector tied to frame ground.

Cable Interconnection - 4 Drive System

```
        HOST
    +-----------+                                  +-----------------+
    |               +---o---Control-----------------+P1      Drive 1   |
    |               |   |     +-------Data------------+P2               |
    |               |   |     |             +-Power---+P3  P4     ...    |
    |               |   |     |             |         +-----+-----------+
    |               |   |     |             |     +-Frame----+
    |               |   |     |             |     |   +-----------------+
    |Controller |   o----+-------------+----+----+P1      Drive 2   |
    |               |   |   | +-----------+----+----+P2               |
    |               |   |   | |         o----+----+P3  P4     ...    |
    |               |   |   | |             |   |   +----+-----------+
    |               |   |   | |             |   o---------+
    |               |   |   | |             |   |   +-----------------+
    +-----------+   o----+-+-----------+----+----+P1      Drive 3   |
    |               |   |   | | +---------+----+----+P2               |
    |               +---+----+ | |         o----+----+P3  P4     ...    |
    |               +---+------+ |         |   |   +-----+-----------+
    |               |   |   |     |         |   o---------+
    |Data        +---+--------+   |   |   +-----------------+
    |Separator  |   +-----------------+----+----+P1      Drive 4   |
    |               +-----------------------+----+----+P2               |
    |               |                 o----+----+P3  P4     XXX    |
    +-----------+                 |   |   +-----+-----------+
                    DC voltages----+   o----------+
                                       |
                    Frame Ground--------+
```

... = Terminator Pack removed

XXX = Terminator Pack installed

P1 Connector - Control Signals

Connection to P1 is through a 34 pin PCB edge connector. The pins are
numbered 1 through 34 with the odd pins located on the componet side
of the printed circuit board. A key slot is provided betweeen pins 4
and 6.

The recommended mating connector (J1) is AMP Ribbon Connector, P/N
88373-3.

P2 Connector - Data Signals

Connection to P2 is through a 20 pin edge connector. The pins are
numbered 1 through 20 with the odd pins located on the component side
of the Printed Circuit Board. A key slot is provided between pins 4
and 6.

The recommended mating connector (J2) is AMP Ribbon Connector, P/N
88373-6.

P3 Connector - DC Power

DC power connector (P3) is a 4 pin AMP Mate-N-Lok connector, mounted
on the PCB. The P3 connector is mounted on the component side of the
PCB.

The recommended mating connector (J3) is AMP P/N 1-480424-0 utilizing
AMP pins P/N 350078-4.

```
    +-----P3-----+   pin 1    +12 VDC
    | 4  3  2  1 |   pin 2    +12 Ground Return
    +-----------+    pin 3    + 5 Ground Return
                     pin 4    + 5 VDC
```

P4 Connector - Frame Ground

Fasten AMP P/N 61761-2.

The recommended mating connector (J4) is AMP 62187-1.

If used, the hole in P4 will accommodate a wire size of 18 AWG
maximum.

Caution/Warning

The Miniscribe drive is a precision product weighing 3.5 pounds.
During handling the unit must not be dropped, jarred or bumped.
Otherwise, damage to the heads and disks may occur. When the drive is
removed from the Miniscribe shipping container and not immediately
secured within a chassis through its shock mounts, it must be stored
on a soft padded surface.

Failure to comply with the above procedure will render null and void
all warranties.

Features

MINISC. 3425/3212PLUS PRODUCT MANUAL P/N 1008 REV. H, MAY 6, 1987

Introduction

The MiniScribe 3425/3212P is a half-height random access 5-1/4 inch
rigid media disk drive employing Winchester technology. The drive
utilizes a rack-and-pinion actuator, microprocessor control, and open
loop stepper head positioning.

The Model 3425/3212P features power up diagnostics, buffered seek and
5 Megabit/Sec. transfer rate. D.C. voltages and physical form factor
are the same as the 5-1/4 inch half height floppy disk drive.


```
    Seek Time (including settling time)
    ----------------------------------
        +---------------------------------+--------+
        |Track-to-Track       msec. typ. |  15    |
        +---------------------------------+--------+
        |Average              msec. typ. |  85    |
        |                     msec. max. | 190    |
        +---------------------------------+--------+
        |Latency              msec. avg. |  8.33 |
        +---------------------------------+--------+
```

Track Zero Detector

The Track Zero Detector resides on the stepper motor. This optical

sensor consists of a light source (activated only when a seek is initiated) and a receiver which when blocked by an interrupter on the motor shaft indicates one of several logical Track Zero positions. The microprocessor determines the physical location of Track Zero from the redundant logical Track Zeros.

```
Media Defect Criteria (as shipped from MiniScribe)
--------------------------------------------------
Model 3425   30 defects maximum per drive
             10 defects maximum per surface
```

```
Model 3212P  20 defects maximum per drive
             Defects < 2 bytes in length
             Defects may be continguous
             Cylinder Zero Defect Free for
             both models.
```

Error Messages

The microprocessor performs wake up diagnostics on power up. Additionally, some operations are monitored during normal operations. If an error is detected, the microprocessor will flash a warning by blinking the activity LED.

Error codes may be generated by the microprocessor to indicate hardware failures or warnings that are detected during power-on diagnostics, burn-in mode, or normal operation. Error codes are diaplayed in a "morse-code" type manner. Bits may be interpreted and converted into hexadecimal error codes. "Zeros" are indicated by a short (1/2 second) flashingn mode. "Ones" are indicated by a short (1/2 second) continuous ON mode. Error "Words" are separated by a one second LED off time.

```
    Zero                 = 0.5 second flashing mode
    One                  = 0.5 second continuous ON mode
    Between Bits         = 0.5 second Off
    Between Repeat Cycles = 1.0 second Off
```

Listed Below are the binary to hexadecimal conversion values:

0 = 0000 4 = 0100 8 = 1000 C = 1100
1 = 0001 5 = 0101 9 = 1001 D = 1101
2 = 0010 6 = 0110 A = 1010 E = 1110
3 = 0011 7 = 0111 B = 1011 F = 1111

Message Definitions

Code 0 - Microprocessor RAM error

Code 1 - Microprocessor ROM checksum error

Code 2 - Interface chip diagnostic failure

Code 3 - Write Fault latch will not reset

Code 4 - Index pulse not detected during spinup

Code 5 - Unable to reach 3600 rpm in 30 seconds

Code 6 - Unable to stabilize spin speed in 10 seconds

Code 7 - Unable to maintain spin speed to 0.5%

Code 8 - Unable to uncover Track Zero sensor

Code 9 - Unable to cover Track Zero sensor

Code A - Track Zero interrupter misadjusted

Code B - Shipping zone error, crash stop misadjusted

Code C - Carriage stuck during recal error

Code D - Seek errror during burn-in or recal

Code E - Unused

Code F - Unexpected interrupt from processor