

The following pictures represent the shape of the clock signal on the CDF 9U VME backplane. The signals were all recorded using a HP 1153A Differential probe and HP Infinium scope. The setup of the crate is as follows, VME Controller slot 1, Testclock slot 2 or 11, Tracer slot 2, 11, or 21, 8 ADMEMs slot 5, 8, 10,13,15,16, and 19. Signals were recorded using the differential probe connected to the front of the backplane (P2 connector) using 1" jumpers.

Procedure was as follows:

- Record the signals at various slots with the **normal** terminating scheme (Each leg of the differential pair is terminated at both ends of the crate with a 330-ohm resistor to VCC and a 470-ohm resistor to GND).
- Do this with the tracer in slots 2, 11 and 21.
- Do this with the crate loaded and unloaded.
- Change the terminating scheme (**A**- 330-ohm on each leg of the pair to GND at the Tracer and 100 ohms across the pair at each end of the backplane). The normal sip was removed and the 100-ohm resistor was placed in the Sip's location).
- Change the terminating scheme (**B**- Change the 100 ohms to 50 ohms).
- Change the terminating scheme (**C**- Remove the 50 ohms from the opposite end of the backplane that the Tracer was on).
- Change the terminating scheme (**D**- Change the remaining 50 ohm to the following: a 50 ohm from each side of the differential pair to a node that connects a 100 ohm to GND and a 4700pf capacitor to VCC). This was placed on the far end of the backplane from the Tracer in the Sip's location.
- Change the terminating scheme (**E**- Change the value of the capacitor to 15000pf).
- Change the terminating scheme (**F**- Place the termination package described for D and E at each end of the backplane).

Observations were as follows:

Driving from slot 2 or slot 21 was practically identical so I didn't test all schemes with the Tracer in slot 21.

The pictures show the ringing that occurs from improper terminations.

The signals changed very little from a loaded to unloaded condition.

It is obvious that there could be a problem.

Conclusion:

The pictures show that the best terminating scheme with a Tracer in slots 2 or 21 would be to terminate the differential clock pair at the opposite end of the backplane with a 50 ohm resistor across the pair and adding two resistors to the driver on the Tracer. This scheme should be easy to incorporate by snipping the two legs of each of the two sips and then placing a resistor on the front of the backplane across the two vacated sip holes. The resistor should only be added to the backplane at the opposite end of the Tracer. Also adding the 2 resistors to the Tracers.

The last terminating scheme F would be a possibility if the Tracer has to be in slot 11. The disadvantages of this scheme: slows down the rise time of the clock signal and large number of components wouldn't be easy to incorporate into the backplane.

To properly select the ultimate value for the terminating resistor the backplane should be evaluated with a TDR both loaded and unloaded.



Tracer Slot 11
 No Load
 Top: Slot 21
 Mid: Slot 17
 Bot: Slot 12
 Termination Standard
 470 ohm to gnd
 330 ohm to VCC
 Slots 2 & 21



Tracer Slot 2
 No Load
 Top: Slot 3
 Mid: Slot 7
 Mid: Slot 12
 Bot: Slot 21
 Termination Standard
 470 ohm to gnd
 330 ohm to VCC
 Slots 2 & 21



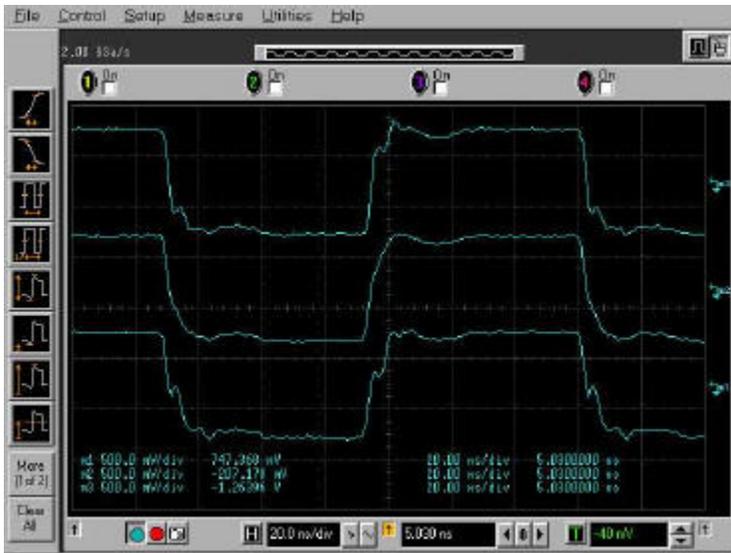
Tracer Slot 21
 No Load
 Top: Slot 20
 Mid: Slot 17
 Mid: Slot 12
 Bot: Slot 3
 Termination Standard
 470 ohm to gnd
 330 ohm to VCC
 Slots 2 & 21



Tracer Slot 11
 8 ADMEM Load
 Top: Slot 21
 Mid: Slot 17
 Bot: Slot 12
 Termination Standard
 470 ohm to gnd
 330 ohm to VCC
 Slots 2 & 21



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Mid: Slot 17
 Bot: Slot 21
 Termination Standard
 470 ohm to gnd
 330 ohm to VCC
 Slots 2 & 21



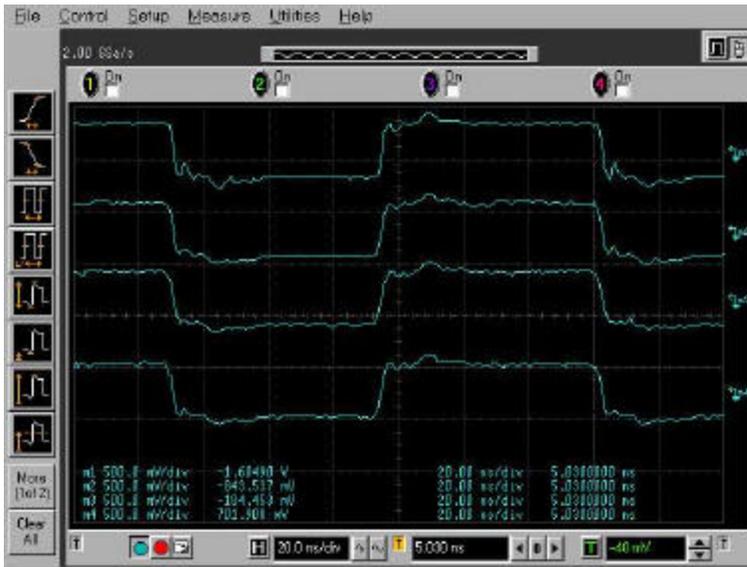
Tracer Slot 11
 8 ADMEM Load
 Top: Slot 21
 Mid: Slot 17
 Bot: Slot 12
 Termination A
 330 ohm(2) @ Driver
 102 ohm(2) @ Slot 2 & 21



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Bot: Slot 21
 Termination A
 330 ohm(2) @ Driver
 102 ohm(2) @ Slot 2 & 21



Tracer Slot 11
 8 ADMEM Load
 Top: Slot 21
 Mid: Slot 17
 Bot: Slot 12
 Termination B
 330 ohm(2) @ Driver
 49 ohm(2) @ Slot 2 & 21



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Mid: Slot 17
 Bot: Slot 21
 Termination B
 330 ohm(2) @ Driver
 49 ohm(2) @ Slot 2 & 21



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Mid: Slot 17
 Bot: Slot 21
 Termination C
 330 ohm(2) @ Driver
 49 ohm(1) @ Slot 21



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Mid: Slot 17
 Bot: Slot 21
 Termination D
 @ Slot 21
 53 ohm(2)/113 ohm to gnd
 4700pf to VCC



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Mid: Slot 17
 Bot: Slot 21
 Termination E
 @ Slot 21
 53 ohm(2)/113 ohm to gnd
 15000pf to VCC



Tracer Slot 2
 8 ADMEM Load
 Top: Slot 3
 Mid: Slot 12
 Mid: Slot 17
 Bot: Slot 21
 Termination F
 @ Slot 21
 53 ohm(2)/113 ohm to gnd
 15000pf to VCC
 @ Slot 21
 53 ohm(2)/113 ohm to gnd
 4700pf to VCC



Tracer Slot 11
 8 ADMEM Load
 Top: Slot 21
 Mid: Slot 17
 Bot: Slot 12
 Termination F
 @ Slot 21
 53 ohm(2)/113 ohm to gnd
 15000pf to VCC
 @ Slot 21
 53 ohm(2)/113 ohm to gnd
 4700pf to VCC