Hard Drive: QUANTUM: PRODRIVE LPS 52 AT 52MB 3.5"/SL IDE / AT

8

```
P R O D R I V E   L P S   5 2   A T    QUANTUM
NO MORE PRODUCED                              Native|  Translation
                                         ------+-----+-----+-----
Form               3.5"/SLIMLINE     Cylinders   1219|  751|    |
Capacity form/unform   52/     MB    Heads          2|    8|    |
Seek time  / track 17.0/ 5.0 ms      Sector/track    |   17|    |
Controller         IDE / AT          Precompensation
Cache/Buffer         64 KB LOOK-AHEAD Landing Zone
Data transfer rate  1.750 MB/S int   Bytes/Sector      512
                    4.000 MB/S ext
Recording method    RLL 2/7                      operating | non-operating
                                         -------------+--------------
Supply voltage     5/12 V     Temperature *C       4 50   |    -40 65
Power: sleep            W     Humidity    %         8 85   |     5 95
       standby          W     Altitude    km   -0.060  3.000| -0.060 12.000
       idle        5.5 W     Shock       g         6     |     60
       seek            W     Rotation    RPM       3662
       read/write  6.5 W     Acoustic    dBA       45
       spin-up         W     ECC         Bit   48,WITH 11BIT BURST COR
                             MTBF        h        60000
                             Warranty Month        12
Lift/Lock/Park     YES       Certificates    CSA,FCC,IEC380,SDA,TUV,UL4...
```

Layout

QUANTUM PRODRIVE LPS 52/105AT PRODUCT MANUAL 803-20-9301

```
    +-----------------------------------------------------------+
    |                                    * * * JP1   |XX
    |                                    * * *       |XX
    |                                 DM SP DS       |XX 40-pin
    |                                                |XX J1
    |+-+                                             |XX
    || |                                            |XX
    || |                                            |.X
    || |HDA                                         |XX
```

```
|+-+                                                        |XX
|                                                           |XX
|+-+                                                        |XX
|| |                                                        |XX
|| |HDA                                                     |XX
|+-+                                                        |
|                                                           |XX Power
|                                                           |XX J3
  +--------------------------------------------------------+


    Jumper Pin Location on the Adapter Board
    +----------------------------------------------------------+
    |O          +-+              +-+         QUANTUM CORP    O |
    |           | +-------------+ |                         O |
    |           +----------------+J1                          |
    |       +---+J3                                           |
    |       +---+                          +---+J4            |
    |                                      +---+              |
    |                                                         |
    |                                                         |
    |                                           SECONDARY    |
    |                                           INTERFACE    |
    |                                             +--+       |
    |               +-+E3                         +--+J5     |
    |             J2| |E4                                    |
    |               +-+                                   O  |
    |O                                                    O  |
    +-----------+---------------+--+--------------------+--+
                +---------------+  +--------------------+
```

Jumpers

QUANTUM PRODRIVE LPS 52/105AT PRODUCT MANUAL 803-20-9301

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

x = Jumpers set at factory

CLOSED = Jumper installed
OPEN = Jumper not installed

The configuration of three jumpers controls the drive's mode
operation.

```
        DS - Drive Select
        SP - Slave Present
        DM - Drive Mode
```

```
+------+------+------+-----------------------------------+
| DS   | SP   | DM   |            Description             |
+------+------+------+-----------------------------------+
|OPEN  |OPEN  |OPEN  |Slave Drive - Compatible with drives |
|      |      |      |using the PDIAG- line to handle    |
|      |      |      |Master/Slave communications.       |
+------+------+------+-----------------------------------+
|OPEN  |OPEN  |CLOSED|Slave Drive (in the ProDrive mode) |
|      |      |      |to provide compatibility with a Pro |
|      |      |      |Drive 40/80AT drive. The PDIAG- line |
|      |      |      |is not used.                       |
+------+------+------+-----------------------------------+
|OPEN  |CLOSED|OPEN  |Self-Seek mode                     |
+------+------+------+-----------------------------------+
|OPEN  |CLOSED|CLOSED|Self-Seek mode                     |
+------+------+------+-----------------------------------+
|CLOSED|OPEN  |OPEN  |Master drive, using DASP- to check |
|      |      |      |for the presense of a slave        |
+------+------+------+-----------------------------------+
|CLOSED|OPEN  |CLOSED|Master Drive - in 40/80AT mode -   |
|      |      |      |using DASP- to check for the       |
|      |      |      |presense of a Slave.               |
+------+------+------+-----------------------------------+
|CLOSED|CLOSED|OPEN  |Master Drive (in PDIAG- mode) using |
|      |      |      |the SP jumper to determine whether a |
|      |      |      |Slave is present, without checking |
|      |      |      |DASP-.                             |
+------+------+------+-----------------------------------+
|CLOSED|CLOSED|CLOSED|Master Drive - in 40/80AT mode     |
|      |      |      |using the SP jumper to determine   |
|      |      |      |whether a Slave is present,        |
|      |      |      |without checking DASP-.            |
+------+------+------+-----------------------------------+
```

Note: In the ProDrive 40/80AT mode, PDIAG- is not used; otherwise, it
is always used.

```
DS  Drive Select Jumper
----------------------
x   CLOSED  Single drive or MASTER (Drive 0)
    OPEN    SLAVE (Drive 1)
```

```
    Note: The order in which drives are connected in a daisy chain has no
          significance.
```

You can daisy-chain two drives on the AT-bus interface by using
their Drive Select (DS) jumpers to configure one drive as the Master
and the other as the Slave.

SP Slave Present Jumper

In combination with the current DS jumper settings, the Slave
Present jumper implements one of two possible configuratons:

When the drive is configured as a Master - that is, with the DS
jumper installed - the SP jumper should be installed on the Master
drive only if the Slave drive does not use the Drive Active/Slave
(DASP-) signal to indicate its presence.

When the drive is cnfigured as a Slave - that is, without the DS
jumper installed - the SP jumper enables the self-seek test. When
power is applied to the drive with the self-seek test enabled, the
drive executes seeks in a butterfly pattern.

During the self-seek test, the LED remains on whle the test proceeds
without error. If the test encounters a seek error, the test
terminates and the LED flashes continuously until the SP jumper is
removed.

DM Drive Mode Jumper

When the Drive Mode jumper is installed, the drive is in the ProDrive
40/80AT-compatible mode and can communicate with a ProDrive 40/80AT
hard disk drive. In this mode, the drive does not use the PDIAG-
signal to control Master/Slave communications. The configuration of
the DS and SP jumpers determines whether the drive is the Master
or the Slave.

```
    J3   DC Power and pin connector assignments
    --------------------------------------------
    --------------------+
              J3       |
   -+   +-----------+ | pin 1    +12 VDC
   1|   | 4  3  2  1 | | pin 2    +12 Volts Return (Ground)
   -+   +-----------+ | pin 3    + 5 Volts Return (Ground)
```

```
-------------------+ pin 4     + 5 VDC
```

Note: Labels indicate the pin numbers on the connector. Pins 2 and 3
are connected on the drive.

Adapter Board Jumper Options
============================
Four jumper pins on the adapter board - labeled J2 through J5 - have
the function described below.

```
J2   Enables the drive's interrupt logic to control IRQ14
     (Interrupt Request 14). This option provides compatibility
     with systems in which the BIOS does not read the STATUS Register
     when the drive issues an interrupt. In such cases, the drive
     might fail to transmit the interrupt to the system.
```

```
     - A jumper from the center pin J2 to E3 enables transmission of
       an interrupt every time the drives goes busy.
```

```
     - A jumper from the center pin J2 to E4 gates the interrupt from
       the drive and transmits it directly to the AT bus. This is the
       default setting.
```

J3 These pins should always remain open, with no jumper installed.

```
J4   This jumper should generally remain open. A jumper should be
     installed here only when installing the adapter board
     in a system that uses the Chips & Technologies chip set. This
     chip set runs the I/O bus faster than the standard 12 Mhz, one
     wait state.
```

```
J5   Enables secondary interface selection on a second adapter board
     installed in a system. When a jumper is installed here,
     drives connected to the adapter board respond to commands
     transmitted via the secondary address, 170H-177H. Standard BIOS
     versions do not support secondary addresses. Therefore, you must
```

```
        write a custom driver to implement a secondary interface.
```

```
    Note: A second adapter board is supported only when both adapter
          boards are Quantum boards.
```

Install

QUANTUM PRODRIVE LPS 52/105AT PRODUCT MANUAL 803-20-9301

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

Mounting

The mounting holes on the ProDrive LPS 52/105AT hard disk drive
allow the drive to be mounted in any orientation. For mounting #6-32
UNC screws are recommended.

Caution: The PCB is very close to the mounting holes. Do not
exceed the specified length for the mounting screws. The specified
screw length allows full use of the mounting-hole threads, while
avoiding damaging or placing unwanted stress on the PCB. To avoid
stripping the mounting-hole threads, the maximum torque applied to
the mounting screws must not exceed 8 inch-pounds.

Clearance

Clearance from the drive - except mounting surfaces - to any surface
must be 0.10 inches minimum (2.6mm maximum).

Ventilation

The ProDrive LPS 52/105AT hard disk drives operates without a cooling
fan, provided the ambient air temperature does not exceed 122*F
(50*C). Any user-designed cabinet must provide adequate air circula-
tion, to prevent the maximum temperature being exceeded.

J1 AT-Bus Interface Connector

On the ProDrive LPS 52/105AT hard disk drive, the AT-bus interface
cable connector (J1) is a 40-pin Universal Header.

To prevent the possibility of incorrect installation, you should be keyed by removing pin 20. This will ensure that the connector cannot be installed upside down. All signal are relative to Pin 20.

For the mating J1 connector, recommended cable connectors include AMP receptacle P/N 1-499506-0, with strain relief; P/N 1-746193-0, without strain relief; or an equivalent. To key the cable connectors, you must plug the hole that corresponds to pin 20.

Other recommended part numbers for the mating connector include:

```
    40-Pin Connector              3M 3417-7000 or equivalent
```

```
    Strain Relief                 3M 3448-2040 or equivalent
```

```
    Flat Cable (Stranded 28 AWG)   3M 3365-40 or equivalent
```

```
    Flat Cable (Stranded 28 AWG)   3M 3517-40 (shielded) or equivalent
```

Adapter Board Installation

The adapter board is a half-size board. You can install it in any available 16-bit slot in an IBM PC-AT or compatible personal computer. Before installing the adapter board, make sure that no other hard drive controller resides at the primary hard drive address, 1F0H-1F7H.

If a combination floppy and hard disk drive controller is present, its hard disk drive controller functions must be disabled. To disable the hard disk drive controller functions, follow these instructions:

On a Western Digital WD1002-WA2 or WD1003-WA2 floppy/hard disk drive controller card:

```
  - Do not install jumpers on pins E5 and E6.
    Install jumpers on pins E4 and E5 to ensure that the controller
    card resides at the secondary address, 170H-177H, rather than at
    the primary address, 1F0H-1F7H.
```

```
  - Move the card from a 16-bit I/O slot to an 8-bit slot to
    disconnect the IRQ14 output driver.
```

On a Data Technology Corporation (DTC) floppy/hard disk drive
controller card:

```
  - Install a jumper on pins W3.
```

```
  -  Move the card from a 16-bit I/O slot to an 8-bit slot to
     disconnet the IRQ14 output driver,
```

Once you have disabled hard disk drive controller functions on the
card, install the adapter board in a 16-pin slot.

Connecting the Adapter Board and the Drive

Use the ribbon cable supplied with the adapter board to connect the
drive to the board. To ensure taht the cable is plugged into the
adapter board and the drive correctly, there is a red wire at one
edge of the cable. To connect the drive to the board:

```
1. Note the number 1 printed on the board next to the header. When
   inserting the cable connector into the header on the adapter
   board, make sure the red wire on the cable is at the side of the
   header labeled 1.
```

```
2. When inserting the other end of the cable connector into the
   header on the drive, make sure the red wire on the cable is at
   the inside edge of the header, next to the J3 power connector.
```

To complete the installation of the drive, secure it to the system chassis by using the mounting screws.

J3 DC Power Connector

The drive's DC power connector is a 4-pin Ranoda Electronics Connector (06300010-04-1) or equivalent, mounted on the back edge of the Printed Circuit Board (PCB).

Recommended connectors and their numbers:

4-pin connector AMP P/N 1-480424-0 or equivalent

Loose-piece contacts AMP P/N 61173-4 or equivalent

Strip contacts AMP P/N 350078-4 or equivalent

Air Filtration

Low Profile Series hard drives are Winchester-type drives. The heads fly very close to the media surface, at a nominal flying height of 4 microinches. Therefore, it is essential that the air circulating within the drive be kept free of particles. Quantum assembles the drive in a Class-100, purified-air environment, sealing the drive mechanism under a metal cover. When the drive is in use, the rotation of the disks forces the air inside the drive through an internal filter.

Electrical Characteristics

All signals are TTL-compatible - with logic one greater than 2.0 volts and less than 5.25 volts; and logic zero, greater than 0.0 volts and less than 0.7 volts. Neither the adapter board nor the drives require terminating resistors.

AT-Bus Interface Characteristics

The AT-Bus interface supports one or two hard drives per adapter board and a maximum of two adapter boards - or a maximum of four drives. When more than one drive is present, a master/slave relationship exists between the two drives. The host always maintains control of the bus - no arbitration occurs.

Features

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General Description

Quantum's ProDrive Low Profile Series (LPS) 105AT and 52AT hard disk
drives are a part of a family of high-performance, 1-inch-high hard
disk drives manufactured to meet the highest product quality
standards. ProDrive LPS hard disk drives use nonremovable, 3 -inch
hard disks, and are available with a Small Computer System Interface
(SCSI) or Advanced Technology (AT) interface.

The ProDrive LPS 105/52AT hard disk drives feature an embedded AT
drive controller and use AT commands to optimize systems performance.
Because the drive manages media defects and error recovery
internally, these operations are fully transparent to the user.

Seek Times

```
    Times                | Typical   | Maximum   | Maximum    |
    msec.                 | Nominal   | Nominal   | Worst-Case |
                          | Condition | Condition | Condition  |
    ----------------------+-----------+-----------+------------+
    Single Track Seek     |     5     |     6     |    6ms     |
    Average Seek          |    17ms   |    19ms   |    21ms    |
    Third-Stroke Seek     |    18ms   |    21ms   |    23ms    |
    Full-Stroke Seek      |    33ms   |    38ms   |    43ms    |
    Average Rotational    |           |           |            |
    Latency               |   8.2ms   |    8.2ms  |    8.2ms   |
    Sequential Head Switch|   2.0ms   |    2.0ms  |    2.0ms   |
    Power-Up Time         |   8.0ms   |   10.0ms  |   10.0ms   |
    ----------------------+-----------+-----------+------------+
```

Preventive Maintenance

The ProDrive LPS 52/105AT hard disk drive requires no preventive
maintenance.

Formatting

At the factory, the LPS 52/105AT receives a low-level format that
creates the actual tracks and sectors on the drive.

Defect Detection

At the sector level, any discrepancy between recorded data and re-covered data constitutes a data error. In high-density digital recording systems, it is necessary to use an error-detection and correction scheme to increase the reliability of the system.

Data errors are either soft- not readily repeatable on retries - or hard - repeatable with high probability. The signal-to-noise ratio of the system affects the occurrence of soft errors, which present marginal conditions of the media, heads, or read/write circuitry. Hard errors occur due to defects, pits, scratches, or thin spot in the media. The drive can skip, or not use, defective sectors on the media for data storage.

Defect Management

Factory Found Defects
At the factory, Quantum scans the disks for defective sectors and de-allocates sectors containing defects prior to shipment. The drive records a primary defect list that contains the locations of all factory-found defective sectors in a reserved cylinder on the disk. In-line sparing skips each factory-found defect and shifts subsequent sectors on the track to sequential sectors. One sector at the end of each cylinder is a spare, or replacement sector. The drive allocates spare sectors as required to maintain the proper number of blocks per cylinder.

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Search