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APPLICATION NOTE

Target Testing Examples with the SAS PacketMaker II.

OVERVIEW

The Finisar PacketMaker II (PM2) is a flexible traffic generator for Serial Attached SCSI (SAS) and Serial ATA (SATA). It provides full link control of bus traffic and an immense array of features, allowing users to test a variety of SAS and SATA specifications.

This document provides a number of examples on how the PM2 may be used to test various target features. It assumes an understanding of basic PM2 operations and features.

NAK

A NAK expresses a negative acknowledgement of a frame. A NAK could be caused by a CRC error.

A SAS target may have different responses to a NAK, depending on the type of frame that was NAKed and the circumstances that triggered the NAK (See 9.2.4.5 of the SAS 1.1 specification).

A target's response to a NAK can be checked to make sure it adheres to the SAS specification by using the PM. This can be done by using the Modify Behavior packet.



Figure 1: Resets a SAS Drive and Sends a Test Unit Ready command

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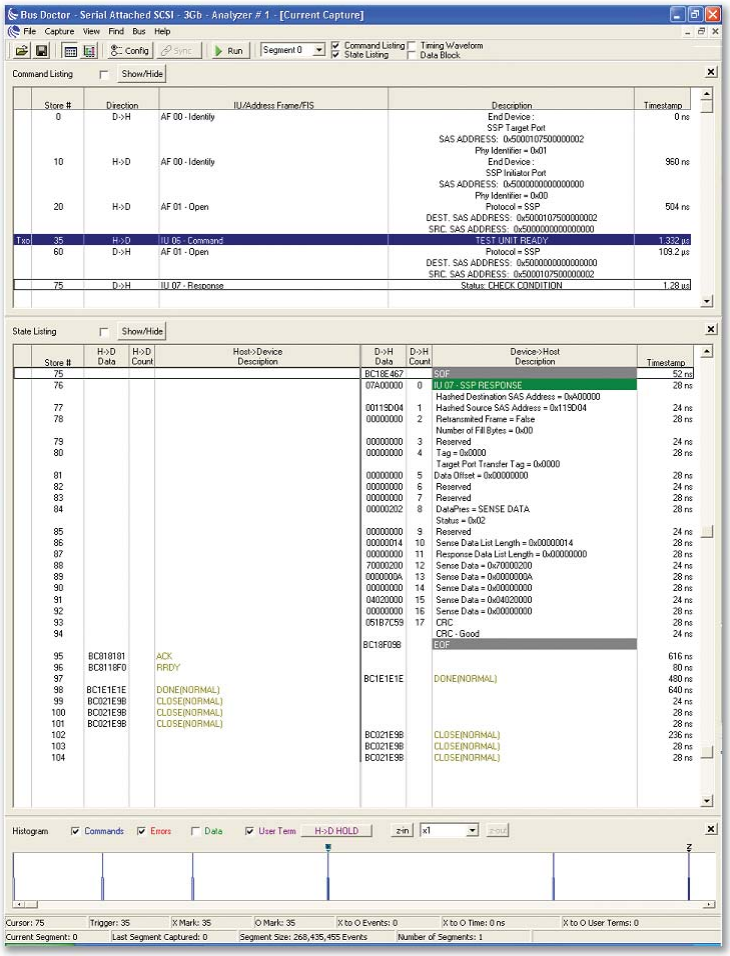


Figure 2: Creating a Packet Stream/Three Tier Structure

The packet stream shown in Figure 1 resets a SAS drive and sends a Test Unit Ready command.

After the packet stream is executed the target will open a connection to the PM and send a RESPONSE frame with drive status information, as long as the target is connected and operating correctly. A typical response to this packet stream may be captured by using the Bus Doctor analyzer (see Figure 2).

The Command Listing in Figure 2 shows a summary of each frame transmitted by the PM2 and target. The State Listing shows more specific information on the RESPONSE frame selected in the Command Listing, including individual primitives.

The RESPONSE packet could be NAK'ed by using the Modify Behavior packet. The PM2, by default, will handle primitive handshaking without having this behavior scripted explicitly into the packet stream. A Modify Behavior packet can be used to change this behavior (See PacketMaker II User Manual pg 3-8).

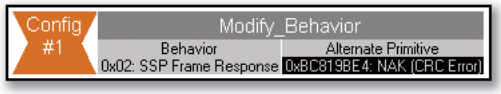


Figure 3: Modify Behavior Packet

The Modify Behavior packet can be placed in the packet stream (see Figure 3) anywhere before the RESPONSE is expected (see Figure 4).

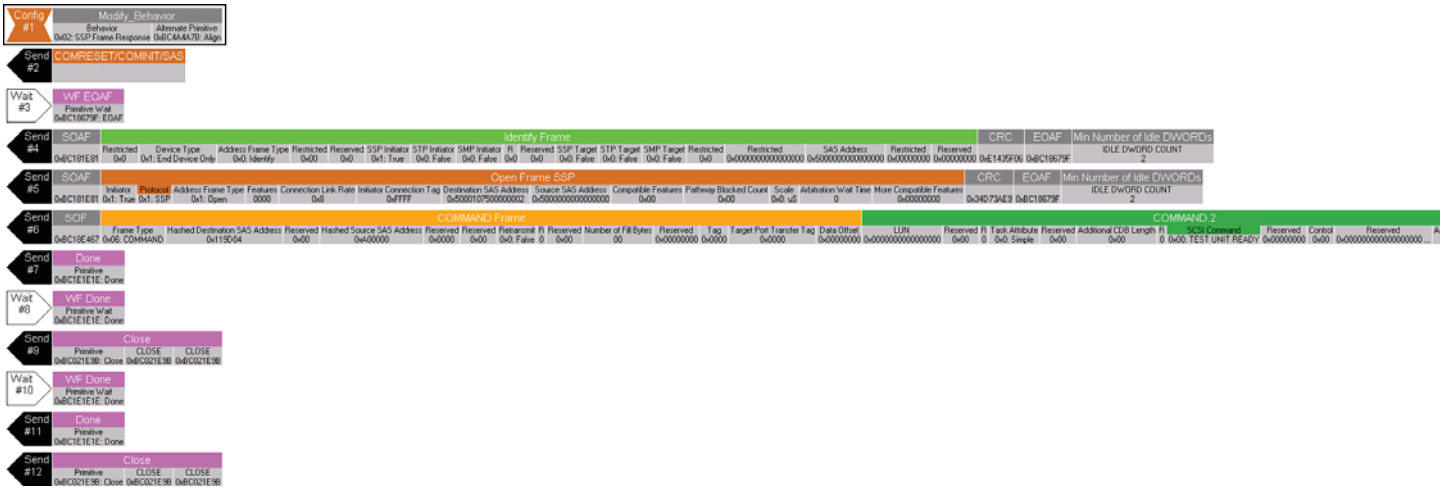


Figure 4: Modify Behavior Packet in a Packet Sequence

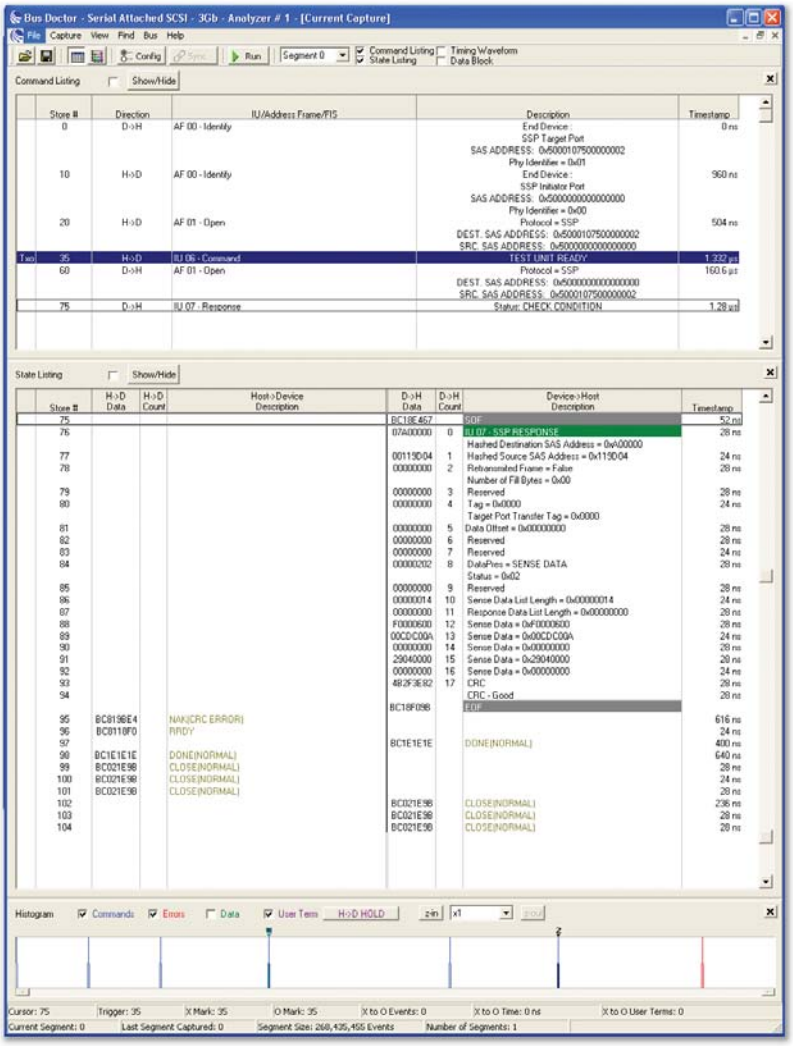


Figure 5: Modify Behavior Packet in a Packet Sequence

For a NAK, select SSP Frame Response. Alternate Primitive should be set to NAK (CRC Error). This will cause the PacketMaker to replace it's ACK with a NAK for any SSP frame it receives.

The target's response to the NAK primitive can be seen with the Bus Doctor analyzer. A sample trace can be seen in Figure 5.

In the Bus Doctor Trace, the NAK (CRC ERROR) appears in event number 95. The trace shows that this particular target responded in the same manner as when the RESPONSE frame received an ACK.

Section 9.2.4.5 of the SAS 1.1 specification states that if an SSP target port transmits a RESPONSE frame and receives a NAK, it shall retry transmitting the RESPONSE frame at least one time.

In this case, the Bus Doctor trace shows that the target did not retry transmitting the RESPONSE frame, and that the target will need improvement to meet the current SAS specification.

ACK/NAK TIMEOUT

Section 7.16.6 states that if a SSP device transmits a frame and does not receive an ACK or NAK within 1 ms, it will sent a DONE (ACK/NAK TIMEOUT) primitive.

This feature can be tested by using the Modify Behavior packet as described above.

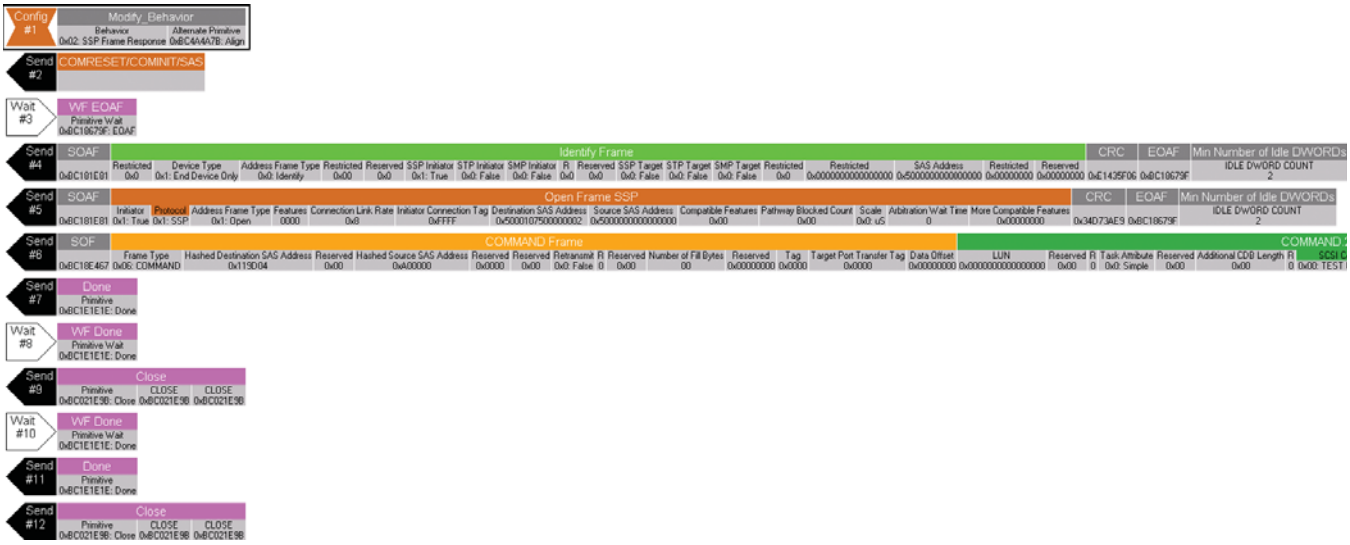


Figure 6: ACK/NAK Timeout Packet Sequence

To test an ACK/NAK Timeout simply choose SSP response and choose ALIGN in the second field (see Figure 6). This will cause the PM2 to replace its ACK with an ALIGN and the target will experience an ACK/NAK timeout.

The target's response to the ACK/NAK timeout can be seen with the Bus Doctor analyzer.

A sample trace of an ACK/NAK timeout is shown in Figure 7.

In this case, the Bus Doctor trace shows that the target did not send a DONE (ACK/NAK TIMEOUT).

The target failed to close the connection or send any other frame or primitive after the RESPONSE frame.

The target will need improvement to meet the current SAS specification.

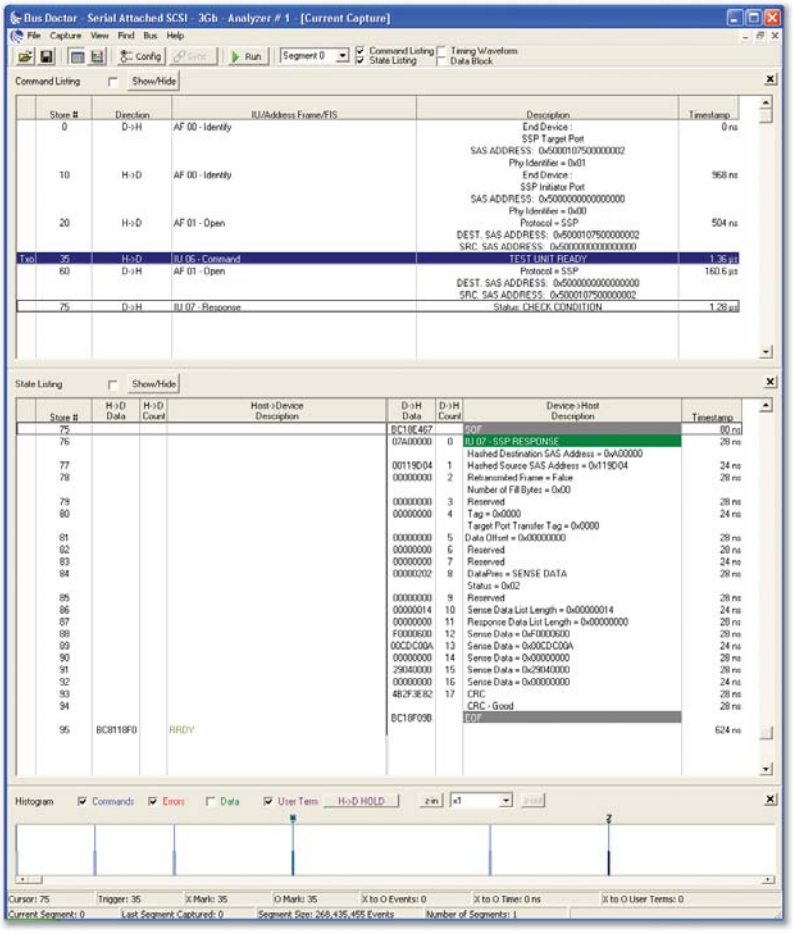


Figure 7: ACK/NAK Timeout Packet Sequence



Figure 8: OPEN Timeout Packet Sequence

OPEN TIMEOUT

Section 7.12.2.1 states that if a SSP device transmits an OPEN frame and does not receive an OPEN_ACCEPT or OPEN_REJECT within 1 ms, it will cancel the connection request by sending the BREAK primitive.

This feature can be tested by again using the Modify Behavior packet described above (see Figure 8).

To test an OPEN Timeout simply choose OPEN response and choose ALIGN in the second field. This will cause the PacketMaker to replace it's OPEN_ACCEPT with an ALIGN and the target will experience an OPEN timeout.

The target's response to the OPEN timeout can be seen with the Bus Doctor analyzer. A sample trace of an OPEN timeout is shown in Figure 9.

In this case, the Bus Doctor trace shows that the target did not send a BREAK primitive.

The target failed to cancel the connection or send any other frame or primitive after the OPEN frame.

The target will need improvement to meet the current SAS specification

CONCLUSION

This document shows several examples of how the Finisar PM2 can be used to test various SAS target features.

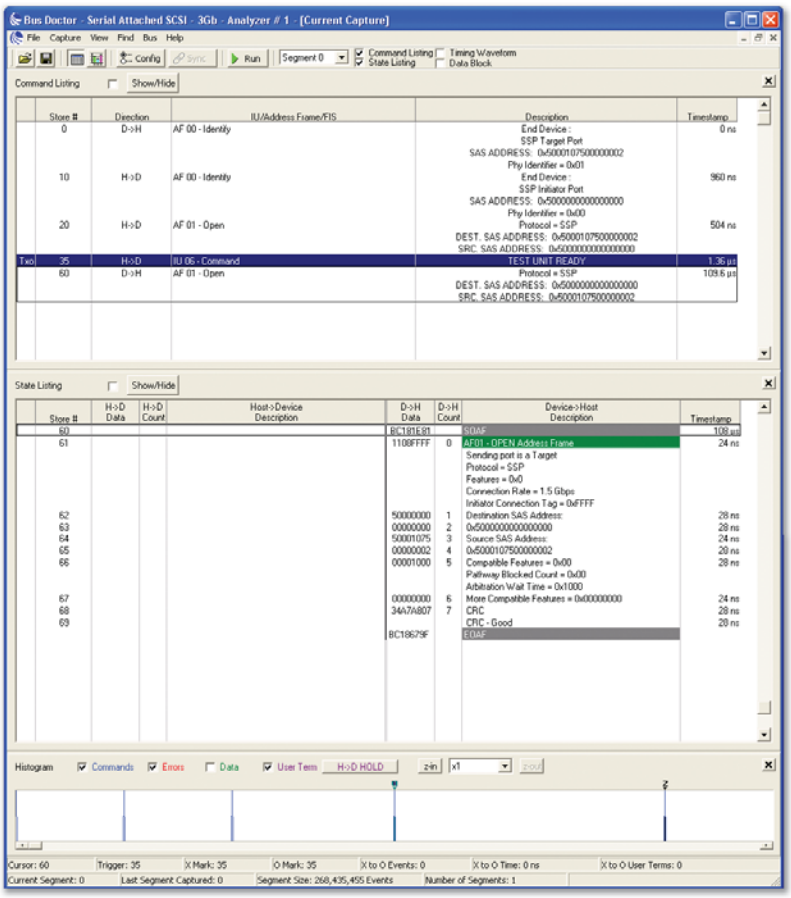


Figure 9: OPEN Timeout Packet Sequence

PRODUCT ORDERING INFORMATION

Model Number	Description
	PacketMaker II Traffic Generators[1]
PM-SAS-1501e	SAS PacketMaker II, 1 Phy Link, (1.5 Gb/s)[2]
PM-SAS-1504e	SAS PacketMaker II, 4 Phy Link, (1.5 Gb/s)[2]
PM-SAS-1504Qe	SAS PacketMaker II, 4 Phy Link, H/W emulation, (1.5 Gb/s)[2]
PM-SAS-3001e	SAS PacketMaker II, 1 Phy Link, (1.5 & 3.0 Gb/s)[2]
PM-SAS-3002e	SAS PacketMaker II, 4 Phy Link, (1.5 & 3.0 Gb/s)[2]
	Software
PM-DEV	PacketMaker Development Software Upgrade[3][4]
PM-SVT	PacketMaker II SAS Validation Tool[4]

Model Number	Description (SAS Analyzers/Related Products)
	USB-Controlled Analyzers
RX-108P-SLIM	Bus Doctor RX, 108 channels, 64M events buffer
RX-108P-FIT	Bus Doctor RX, 108 channels, 128M events buffer
RX-108P-BUFF	Bus Doctor RX, 108 channels, 256M events buffer
RX-252P-SLIM	Bus Doctor RX, 252 channels, 64M events buffer
RX-252P-FIT	Bus Doctor RX, 252 channels, 128M events buffer
RX-252P-BUFF	Bus Doctor RX, 252 channels, 256M events buffer
	Bus Pods
DR-SAS-3000	Serial Attached SCSI pod, (1.5 & 3.0 Gb/s)[5]
DR-SATA-3000	Serial ATA pod, (1.5 & 3.0 Gb/s)[5]
DR-SAS-3004	SAS Pod, 4 Phy Link, (1.5 & 3.0 Gb/s), SATA Connectors[6]
DR-SAS-30W4	SAS Pod, 4 Phy Link, (1.5 & 3.0 Gb/s), MicroGIGA Connectors[6]

(1): Includes: PM2 board, GUI control software, user manual and API.

(2): Includes PM-DEV.

(3): Provides 3 SAS/SATA focused PacketMaker II test tools that will dramatically cut the development process and time-to-market of new SAS/SATA devices.
a) Extreme SCSI issues any SCSI command to any device running the SAS/SATA protocols.
b) Extreme Manufacturing test environment is designed for SAS/SATA peripheral testing as well as manufacturing, DVT, ORT, incoming inspection and final inspection.
c) Scriptgen is an easy to use tool for rapidly creating simple or complex test scripts.

(4): Requires a PacketMaker II Traffic Generator.

(5): Compatible with RX-108P Analyzers.

(6): Compatible with RX-252P Analyzers.

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SNIA
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