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DDR2 DIMM Clock Skew Measurement Procedure Using A Clock Reference Board

JEP152

MAY 2007

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



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Published by

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(From JEDEC Board Ballot, JCB-04-84A, Formulated under the cognizance of the JC-45.1 Subcommittee on RDIMM.)

1 Scope

This document is the work product of the JC-45.1 “DDR2 DIMM Clock Skew Measurement” task group.

The purpose of this document is to define procedures to measure clock parameters on registered DIMMs using the DDR2 Clock Reference Board. It is NOT the intent of this document to set specification values or validation requirements.

2 Differential vs. Single-ended probing

This document describes measurements with both single-ended and differential probes. There are several pros and cons of each method:

- hard to calibrate and keep calibrated four probes at once.
- more chances for human error with four probes.
- roughly half the effort with four single-ended probes if Vix measurement is required
- differential probes are perceived to be more accurate especially when close-by GND contact for the single ended probes is not available.
- single ended jitter measurements can be more accurate than those with differential probes, especially if the bandwidth of the single ended probes is higher.

3 Measurement of skew, jitter and slew rate using differential probes

3.1 Test equipment and setup

- Oscilloscope with minimum bandwidth of 3 GHz and 8— Gigasamples/s,
- Two differential probes with minimum bandwidth of 3 GHz, resulting in a probe tip bandwidth of no less than 2.5 GHz
- PC2-3200/4300 JEDEC CRB Clock Reference Board (=CRB) by CST,
- DC Power Supply for 3.3 V to CRB

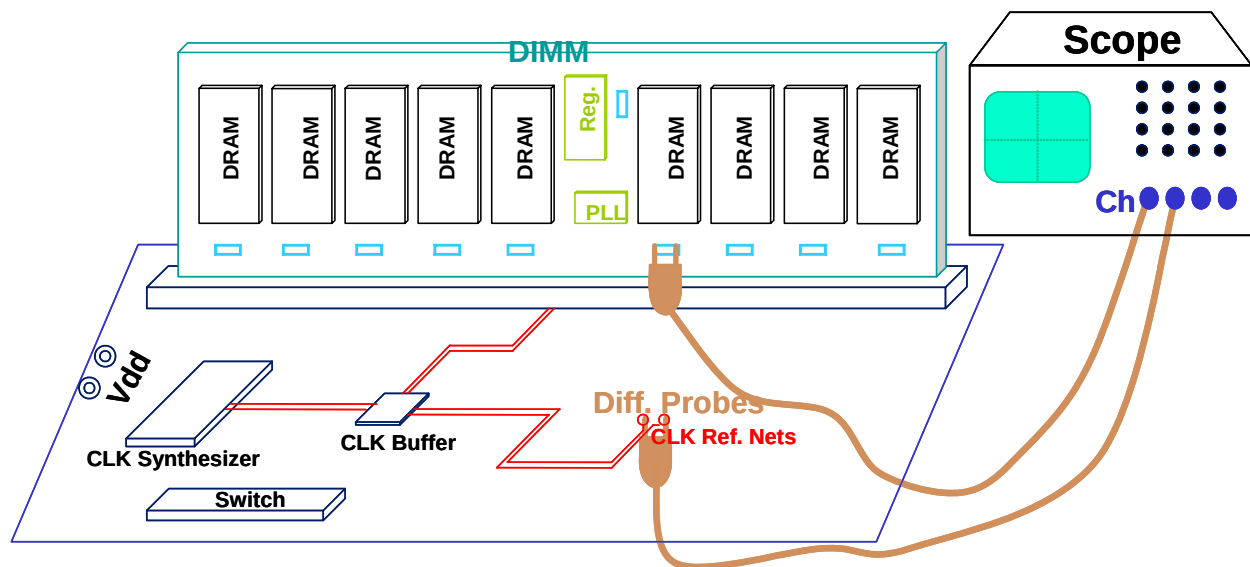


Figure 1 — Measurement setup with differential probes

3 Measurement of skew, jitter and slew rate using differential probes (cont'd)

3.2 Preparation

- 1) Allow instruments to warm up (> 20 min),
- 2) Disconnect all probes from the scope,
- 3) Perform the scope calibration,
- 4) Attach differential probes 1& 2 to CH1 & CH2¹ of the scope,
- 5) Perform the probes calibration² using the calibration fixture delivered with the scope,
- 6) determine equipment jitter as described in Annex A
- 7) Attach wires of equal length & less than 10 mm to the (PLL-in, DRAMs & register) termination resistors of the DIMM under test (not required for “direct attach” probes),
- 8) Plug the DIMM into the CRB socket,
- 9) Set the CRB power supply voltage,
- 10) Check the value of supplies at the CRB & DIMM test points (centermost decoupling capacitor on the top edge of the DIMM),
- 11) Ensure that switches on the CRB are set at the right position (measurement frequency (see CRB Manual, page TBD),
- 12) Make sure that the probes are properly de-skewed (see CRB Manual, page TBD),
- 13) Connect the CH1 to the CKref probe points of the CRB.

1. Other channels may be used, however the text assumes the suggested assignments.

2. A good check on the proper de-skewing of the oscilloscope probes is to follow this same procedure, exchanging the roles of CH1 and CH2. Next, switch CH3 and CH4. If you do not get the same answer for all measurements, the probes have not been properly de-skewed, OR the frequency responses of the two channel + probe combinations are insufficiently matched. This step should be performed as often as necessary depending on the actual drift of the measurement setup.