



Fast XX SCSI Testing

- **Next Step Goals**
- **Setup Hold Testing**
- **BIAS Issue (Wally)**
- **ISI Issue (Bill Gintz)**



Next Step

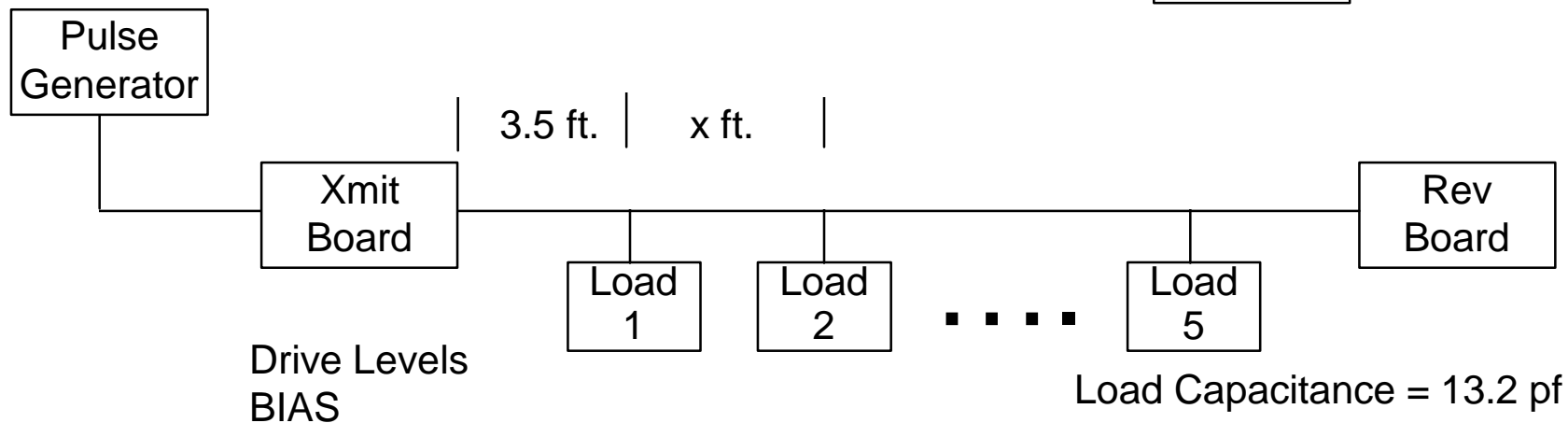
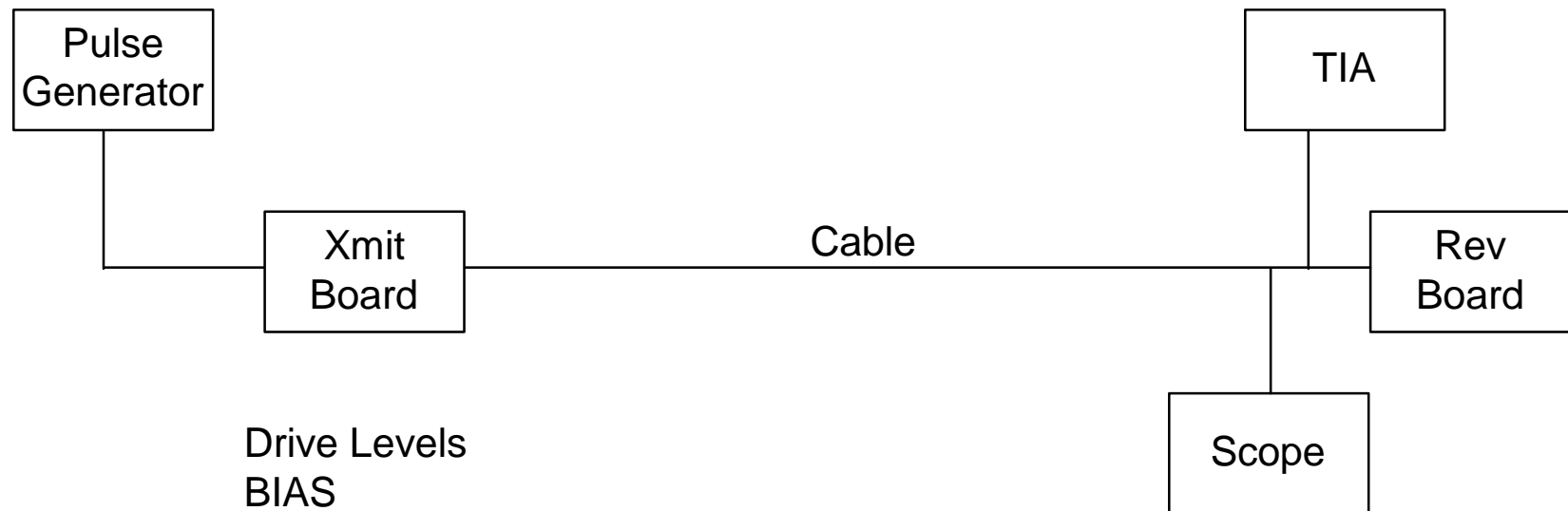
- **80 Mega Transfers Using Dual Edge Clocking**
 - Keeps max frequency same
- **ISI Resolved By Some Means/Suggesting Dual Strength Driver**
- **BIAS Would be Better If Lower But To Keep Compatibility Could Just Lower The Low Limit**
- **Distance - Try To Keep Same. Should Be Possible Since No Frequency Increase And We Now “Recommend” 28 Gauge Above 12 Meters.**



Setup Hold Measurement

- **Used TIA (HP3310A)**
- **Measured Data Transition To ACK Transition With Statistic**
- **Tests Run @ 80 MHz Single Edge Which Provides Same Setup And Hold Time Allowances As 40 MHz Dual Edge**
- **Tests Run For:**
 - Short Pt to Pt cable
 - 25 meter Pt to Pt cable
 - Multipoint loaded

Test Setup



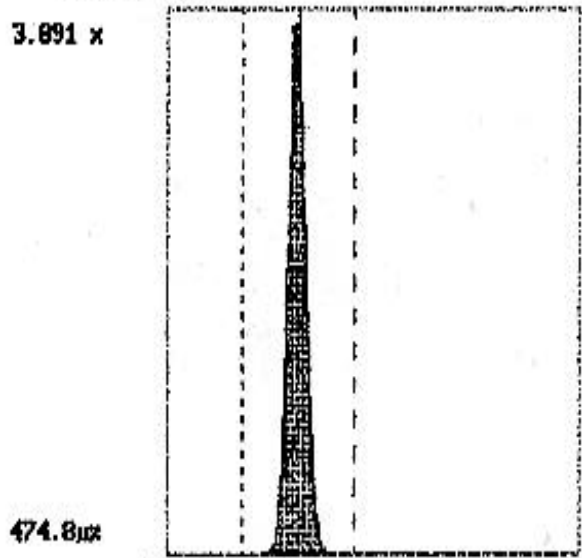
Comparison Short Cable Vers 5 25 Meter (Pt to Pt)

| | <u>Short</u> | <u>Long</u> | |
|---------------------|--------------|-------------|-----------------|
| <u>Setup</u> | | | |
| Mean | 6.92 ns | 5.983 ns * | |
| Pk to Pk | 781 ps | 1.191 ns | Δ <u>410 ps</u> |
| Deviation | 103 ps | 206 ps | |
| <u>Hold</u> | | | |
| Mean | 5.68 ns | 6.601 ns * | |
| Pk to Pk | 1.035 ns | 1.465 ns | Δ <u>430 ps</u> |
| Deviation | 139 ps | 230 ps | |



(A) ITI At+Bt tik only
auto triggering

3.091 x



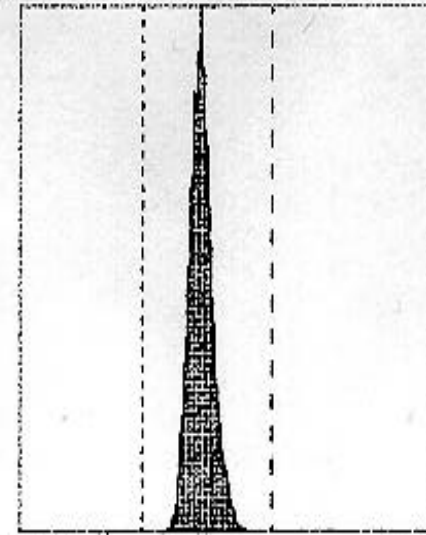
474.8 μV

-8.500ns 53.126k samples 52.192k+

| | | |
|-------------------------|-------------------------|-------------|
| I ₁ -6.234ns | I ₂ -7.582ns | Δ -1.348ns |
| Q ₁ 0.00% | Q ₂ 0.00% | Δ 0.00% |
| Std Dev 183.373ps | Mean -6.923801ns | Pk-Pk 781ps |

(A) ITI At+Bt tik only
auto triggering

3.269 x

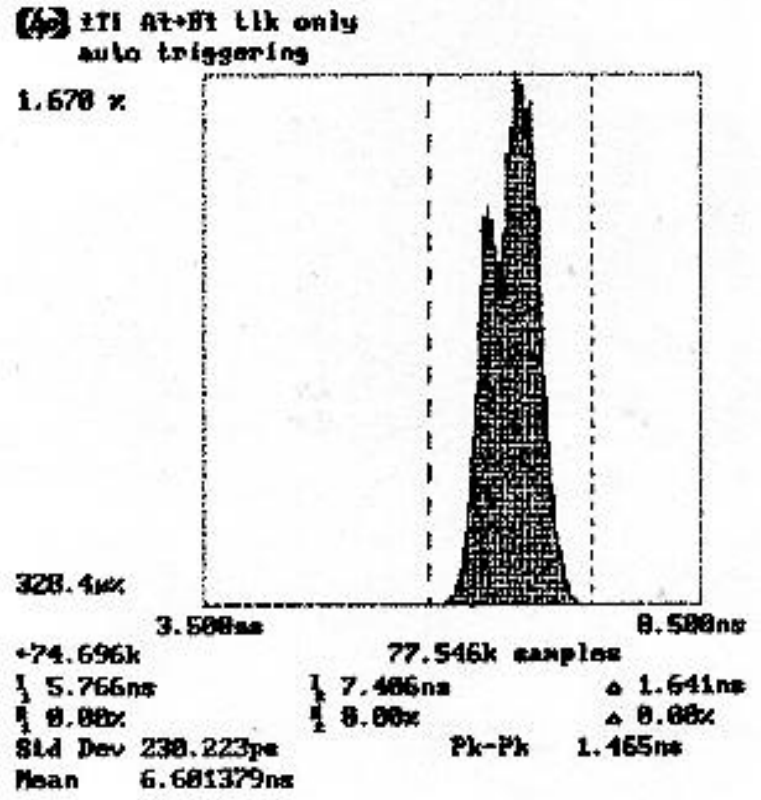
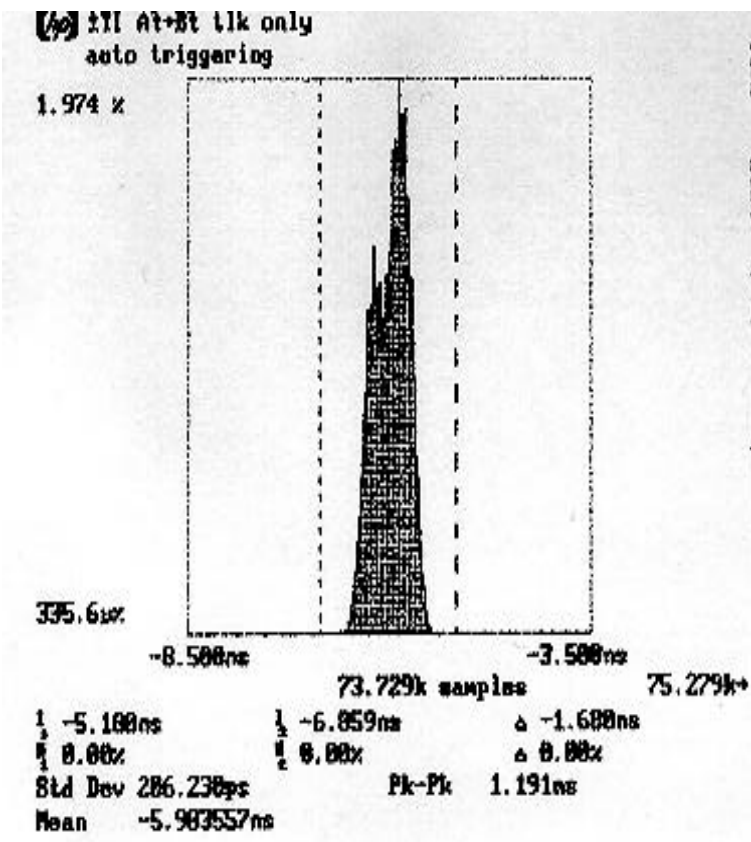


348.7 μV

3.500ns 74.872k samples 8.500ns

| | | | |
|----------------------|------------------------|------------------------|------------|
| +72.688k | I ₁ 6.547ns | I ₂ 4.984ns | Δ -1.562ns |
| Q ₁ 0.00% | Q ₂ 0.00% | Δ 0.00% | |
| Std Dev 139.325ps | Mean 5.694979ns | Pk-Pk 1.035ns | |

Short Cable (PT to PT)



Long Cable (25 M, PT to PT)



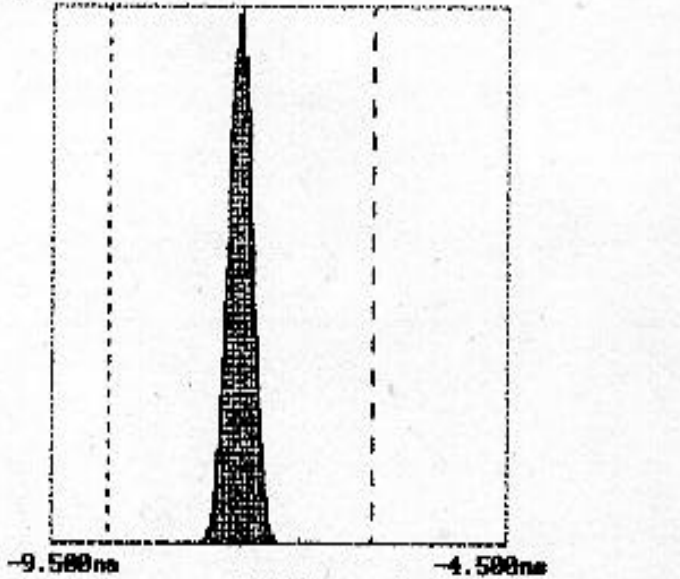
Comparison Short To 13.5 Feet Teflon MP

| <u>Setup</u> | <u>Short</u> | <u>1</u> (3 Loads) | <u>2</u> 3 Loads) | <u>3</u> (8 Loads) | |
|------------------------|--------------|-----------------------|----------------------|-----------------------|----------|
| Mean | 6.92 ns | 7.43 ns | 6.95 ns | 7.6 ns | |
| Pk to Pk | 781 ps | 898 ps | 918 ps | <u>1.426 ns</u> | △ 645 ps |
| Deviation | 105 ps | 126 ps | 133 ps | 235 ps | |
| <u>Hold</u> | | | | | |
| Mean | 5.68 ns | 5.21 ns | 5.63 ns | 4.99 ns * | |
| Pk to Pk | 1.035 ns | 1.23 ns | 1.113 ns | <u>1.602 ns</u> | △ 567 ps |
| Deviation | 139 ps | 154 ps | 157 ps | 256 ps | |

(A) 111 At-Bt tik only
auto triggering

2.981%

3.185%



7.94k samples
B.163k*

| | | |
|------------------|--------------|------------|
| 1/2 -5.984ns | 1/2 -8.875ns | Δ -2.891ns |
| 1/4 8.88% | 1/4 8.88% | Δ 8.88% |
| Std Dev 126.88ps | Pk-Pk 898ps | |
| Mean -7.43453ns | | |

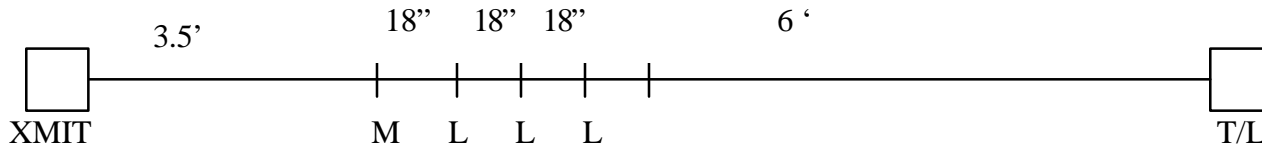
1.228%

3.580ns 8.500ns

+28.628k
28.350k samples

| | | |
|-------------------|---------------|-----------|
| 1/2 4.185ns | 1/2 6.839ns | Δ 1.934ns |
| 1/4 8.88% | 1/4 8.88% | Δ 8.88% |
| Std Dev 154.712ps | Pk-Pk 1.238ns | |
| Mean 5.211245ns | | |

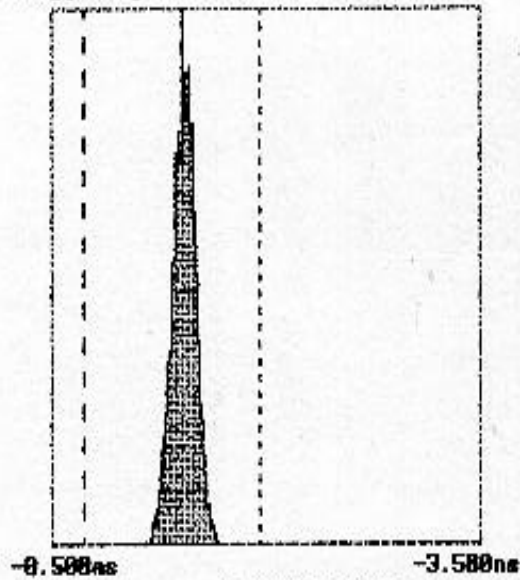
1. Flat (Teflon), 14 ft, 3 Loads



(A) ITI AT→BT Lik only
auto triggering

3.316 %

4.820nx

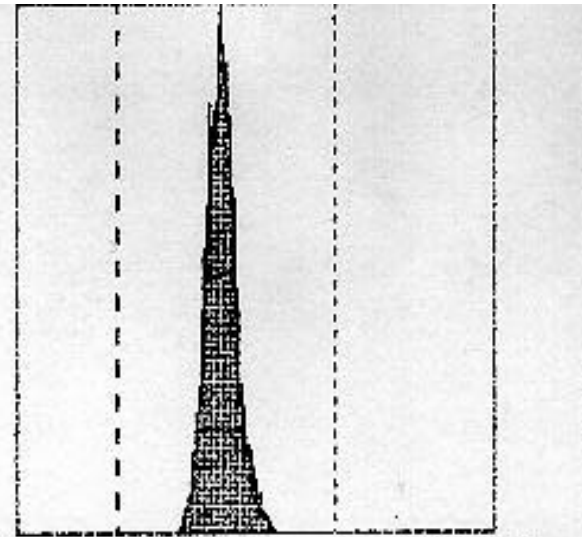


5.258k samples
-8.129ns
0.88%
Std Dev 133.28ps
Mean -6.95930ns
-6.878ns
0.88%
Pk-Pk 918ps
2.851ns
0.88%

5.115k

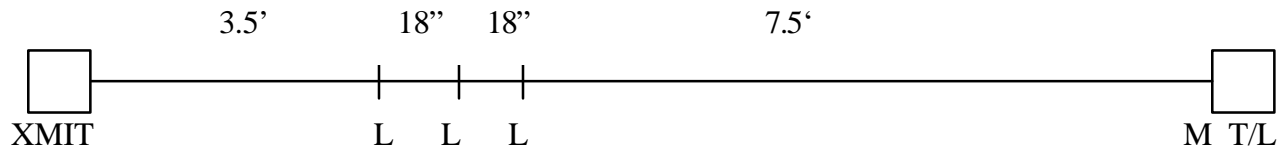
3.868 %

5.331nx



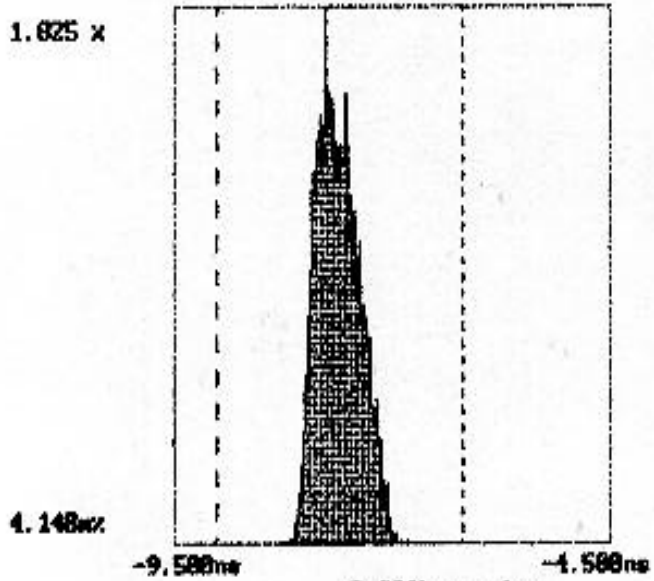
3.580ns
+4.297k
4.555ns
0.88%
Std Dev 157.63ps
Mean 5.63644ns
8.500ns
5.802k samples
6.828ns
0.88%
Pk-Pk 1.113ns
2.266ns
0.88%

2. Flat (Teflon), 14 ft, 3 Loads



(A) ITI A7-B7 tik only
auto triggering

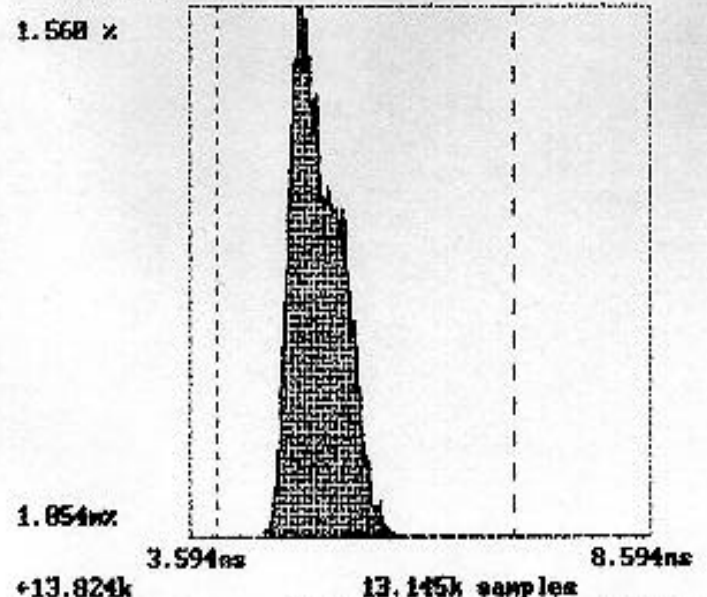
1.825 x



5.996k samples
-9.812ns
0.88x
Std Dev 235.25ps
Mean -7.61722ns
-6.199ns
0.88x
Pk-Pk 1.426ns
2.812ns
0.88x

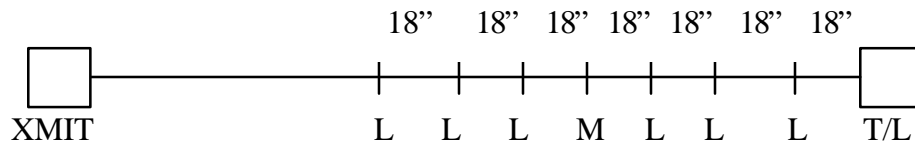
(A) ITI A7-B7 tik only
auto triggering

1.568 x



13.145k samples
+13.824k
7.189ns
0.88x
Std Dev 256.663ps
Mean 4.996882ns
3.887ns
0.88x
Pk-Pk 1.682ns
-3.223ns
0.88x

3. Flat (Teflon), 14 ft, 9 Loads

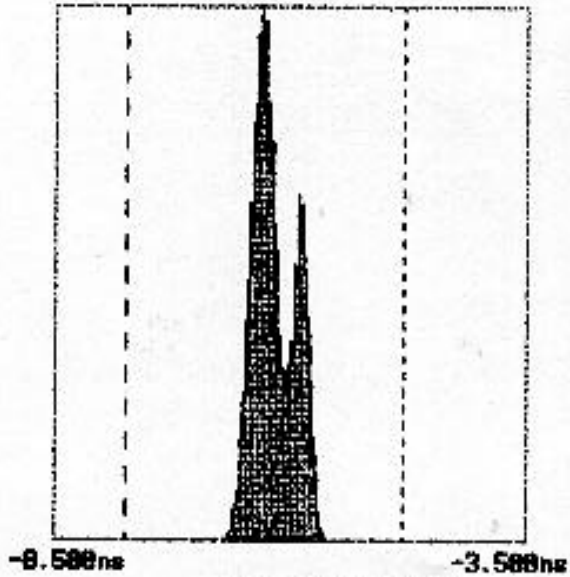


Comparisions Short To 14 Feet Twisted/Flat MP

| <u>Setup</u> | <u>Short</u> | <u>1</u> 5 Loads | <u>2</u> 10 Loads | <u>3</u> 10 Loads | |
|--------------------|--------------|---------------------|----------------------|----------------------|----------|
| Mean | 6.92 ns | 6.17 ns | 6.42 ns | 6.040 ns * | |
| Pk to Pk | 781 ps | <u>1.13 ns</u> | 957 ps | 773 ps | △ 349 ps |
| Deviation | 105 ps | 218 ps | 119 ps | 122 ps | |
| <u>Hold</u> | | | | | |
| Mean | 5.68 ns | 6.432 ns | 6.197 ns | 6.586 ns | |
| Pk to Pk | 1.035 ns | <u>1.406 ns</u> | 1.094 ns | 1.016 ns | △ 371 ps |
| Deviation | 139 ps | 237 ps | 155 ps | 157 ps | |

(4) ITI At+Bt Lik only
auto triggering

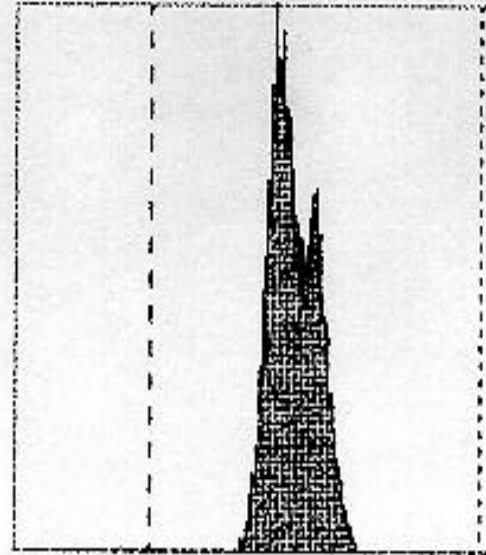
2.241 x



18.817k samples
 I_1 -7.738ns
 I_2 -4.889ns
 I_3 -2.938ns
 I_4 0.00x
 I_5 0.00x
 Std Dev 218.343ps
 Mean -6.172872ns
 Pk-Pk 1.133ns
 Δ 2.938ns
 Δ 8.88x

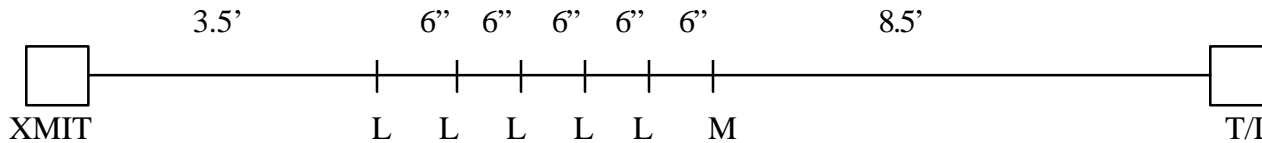
(5) ITI At+Bt Lik only
auto triggering

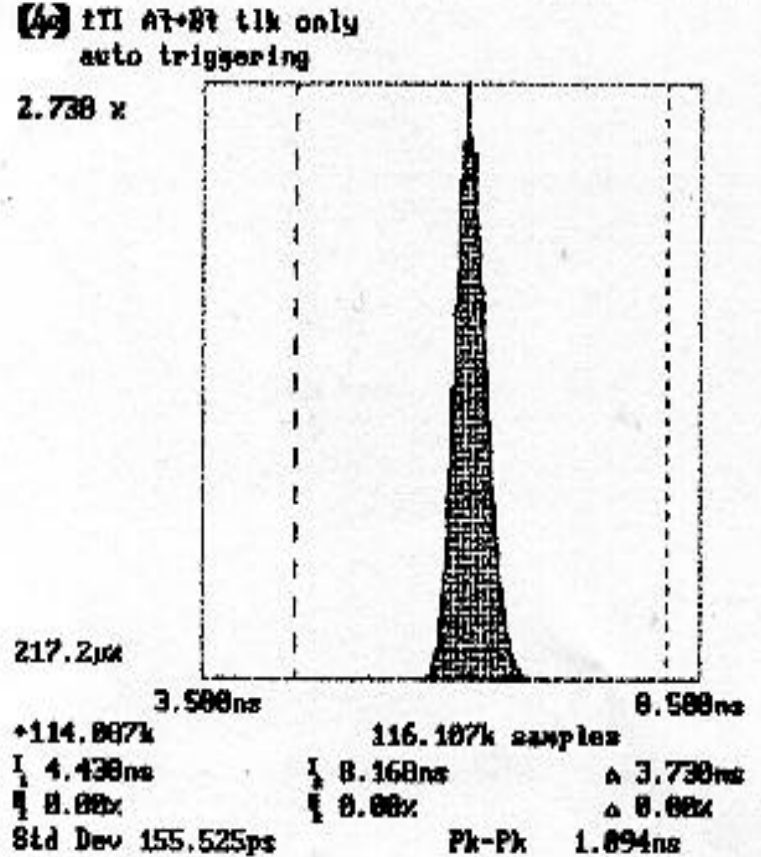
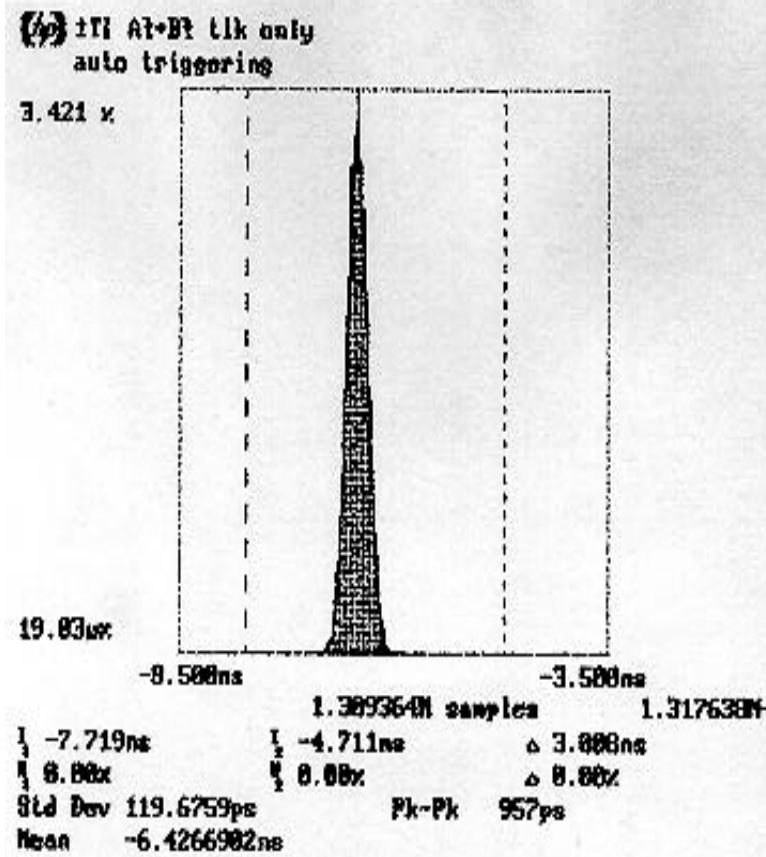
1.865 x



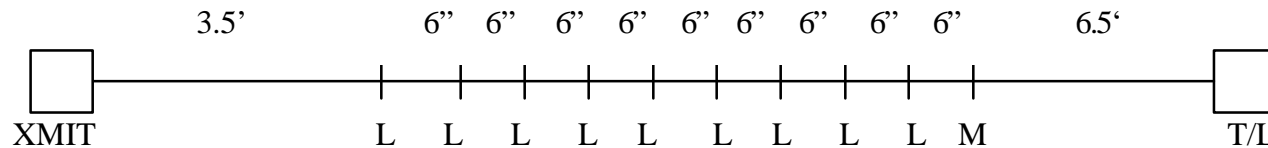
10.831k samples
 I_1 4.926ns
 I_2 8.482ns
 I_3 10.453k
 I_4 0.00x
 I_5 0.00x
 Std Dev 237.237ps
 Mean 6.432857ns
 Pk-Pk 1.486ns
 Δ 3.477ns
 Δ 8.88x

1. Twist/Flat, 14.5 ft, 5 Loads



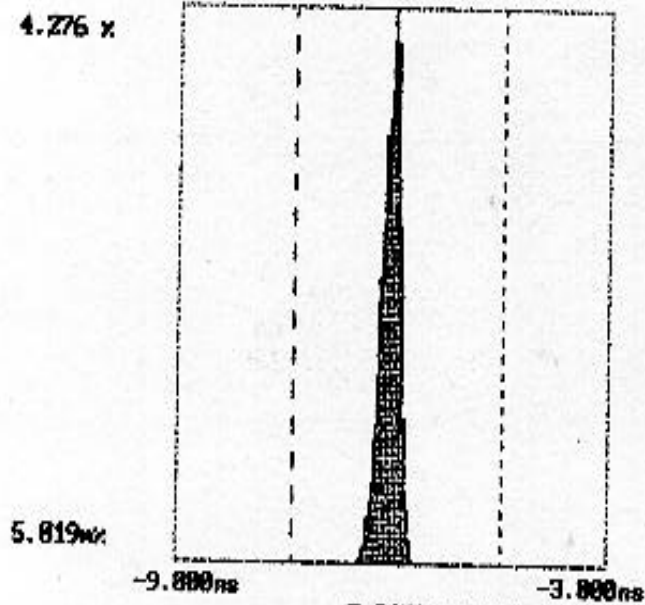


2. Twist/Flat, 14.5 ft, 10 Loads



(A) ITI A1+B1 tik only
auto triggering

4.276 x



5.819w

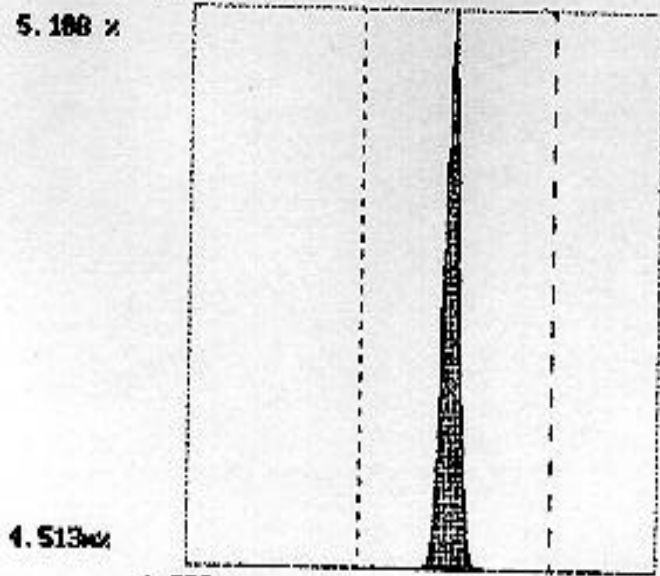
-7.383ns
0.88x
Std Dev 122.88ps
Mean -6.04876ns

5.217k samples
-4.477ns
0.88x
Pk-Pk 773ps

4.746k

(B) ITI A1+B1 tik only
auto triggering

5.188 x

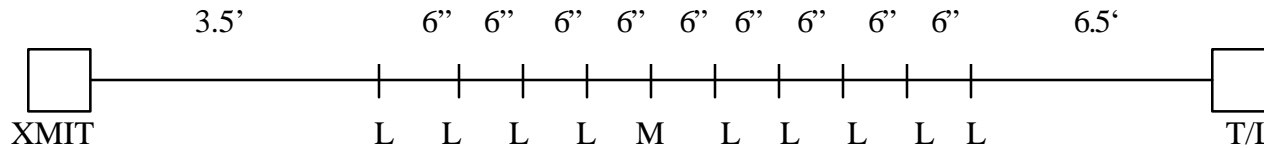


4.513w

+5.679k
0.734ns
0.88x
Std Dev 157.73ps
Mean 6.58668ns

5.481k samples
4.672ns
0.88x
Pk-Pk 1.816ns

3. Twist/Flat, 14.5 ft, 10 Loads





To The Distributions Measured One Must Add Cable Skew Factor.

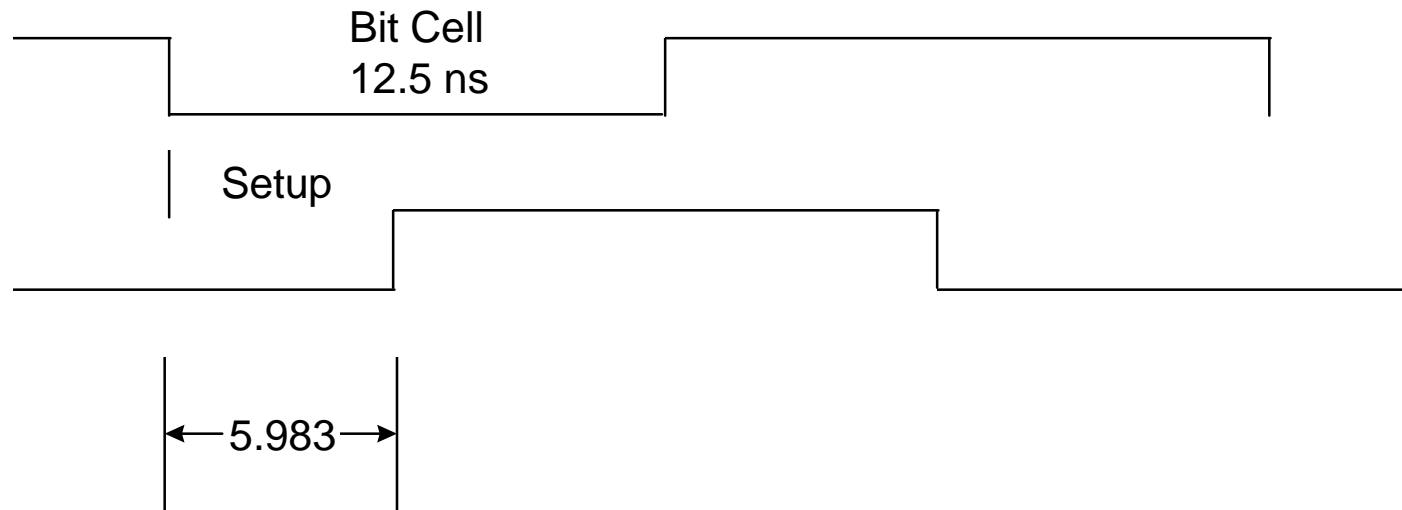
Cable Skew Pair To Pair Difference Range. Form.

0.03 ms/ft ----- 0.045 ns/ft (Hitachi Catalog)

| | | |
|-----|------------|-------------|
| | <u>.03</u> | <u>.045</u> |
| 12m | 1.17 | 1.755 |
| 25m | 2.43 | 3.65 |

Margin (Setup)

25 Meter Pt to Pt



$$\text{Margin} = \text{Mean} - 1/2 \text{ pp} - \text{Cable Skew}$$

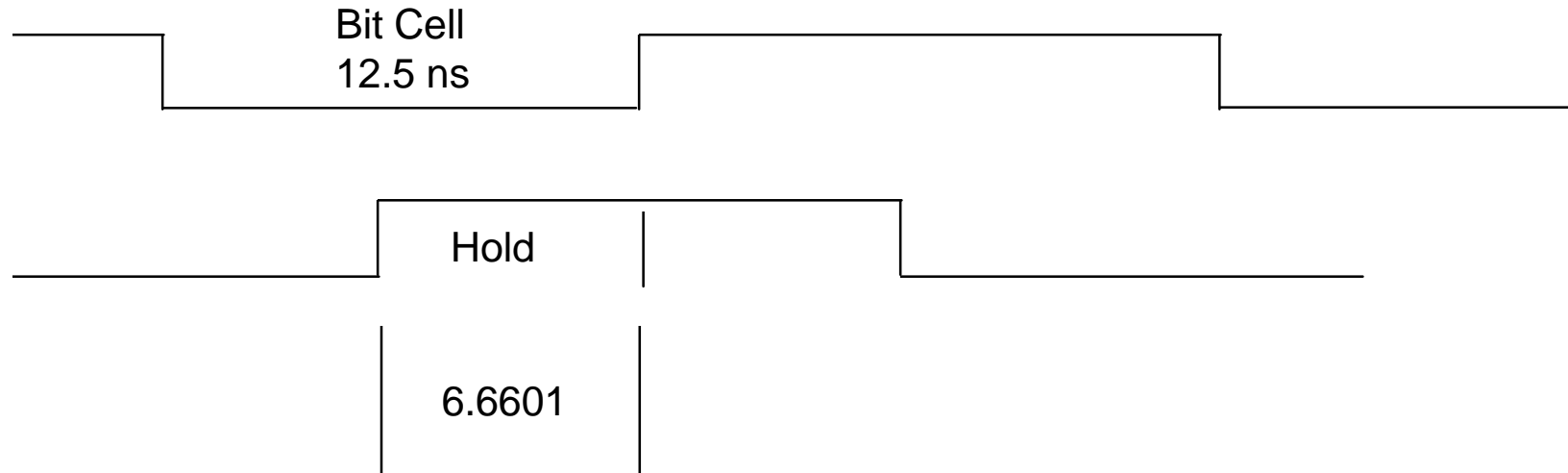
$$\begin{aligned} \text{Margin (Low Skew Cable)} &= 5.983 - 0.5955 - 2.43 \\ &= 2.9575 \text{ ns} \end{aligned}$$

$$\begin{aligned} \text{Margin (High Skew Cable)} &= 5.983 - .5955 - 3.65 \\ &= 1.7375 \text{ ns} \end{aligned}$$



Margin (Hold)

25 Meter Pt to Pt



$$\text{Margin} = \text{Mean} - 1/2 \text{ pp} - \text{Cable Skew}$$

$$\text{Margin (Low Skew Cable)} = 6.601 - 0.7325 - 2.43$$

$$= \underline{3.43 \text{ ns}}$$

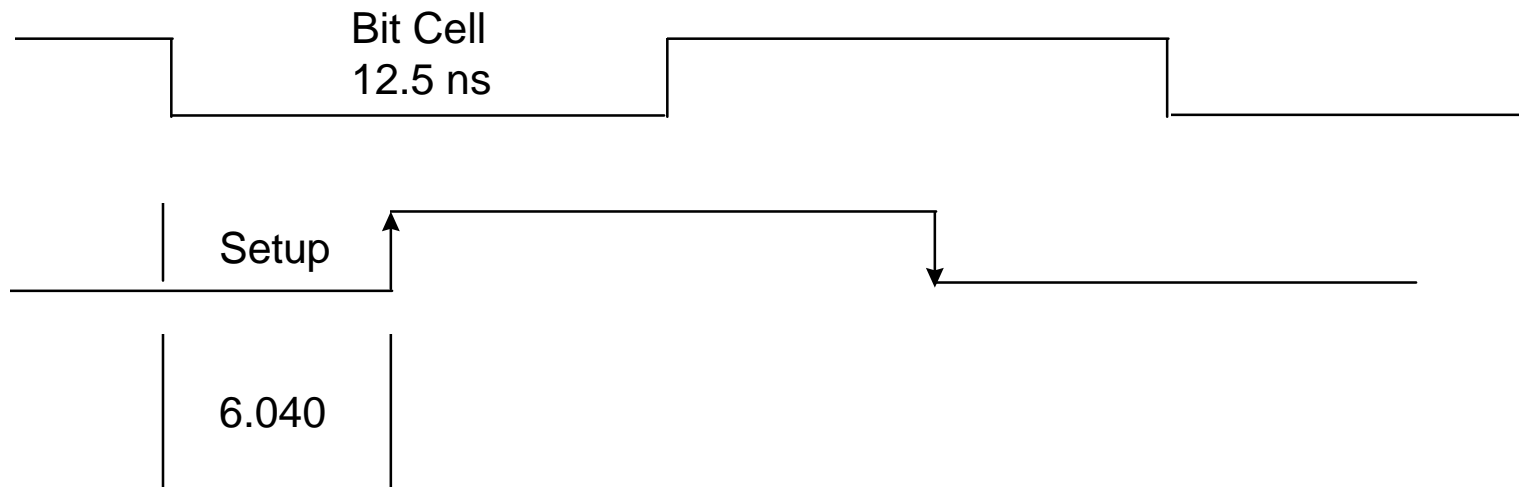
$$\text{Margin (High Skew Cable)} = 6.601 - 0.7325 - 3.65$$

$$= \underline{2.2189 \text{ ns}}$$



Margin (Setup)

Multipoint



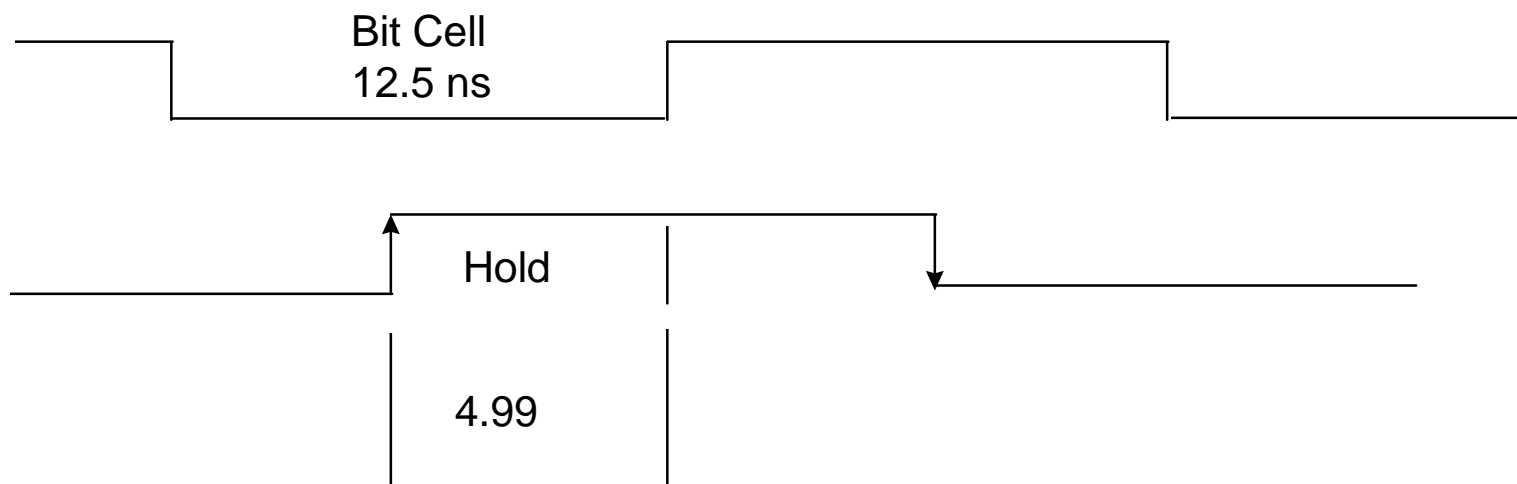
$$\text{Margin} = \text{Mean} - 1/2 \text{ pp} - \text{Cable Skew}$$

$$\begin{aligned} \text{Margin (Low Skew Cable)} &= 6.040 - 0.386 - 1.17 \\ &= \underline{4.48 \text{ ns}} \end{aligned}$$

$$\begin{aligned} \text{Margin (High Skew Cable)} &= 6.040 - 0.386 - 1.755 \\ &= \underline{3.899 \text{ ns}} \end{aligned}$$

Margin (Hold)

Multipoint



$$\text{Margin} = \text{Mean } 1/2 \text{ pp} - \text{Cable Skew}$$

$$\text{Margin (Low Skew Cable)} = 4.99 - 0.801 - 1.17$$

$$= \underline{3.019 \text{ ns}}$$

$$\text{Margin (High Skew Cable)} = 4.99 - 0.801 - 1.755$$

$$= \underline{2.434 \text{ ns}}$$