Ultra 320 with Precompensation

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Presentation Data

- Data Taken from actual measurements of systems in the lab
  - Using actual SCSI initiator with full data bus functionality
  - Using an HP81111A for Precomp.
- Predictions are made for silicon SCSI transceiver using the above data
Data to be Presented

- Actual Silicon running at Ultra 320 Speeds
  - 4 Different Cables
    - 4 Different Lengths
  - 3 Different Environments
    - 2 Backplane configurations
    - Point to Point
Cables

- TempFlex 30 Ga. Solid
- Amphenol Twist ‘N’ Flat #125-3096-996
- Madison Round #68KBK00051
- Hitachi Round #48213-068-H00-000
- Cable Lengths:
  - 18”, 1 meter, 12 meters, 25 meters
Data to be Presented (continued)

- Actual Silicon running at Ultra 320 Speeds
  - 4 Different Signaling methods
    - Without Precompensation
    - Actual data transfer with pseudo-random data on all bits
    - Pseudo-random on subject bit w/ 101010… on the rest of the bits
    - Single bit without crosstalk
Data to be Presented (continued)

- HP81111A running at Ultra 320 Speeds
  - With and without Precompensation
  - Single bit and 1010… on adjacent channels
  - Same Environments (cables & backplanes) as used with Actual Silicon
- Three (3) Precomp levels:
  - 33%, 25%, and 15% cutback
Precompensation

The first bit at a transition was driven with approximately 500 mv, the subsequent bits without transitions were driven at 335 mv (33% cutback), 375 (25% cutback) or 425mv (15% cutback) precompensation.
Format of Data to be Presented

- Eye-diagrams of pseudo-random data
  - Real Silicon
  - HP81111A without Precomp
  - HP81111A with Precomp
- Silicon Driver has better performance than the HP81111A as a SCSI driver
- Presently only able to compare Precomp Vs. no Precomp with HP81111A
Eye Diags falsely predict errors w/Precomp

These areas contain cutback signals from precomp; not signals to be detected as transitions.
Eye diagrams and noise, false prediction

These areas contain noise, not signals to be detected as transitions.
Windows in Eyes

- Boxes have been drawn in the Eyes of the following data to depict the following:
  - A 2 nanosecond by 130 millivolt opening
  - A 3 nanosecond by 80 millivolt opening
Data Presentation

- The first section of data is using SCSI initiator with full data bus functionality without precompensation.
- The second section is using an HP81111A generator with and without precompensation.
- The HP generator is a voltage drive and is essentially a single ended (not differential); as opposed to the silicon driver which is a differential current driver.
Conclusions

- Non-precomp SCSI Initiator works in most cases with margin.
- All cases with the addition of precompensation will give considerable margin.
- Extended Domain Validation and/or margining may be used to increase margins significantly.
- Actual SCSI initiator results are much better than test equipment (signal generator) would indicate.
Backplane/Cable Signal Analysis at 320 MB/Sec
## Index of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 302</td>
<td>Point-to-Point, 25m Hitachi Round, Nom Slew, No Precomp, DB4</td>
</tr>
<tr>
<td>Figure 304</td>
<td>SEG U2 Backplane - 25m Round, PtP, Nom Slew, No Precomp</td>
</tr>
<tr>
<td>Figure 305</td>
<td>SEG U2 Backplane - 25m Round, 15 Loads Nom Slew, No Precomp</td>
</tr>
<tr>
<td>Figure 306</td>
<td>SEG U2 Backplane - 12m Amph, 15 Loads, Fast Slew, No Precomp</td>
</tr>
<tr>
<td>Figure 308</td>
<td>SEG U2 Backplane - 25m Round, PtP Fast Slew, No Precomp</td>
</tr>
<tr>
<td>Figure 309</td>
<td>SEG U2 Backplane - 25m Round, 15 Loads, Fast Slew, No Precomp</td>
</tr>
<tr>
<td>Figure 310</td>
<td>SEG 320BM Backplane - 12m Amph, 15 Loads, Nom Slew, No Pre</td>
</tr>
<tr>
<td>Figure 311</td>
<td>SEG 320BM Backplane - 18” Amph, 15 Loads, Nom Slew, No Pre</td>
</tr>
</tbody>
</table>

![Diagram](image-url)
Point-to-Point, 25m Hitachi Round, Nom Slew, No Precomp, DB4

SCSI Initiator, all 16 bits 256k ISI Pattern, DB4, Hitachi 25m round, 1 load. Driving signal 411 mV/nS, 400 driver Amplitude.
SEG U2 Backplane - 12m Amph, 15 Loads, Nom Slew, No Precomp

SCSI Initiator, all 16 bits 256k Random Pattern, DB7, Seagate U2 backplane (older 16-slot), Amphenol 12m twisted-flat - 15 loads. Driving signal 411 mV/nS, 400/500 mV driver Amplitude. Data taken at slot 1 (closest to cable).

(File 25) 400 mV Amplitude

(File 29) 500 mV Amplitude
Point-to-Point SEG U2 Backplane -25m Round, Norm Slew, No Precomp

SCSI Initiator, all 16 bits 256k Random Pattern, DB7, Hitachi Round 25m - 1 load. Driving signal 411 mV/nS, 400/500 mV driver Amplitude. Data taken at slot 1 (closest to cable).

(File 43)

400 mV Amplitude

(File 44)

500 mV Amplitude

(File 43)
SEG U2 Backplane - 25m Round, 15 Loads Nom Slew, No Precomp

SCSI Initiator, all 16 bits 256k Random Pattern, DB7, Seagate U2 backplane (older 16-slot), Hitachi Round 25m - 15 loads. Driving signal 411 mV/nS, 400/500 mV driver Amplitude. Data taken at slot 1 (closest to cable).

(File 52) 400 mV Amplitude  

(File 51) 500 mV Amplitude
SEG U2 Backplane - 12m Amph, 15 Loads, Fast Slew, No Precomp

SCSI Initiator, all 16 bits 256k Random Pattern, DB7, Seagate U2 backplane (older 16-slot), Amphenol 12m twisted-flat - 15 loads. Driving signal 775 mV/nS, 400/500 mV driver Amplitude. Data taken at slot 1 (closest to cable).

(File 30) 400 mV Amplitude

(File 33) 500 mV Amplitude
Point-to-Point SEG U2 Backplane - 25m Round, Fast Slew, No Precomp

SCSI Initiator, all 16 bits 256k Random Pattern, DB7), Hitachi Round 25m - 1 load. Driving signal 775 mV/nS, 400/500 mV driver Amplitude. Data taken at slot 1 (closest to cable).

400 mV Amplitude

500 mV Amplitude

(File 47)

(File 48)
SEG U2 Backplane - 25m Round, 15 Loads, Fast Slew, No Precomp

SCSI Initiator, all 16 bits 256k Random Pattern, DB7, Seagate backplane (older 16-slot) 3-18-00 tests, Hitachi Round 25m - 15 loads. Driving signal 775 mV/nS, 400/500 mV driver Amplitude. Data taken at slot 1 (closest to cable).

(File 53)
400 mV Amplitude

(File 54)
500 mV Amplitude
SEG 320BM Backplane -12m Amph, 15 Loads, Nom Slew, No Pre

SCSI Initiator, all 16 bits 256k Random Pattern, DB4, Seagate U2/320BM backplanes, Amphenol twisted-flat 12m - 15 loads. Driving signal 411mV/nS, 400mV driver Amplitude. Data taken at slot 1 (closest to cable).

Old U2 Backplane

New 320BM Backplane
SEG 320BM Backplane -18” Amph, 15 Loads, Nom Slew, No Pre

SCSI Initiator, all 16 bits 256k Random Pattern, DB4, Seagate U2/320BM backplanes, Amphenol twisted-flat 18” - 15 loads. Driving signal 411mV/nS, 400mV driver Amplitude. Data taken at slot 1 (closest to cable).

Old U2 Backplane

Disk 18 File 0

New 320BM Backplane

Disk 18 File 3
320 MB Eye Pattern Data with 15-25-33% Precomp and Crosstalk

Controller Development Engineering
Scotts Valley
#00-194
## Index of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Generator Driver, Example @ 33% Cutback</td>
</tr>
<tr>
<td>204</td>
<td>Generator Driver without Cutback</td>
</tr>
<tr>
<td>205</td>
<td>Generator Driver with Cutback</td>
</tr>
<tr>
<td>206</td>
<td>Point-to-Point 18” Twisted-Flat, 15% Cutback with &amp; without Crosstalk</td>
</tr>
<tr>
<td>207</td>
<td>Point-to-Point 18” Twisted-Flat, 25% Cutback with &amp; without Crosstalk</td>
</tr>
<tr>
<td>208</td>
<td>Point-to-Point 18” Twisted-Flat, 33% Cutback with &amp; without Crosstalk</td>
</tr>
<tr>
<td>212</td>
<td>Point-to-Point 12m Twisted-Flat, 15% Cutback with &amp; without Crosstalk</td>
</tr>
<tr>
<td>213</td>
<td>Point-to-Point 12m Twisted-Flat, 25% Cutback with &amp; without Crosstalk</td>
</tr>
<tr>
<td>214</td>
<td>Point-to-Point 12m Twisted-Flat, 33% Cutback with &amp; without Crosstalk</td>
</tr>
<tr>
<td>215</td>
<td>Point-to-Point 25m Round, 15% Cutback with Crosstalk</td>
</tr>
<tr>
<td>216</td>
<td>Point-to-Point 25m Round, 25% Cutback with Crosstalk</td>
</tr>
<tr>
<td>217</td>
<td>Point-to-Point 25m Round, 33% Cutback with &amp; without Crosstalk</td>
</tr>
</tbody>
</table>
Index of Figures

Figure 218  Seagate U2 Backplane, 12m Round, 15% Cutback with & without Crosstalk.
Figure 219  Seagate U2 Backplane, 12m Round, 25% Cutback with & without Crosstalk.
Figure 220  Seagate U2 Backplane, 12m Round, 33% Cutback with & without Crosstalk.

Figure 221  Seagate U2 Backplane, 18” Twisted-Flat, 15% Cutback with & without Crosstalk.
Figure 222  Seagate U2 Backplane, 18” Twisted-Flat, 25% Cutback with & without Crosstalk.
Figure 223  Seagate U2 Backplane, 18” Twisted-Flat, 33% Cutback with & without Crosstalk.

Figure 224  Seagate U2 Backplane, 12m Twisted-Flat, 15% Cutback with Crosstalk.
Figure 225  Seagate U2 Backplane, 12m Twisted-Flat, 25% Cutback with Crosstalk.
Figure 226  Seagate U2 Backplane, 12m Twisted-Flat, 33% Cutback with & w/o Crosstalk.

Figure 230  Seagate 320BM Backplane, 18” Twisted-Flat, 25% Cutback with Crosstalk.

Figure 231  Seagate 320BM Backplane, 12m Twisted-Flat, 25% Cutback with Crosstalk.

Figure 232  Seagate 320BM Backplane, 12m Round, 25% Cutback with Crosstalk.
Generator Driver, Example @ 33% Cutback

Seagate Backplane (older 16 slot)\3-22-00 HP81111 tests\1m Amphenol twisted-flat - 15 loads

Tek Stop: 5.00GS/s 281 Acqs

\[ \Delta: 476\text{mV} \]
\[ @: 476\text{mV} \]

476 mV
~310mV
Generator Driver with No Precomp

Seagate Backplane (older 16 slot) 3-22-00 HP81111 tests 12m Madison round - 15 loads

Fig 204
Generator Driver with Precomp

Seagate Backplane (older 16 slot) 3-22-00 HP81111 tests 12m Madison round - 15 loads

Tek STOP 5.00GS/s 616 Acqs

Δ: 4.00ns @: 6.72ns

21 Mar 2000 14:32:27

Seagate
Information the way you want it.
Point-to-Point - 18” TnF, 15% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 15% cutback \Amph TnF - 1 loads, Data taken on DB9

Fig 206

No Precomp
No xtalk

Disk 24 file 27

260 mV
2nS

Disk 24 file 25

160 mV
3nS

Disk 24 file 28 with Noise

Disk 24 file 26 with noise

15% Precomp

No Precomp
with xtalk

160 mV
15 Mar 2000
14:17:52

25 Mar 2000
14:18:11

Seagate
Information the way you want it..
Point-to-Point - 18” TnF, 25% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 25% cutback \Amph TnF - 1 loads, Data taken on DB9

Fig 207

Disk 24 file 27
No Precomp
No xtalk

Disk 24 file 28 with Noise
No Precomp
with xtalk

Disk 24 file 29

Disk 24 file 30 with noise
25% Precomp
Point-to-Point - 18” TnF, 33% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 33% cutback Amph TnF - 1 loads, Data taken on DB9

Fig 208

Disk 24 file 27
No Precomp
No xtalk

Disk 24 file 31
33% Precomp

Disk 24 file 28 with Noise
No Precomp
with xtalk

Disk 24 file 33 with noise
Point-to-Point - 12m TnF, 15% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 15% cutback \Amph 12m TnF-1 loads, Data taken on DB9

No Precomp  
No xtalk

No Precomp  
with xtalk

15% Precomp

Fig 212
Point-to-Point - 12m TnF, 25% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 25% cutback \Amph 12m Tnf - 1 loads, Data taken on DB9

Disk 25 file 38

No Precomp
No xtalk

Disk 25 file 40 with noise

25% Precomp

Fig 213

Disk 25 file 39

Disk 25 file 41 with noise
Point-to-Point - 12m TnF, 33% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 33% cutback \Amph 12m Tnf - 1 loads, Data taken on DB9

Disk 24 file 38
No Precomp
No xtalk

Disk 25 file 37 with Noise
No Precomp
with xtalk

Disk 24 file 35
No Precomp
with xtalk

Disk 24 file 36 with noise
33% Precomp

Fig 214
Point-to-Point - 25m round, 15% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3-23-00 HP81111 tests - 15% cutback \Hitachi 25m Round - 1 loads, Data taken on DB9

Disk 20 file 9

No Precomp

15% Precomp

Disc 20 file 8
Point-to-Point - 25m round, 25% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, \3-23-00 HP81111 tests - 25% cutback \Hitachi 25m Round - 1 loads, Data taken on DB9

No Precomp with xtalk

25% Precomp

Disk 20 file 9

Disk 20 file 6
Point-to-Point - 25m round, 33% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, 3/23-00 HP81111 tests - 33% cutback \Hitachi 25m Round - 1 loads, Data taken on DB9

Fig 217

Disk 23 file 12

No Precomp
No xtalk

Disk 23 file 16

Disk 23 file 42 with noise

No Precomp with xtalk

33% Precomp

Disk 23 file 42 with noise

Seagate
Information the way you want it.
Seagate U2 Backplane - 12m round, 15% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) \3-23-00 HP81111 tests - 15% cutback \Madison 12m Round - 15 loads, Data taken on DB9

No Precomp
No xtalk

No Precomp
with xtalk

25% Precomp

Disk file 43 with noise
Seagate U2 Backplane - 12m round, 25% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) \3-23-00 HP81111 tests - 25% cutback \Madison 12m Round - 15 loads, Data taken on DB9

Fig 219

No Precomp
No xtalk

Disk 23 file 4

No Precomp
with xtalk

Disk 23 file 5 with Noise

25% Precomp

Data not taken

23 Mar 2000
18:09:08

200mV

160mV

100mV

-160mV

-242mV

-300mV

1 Mar 2000
12:57:65

100mV

2.00ns

CH4

1.34

1.74

100mV

2.00ns

CH4

1.34

1.74

SCSI T10/00-194 r0 41
A.B.M. 3/27/00
Seagate U2 Backplane - 12m round, 33% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot)\3-23-00 HP81111 tests - 33% cutback \Madison 12m Round - 15 loads, Data taken on DB9

Disk 23 file 4

No Precomp
No xtalk

Disk 23 file 5 with Noise

No Precomp with xtalk

Disk 23 file 6 with noise

33% Precomp
Seagate U2 Backplane - 18” TnF, 15% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) 3-23-00 HP81111 tests - 15% cutback \Amphenol 18” twisted-flat - 15 loads, Data taken on DB9.

Disk 25 file 59
No Precomp
No xtalk

Disk 25 file 61 with Noise
No Precomp
with xtalk

15% Precomp

Disk 25 file 45

Disk 25 file 46 with noise

Fig 221
Seagate U2 Backplane - 18” TnF, 25% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) 3-23-00 HP81111 tests - 25% cutback \Amphenol 18” twisted-flat - 15 loads, Data taken on DB9

No Precomp
No xtalk

Disk 25 file 59

Disk 25 file 57

No Precomp
with xtalk

Disk 25 file 61 with Noise

Disk 25 file 58 with noise

25% Precomp

Fig 222
Seagate U2 Backplane - 18” TnF, 33% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) 3-23-00 HP81111 tests - 33% cutback \Amphenol 18” twisted-flat - 15 loads, Data taken on DB9

Fig 223

No Precomp
No xtalk

Disk 25 file 61 with Noise

No Precomp with xtalk

Disk 25 file 59

33% Precomp

Disk 23 file 9 with noise

Disk 23 file 8

TeK Run. 5.000G/s Sample

Δ: 508mV
@: 136mV

Δ: 300mV
@: -242mV

Δ: 200mV
@: -242mV

25 Mar 2000 15:02:31

25 Mar 2000 13:01:17

SCSI T10/00-194 r0 45
A.B.M. 3/27/00
Seagate U2 Backplane - 12m TnF, 15% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) 3-23-00 HP81111 tests - 15% cutback \Amphenol 12m twisted-flat - 15 loads, Data taken on DB9 at slot 1 (nearest cable)

15% Precomp

Fig 224
Seagate U2 Backplane - 12m TnF, 25% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) 3-23-00 HP81111 tests - 25% cutback \Amphenol 12m twisted-flat - 15 loads, Data taken on DB9

Disk 21 file 3
Generator, No Precomp

Actual SCSI Initiator, No Precomp

25% Precomp

Disk 20 file 3

Fig 225
Seagate U2 Backplane - 12m, 33% Precomp, Slot 1

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate Backplane (older 16 slot) 3-23-00 HP81111 tests - 33% cutback \Amphenol 12m twisted-flat - 15 loads, Data taken on DB9
Seagate 320BM Backplane - 18” TnF, 25% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate 320BM Backplane (New design), HP81111 tests, 25% cutback \Amphenol 18” twisted-flat - 15 loads, Data taken on DB4, Slot 1( nearest cable)

Disk 26 file 62 with noise  No Precomp

Disk 26 file 000 with noise  25% Precomp
Seagate 320BM Backplane - 12M TnF, 25% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate 320BM Backplane (New design), HP81111 tests, 25% cutback /Amphenol 12m twisted-flat - 15 loads, Data taken on DB4, Slot 1 (nearest cable)

Generator, No Precomp

Actual SCSI Initiator, No Precomp

25% Precomp

Fig 231
Seagate 320BM Backplane - 12M Round, 25% Precomp

Data bit Random Pattern, Xtalk worst case adjacent bits, Seagate 320BM Backplane (New design), HP81111 tests, 25% cutback \ 12m Round - 15 loads, Data taken on DB4, Slot 1 (nearest cable)

No Precomp

25% Precomp