

Keysight Technologies

Identifying the Causes of DDR Data Corruption and Elusive Failures Track Infrequent Errors-Glitch, Overshoot, etc.

Application Note

There are times when tracking infrequent errors or events can be challenging because they do not happen regularly. What if a glitch happens once every 5 minutes and can only be observed in infinite persistence display mode? Without the ability to track it, the condition when the glitch happens cannot be fully understood. Some other scenarios include signal overshoot due to crosstalk when the adjacent signal transition or ISI failure is due to a specific DQ pattern.

The InfiniScan zone qualify trigger is a tool that can help you to track the signals. If the event can be observed, it can be tracked. You can set a tracking condition by drawing a “must intersect” or “must not intersect” zone directly on your signal on the oscilloscope screen. This allows you to easily isolate the signal of interest and track a specific error or event. Some examples can be observed in Figure 1 and 2.

Using a logic analyzer with a memory bus decoder provides extensive triggering and storage qualifications for protocol decode of memory transactions. The DDR protocol-decode software in the logic analyzer allows users to input system attributes such as burst length, CAS and additive latency, as well as chip selects to decode the key DDR bus signals. Using these attributes, the software then presents a display that lists the transaction type, address, data and command conditions. Protocol-decode software also supports user-defined symbols that can be easily added to the state listing display. This software allows you to decode and view transactions, commands, and data from a DDR2 or DDR3 memory bus in your target system. This combination provides memory bus triggering, debug and compliance verification measurements to help you find protocol violations within your system such as read or write to an interactive bank row, refresh command to an active bank, or bank row must be pre-charged before being activated. The data is decoded and displayed at any desired level of detail from the protocol to binary. The protocol-decode software then translates acquired signals into easily understood bus transactions, at the full bus speed.

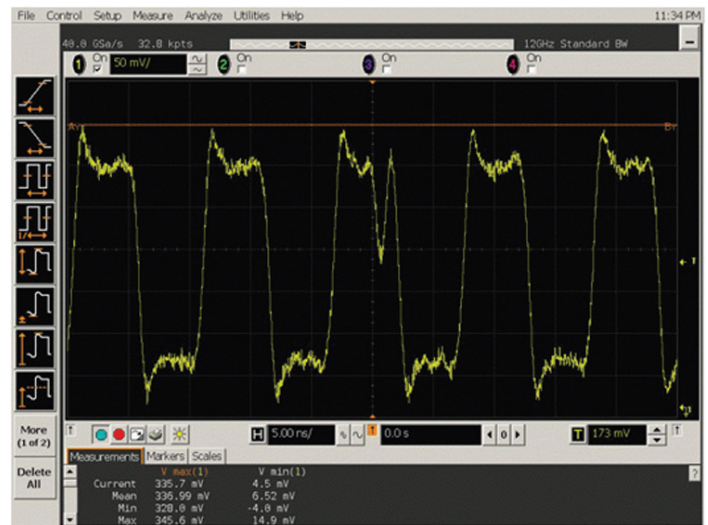


Figure 1: A “Must Intersect” zone is used to track an infrequent glitch on the clock signal.



Figure 2: Using the InfiniScan zones, a condition is set to track a specific DQ pattern of “01000010101”

Using colored filters helps zoom into a protocol error quickly: missing BI activate (turquoise) indicated that bank 1 is not activated before the read command is issued

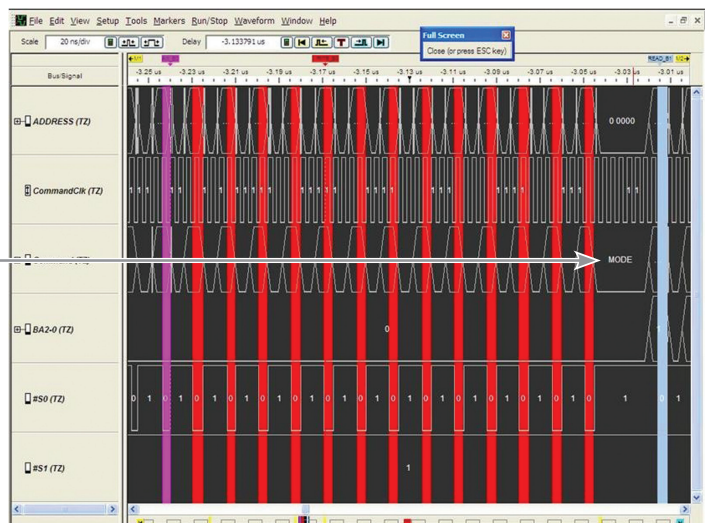


Figure 3: Using colored filters on the command signal can help detect missing commands that indicate a protocol violation.

The Protocol-decode software allows you to track and fix infrequent glitches and other signal anomalies that might otherwise be difficult to find.

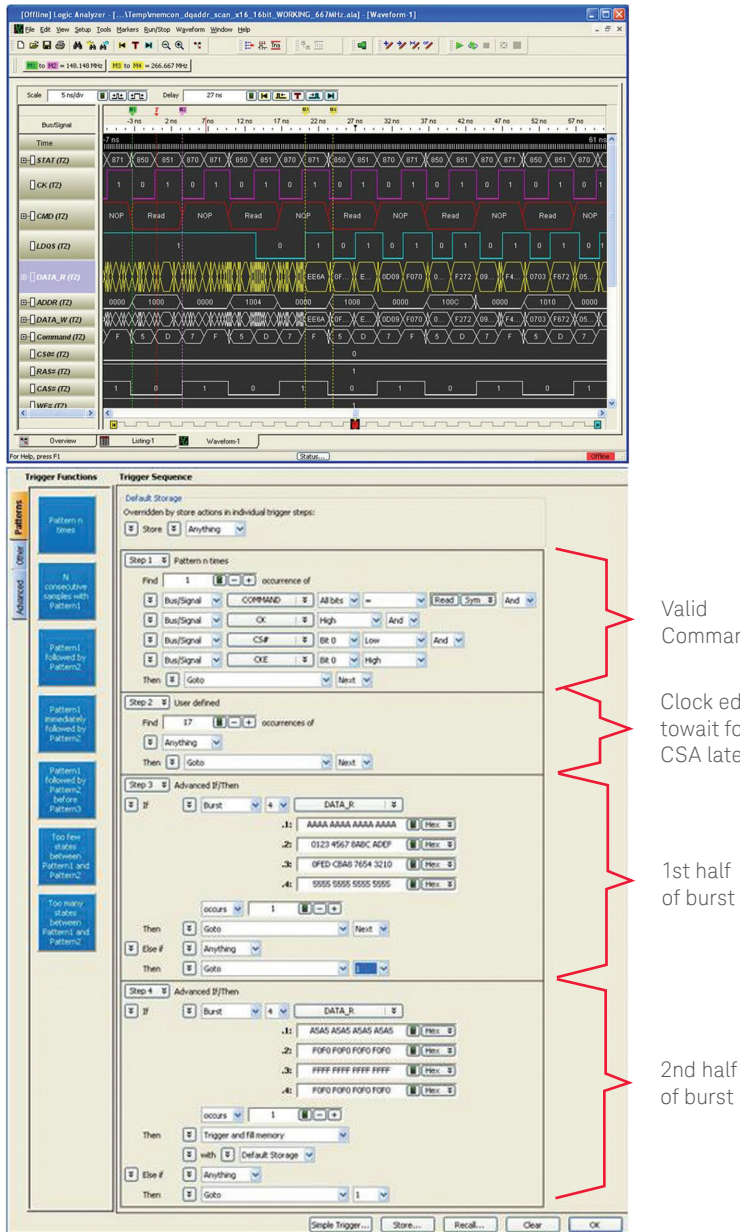


Figure 4. Use the advanced triggering features of the logic analyzer to check for data mismatches for bit error rate measurements.

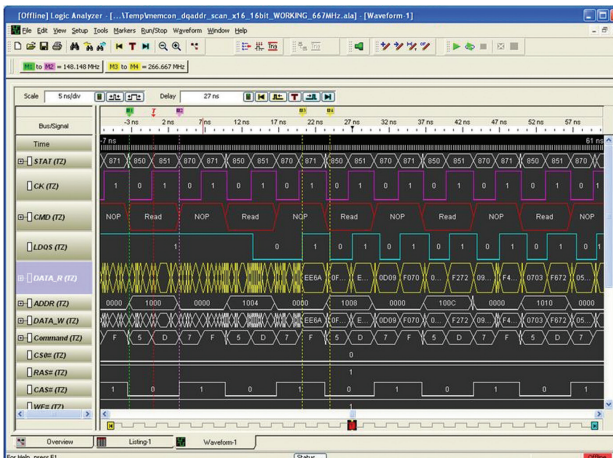


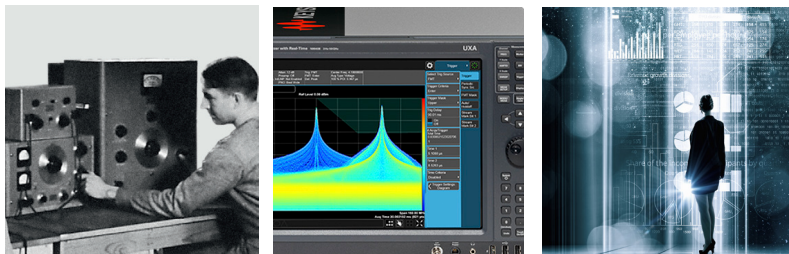
Figure 5. The DDR protocol decoder software provides memory bus decode in an intuitive, consolidated format, eliminating time consuming and tedious review of the waveform traces.

Publication title	Publication type	Publication number
<i>DDR Memory Overview, Development Cycle and Challenges</i>	Application Note	5990-3180EN
<i>DDR Design and Verification through Simulation</i>	Application Note	5990-3317EN
<i>DDR Probing for Physical Layer and Functional Testing</i>	Application Note	5990-3182EN
<i>Debugging Signal Integrity and Protocol Layers on DDR Designs</i>	Application Note	5990-3189EN
<i>Separating Read/Write Signals for DDR DRAM and Controller Validation</i>	Application Note	5990-3187EN
<i>Ensuring Compliance and Interoperability in DDR Designs</i>	Application Note	5990-3188EN
<i>Keysight DDR Memory Solutions</i>	Application Note	5990-3324EN

Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology.

From Hewlett-Packard to Agilent to Keysight.



myKeysight

myKeysight

www.keysight.com/find/mykeysight

A personalized view into the information most relevant to you.

http://www.keysight.com/find/emt_product_registration

Register your products to get up-to-date product information and find warranty information.

KEYSIGHT SERVICES

Accelerate Technology Adoption.
Lower costs.

Keysight Services

www.keysight.com/find/service

Keysight Services can help from acquisition to renewal across your instrument's lifecycle. Our comprehensive service offerings—one-stop calibration, repair, asset management, technology refresh, consulting, training and more—helps you improve product quality and lower costs.



Keysight Assurance Plans

www.keysight.com/find/AssurancePlans

Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

Keysight Channel Partners

www.keysight.com/find/channelpartners

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/ddr

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 11 2626
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-9-7-17)

DEKRA Certified
ISO 9001 Quality Management System

www.keysight.com/go/quality
Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2015
Quality Management System



This information is subject to change without notice.
© Keysight Technologies, 2017
Published in USA, December 1, 2017
5990-3183EN
www.keysight.com