A.4 Frequently Asked Questions

This section lists answers to the following frequently asked questions:

- Why Use a Port Multiplier?
- What Is Changed in the Port Multiplier?
- Does the Port Multiplier Work With Existing SATA Products?
- What If My SATA Host Does Not Support the Port Multiplier? Or If My SATA Host Supports Port Multiplier But My Driver Does Not?
- Do I need PM-Aware SATA drives?
- Why Are the Other PM Ports Disabled?
- How Do The Drives Appear in a Windows System?
- Can I Convert All the PM-Connected Drives Into Just One?
- How Does the Host Access the PM Registers?
- What is SEMB?
- How Do I Detect If a Port is SEMB?
- How Do I Access the SEMB?
- How Do I Program the SEMB and SEP Address?
- How Do I Access Storage Enclosure Process (SEP) Using the SATAPMH141's SEMB?
- Is the UART Debug Port Found on Marvell SATA Products Still Available?
- Does SATAPMH141 Support ATAPI?
- Does SATAPMH141 Support Device Hot Plug?
- What If There is a Problem With the Host-PM Connection?
- Can the Current Bus Analyzer (Data Transit) be used for PM Debugging?

A.4.1 Why Use a Port Multiplier?

One of the most immediate advantages of the SATAPMH141 is to increase the number of Serial ATA connections to a system. Figure A-1 and Figure A-2 illustrate this concept.

Figure A-1 Conventional SATA System

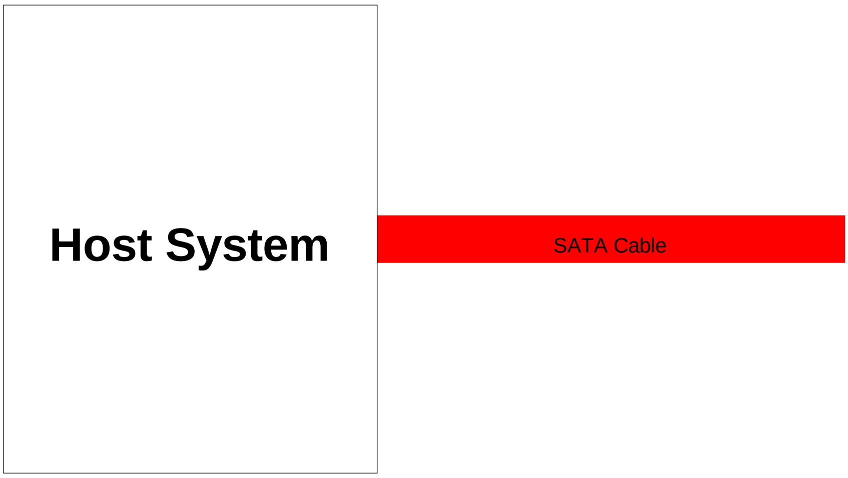
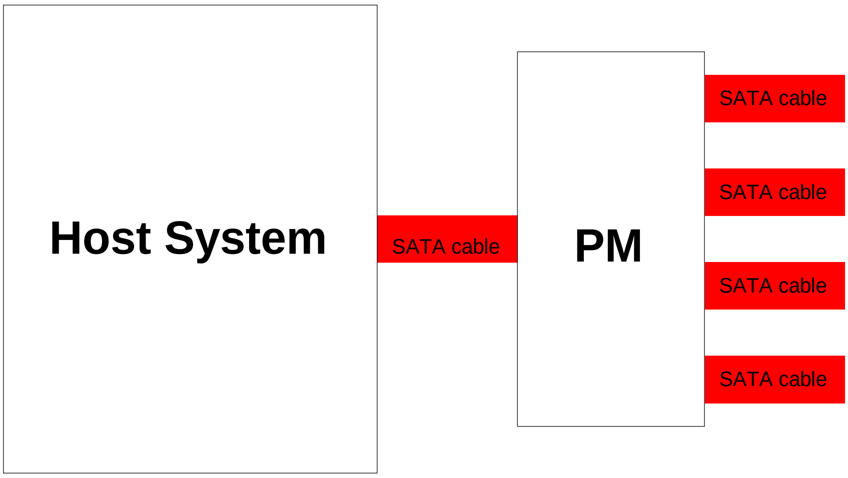


Figure A-2 Conventional SATA System With Port Multiplier



A.4.2 What Is Changed in the Port Multiplier?

In the SATA 1.0 specification, bits 11:8 are normally reserved bits in a Host to Device Register FIS. The SATAPMH141 uses these 4 reserved bits for port selection.

A port multiplier can allow up to 15 device connections, ranging from port 0 (0h) to port 14 (Eh). Port 15 (Fh) is reserved for the PM control port. The host can access the PM control port as port Fh by using the BUFFER READ (E4h) and BUFFER WRITE (E8h) ATA commands. Refer to the section How Does the Host Access the PM Registers? on page A-10 for detail on how these ATA commands can be used with PM. The PM_PORT field must be programmed to Fh for these commands to reach the control port.

The SATAPMH141 can support up to four device connections. If the SEMB feature is enabled, it is set to be device 4 (4h). Refer to the section What is SEMB? on page A-12 for more information on how to enable SEMB in the SATAPMH141.

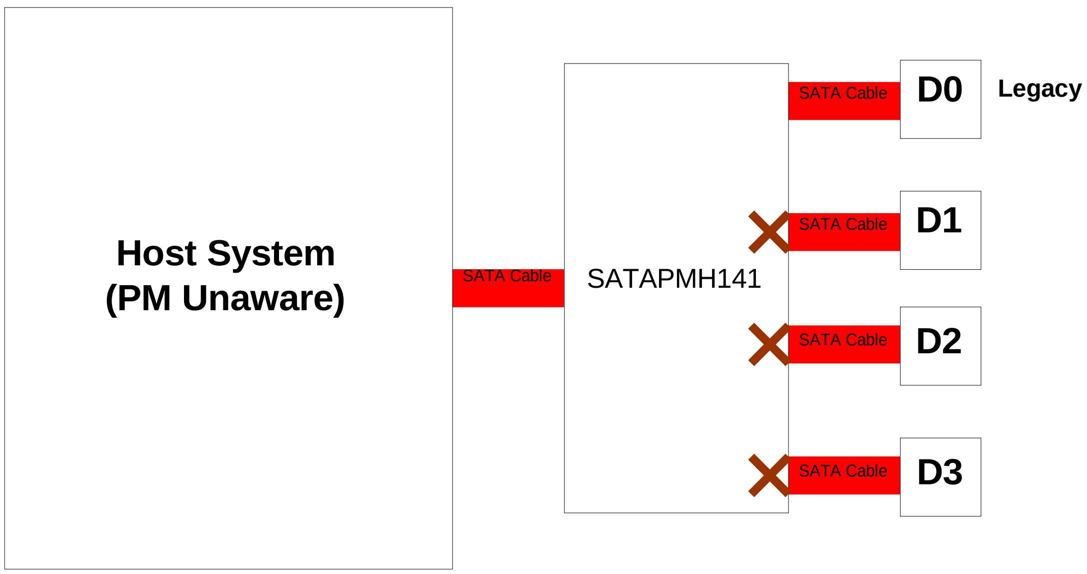
A.4.3 Does the Port Multiplier Work With Existing SATA Products?

The SATAPMH141 Port Multiplier is an extension of the SATA 1.0 specification. Thus, existing SATA products are still usable on a PM system. But in order for the host system to access more than one drive on a single SATA channel, additional configuration information must be provided.

A.4.4 What If My SATA Host Does Not Support the Port Multiplier? Or If My SATA Host Supports Port Multiplier But My Driver Does Not?

Then the SATAPMH141 Port Multiplier does not add any value, as the host system can only see devices connected to port 0 on the PM. By definition, all PM ports except for port 0 are disabled. If one of the SATA drives connected to SATAPMH141 is the boot drive, it should be drive 0. This is known as booting with legacy software. Figure A-3 illustrates this concept.

Figure A-3 PM-Unaware Host/Driver



A.4.5 Do I need PM-Aware SATA drives?

The drives do not need to be PM-aware. For example, when a PM-aware host is sending FISes to the drive connected to port 2 on the PM, bits 11:8 of each FIS = 2h. Once the PM detects this value, it redirects the FISes to the drive that is connected to port 2.

When the device connected to port 2 sends FISes to the host, bits 11:8 of each FISes are programmed to 0h. It is the PM that sets bits 11:8 of each FIS = 2h.

A.4.6 Why Are the Other PM Ports Disabled?

The other drives are disabled in order to support the staggered spin-up feature. If the proper driver is installed, it tries to detect the PM. Once it has detected that a PM is connected, it proceeds to check for drives on each PM port. Next, the driver enables the ports to which a drive is connected. For a PM-aware host (including driver), all drives are available upon boot up.

Diagrams Figure A-4 through Figure A-9 illustrate the process of staggered spin-up.

Figure A-4 Legacy Software Booting From Drive 0 (Ports 1-3 are disabled)

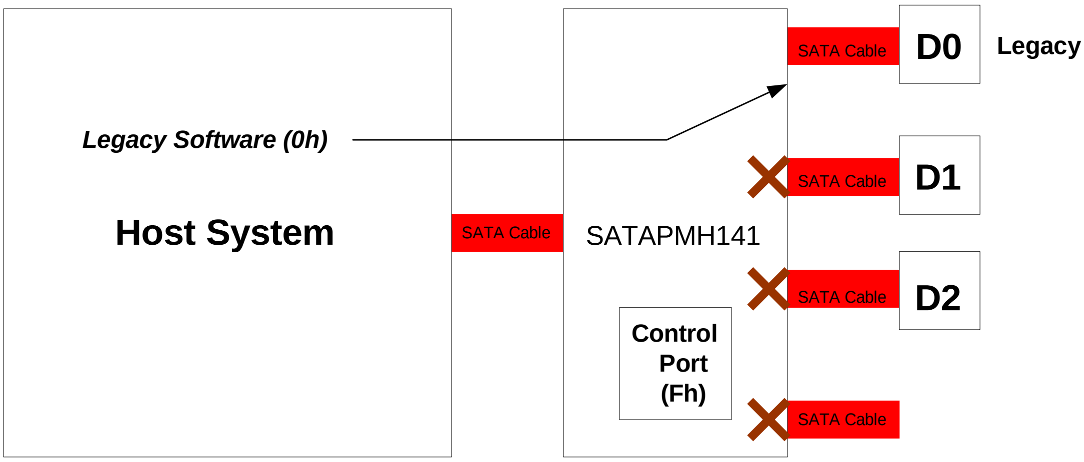


Figure A-5 PM-Aware Driver Present, Driver Accesses Control Port to Enable Drive D1

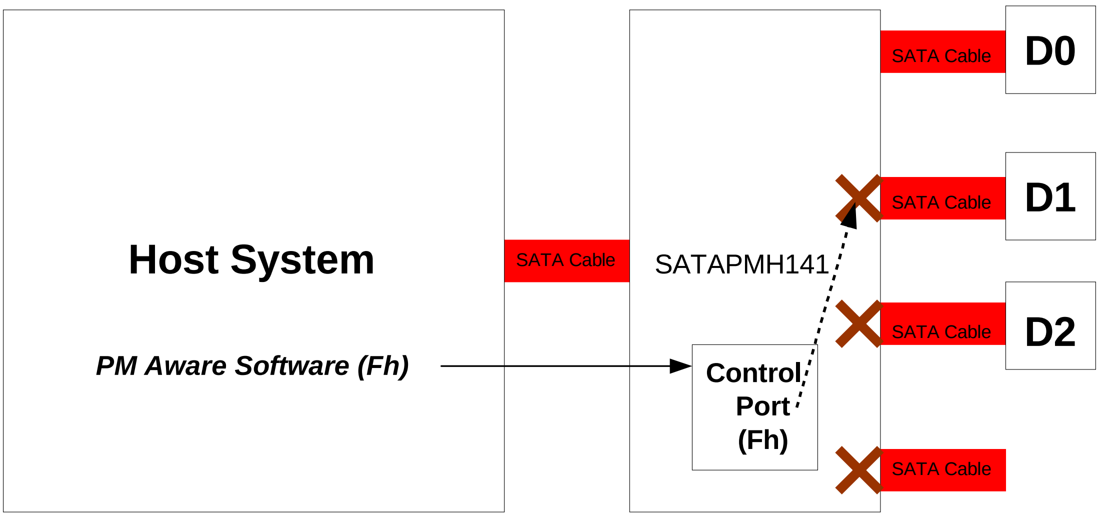


Figure A-6 PM-Aware Driver Present, Driver Accesses Control Port to Enable Drive D2

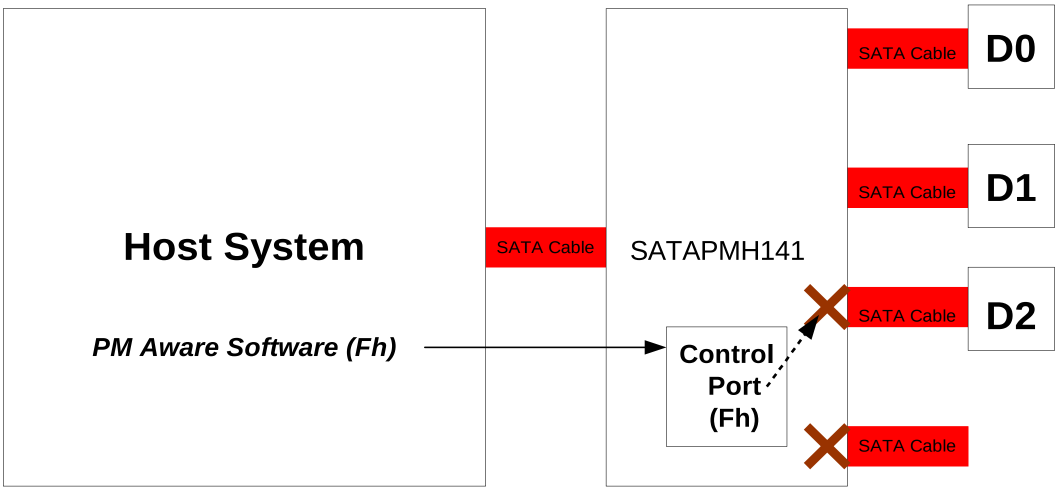


Figure A-7 PM-Aware Driver Present, Driver Accesses Control Port to Enable Drive D3 (which is not present)

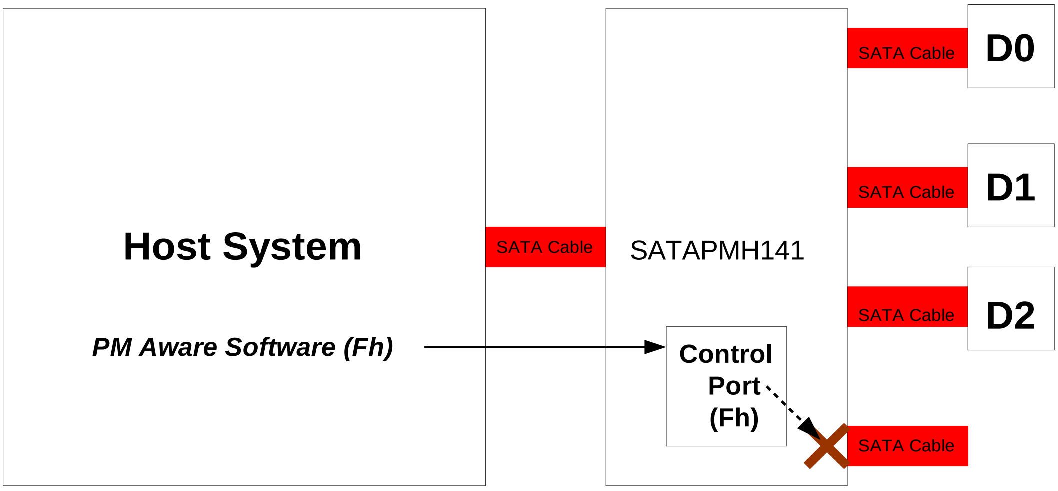


Figure A-8 PM-Aware Driver Present, Driver Can Now Access Drive D1

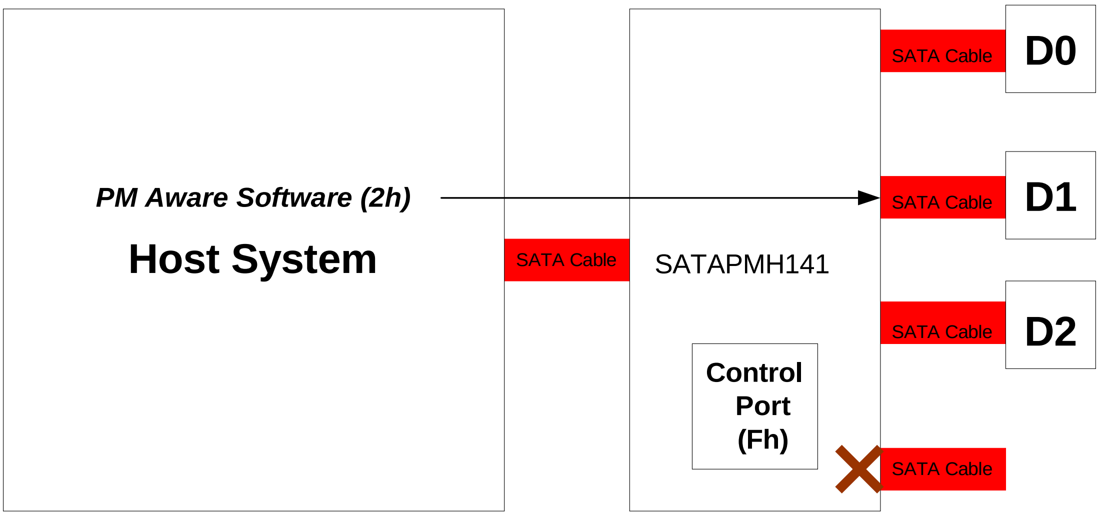
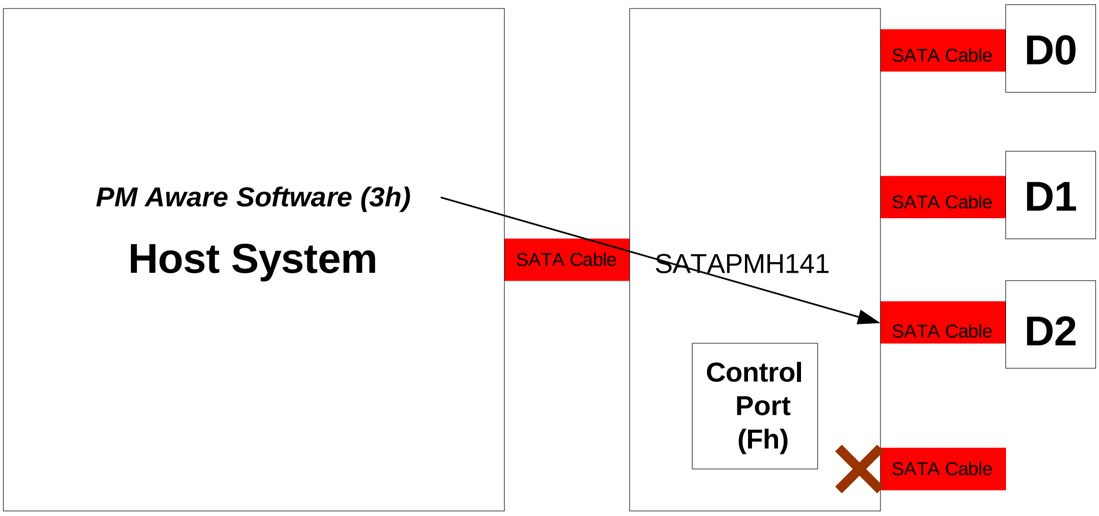


Figure A-9 PM-Aware Driver Present, Driver Can Now Access Drive D2



A.4.7 How Do The Drives Appear in a Windows System?

Drives connected to the PM appear normally as they would in any other setup.

A.4.8 Can I Convert All the PM-Connected Drives Into Just One?

Yes, if Windows 2000 or Windows XP are being used. Simply convert the PM-connected drives to dynamic and configure them as either mirrored or stripped. Refer to your Windows Computer Management online help for more information.

Alternatively, use PM-aware SATA RAID controllers.

A.4.9 How Does the Host Access the PM Registers?

The PM registers (GSCR and PSCR) can be accessed using the ATA BUFFER READ and BUFFER WRITE commands. The following sections from the Serial ATA II: Port Multiplier Specification detail the command definitions used to access the PM registers.

A.4.9.1 Read PM

The format for reading PM registers is given in Table A-1, and the results from this command is given in Table A-2 through Table A-3.

Table A-1 Read PM Registers Command Definition

SATA Register	7	6	5	4	3	2	1	0
Features	RegNum							
Features (expected)	N/A							
Sector Count	Reserved (0)							
Sector Count (expected)	N/A							
Sector Number	Reserved (0)							
Sector Number (expected)	N/A							
Cylinder Low	Reserved (0)							
Cylinder Low (expected)	N/A							
Cylinder High	Reserved (0)							
Cylinder High (expected)	N/A							
Device/Head	N/A				PortNum			
Command	E4h							

Table A-2 Read PM Success Status Result Values

SATA Register	7	6	5	4	3	2	1	0
Error	0							
Sector Count	Value [7:0]							
Sector Count (expected)	N/A							
Sector Number	Value [15:8]							
Sector Number (expected)	N/A							
Cylinder Low	Value [23:16]							
Cylinder Low (expected)	N/A							

Table A-2 Read PM Success Status Result Values

SATA Register	7	6	5	4	3	2	1	0
Cylinder High	Value [31:24]							
Cylinder High (expected)	N/A							
Device/Head	Reserved (0)							
Status	BSY	DRDY	DF	N/A	DRQ	0	0	ERR

Table A-3 Read PM Error Status Result Values

SATA Register	7	6	5	4	3	2	1	0
Error	Reserved (0)					ABRT	REG	PORT
Sector Count	Reserved (0)							
Sector Count (expected)	N/A							
Sector Number	Reserved (0)							
Sector Number (expected)	N/A							
Cylinder Low	Reserved (0)							
Cylinder Low (expected)	N/A							
Cylinder High	Reserved (0)							
Cylinder High (expected)	N/A							
Device/Head	Reserved (0)							
Status	BSY	DRDY	DF	N/A	DRQ	0	0	ERR

A.4.9.2 Write PM

The format for reading PM registers is given in Table A-4, and the results from this command is given in Table A-5 through Table A-6.

Table A-4 Write PM Registers Command Definition

SATA Register	7	6	5	4	3	2	1	0
Features	RegNum							
Features (expected)	N/A							
Sector Count	Value [7:0]							
Sector Count (expected)	N/A							
Sector Number	Value [15:8]							
Sector Number (expected)	N/A							
Cylinder Low	Value [23:16]							
Cylinder Low (expected)	N/A							
Cylinder High	Value [31:24]							
Cylinder High (expected)	N/A							
Device/Head	N/A				PortNum			
Command	E8h							

Table A-5 Write PM Success Status Result Values

SATA Register	7	6	5	4	3	2	1	0
Error	0							
Sector Count	Reserved (0)							
Sector Count (expected)	N/A							
Sector Number	Reserved (0)							
Sector Number (expected)	N/A							
Cylinder Low	Reserved (0)							
Cylinder Low (expected)	N/A							
Cylinder High	Reserved (0)							
Cylinder High (expected)	N/A							
Device/Head	Reserved (0)							
Status	BSY	DRDY	DF	N/A	DRQ	0	0	ERR

Table A-6 Write PM Error Status Result Values

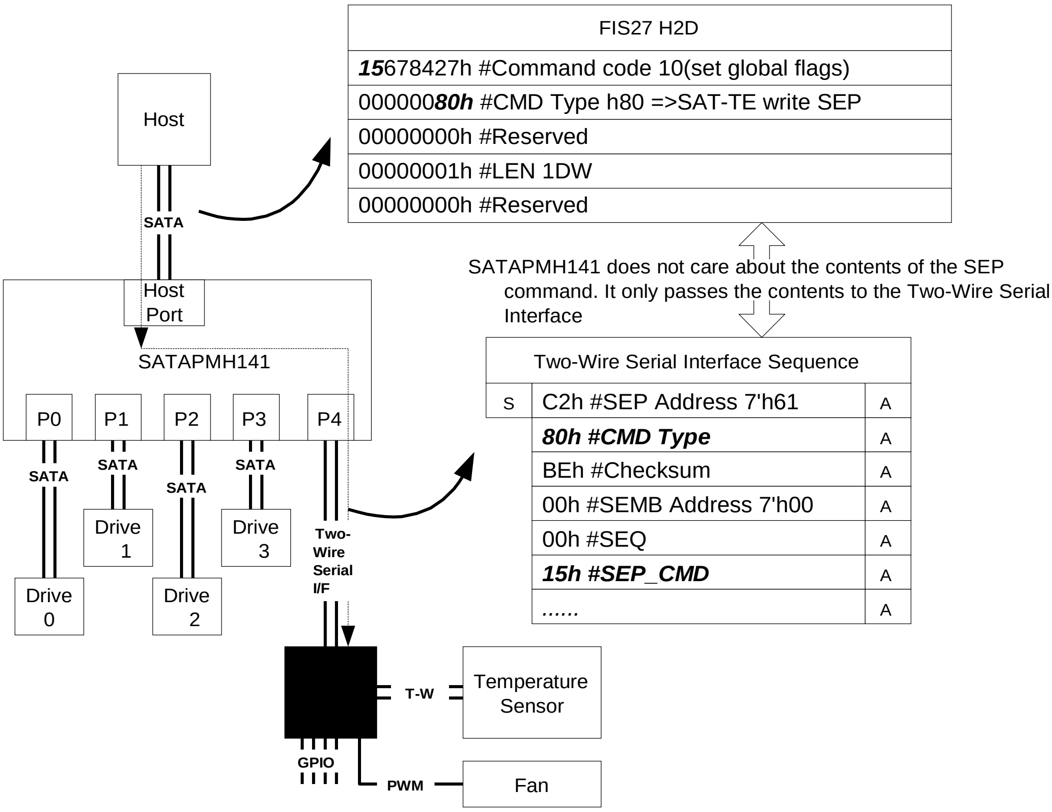
SATA Register	7	6	5	4	3	2	1	0
Error	Reserved (0)					ABRT	REG	PORT
Sector Count	Reserved (0)							
Sector Count (expected)	N/A							
Sector Number	Reserved (0)							
Sector Number (expected)	N/A							
Cylinder Low	Reserved (0)							
Cylinder Low (expected)	N/A							
Cylinder High	Reserved (0)							
Cylinder High (expected)	N/A							
Device/Head	Reserved (0)							
Status	BSY	DRDY	DF	N/A	DRQ	0	0	ERR

A.4.10 What is SEMB?

The Serial ATA Enclosure Management Bridge (SEMB) translates information on the SATA bus to a serial bus that controls devices such as the LED, the fan, and the sensors.

The SATAPMH141 supports the Storage Enclosure Management Bridge service as part of the topology shown in Figure A-10. The SEMB inside the SATAPMH141 consists of controller logic that bridges the Two-Wire Serial interface to the Serial ATA interface using a logical ATA command block register. The host sends commands to the SEP through the SATA interface to the SATAPMH141, and the SATAPMH141 then translates to the Two-Wire Serial interface which connects with the SEP. The SEP provides the embedded functions needed for monitoring and managing storage enclosure. Figure A-10 illustrates this concept.

Figure A-10 SEP Architecture



Functionality such as door lock sense, PWM fan control, device present detection, and temperature sensing can be provided by the SEP.

Refer to the *Serial ATA II: Extensions to Serial ATA1.0a* specification for more information.

A.4.11 Is SEMB Compatible WIth All Versions of the SAF-TE or SES Commands?

Yes. The SEMB service is transparent to SCSI Access Fault-Tolerant Enclosures (SAF-TE) and SCSI Enclosure Spaces (SES) command content.

A.4.12 How Do I Detect If a Port is SEMB?

The host can check the device signature by sending a Soft Reset. The SEMB has a signature of C33C0101h. Table A-7 shows the command reference for the SEMB.

Table A-7 SEMB Signature Command Reference

SATA Register	7	6	5	4	3	2	1	0
Error	00h							
Sector Count	01h							
Sector Count (expected)	00h							
Sector Number	01h							
Sector Number (expected)	00h							
Cylinder Low	3Ch							
Cylinder Low (expected)	00h							
Cylinder High	C3h							
Cylinder High (expected)	00h							
Device/Head	00h							
Status	BSY	DRDY	DF	N/A	DRQ	0	0	ERR

A.4.13 How Do I Access the SEMB?

To use the SEMB feature, set TESTMODE [1:0] = 1h. Once this is done, the SEMB can be accessed through port 4. In this case, PORT_NUM (R0002h [3:0]) = 5h.

1. Select the PM control port
2. Read number of ports on PM

For example:

```
# WTASK <CH> <FE> <SC> <SN> <CL> <CH> <DH> <CMD>

wtask 0 2 0 0 0 0 f e4

# CTASK <CH> <ERR> <SC> <SN> <CL> <CH> <DH> <STS>

ctask 0 0 5 0 0 0 0 50

# expected 5 (including Two-Wire Serial Interface)
```

3. Change to port 4 (Two-Wire Serial Interface port).
4. The SRST bit gets the Two-Wire Serial Interface master signature.

For example:

```
# Soft Reset Channel 0

srst 0

# CTASK <CH> <ERR> <SC> <SN> <CL> <CH> <DH> <STS>

ctask 0 0 1 1 3c c3 0 50

# Expected C33C0101
```

A.4.14 How Do I Program the SEMB and SEP Address?

The default Two-Wire Serial Interface address for SEMB and SEP are 2Bh and 2Ch, respectively. These values can be changed by setting TSC_SEMB_ADDR (R0096h [6:0]) and TSC_SEP_ADDR (R0096h [14:8]), respectively.

To program the SEMB and SEP address, program Two-Wire Serial Control (R0096h), by programing TSC_SM_WR (R0096h [27]) = 1h, TSC_SM_ADDR (R0096h [26:24]) = 0h, TSC_SM_RD_DATA / TSC_SM_WR_DATA (R0096h [23:16]) = 00h, and TSC_SEMB_ADDR = 00h.

A.4.15 How Do I Access Storage Enclosure Process (SEP) Using the SATAPMH141's SEMB?

In order to start using the SATAPMH141 SEMB, its SEP and SEMB addresses must first be initialized. The host should use the DMA protocol for transferring data between itself and the SEMB.

Once the SEMB address has been initialized, the host can begin sending commands acceptable by the SEP device. Host-to-SEP commands should be in the form as specified in Table A-8.

Table A-8 Command Block Register Fields Used in SEP Communications

SATA Register	7	6	5	4	3	2	1	0
Features	SEP_CMD							
Features (expected)	Reserved.							
Sector Count	LEN							
Sector Count (expected)	Reserved							
Sector Number	CMD_TYPE							
Sector Number (expected)	Reserved							
Cylinder Low	Reserved							
Cylinder Low (expected)	Reserved							
Cylinder High	Reserved							
Cylinder High (expected)	Reserved							
Device/Head	0	1	0	0	Reserved			
Command	SEP_ATTN (67h)							

Table A-9 details the SEP command codes.

Table A-9 SEP Commands

Command	Description
SEP_CMD	Specifies the SAF-TE or SES command code to be issued. See the SCSI Accessed Fault-Tolerant Enclosures (SAF-TE) and SCSI Enclosure Surfaces (SES) references for the command codes and their functions.
LEN	The transfer length of the data transfer phase of the command in Dword units. Valid values are 1-255 (yielding a maximum transfer length of 1020 bytes). Data transfers that are not a multiple of four bytes are padded by the transmitter with zeros to the next 4-byte (Dword) granularity.

Table A-9 SEP Commands

Command	Description
CMD_TYPE	Flag indicating whether the issued SEP command is a SAF-TE command code or an SES command code, and whether the data transfer protocol is from SEP-to-host or host-to-SEP. The encoding of the field is as follows: **00h**: SAF-TE command code with SEP-to-host data transfer (SAF-TE Read Buffer). **02h**: SES command code with SEP-to-host data transfer (SES Receive Diagnostic). **80h**: SAF-TE command code with host-to-SEP data transfer (SAF-TE Write Buffer). **82h**: SES command code with host-to-SEP data transfer (SES Send Diagnostic). All other values are reserved.

A.4.15.1 Two-Wire Serial Interface Read/Write

Figure A-11 and Figure A-12 illustrate the Two-Wire Serial Interface traffic for both Read and Write SEP activity.

Figure A-11 Two-Wire Serial Interface Transactions for Read SEP Command

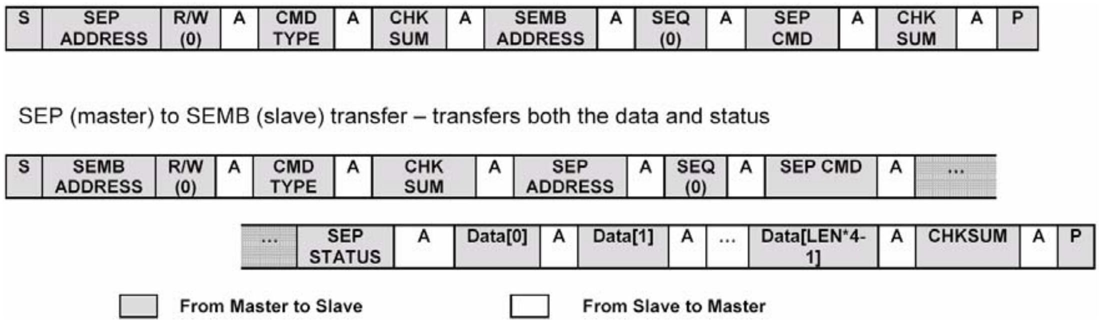
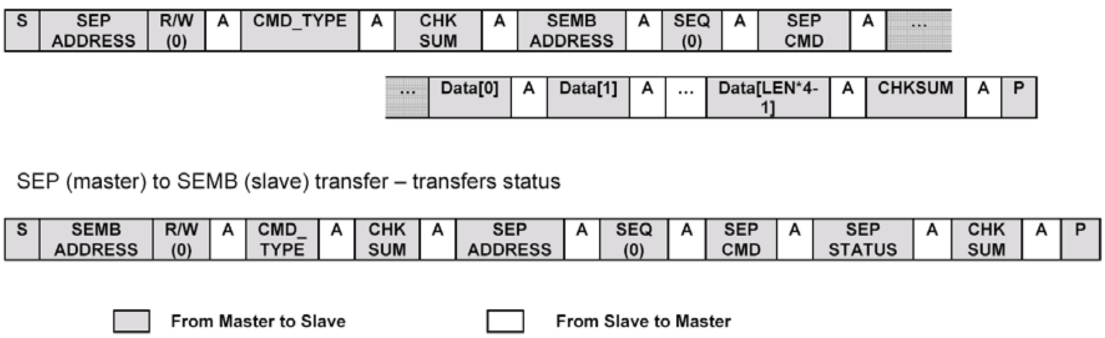


Figure A-12 Two-Wire Serial Interface Transactions for Write SEP Command



The following shows the PM port switch operation:

```
#######################
# Switch to PM port F #
#######################

################################################
# Setup SEMB addr = 0000h and SEP addr = 0061h #
################################################
# WTASK <Ch> <FE> <SC> <SN> <CL> <CH> <DH> <CMD>
wtask 0 96 00 61 00 08 0F E8

###################################
# Switch to PM port 4 (SEMB port) #
###################################

################################################
# Send SAF-TE read cmd "ID SEP" to Q-Logic SEP #
################################################
# WTASK <Ch> <FE> <SC> <SN> <CL> <CH> <DH> <CMD>
wtask 0 EC 10 00 00 00 40 67
# RSEP <Ch> <Sz in DW> ... this is a read DMA for stated number of
Dwords
rsep 0 10
# Dump read buffer for visual check
drb 0 10

###########################################################
# Send SAF-TE read cmd "READ GLOBAL FLAGS" to Q-Logic SEP #
###########################################################
# WTASK <Ch> <FE> <SC> <SN> <CL> <CH> <DH> <CMD>
wtask 0 05 03 00 00 00 40 67
```

```
# RSEP <Ch> <Sz in DW> ... this is a read DMA for stated number of
Dwords
rsep 0 3
# Dump read buffer for visual check
drb 0 10

############################################################
# Send SAF-TE write cmd "SEND GLOBAL FLAGS" to Q-Logic SEP #
############################################################
# WTASK <Ch> <FE> <SC> <SN> <CL> <CH> <DH> <CMD>
wtask 0 15 03 80 00 00 40 67
# WSEP <Ch> <Sz in DW> ... this is a write DMA for stated number of
Dwords
wsep 0 3 FFFFFFFF FFFFFFFF FFFFFFFF
```

A.4.16 Is the UART Debug Port Found on Marvell SATA Products Still Available?

Yes.

A.4.17 Does SATAPMH141 Support ATAPI?

Yes, the content does not matter to the SATAPMH141.

A.4.18 Does SATAPMH141 Support Device Hot Plug?

Yes. The host can program the ERR_MASK (R0021h [0]) bits to set the error status shown in Error Status (R0020h). The host software queries Error Status (R0020h) regularly for the status of each port.

If the host supports SDB notification, it can enable NOTIFY_EN (R0060h [3]). Thus, if there is an error which causes the error status bits to be asserted, the host is automatically notified. Table A-10 and Table A-11 shows the format of the SDB FIS.

Table A-10 SDB FIS: DWord 0

Byte Position	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
DWord 0	Error								RSVD					STA_LO			N	I	R		PM_PORT				FIS Type							
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-11 SDB: DWord 1

Byte Position	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
DWord 1	SActive																															
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A.4.19 What If There is a Problem With the Host-PM Connection?

When the host detects that a PM device connection has been lost, the host should check the Serial ATA S-Status register for the SATA link status until the SATA connection has been re-established. Once the connection has been re-established, the host need to perform then enumeration process again, and then can continue or recover the last operation.

A.4.20 Can the Current Bus Analyzer (Data Transit) be used for PM Debugging?

Yes.