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

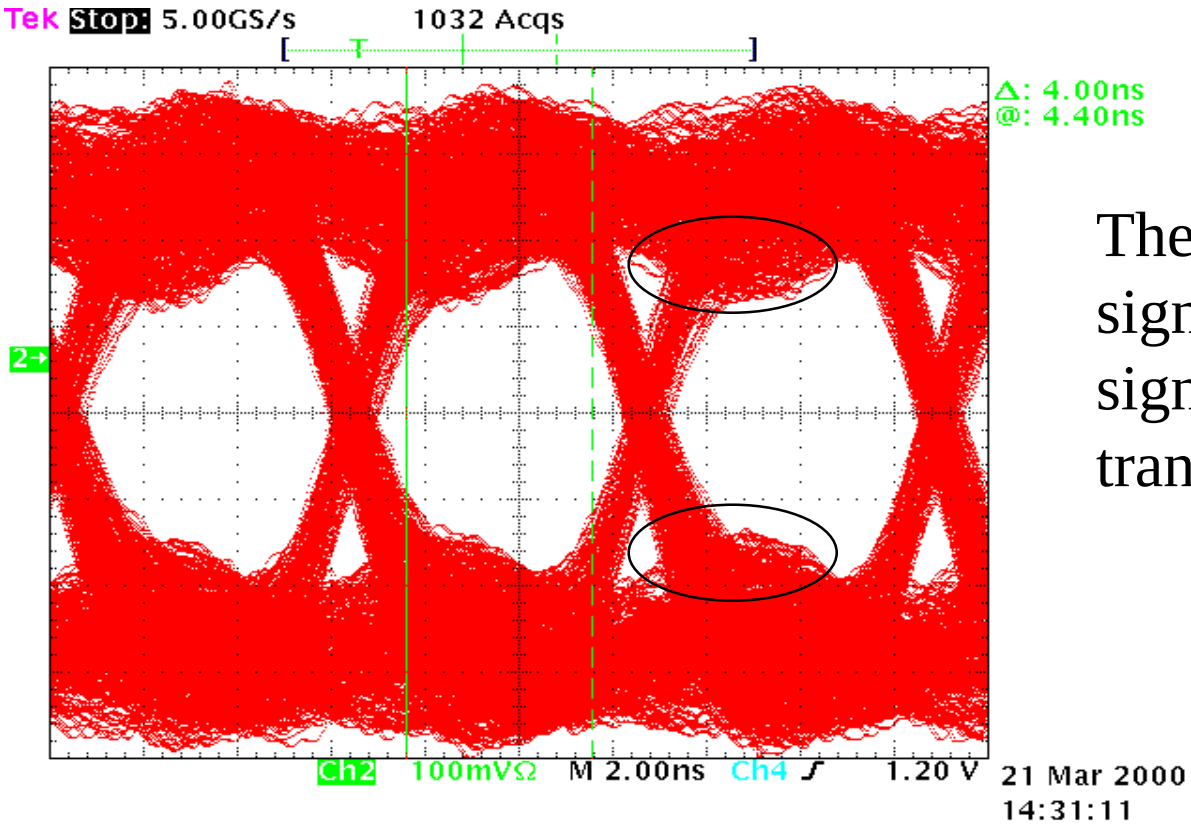
Precompensation

- 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

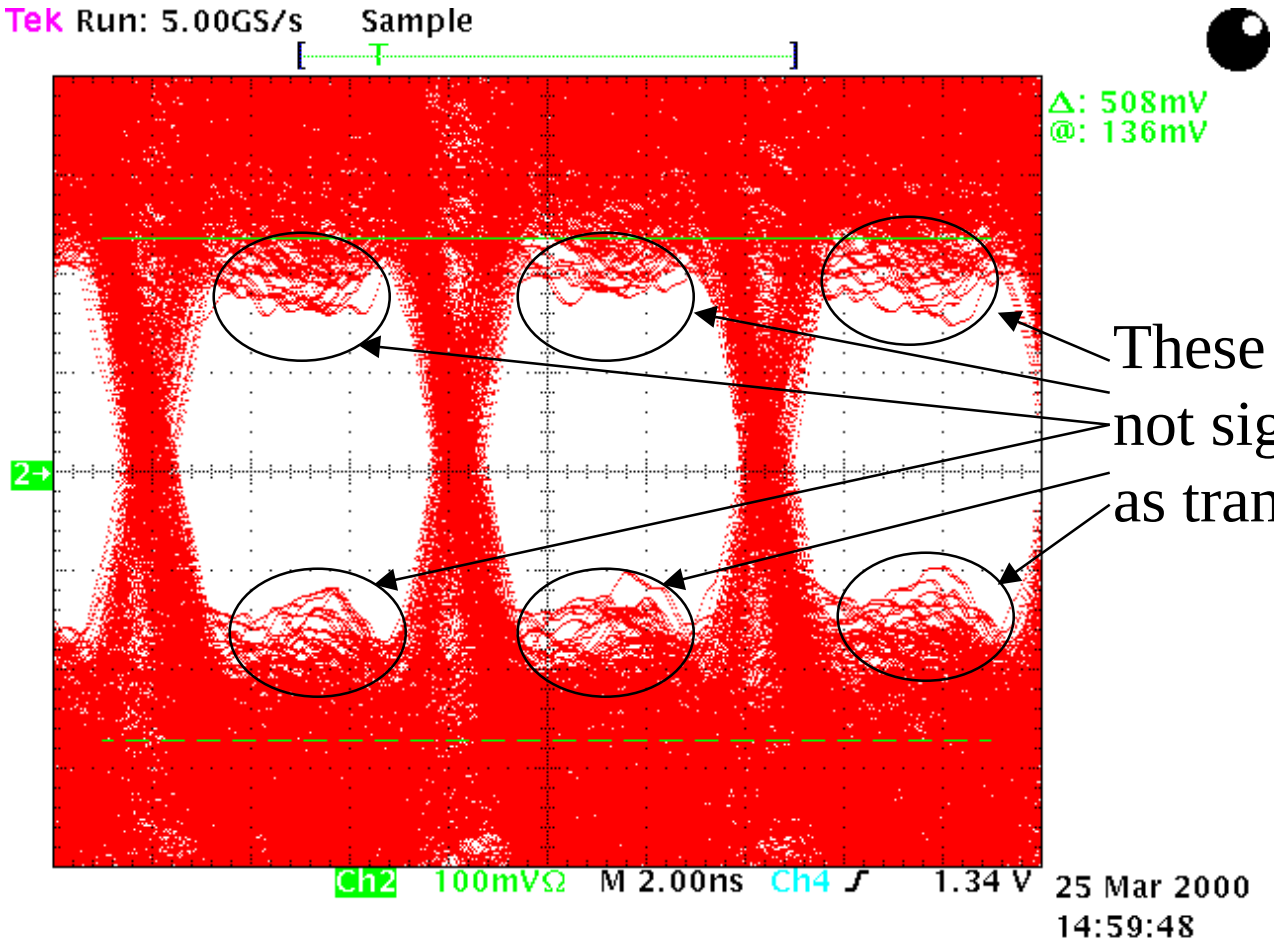
- Eye-diagrams of pseudo-random data
  - Real Silicon
  - HP81111A without Precomp
  - HP81111A with Precomp
- Silicon Driver has better performance than the HP81111A as a SCSI driver
- Presently only able to compare Precomp Vs. no Precomp with HP81111A

Eye Diags falsely predict errors w/Precomp



These areas contains cutback signals from precomp; not signals to be detected as transitions.

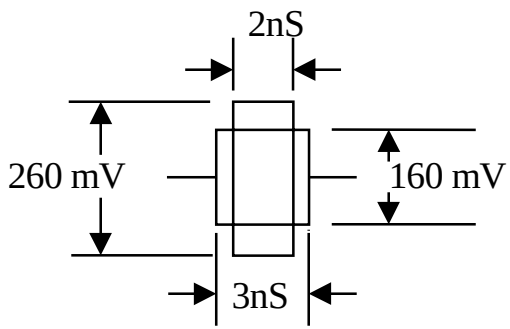
Eye diagrams and noise, false prediction



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

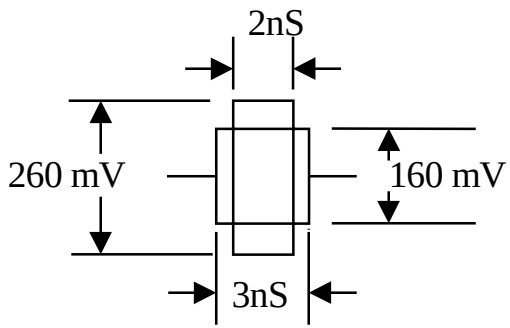
- The first section of data is using SCSI initiator with full data bus functionality without precompensation
- The second section is using an HP81111A generator with and without precompensation
- The HP generator is a voltage drive and is essentially a single ended (not differential); as opposed to the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

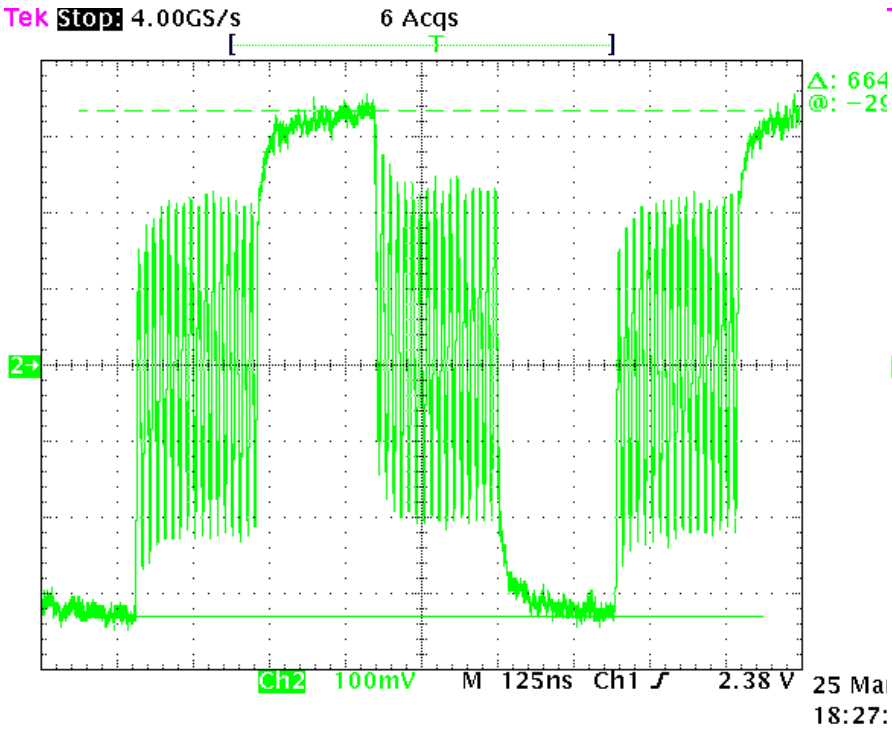
Backplane/Cable Signal Analysis at 320 MB/Sec

Index of Figures



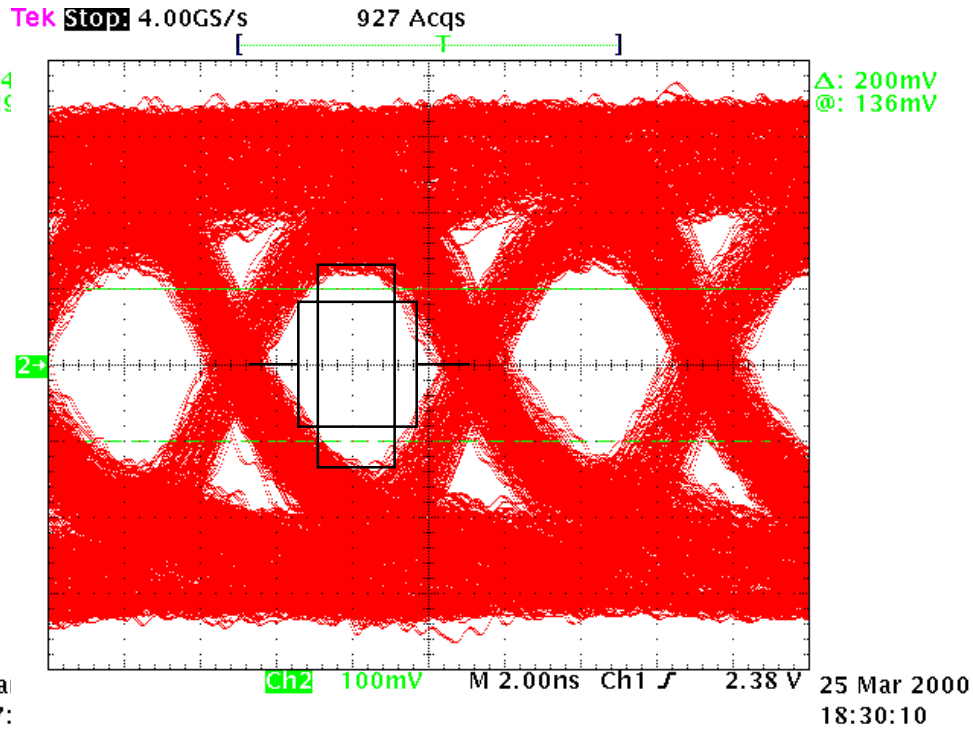
Point-to-Point, 25m Hitachi Round, Nom Slew, No Precomp, DB4

SCSI Initiator, all 16 bits 256k ISI Pattern, DB4, Hitachi 25m round, 1 load. Driving signal 411 mV/nS, 400 driver Amplitude.



Disk 19 File 0

ISI



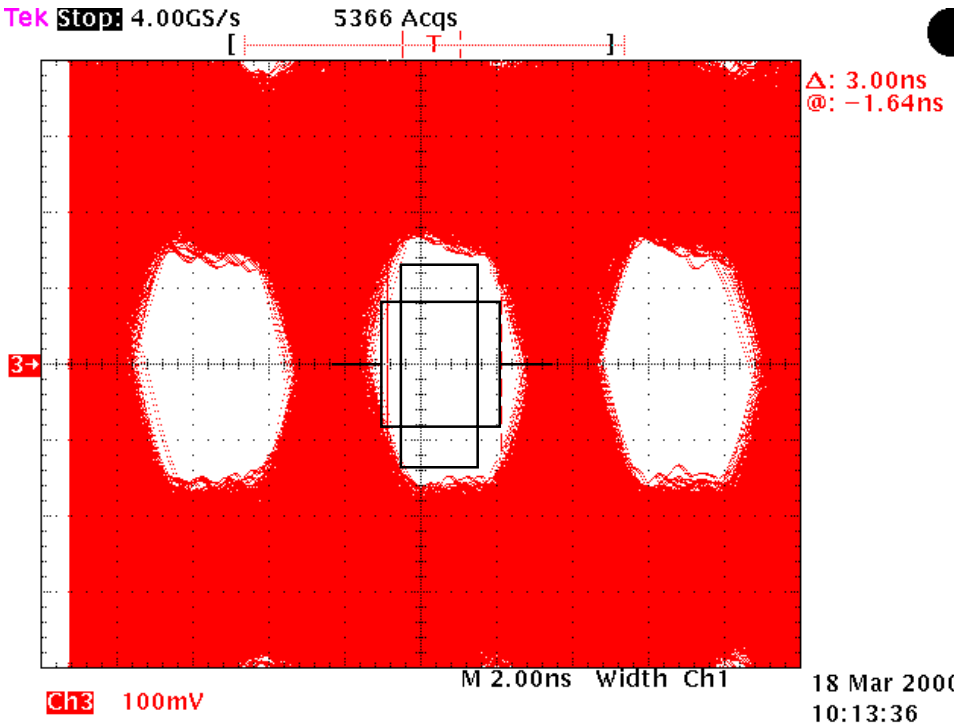
Disk 19 File 1

Eye Pattern

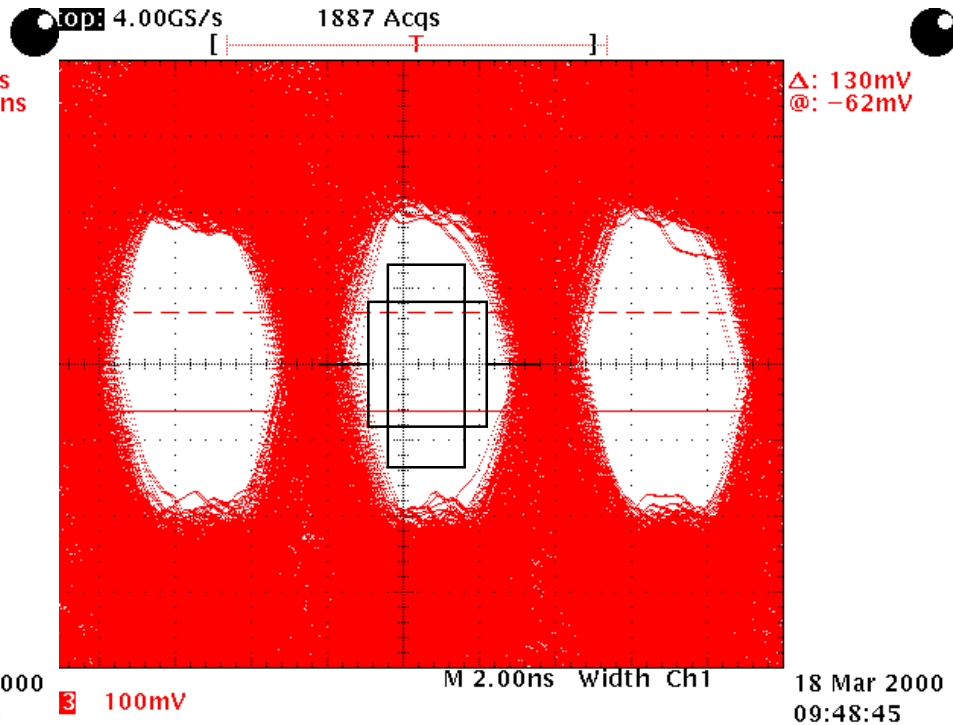
Fig 301

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

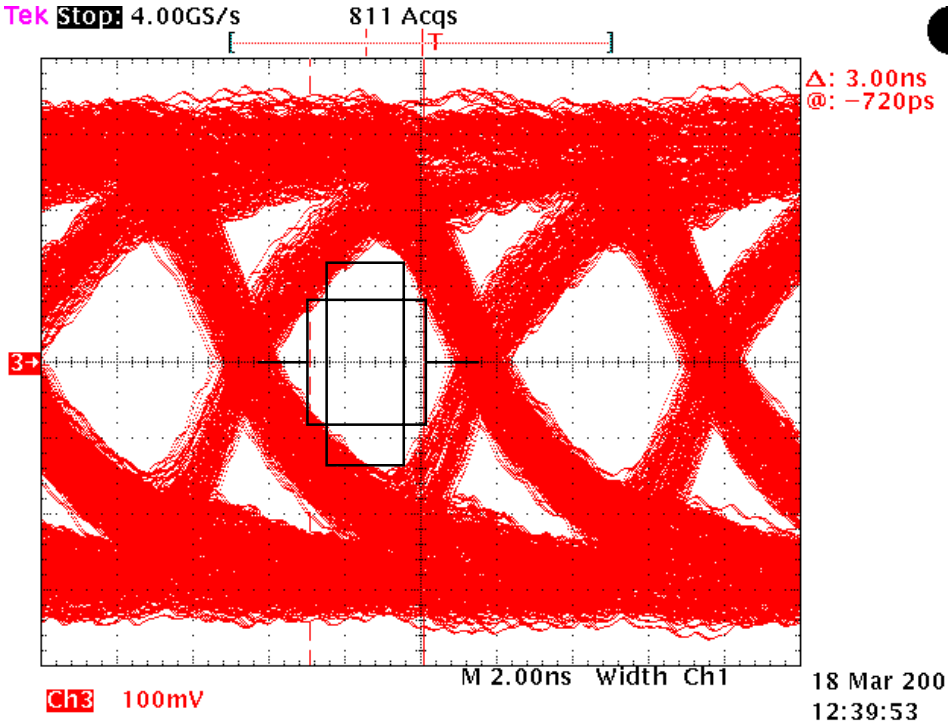


500 mV Amplitude (File 29)

Fig 302

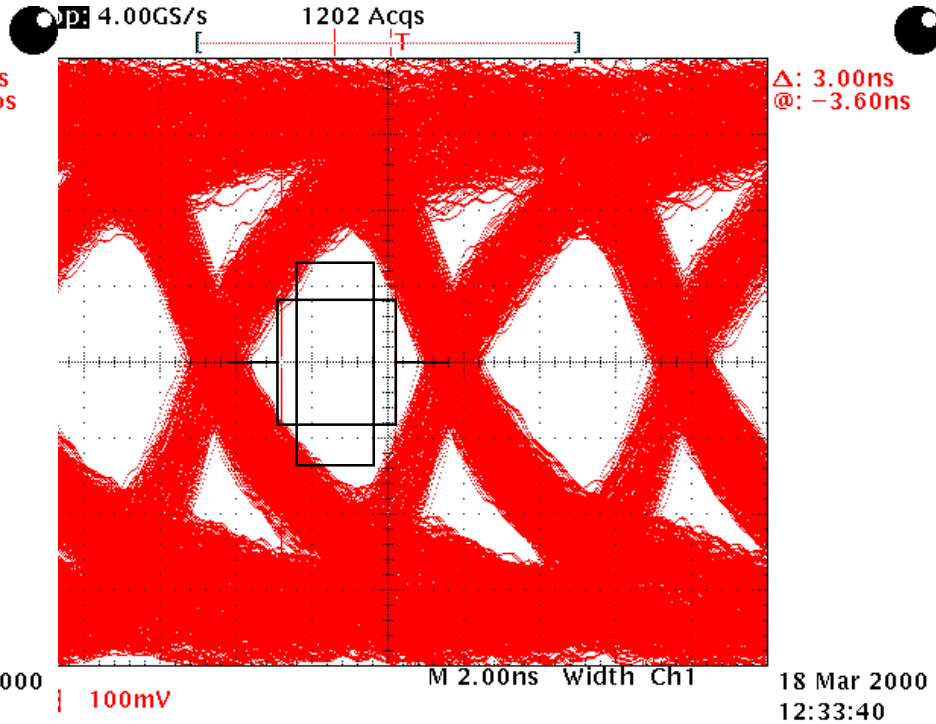
Point-to-Point SEG U2 Backplane -25m Round, Norm Slew, No Precomp

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 44)

400 mV Amplitude



(File 43)

500 mV Amplitude

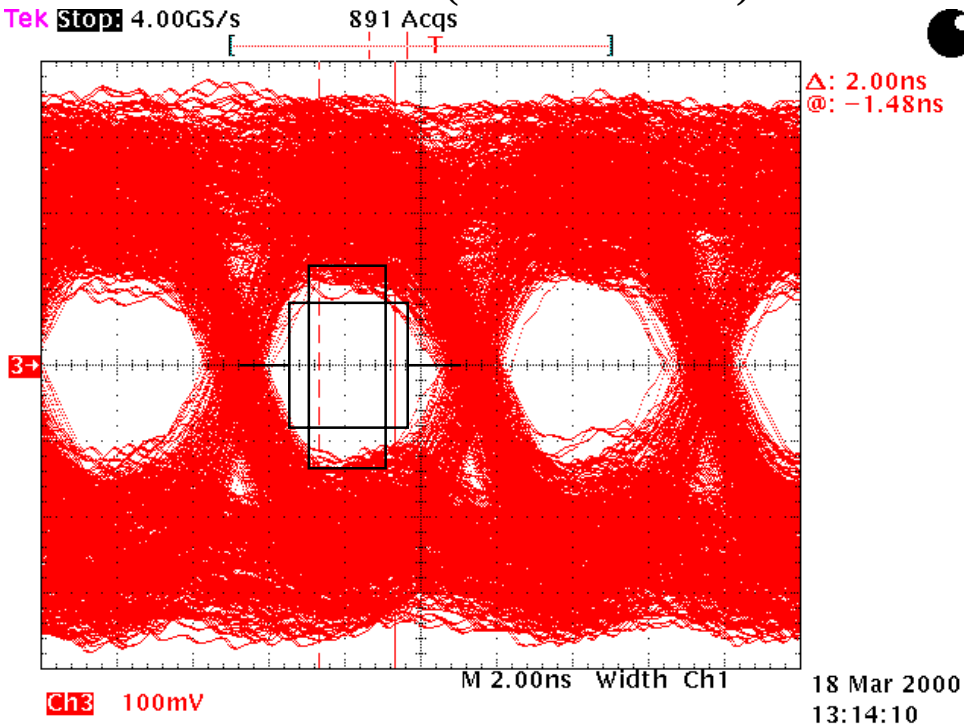
Fig 304

T10/00-194r0

Seagate
Information the way you want it.

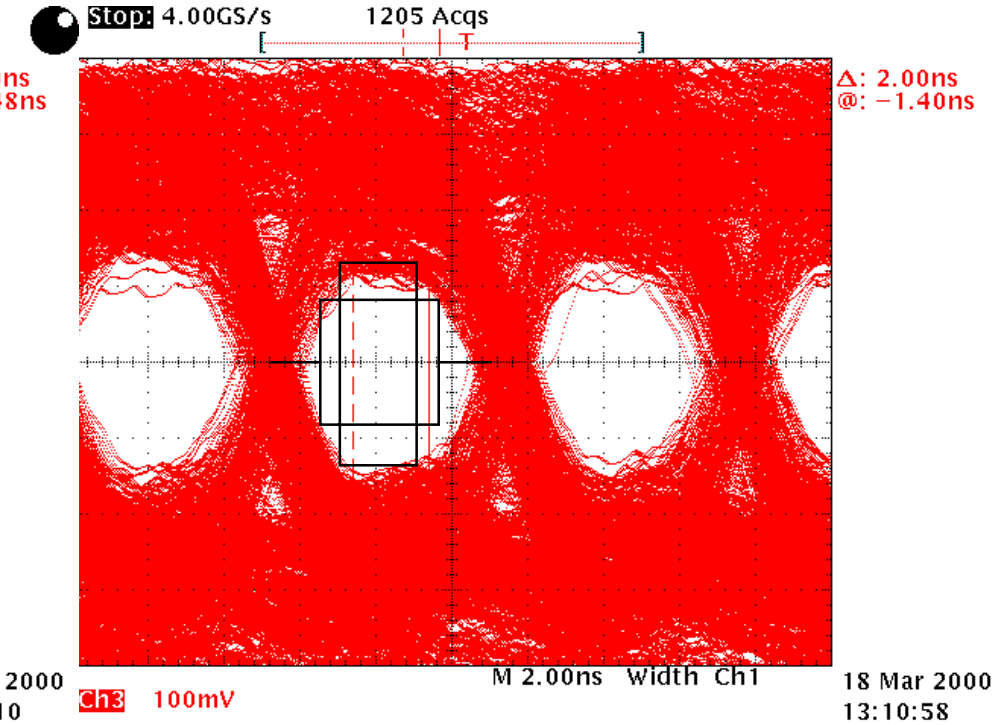
SEG U2 Backplane - 25m Round,15 Loads Nom Slew, No Precomp

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



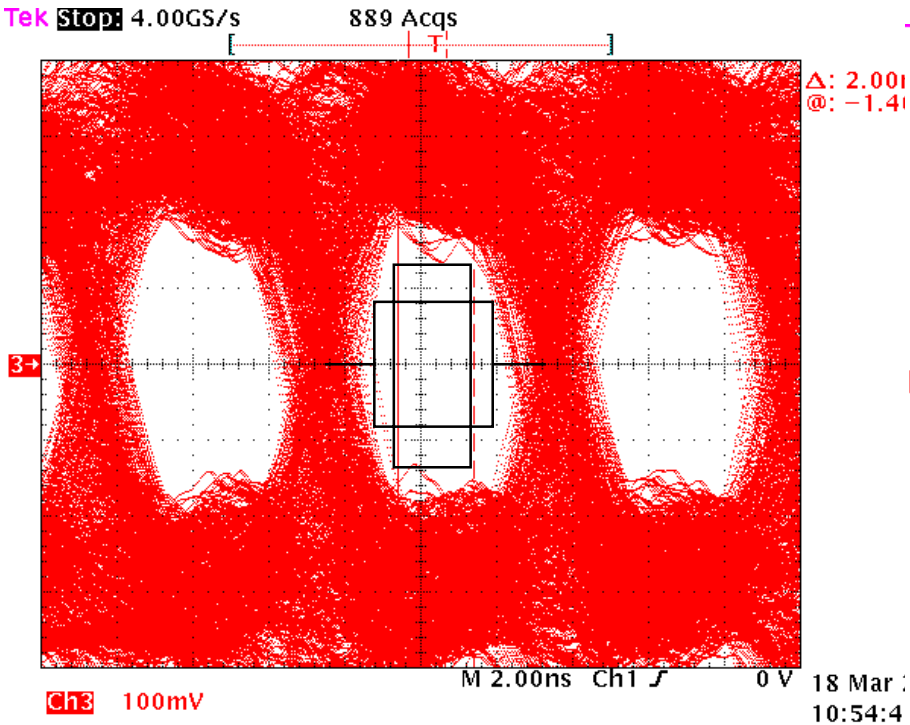
500 mV Amplitude

(File 51)

Fig 305

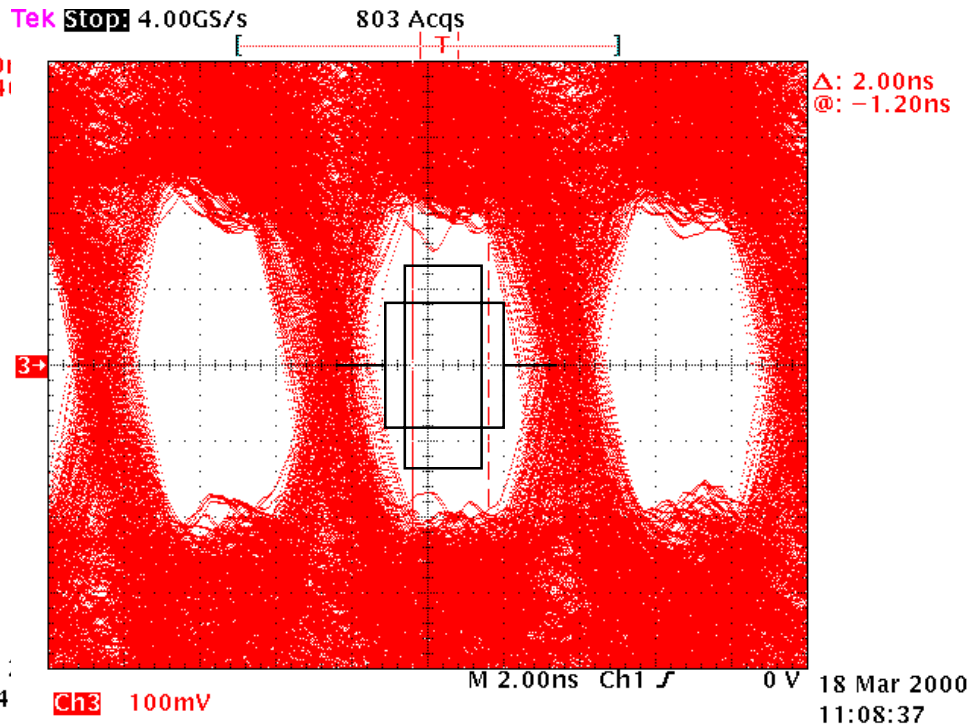
SEG U2 Backplane - 12m Amph, 15 Loads,Fast Slew, No Precomp

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



500 mV Amplitude

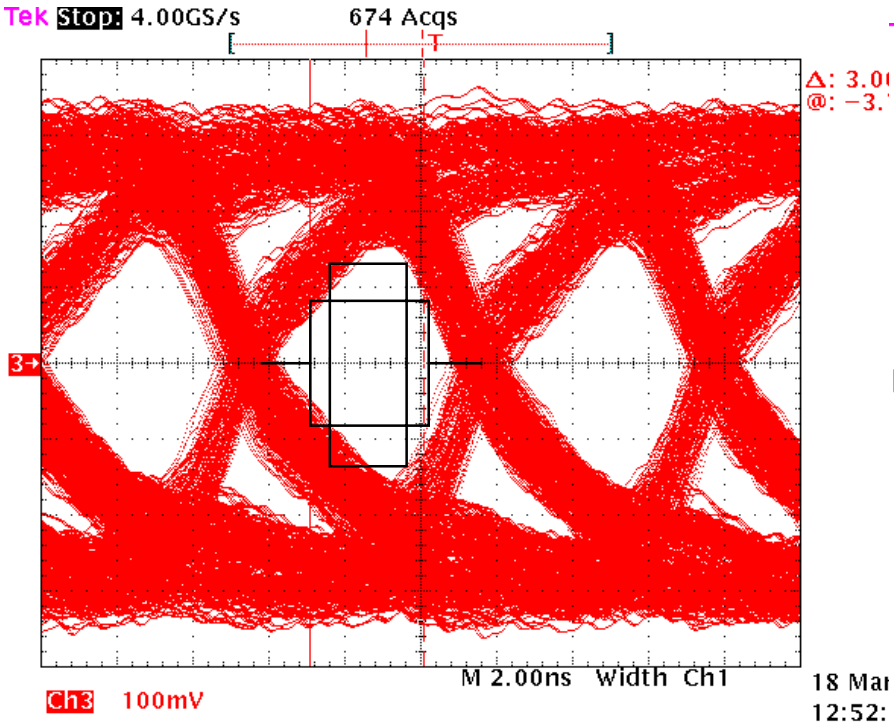
(File 33)

Fig 306

Seagate
Information the way you want it.

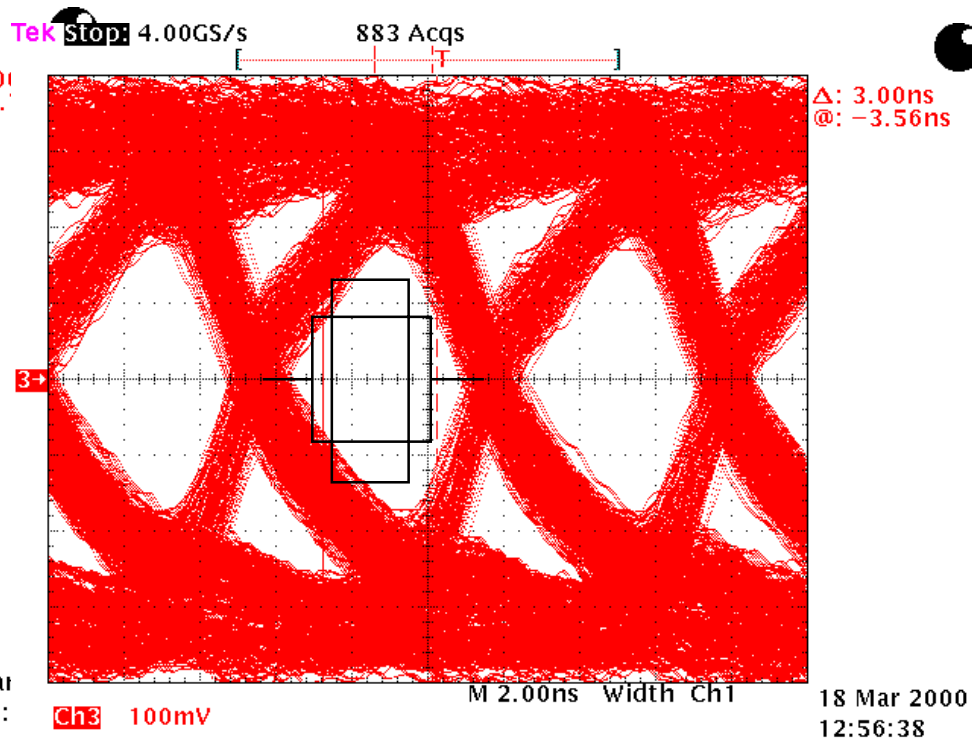
Point-to-Point SEG U2 Backplane - 25m Round, Fast Slew, No Precomp

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).



(File 47)

400 mV Amplitude



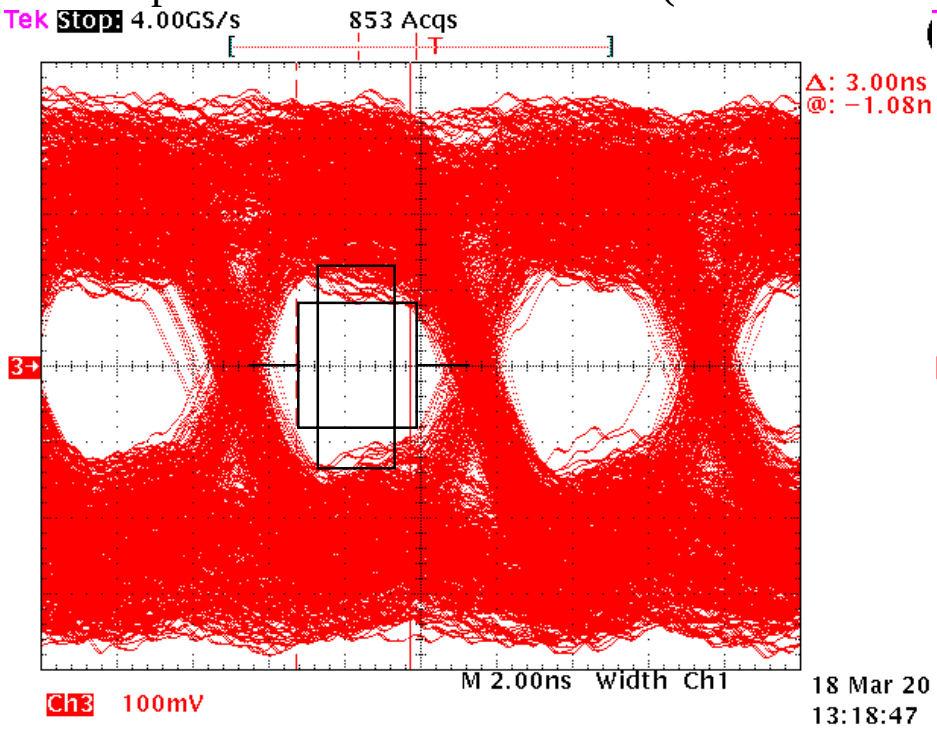
(File 48)

500 mV Amplitude

Fig 308

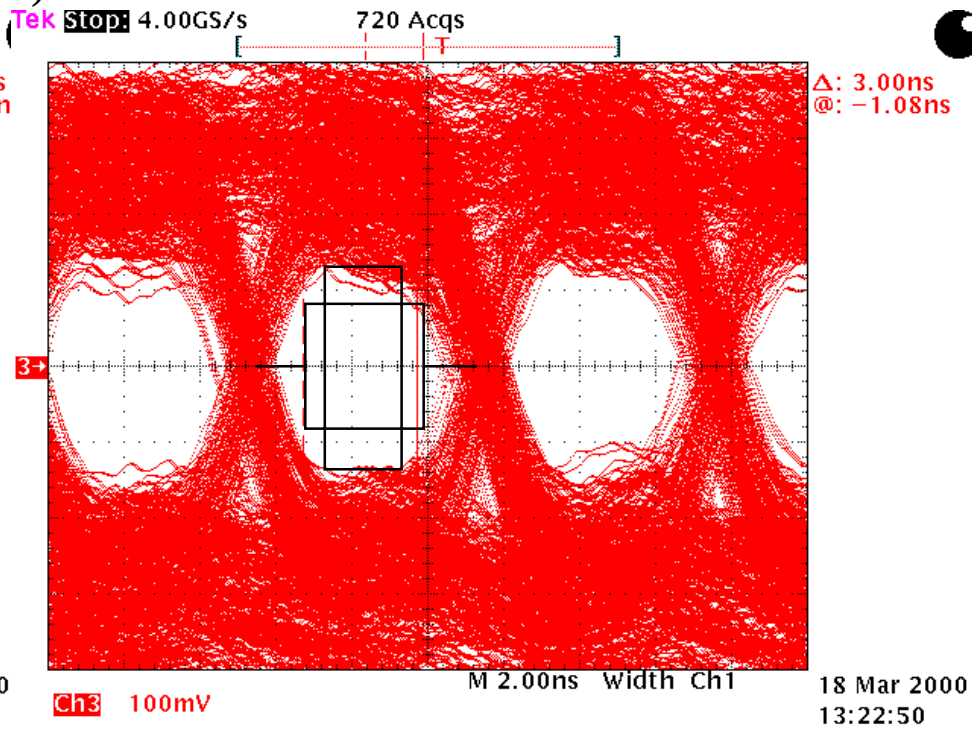
SEG U2 Backplane - 25m Round,15 Loads, Fast Slew, No Precomp

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



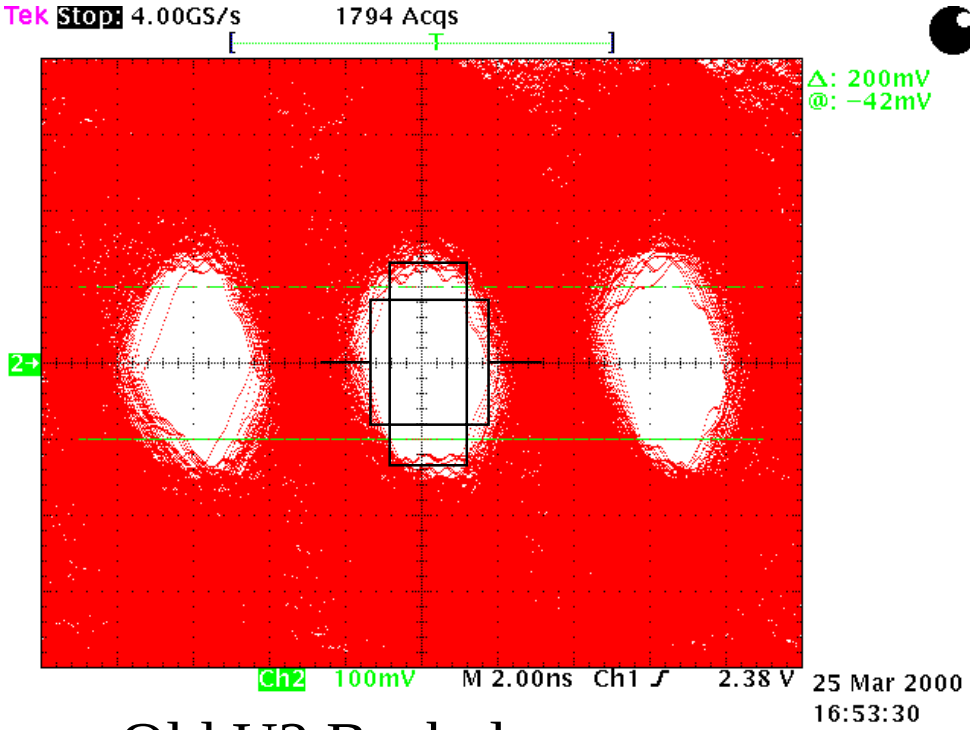
(File 54)

500 mV Amplitude

Fig 309

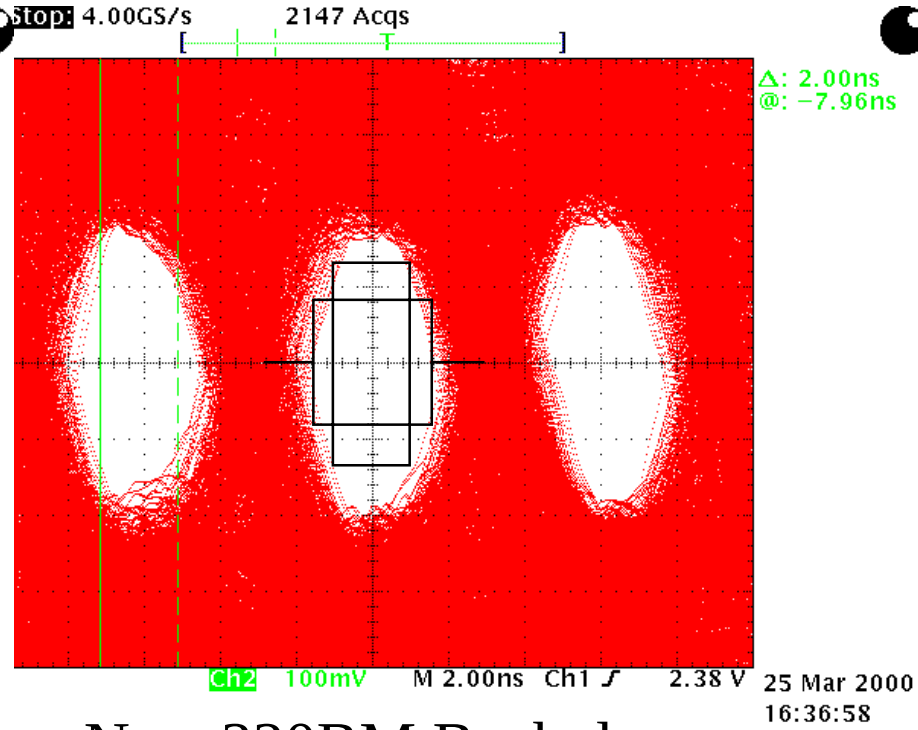
SEG 320BM Backplane -12m Amph, 15 Loads, Nom Slew, No Pre

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

Disk 18 File 2



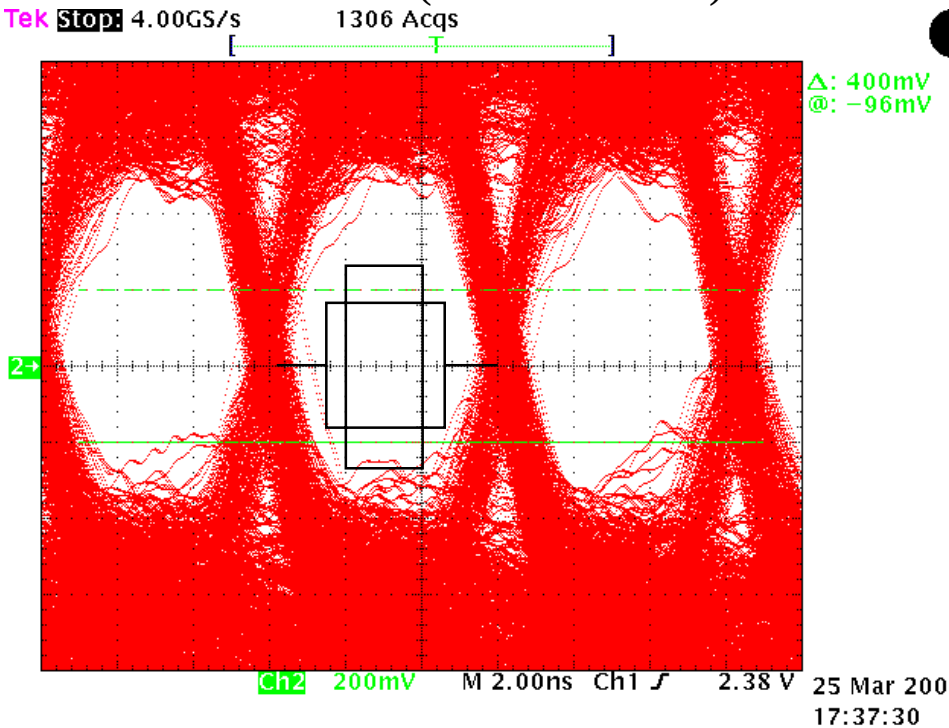
New 320BM Backplane

Disk 18 File 1

Fig 310

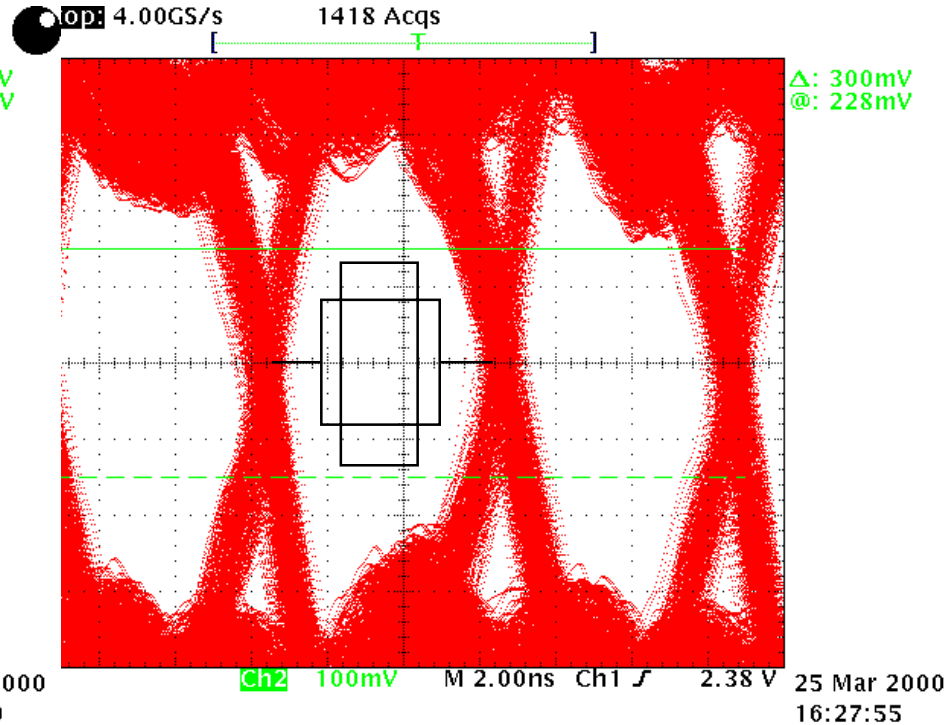
SEG 320BM Backplane -18" Amph, 15 Loads, Nom Slew, No Pre

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

Fig 311

320 MB Eye Pattern Data with 15-25-33% Precomp and Crosstalk

Controller Development Engineering

Scotts Valley

#00-194

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Generator Driver, Example @ 33% Cutback

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

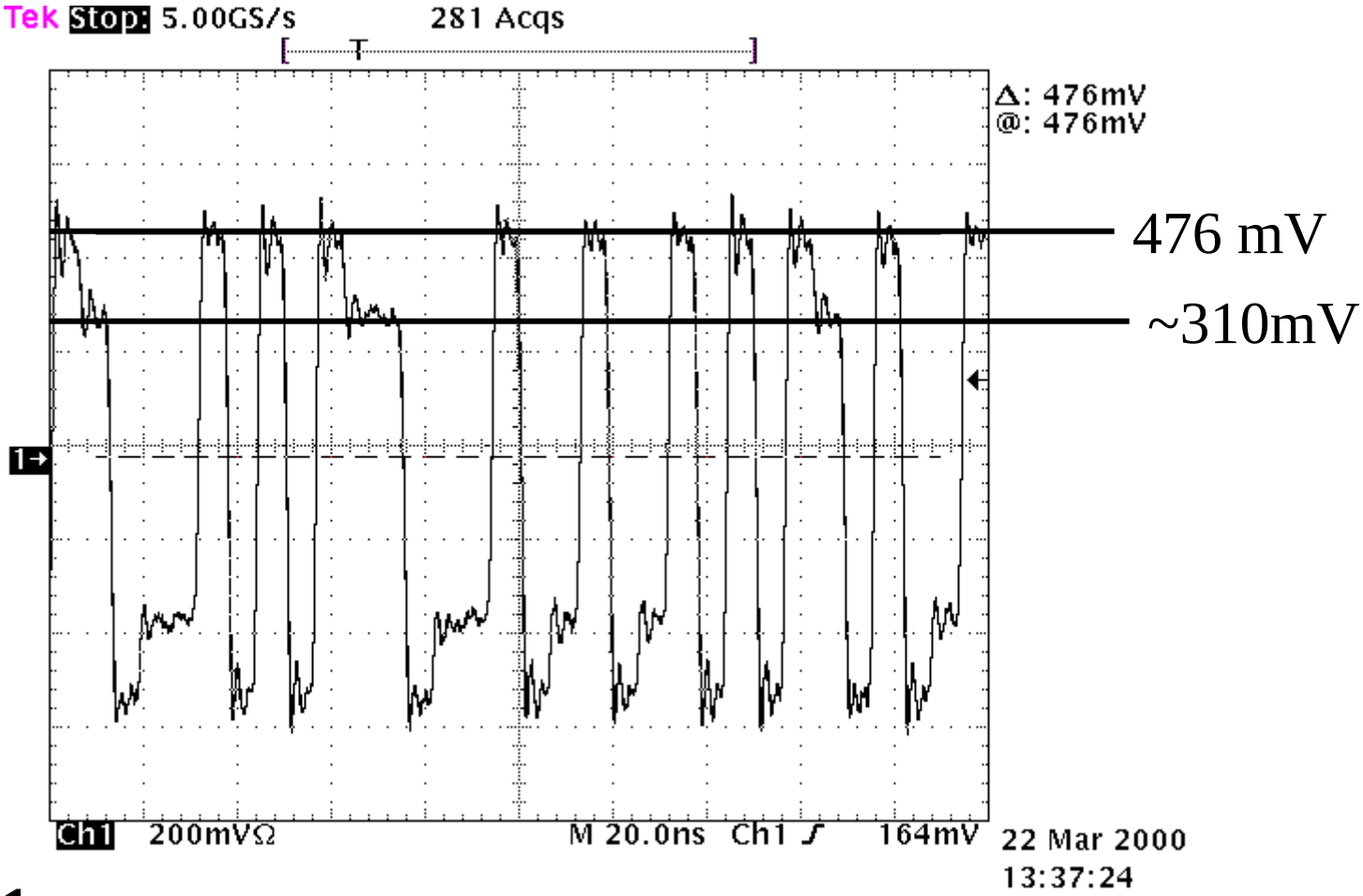


Fig 201

Generator Driver with No Precomp

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

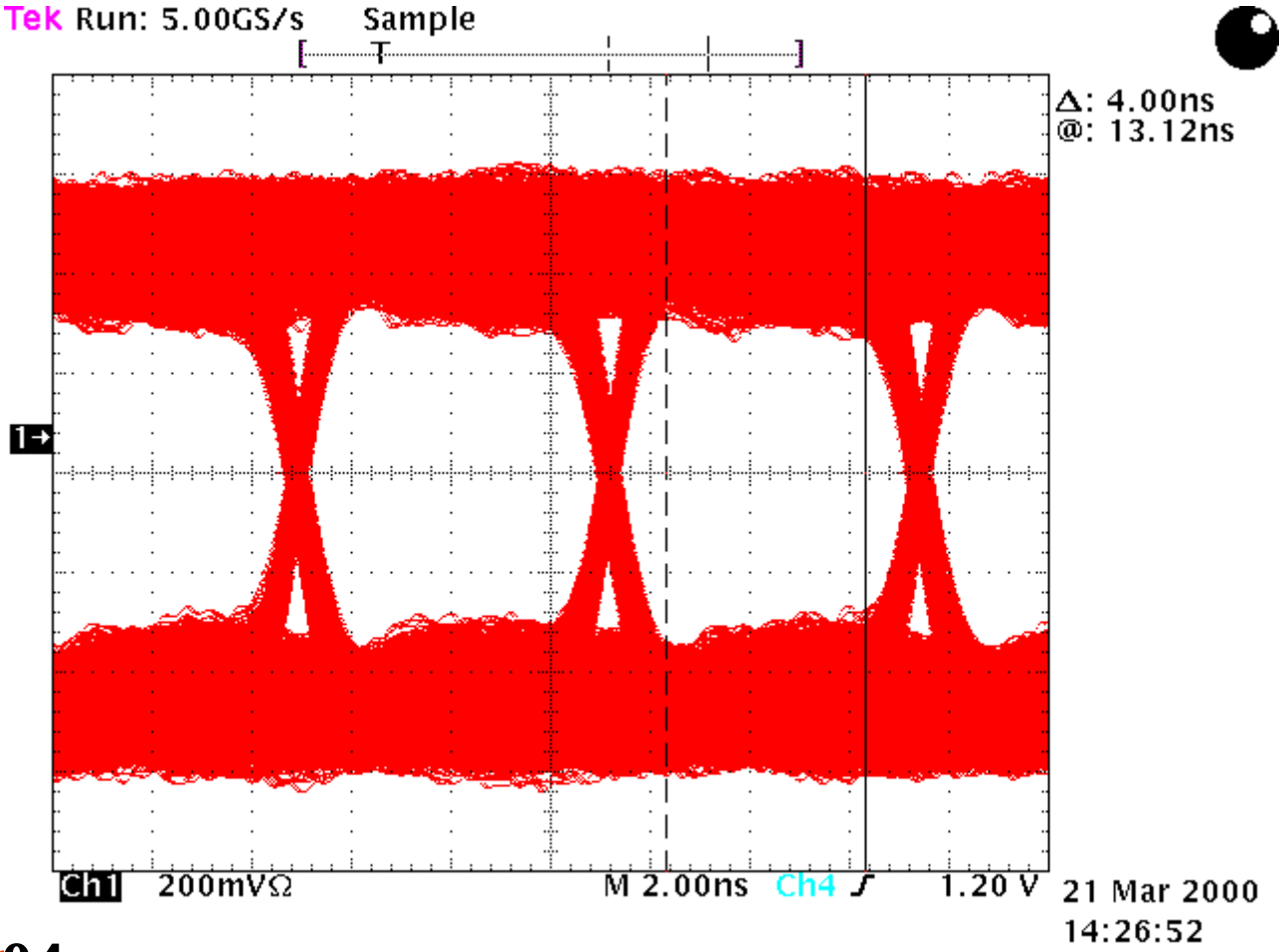


Fig 204

Generator Driver with Precomp

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

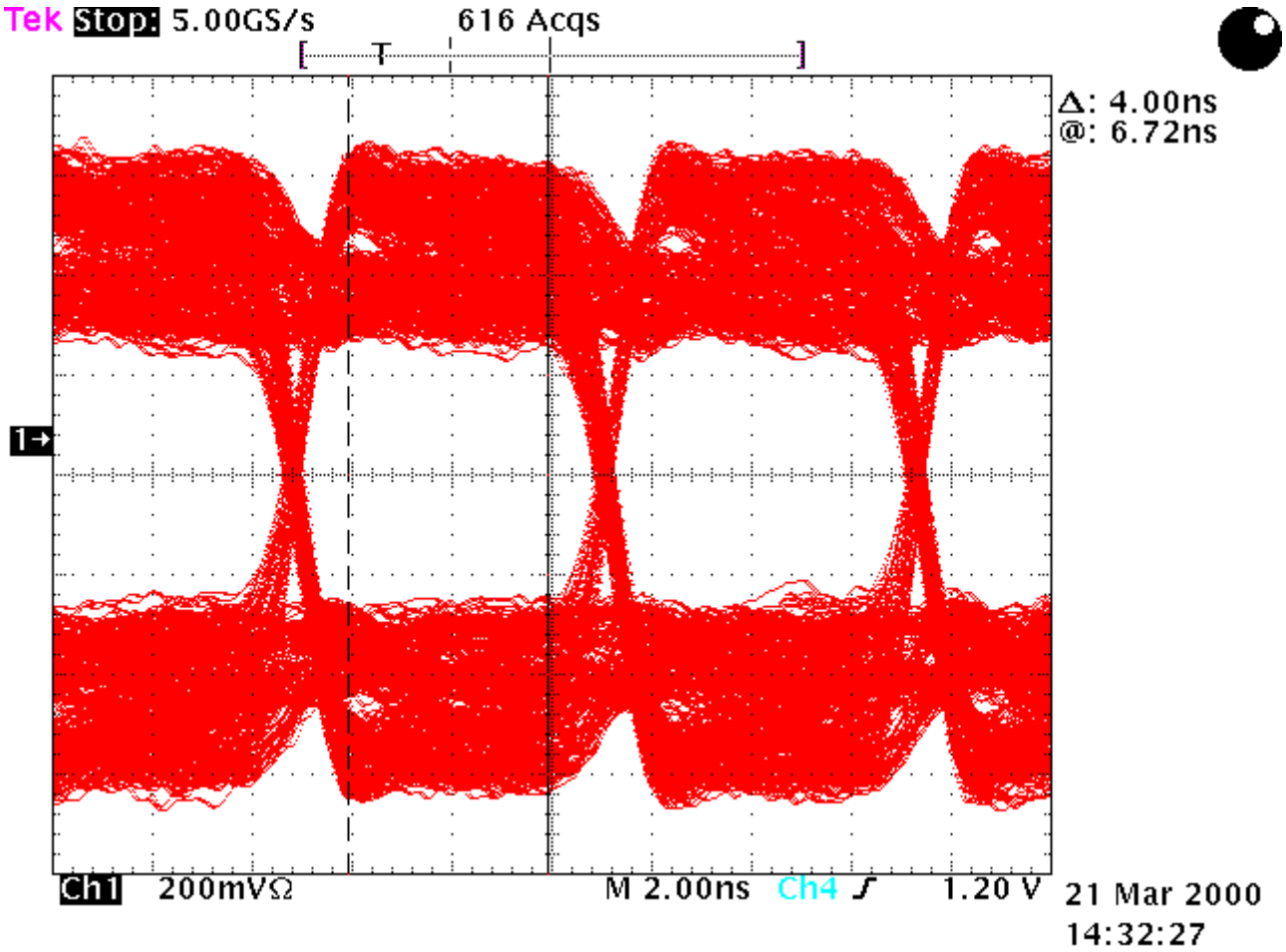


Fig 205

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

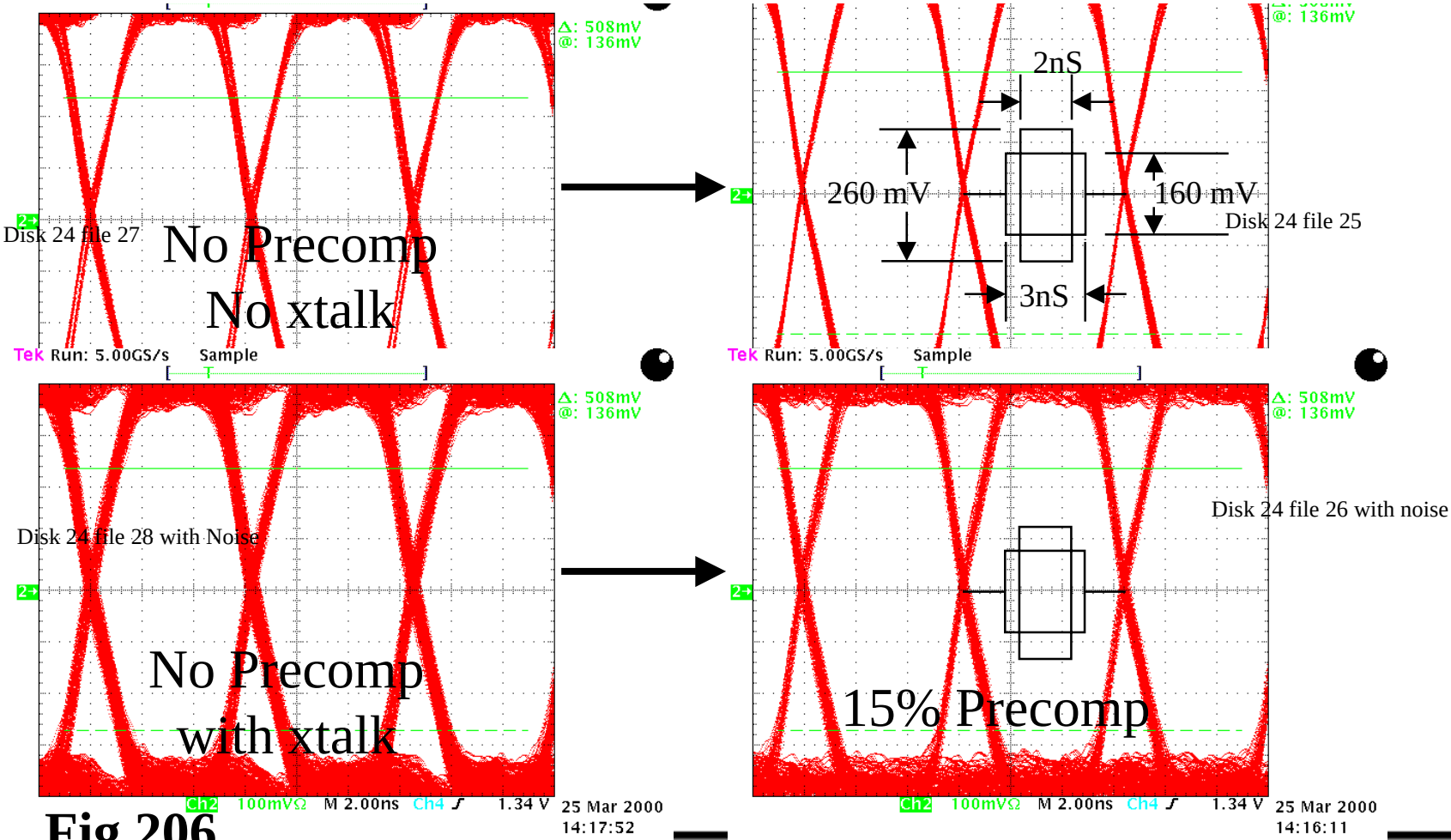


Fig 206

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

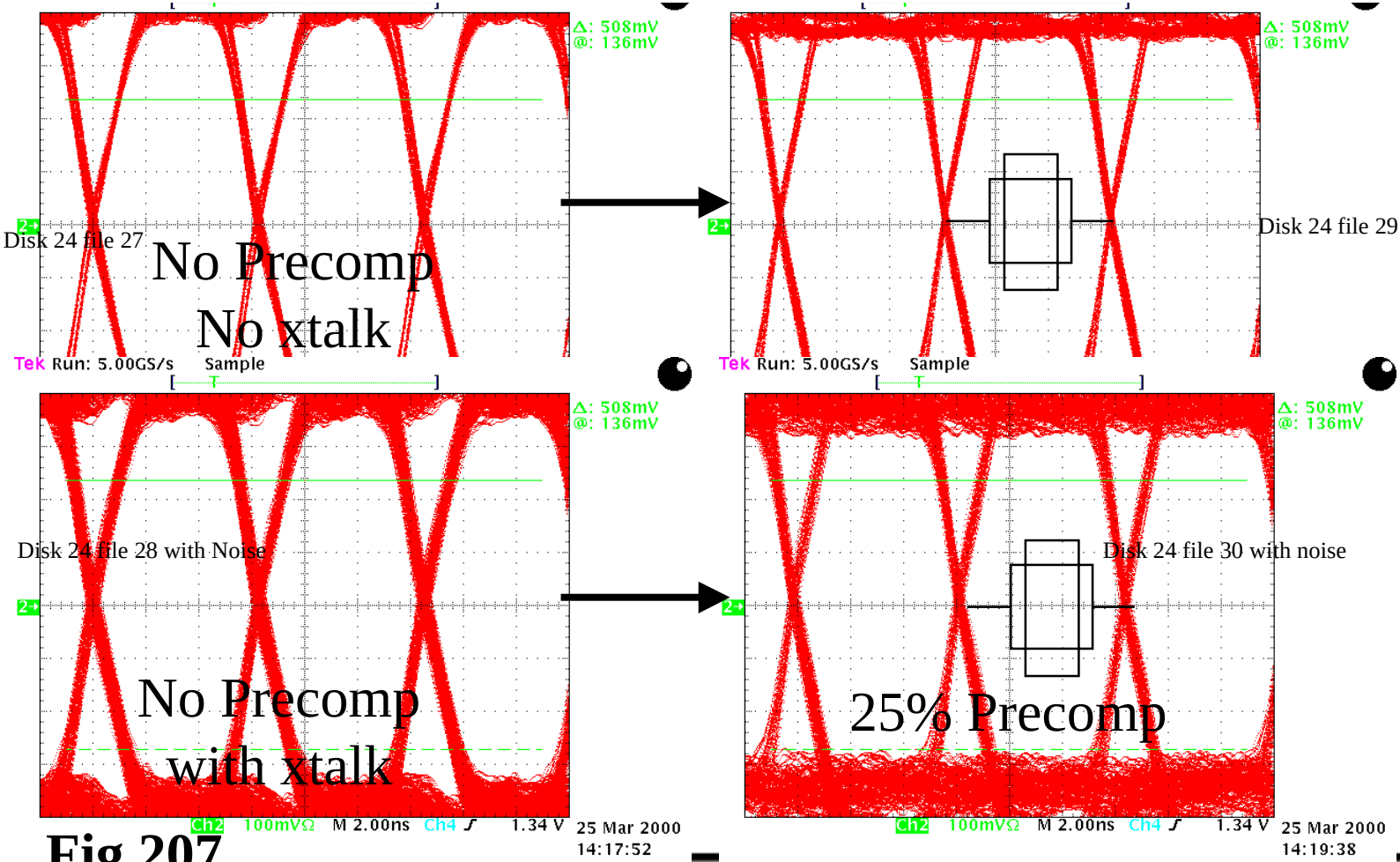


Fig 207

Seagate
Information the way you want it.

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

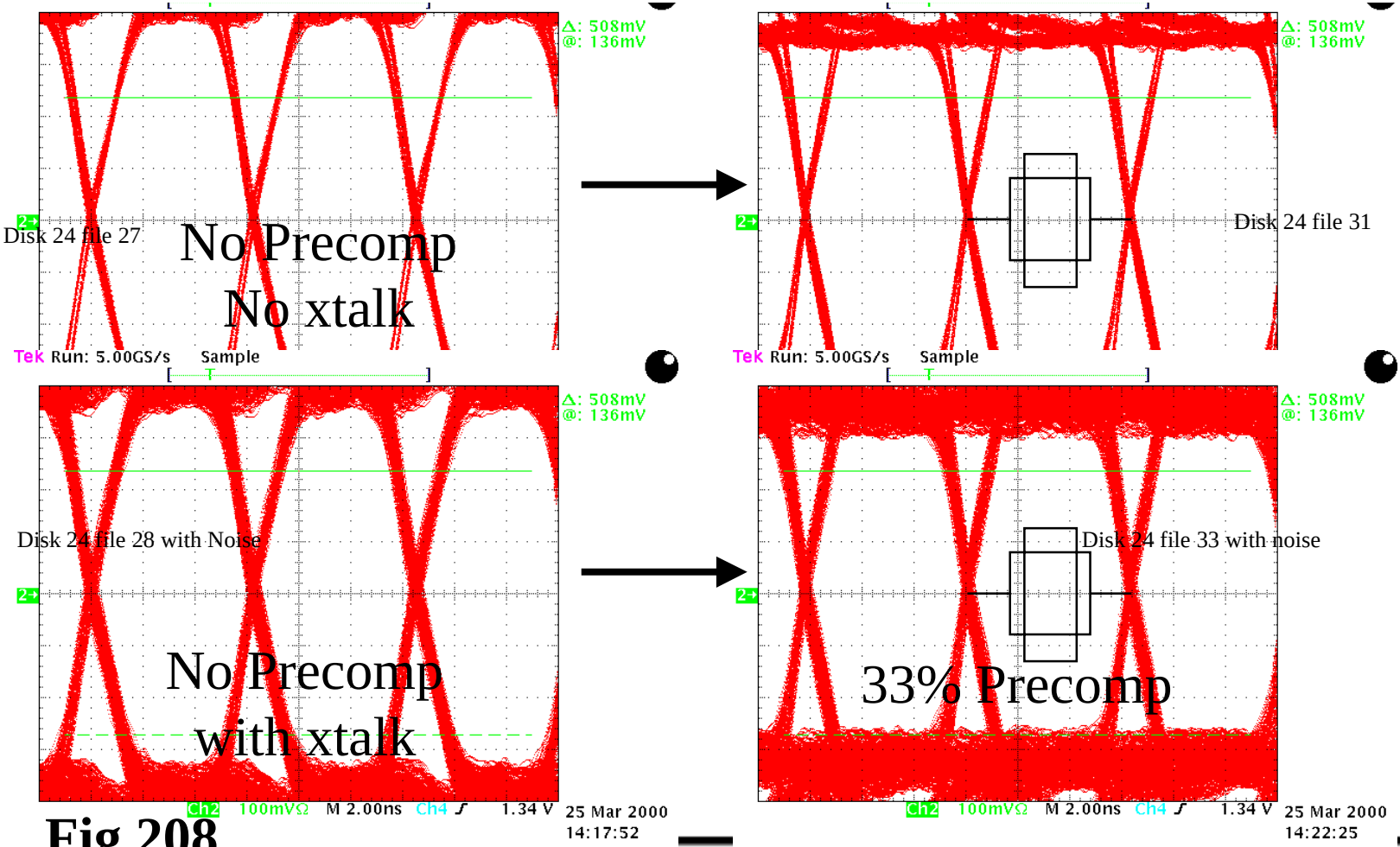


Fig 208

Seagate
Information the way you want it.

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

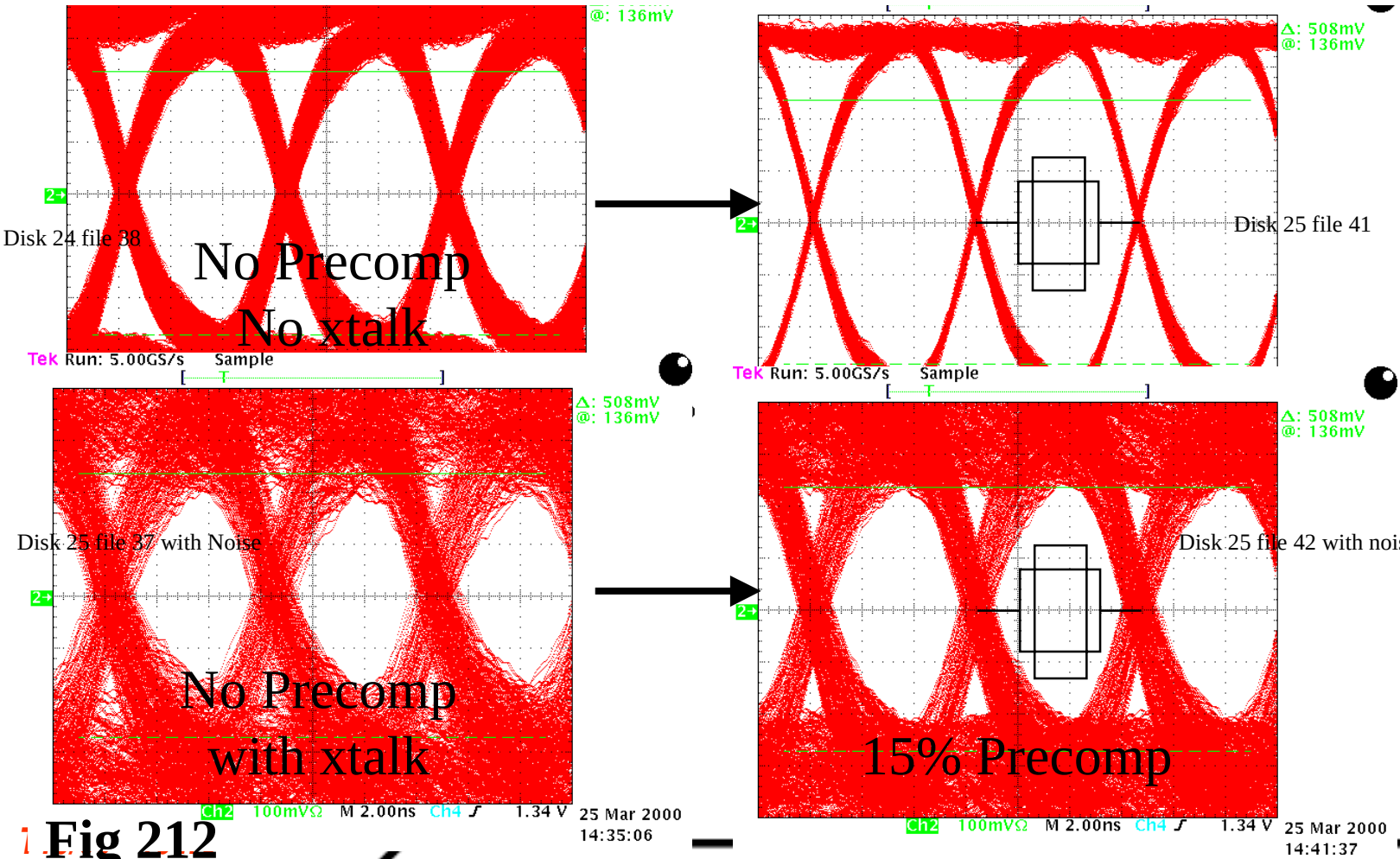


Fig 212

Seagate
Information the way you want it.

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

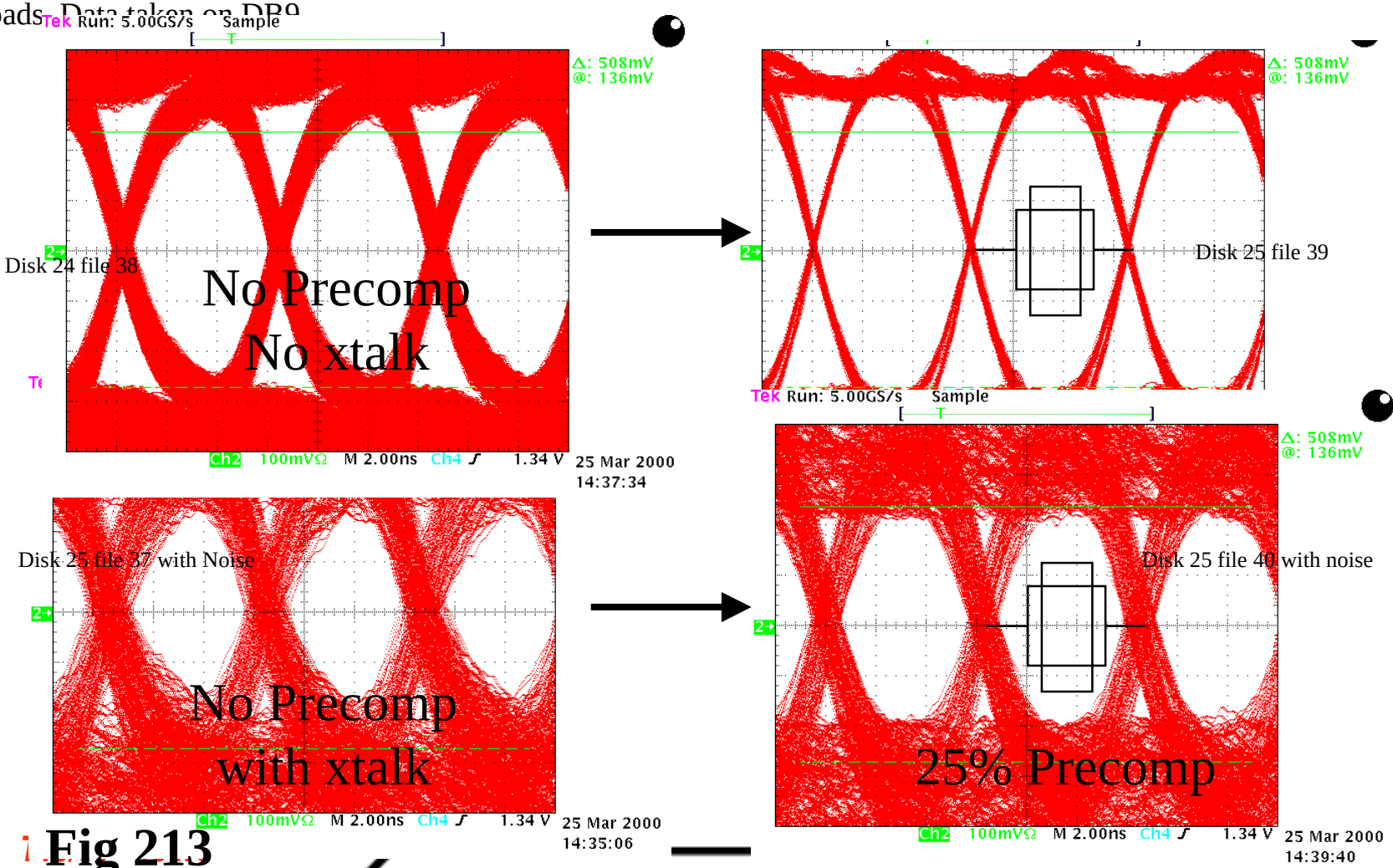


Fig 213

Seagate
Information the way you want it.

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

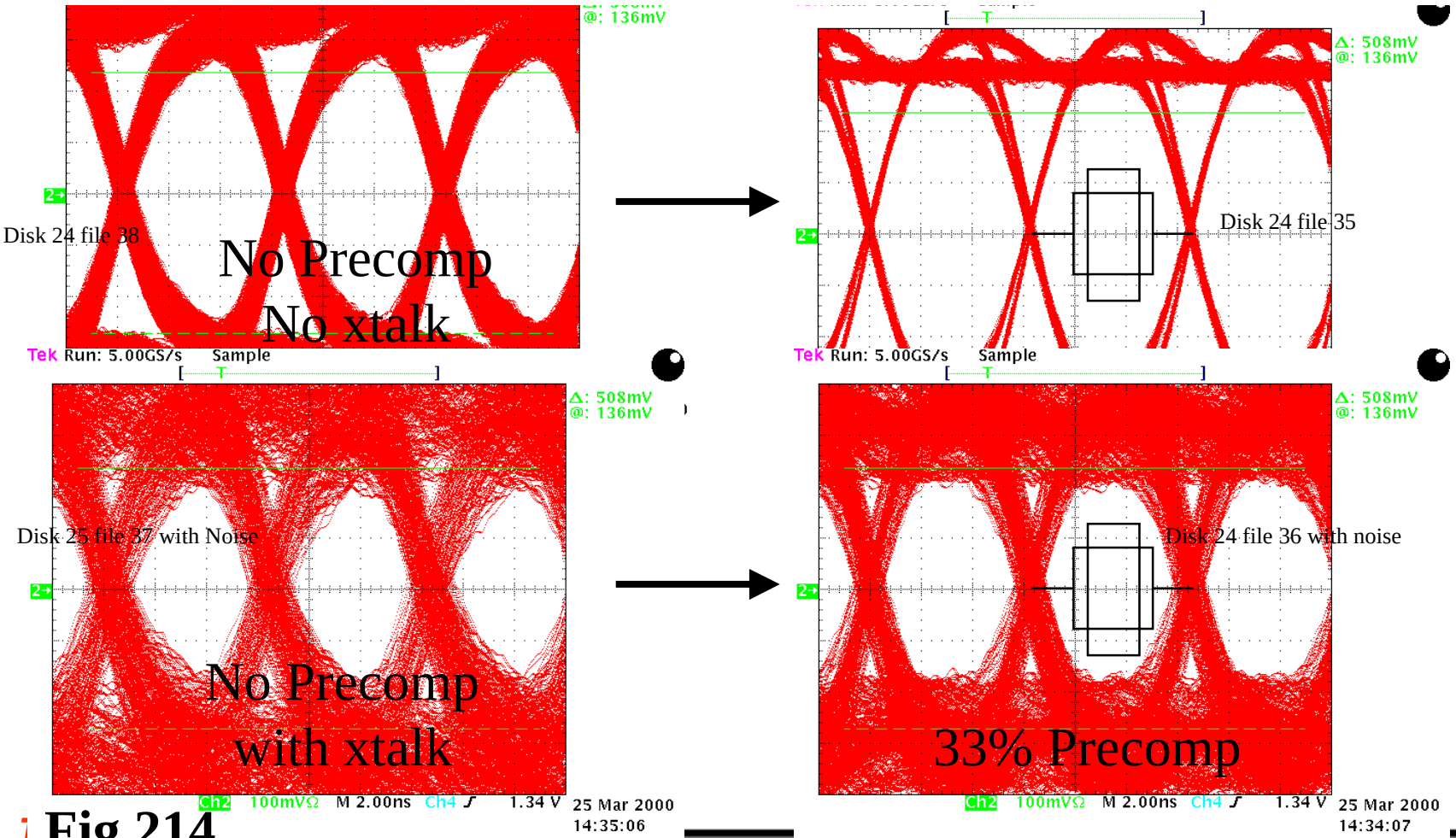
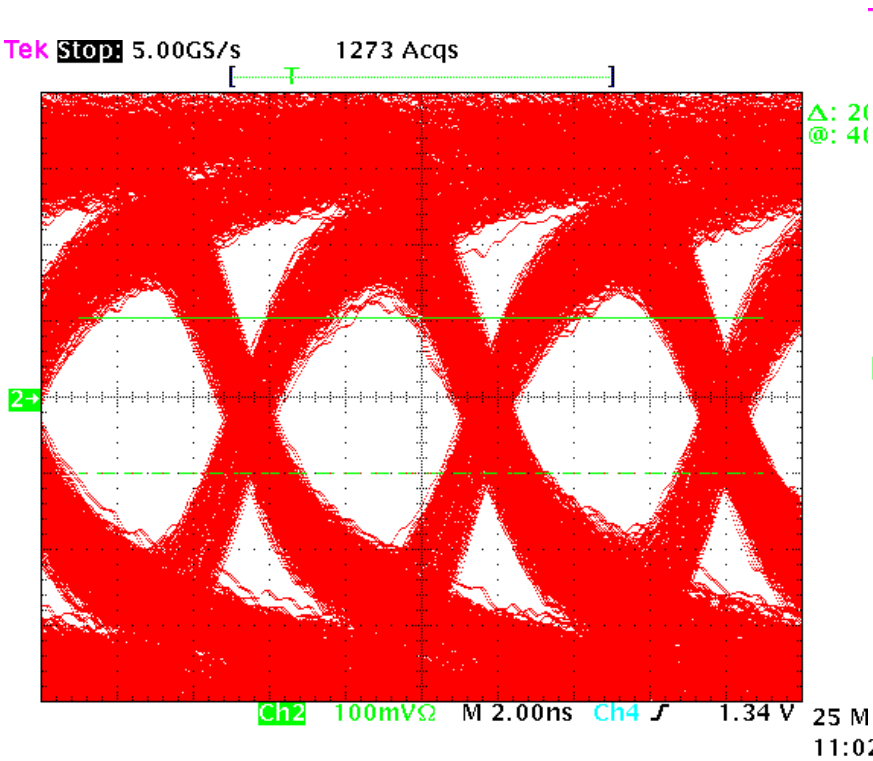


Fig 214

Seagate
Information the way you want it.

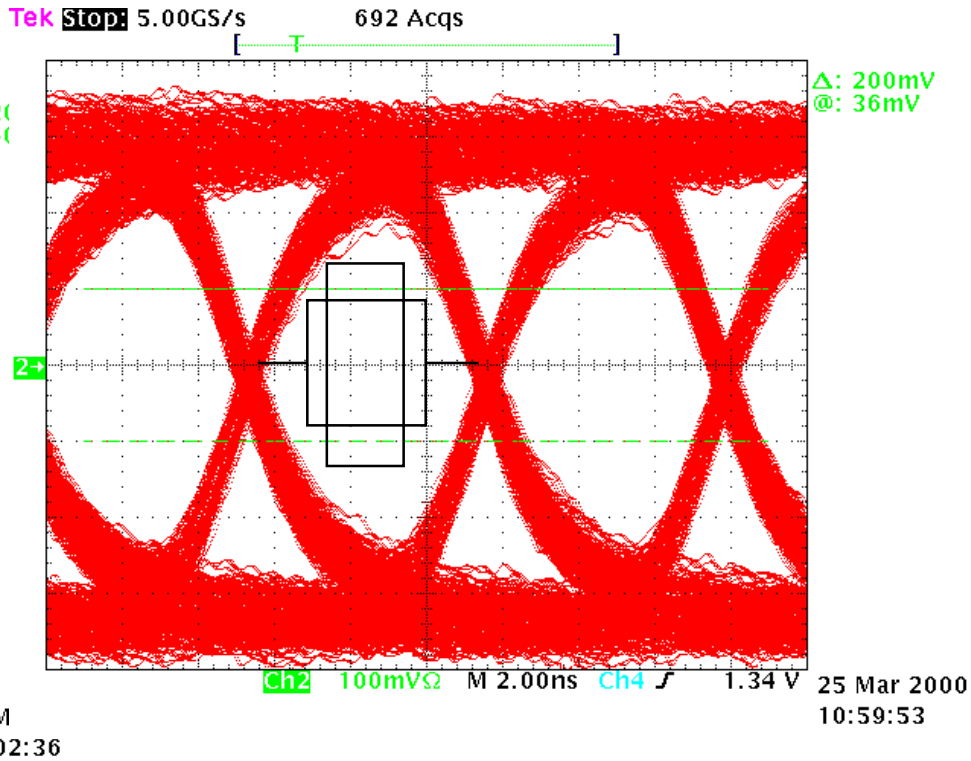
Point-to-Point - 25m round, 15% Precomp

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



Disk 20 file8

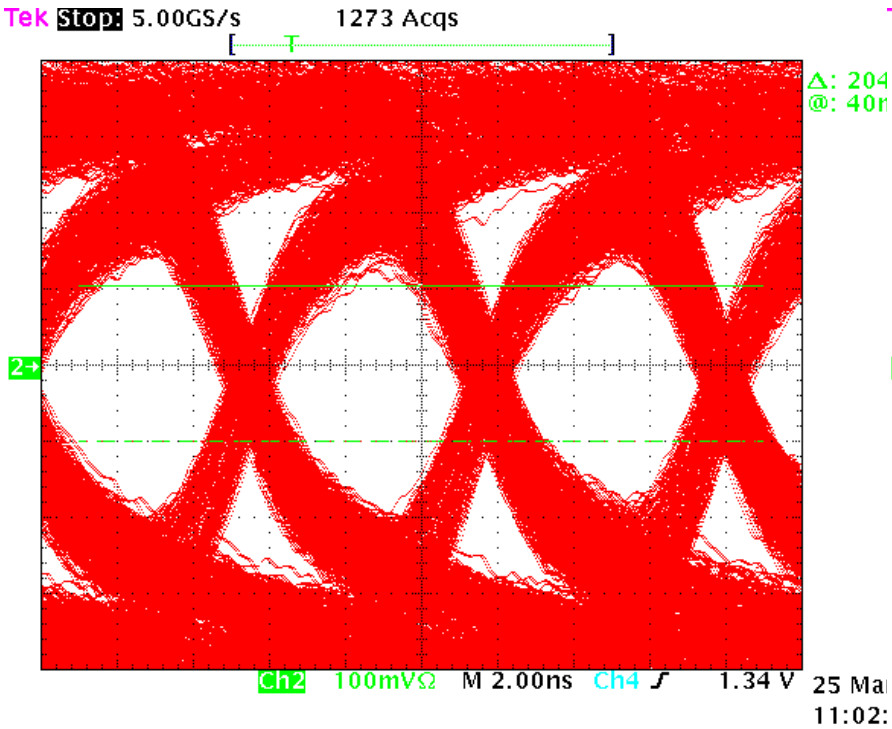
15% Precomp

Fig 215

Seagate
Information the way you want it.

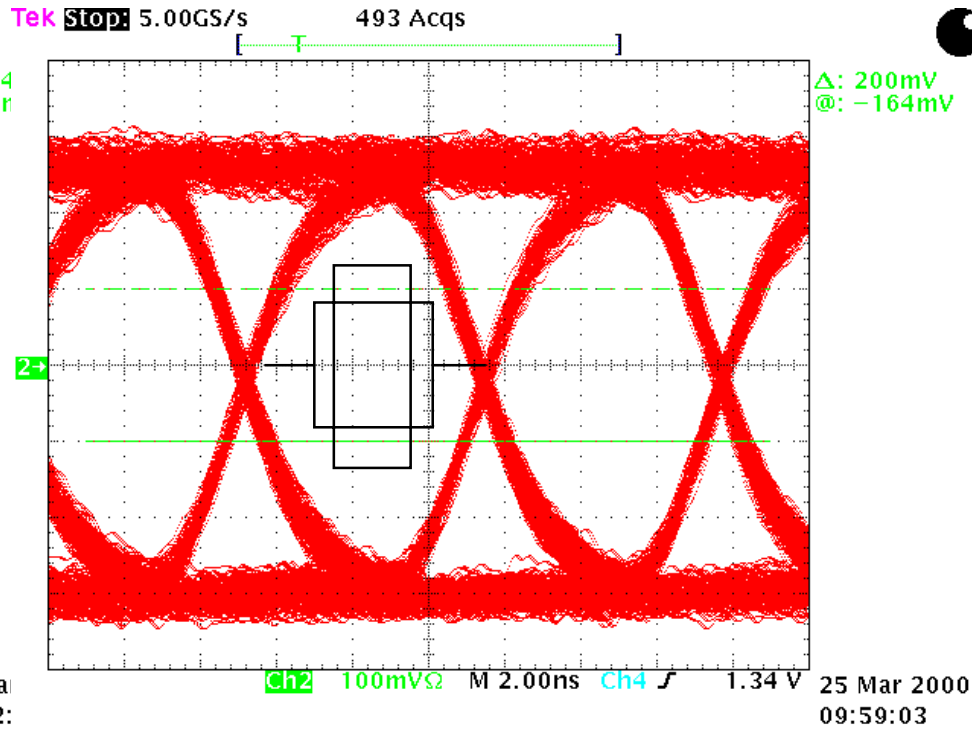
Point-to-Point - 25m round, 25% Precomp

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



Disk 20 file 9

No Precomp
with xtalk



Disk 20 file 6

25% Precomp

Fig 216

Seagate
Information the way you want it.

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

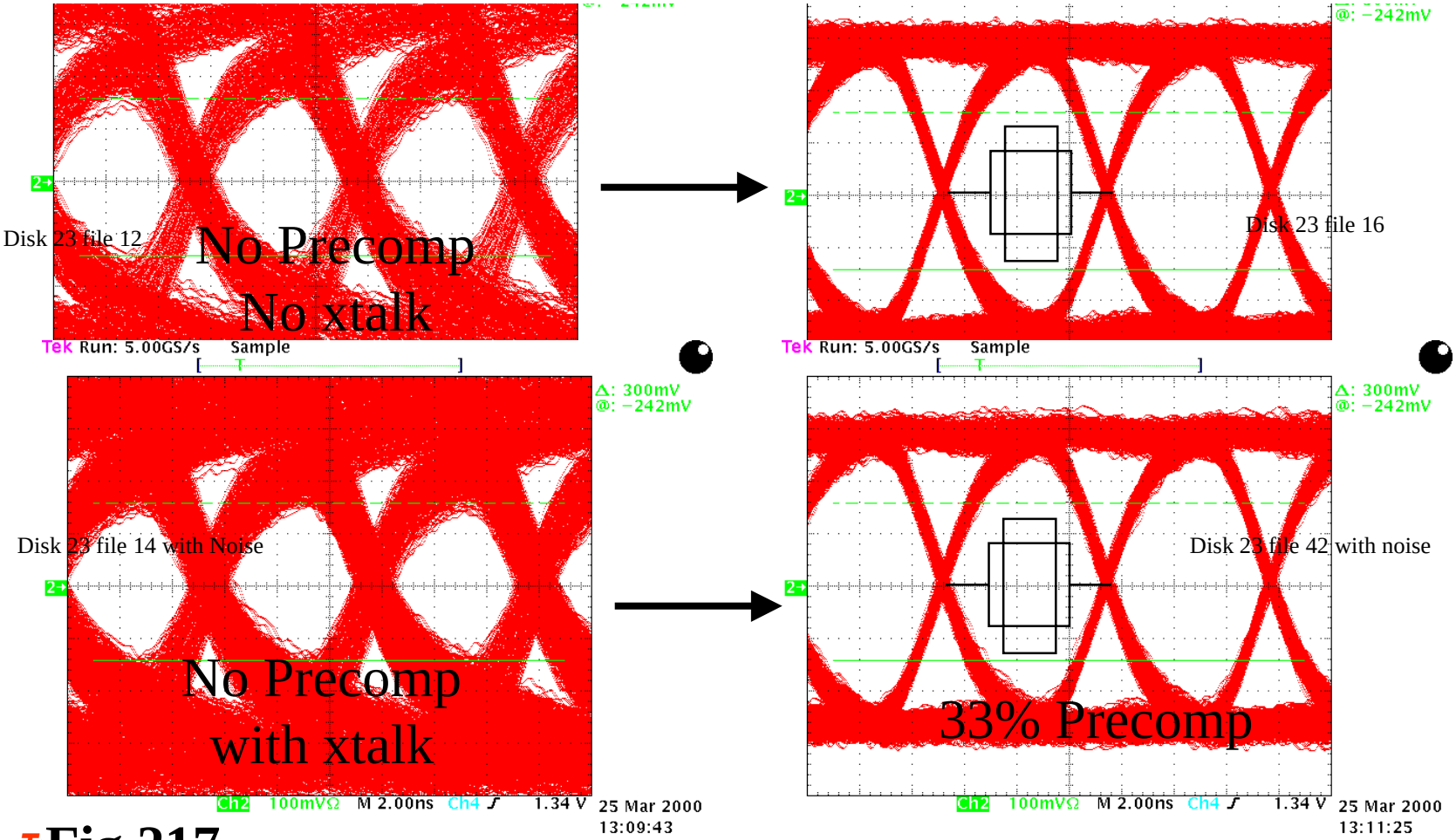


Fig 217

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

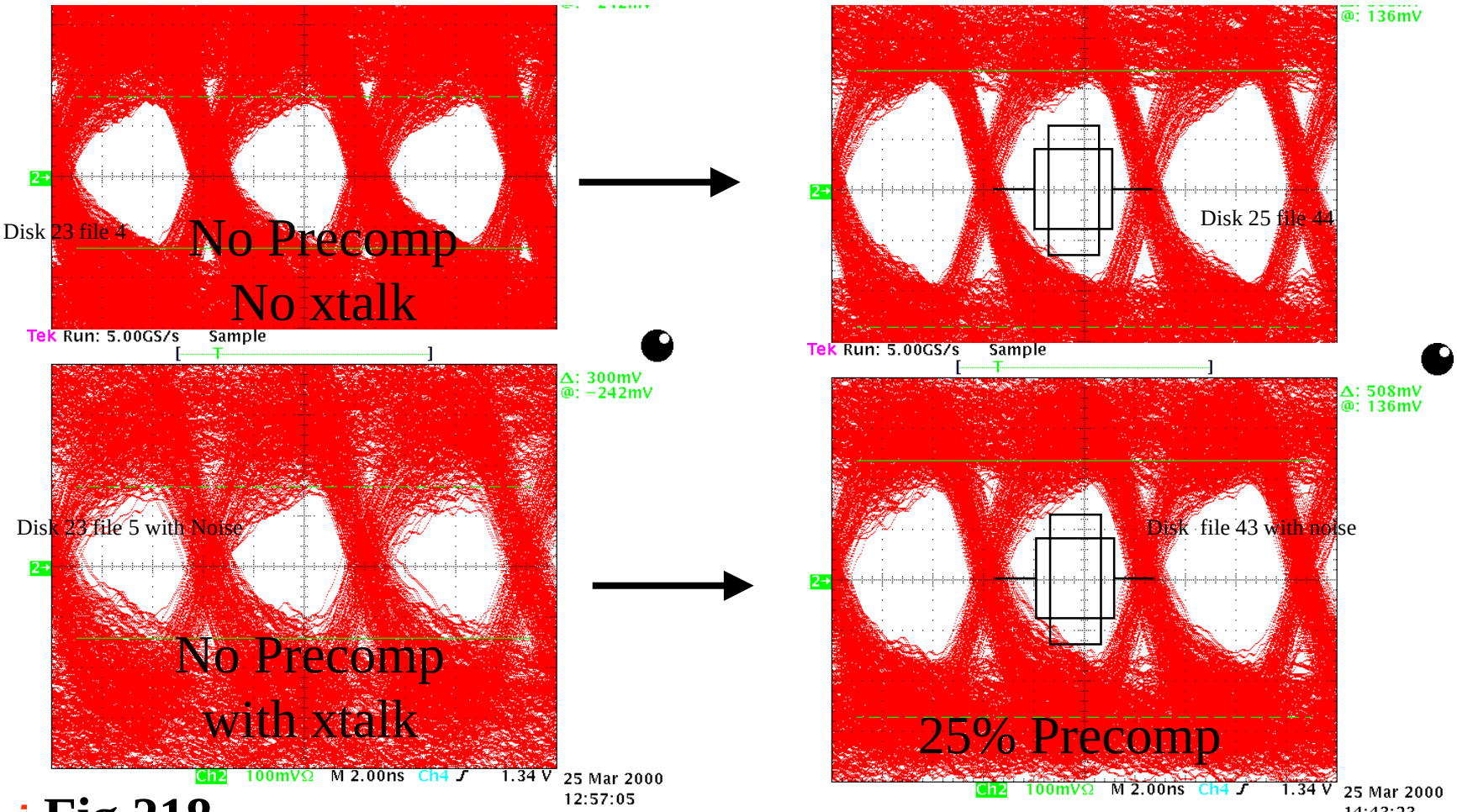


Fig 218

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

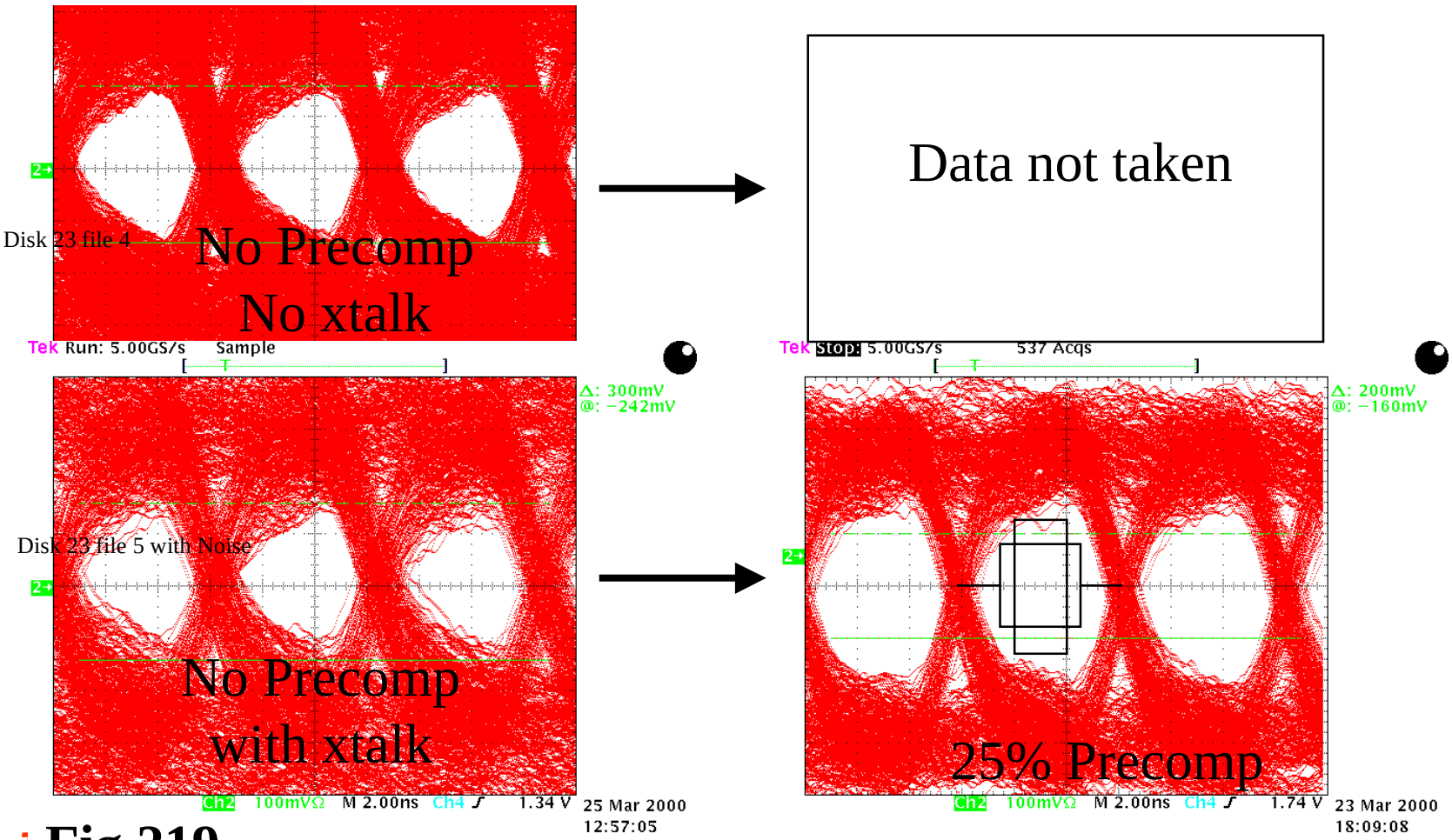


Fig 219

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

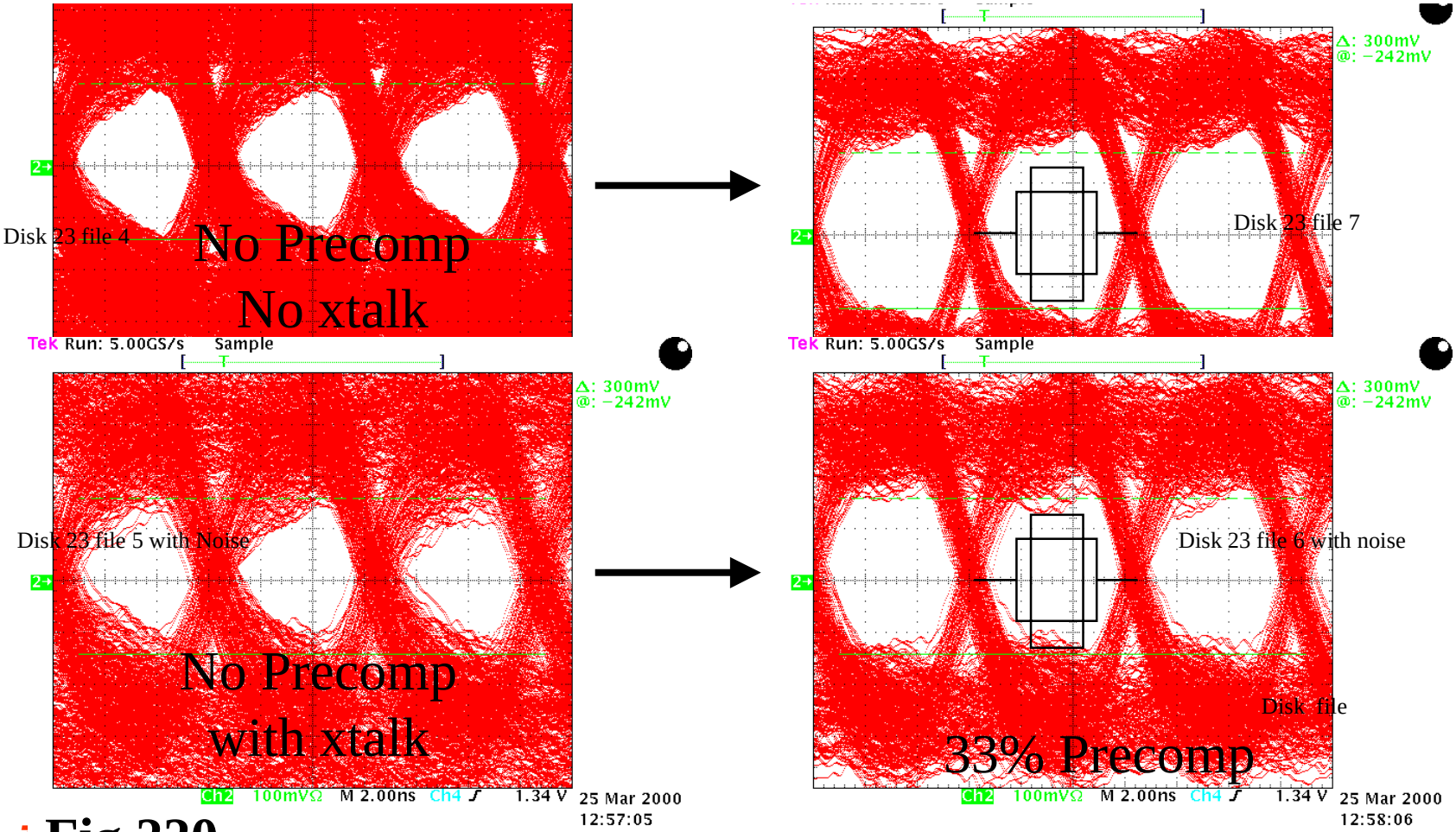


Fig 220

Seagate
Information the way you want it.

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

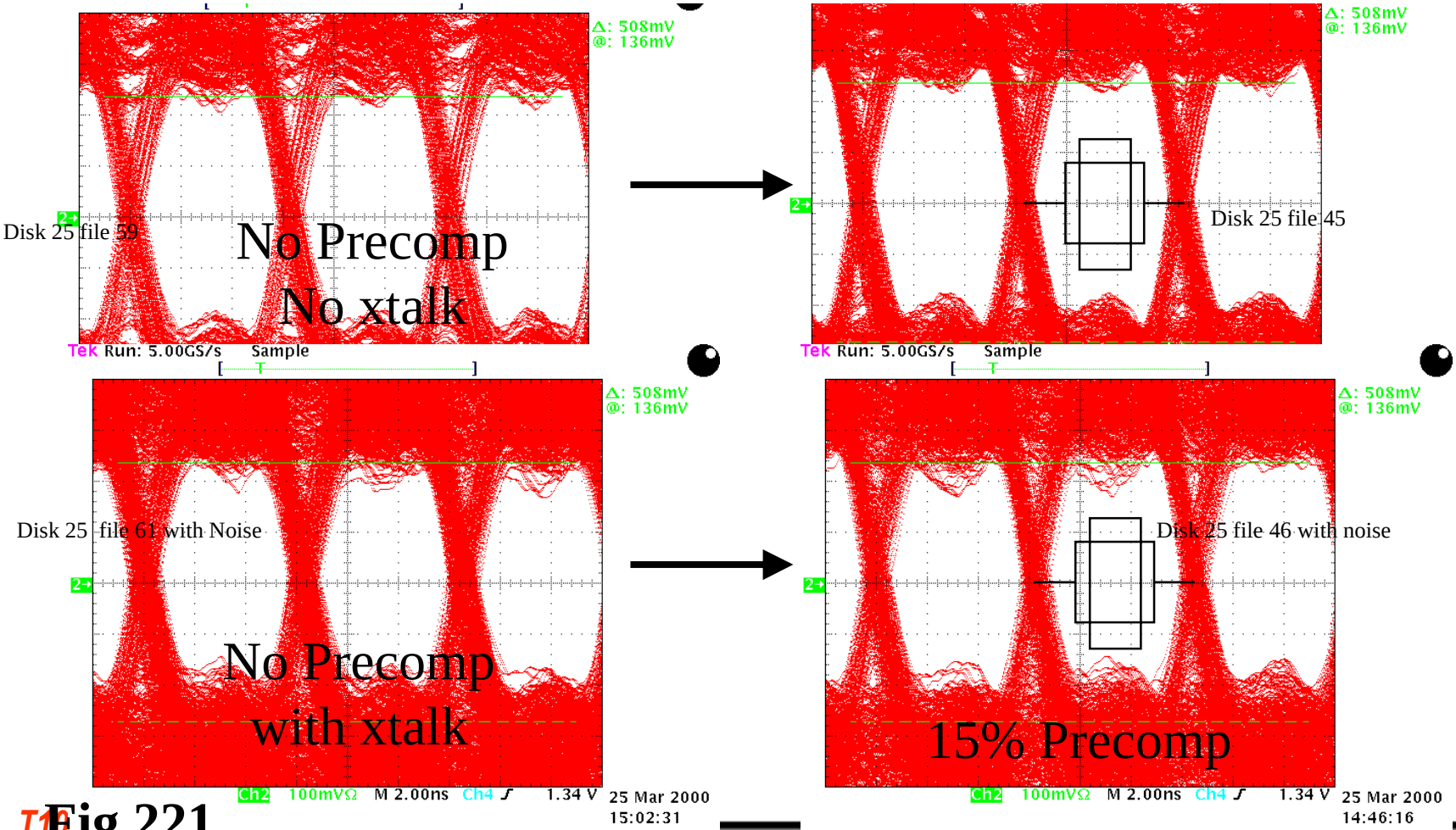


Fig 221

Seagate
Information the way you want it.

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

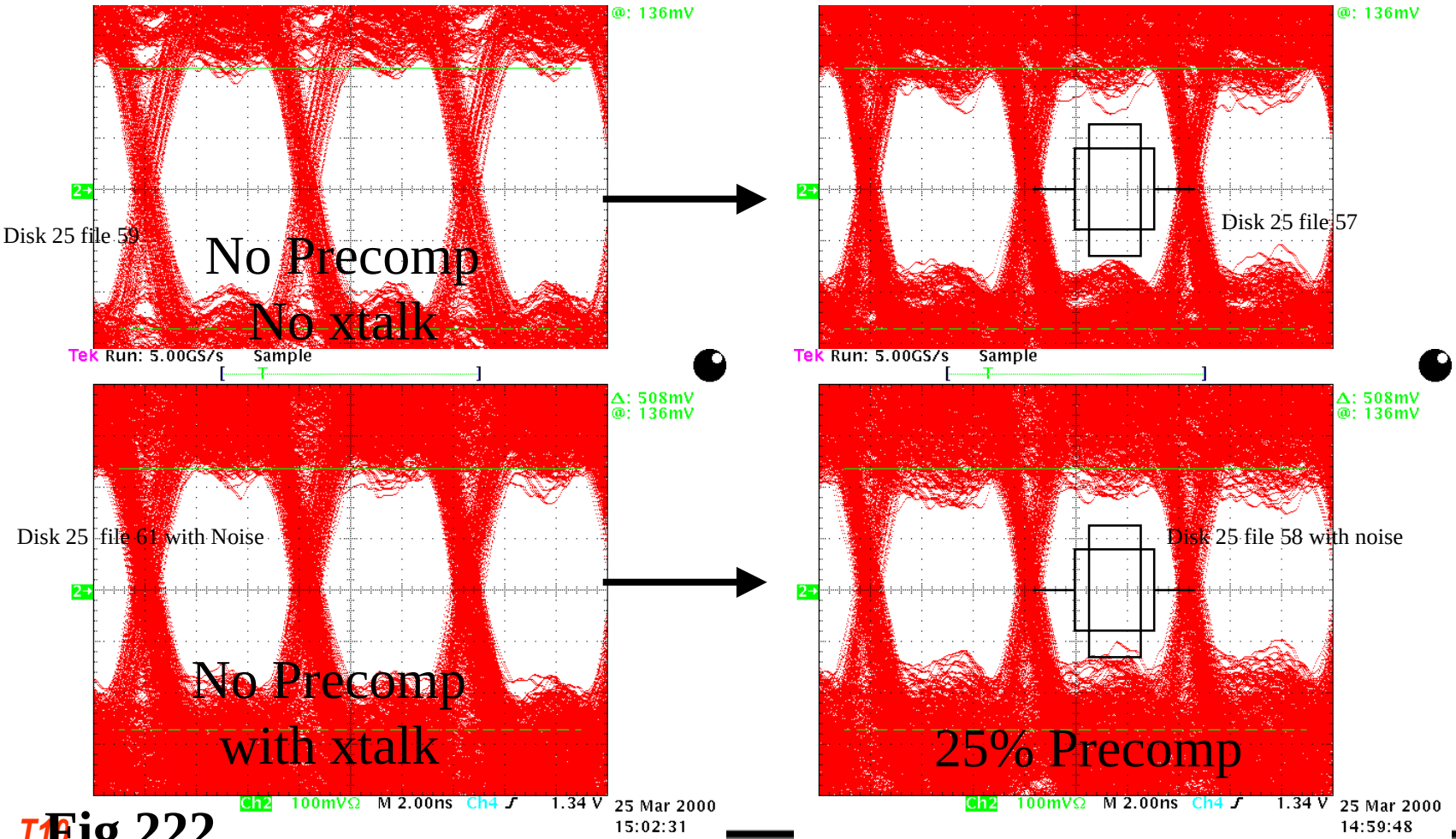


Fig 222

Seagate
Information the way you want it.

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

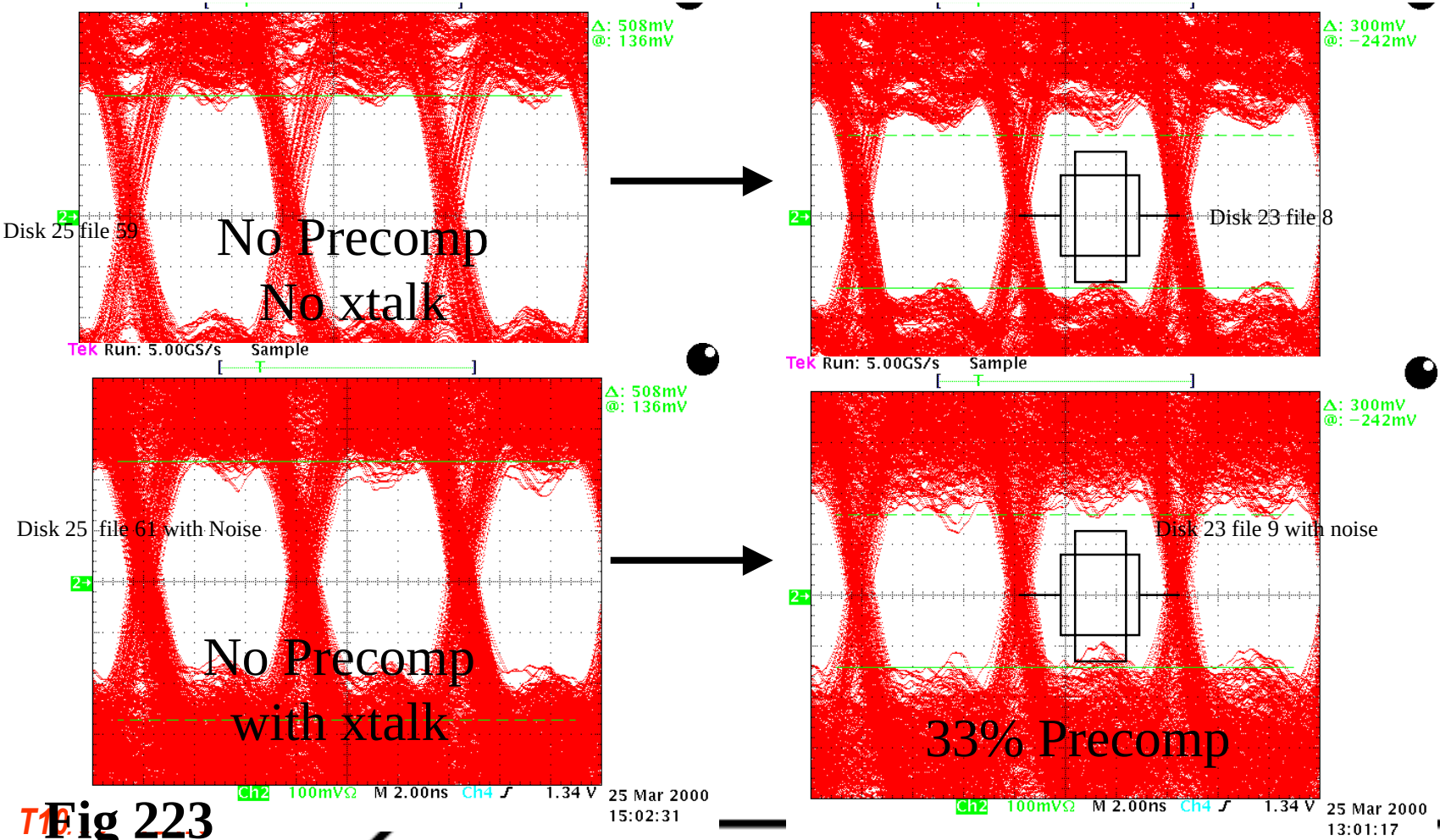


Fig 223

Seagate
Information the way you want it.

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)

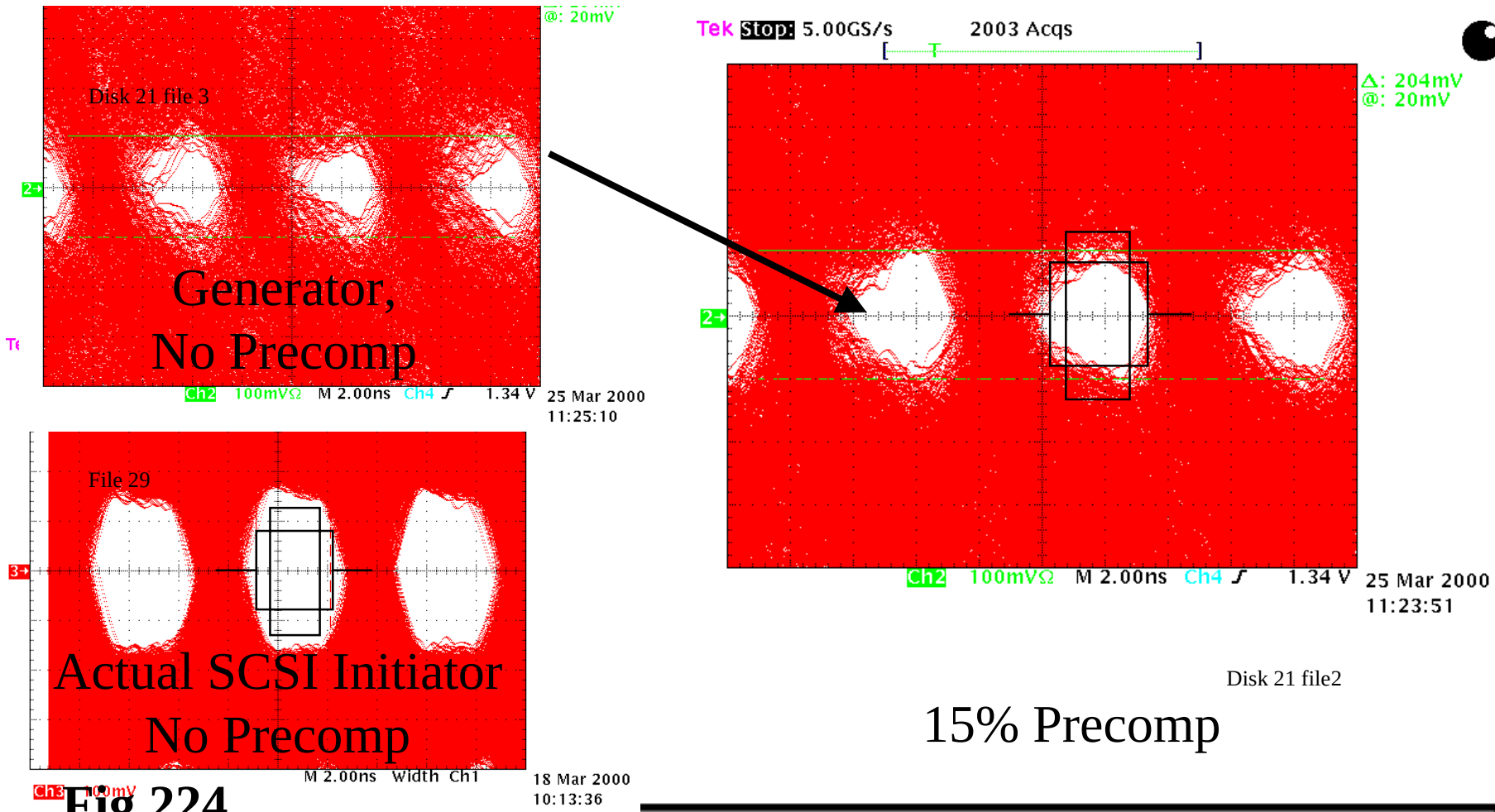
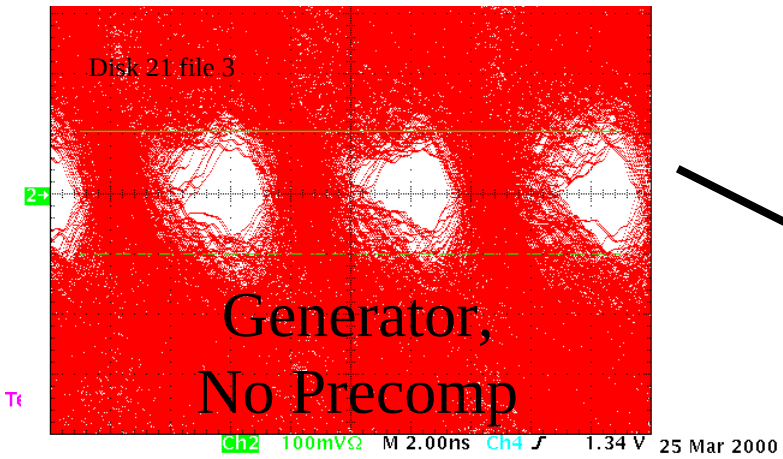


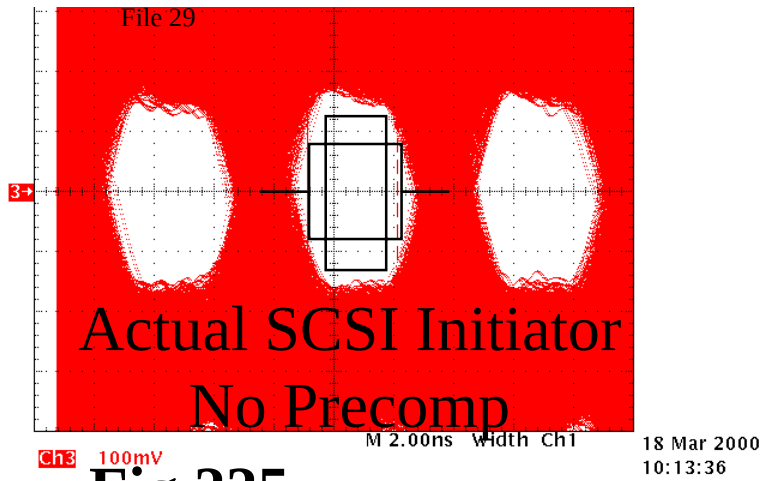
Fig 224

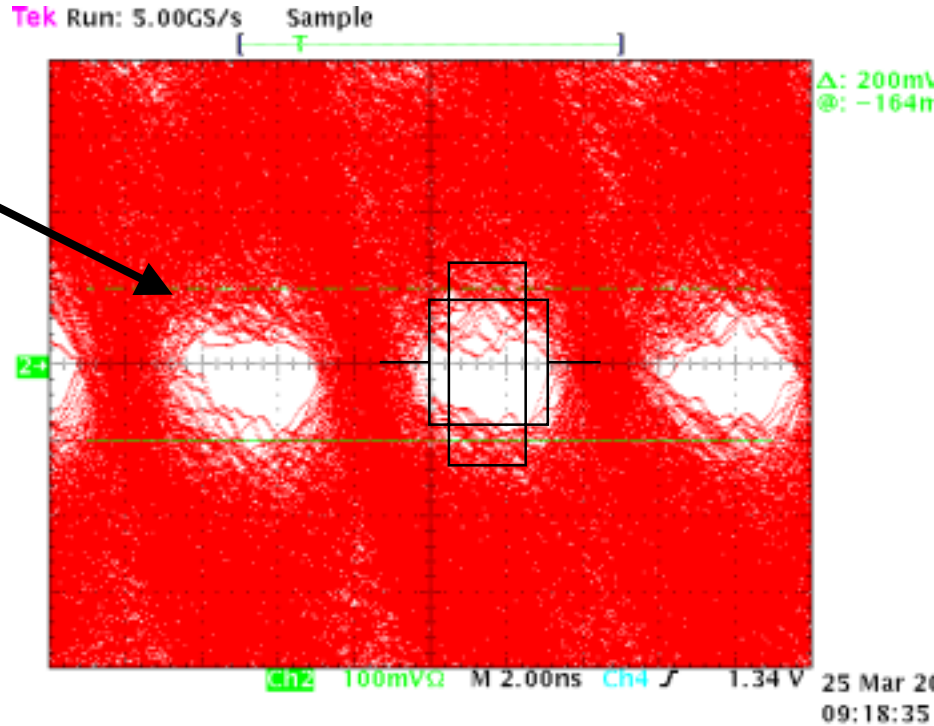
Seagate
Information the way you want it.

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 20 file 3

25% Precomp

Fig 225

Seagate
Information the way you want it.

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

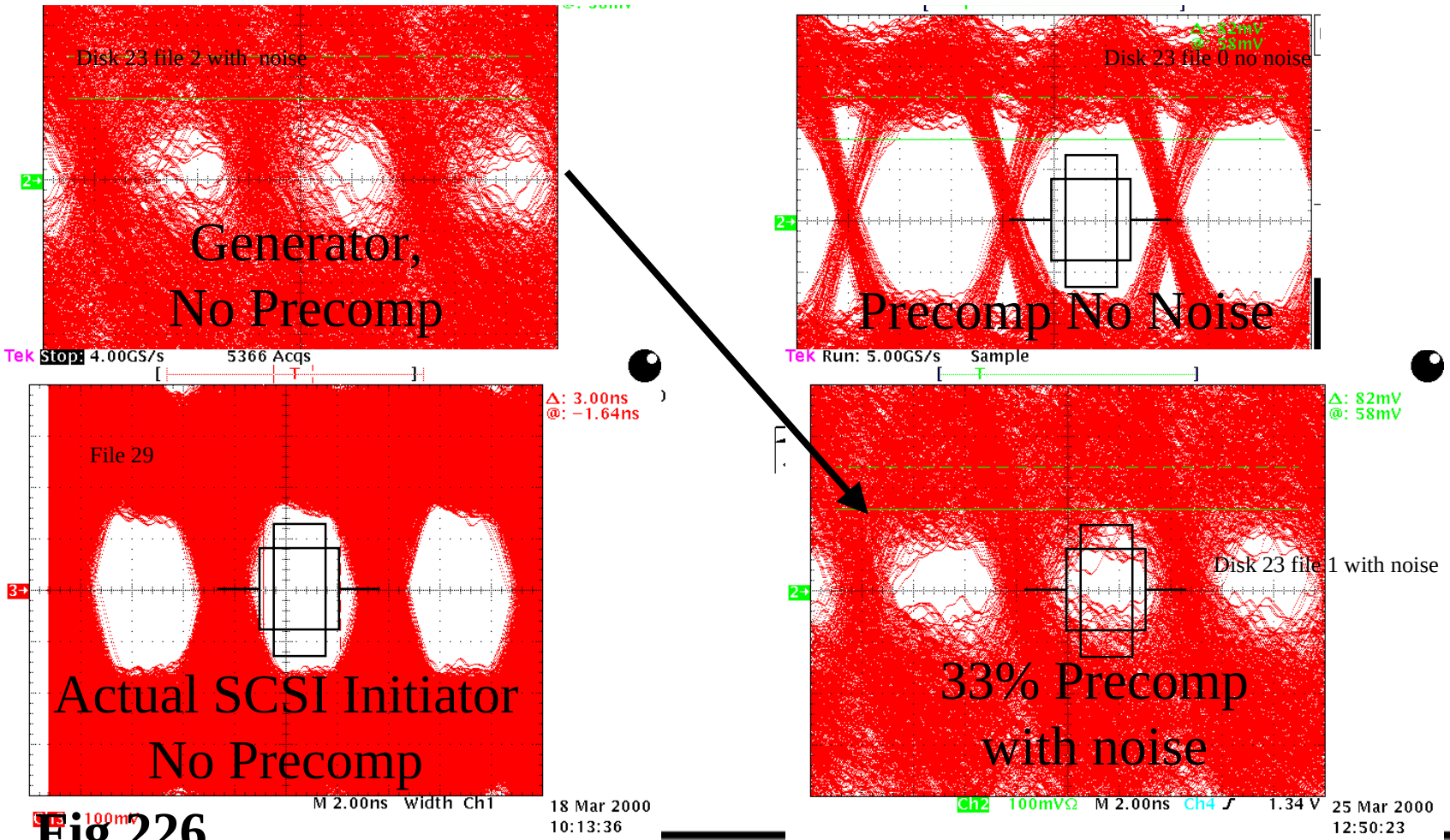
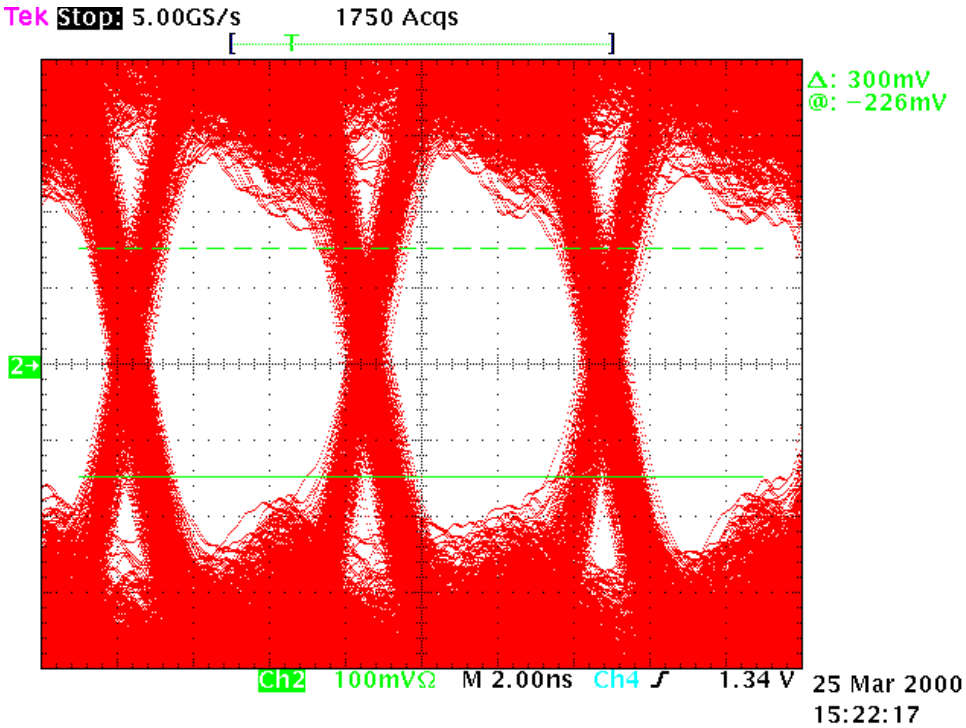


Fig 226

Seagate
Information the way you want it.

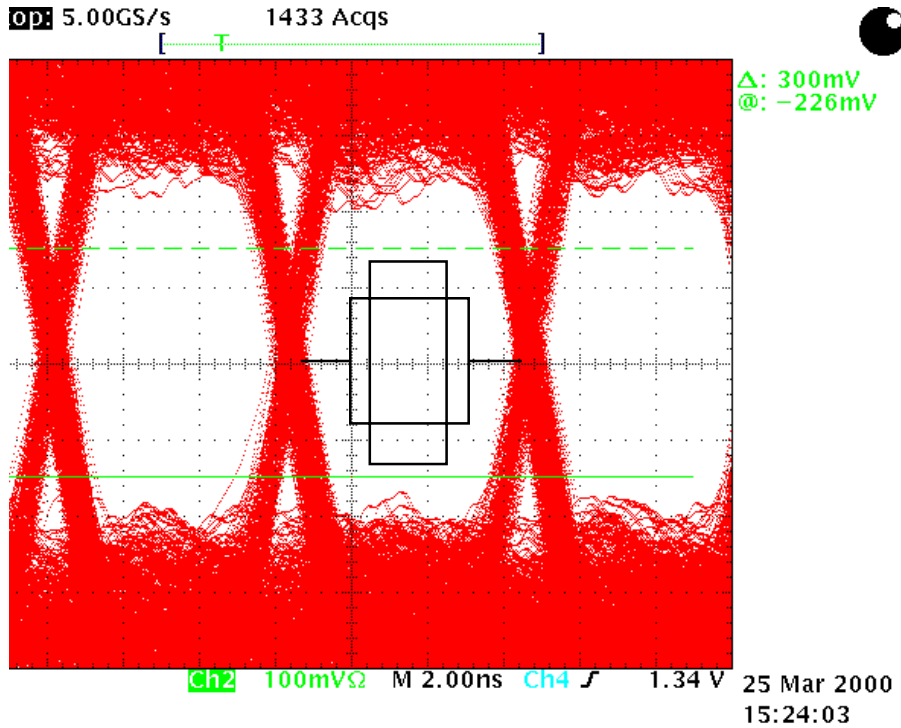
Seagate 320BM Backplane - 18” TnF, 25% Precomp

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

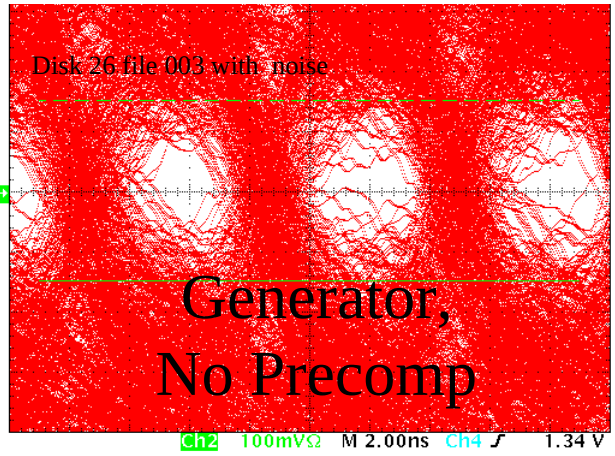
25% Precomp

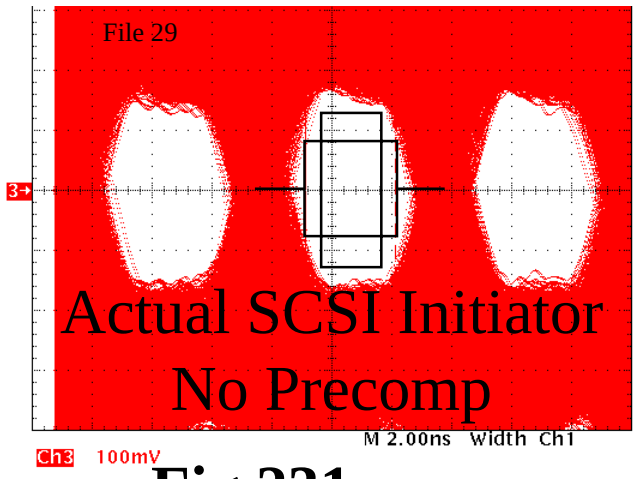
Fig 230

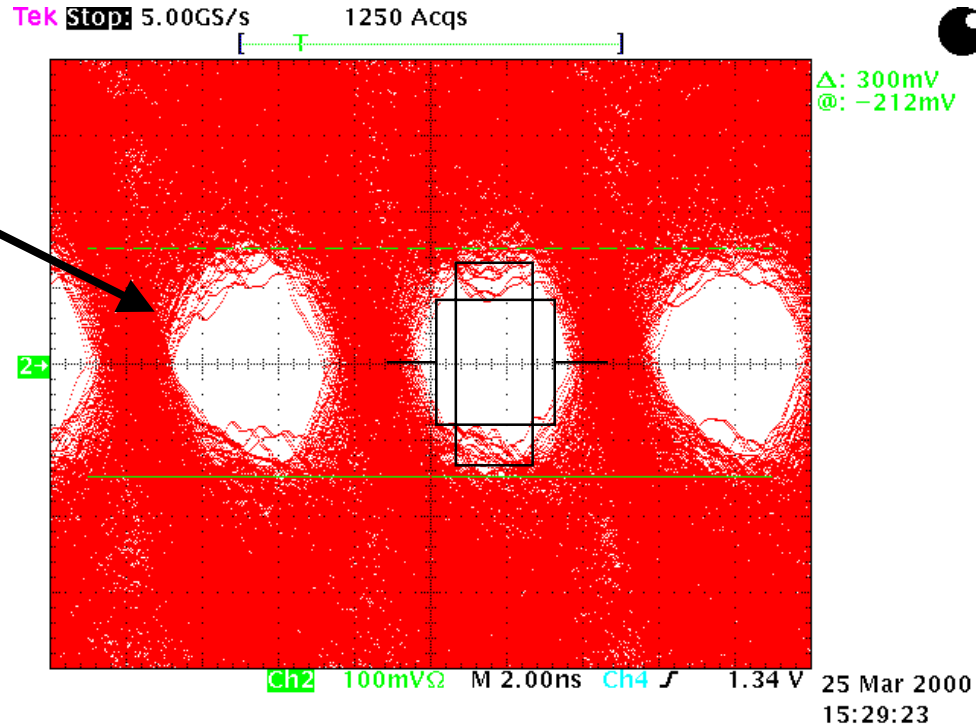
Seagate
Information the way you want it.

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)







Disk 26 file 002 with noise

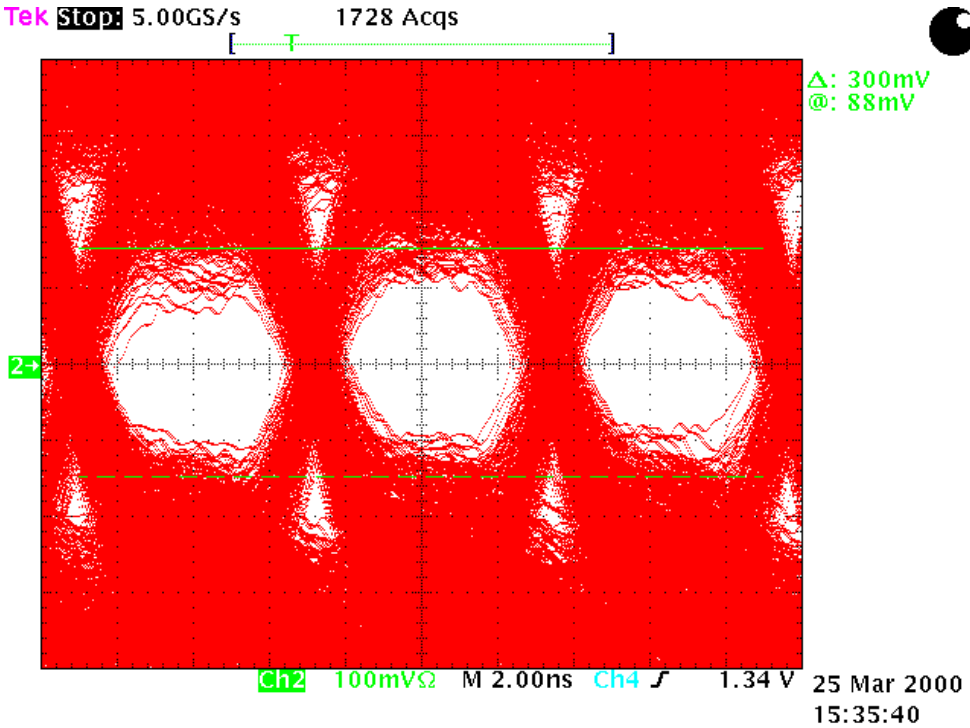
25% Precomp

Fig 231

Seagate
Information the way you want it.

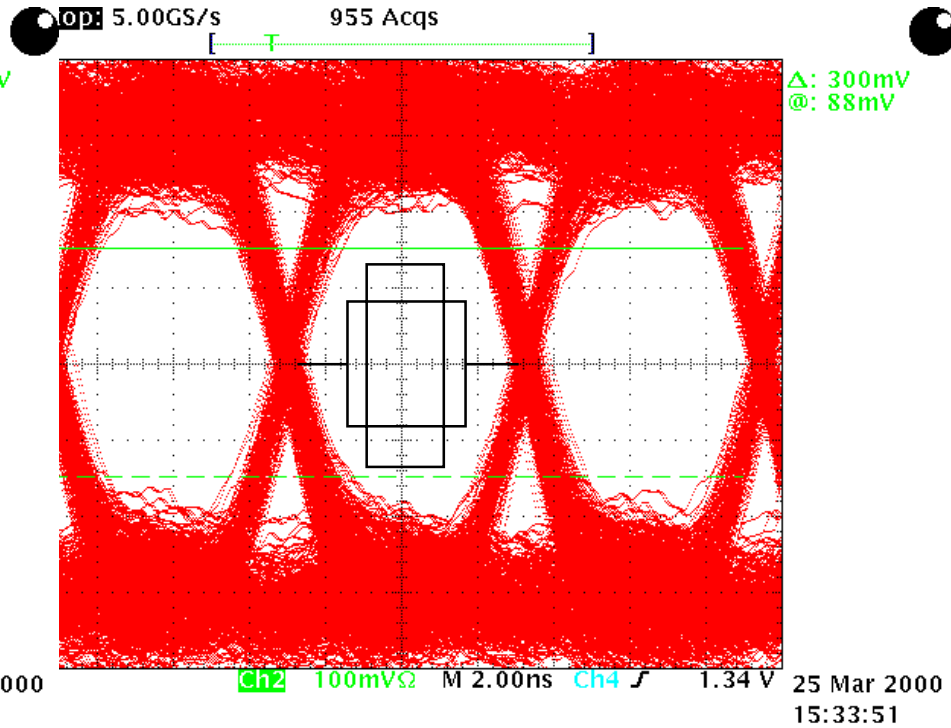
Seagate 320BM Backplane - 12M Round, 25% Precomp

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)



Disk 26 file 005 with noise

No Precomp



Disk 26 file 005 with noise

25% Precomp

Fig 232