

BUS DOCTOR™ SATA Analyzer

Protocol, Timing & Statistical Analysis

Application Note



How to Optimize the Configuration Settings for the Bus Doctor SATA (Serial ATA) Analyzer

INTRODUCTION

Finisar's Bus Doctor SATA Analyzer has several different configuration settings and options available. These options are designed to help users test various types of SATA traffic at different stages of development.

This document is intended to assist users in optimizing the Bus Doctor analyzer configuration settings.

CONFIGURATION SETTINGS

State/Timing: The Bus Doctor analyzer will capture and decode many different types of SATA events. The State/Timing tab in the Configure Analyzer dialog box will specify which types of events are captured and which ones will be ignored.

Figure 1 shows the Configuration for the Analyzer where all State modes are captured for both the Host and Device side traffic.

VALID FRAMES: This check box programs the analyzer to capture any FIS (Frame Information Structure) that occurs on the SATA bus. Selecting this

option will also cause the analyzer to capture all SOF (Start of Frame) and EOF (End of Frame) primitives.

A FIS will contain protocol level information such as commands, payload data, and device status information. This option should almost always remain enabled.

PRIMITIVES: A primitive is a single Dword that begins with a control character. It is used to control and provide status of the serial line. This option should be enabled whenever link level issues are encountered.

Often times a FIS may fail to transmit correctly because the primitive handshaking protocol has not been followed properly.

Furthermore the SATA specification outlines various state machines for both the SATA Host and Device.

By following the primitives sent by the Host and Device users can identify what state the Host or Device is in at various points in time.

Primitives occur much more frequently on the SATA bus than FIS's. Enabling primitives will display much more detail

of the SATA traffic but will also fill the Bus Doctor's trace buffer much more quickly.

In addition, unnecessarily filling the display with primitives may make it much more difficult locate and pinpoint important information in the trace.

A very useful strategy is to disable primitive capturing in the Bus Doctor software until a link level issue becomes apparent. Once a link level problem is suspected, enable primitive capturing and set an appropriate trigger to help find any potential issues related to primitive control or handshaking.

SYNCs and ALIGNs: A SYNC primitive on the SATA bus represents an idle state from the sender. When a SYNC is transmitted then the sender is free to begin other transactions by sending or receiving another primitive.

An ALIGN is used by the physical layer to establish Dword synchronization. ALIGN primitives are usually transmitted in pairs. ALIGNs are also a part of the OOB link initialization sequence.

Enabling this capture option on the Bus Doctor analyzer is useful for examining issues on the physical layer. If a SATA link is difficult to establish or maintain then enabling this option may present additional information regarding the cause of the failure.

The SYNC primitive occurs much more frequently on the serial line than any other primitive. Enabling this option will fill the Bus Doctor trace buffer much more quickly. Disable this option when the physical link is behaving normally.

CONT PRIMITIVE AND DATA AFTER THE CONT PRIMITIVE: It is common for a single primitive to be transmitted repeatedly without interruption.

To reduce EMI (Electro-Magnetic Interference), long strings of repeated primitives may be eliminated through the use of the CONT primitive. Random data is then continually transmitted until the next valid primitive.

All data after the CONT primitive is implied to be a repeat of the last valid primitive received. Enabling this option will cause the Bus Doctor to capture and display the CONT primitive as well as the random data that follows it.

This option is useful for link layer issues particular to the CONT primitive and the subsequent data. Disabling this option will filter out these implied

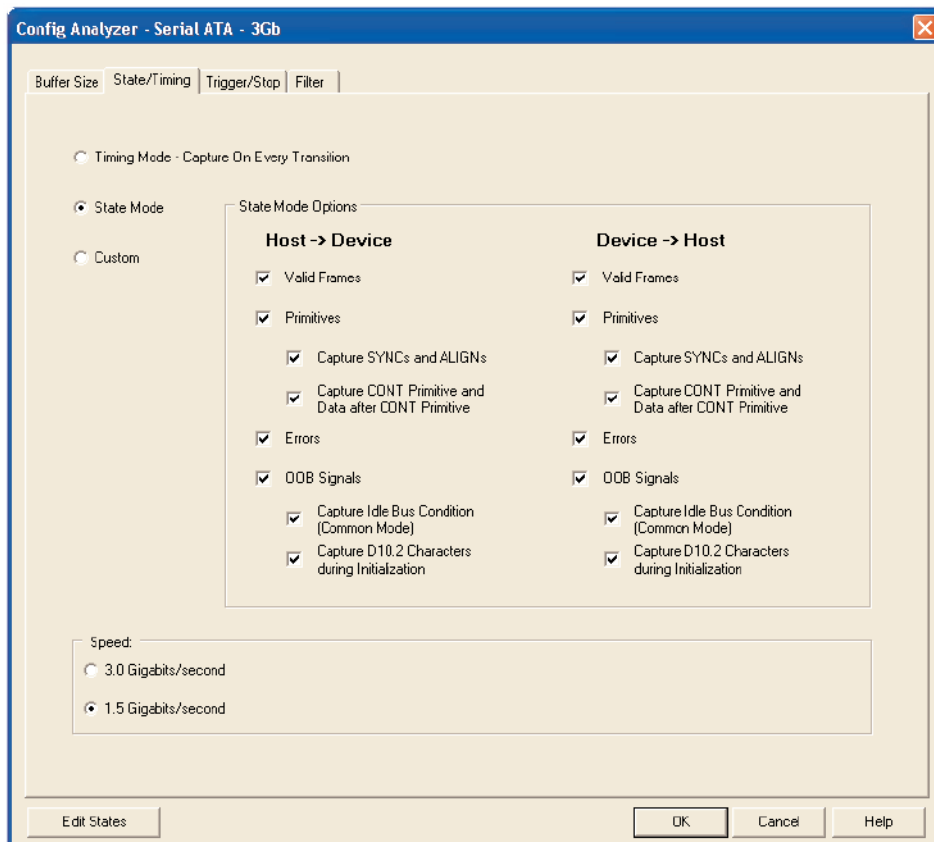


Figure 1: SATA State Mode Settings

primitives, conserve trace buffer space, and leave the State Listing of the user interface less cluttered.

ERRORS: The Bus Doctor analyzer can capture and identify many different types of errors. This option will set the analyzer to display the following types of errors.

- Coding errors
- Disparity errors
- Primitive errors
- Framing errors
- CRC errors

These errors are often the most obvious indicators of a problem and are plainly displayed in red in the histogram (see the Histogram section on the bottom of figure 2).

If one or both directions of the serial line display nothing but coding or disparity errors then this will usually indicate that the link could not be established. It is usually helpful to have this option enabled.

It is important to note that the DR-SATA-1500S pod will detect coding and disparity errors on the serial line before the SATA link is established. Users of this pod may at times find it useful to disable this option if they do not want to capture any events before the link is established. The DR-SATA-

3000 pod will detect a BUS IDLE condition during this time.

OOB SIGNALS: OOB signals (Out of Band signals) are a pattern composed of ALIGNs separated by common mode signals. It is used to transition the PHY to the Phy Ready state and establish a link between the host and device. It is usually helpful to see the OOB signaling if there is trouble establishing a link between the Host and Device.

IDLE BUS CONDITION: The Idle Bus condition is also known as Common Mode. In Common Mode, the Tx and Rx signals are driven to the same voltage. A combination of Common Mode and Align primitives compose individual OOB signals.

This feature may be useful when examining details of OOB. During a typical OOB start up sequence the analyzer will capture several thousand IDLE (COMMON MODE) events. If the bus under test does not have any problems with OOB then it is helpful to disable this feature.

D10.2 CHARACTERS: D10.2 characters are used to negotiate speed on a SATA bus. They are typically sent after an Out-of-Band COMWAKE (See section 6.8.1.1.1 of SATA specification 1.0a).

These characters will appear in the analyzer as non-decoded, blank events with the data displayed as "4A4A4A4A." It is useful to see D10.2 characters anytime more detail is required concerning PHY initialization or speed negotiation.

CONCLUSION

The Bus Doctor SATA Analyzer configuration settings and options assist users in optimizing the Bus Doctor SATA analyzer for analysis.

PRODUCT ORDERING INFORMATION

Model Number	Description
<u>Bus Doctor RX Analyzers</u>	
RX-108P-SLIM	Bus Doctor RX, 108 Channels, 16M Events Buffer
RX-108P-FIT	Bus Doctor RX, 108 Channels, 64M Events Buffer
RX-108P-BUFF	Bus Doctor RX, 108 Channels, 256M Events Buffer
<u>Bus Doctor RX Pods</u>	
DR-SATA-1500S	Serial ATA (1.5 Gb/s) Pod
DR-SATA-3000	Serial ATA (1.5 & 3.0 Gb/s) Pod

Please specify model number, name and quantity when ordering. Please contact Finisar or one of its Sales Representatives or Distributors for the latest pricing and availability.



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