Driver Precomp Proposal, Review   50 mV removed from the equations, it is a problem for the driver spec.
00-227r9   12-Sep-00   500 mV strong driver

Paul Aloisi - TI	370	410	427	485	500	533	600	700	800	**Millivolt drive**
Nominal Voltage										
No driver imbalance, matched assertion and negation										
Driver fall back 22%	288.6	319.8	333.06	378.3	390	415.74	468	546	624	410.2564 mV
Driver fall back 25%	277.5	307.5	320.25	363.75	375	399.75	450	525	600	426.6667 mV
Driver Fall back 33%	244.2	270.6	281.82	320.1	330	351.78	396	462	528	484.8485 mV
Driver Fall Back 40%	222	246	256.2	291	300	319.8	360	420	480	533.3333 mV
Driver Fall Back 50%	185	205	213.5	242.5	250	266.5	300	350	400	Min high drive, for 320 mV

Assuming perfect driver assymetry   Signals levels below are at the connector of the receiving device, use the numbers with DC loss

	370	410	427	485	500	533	600	700	800	
No Fall back	14	22	25.4	37	40	46.6	60	80	100	
Precomp off	10.3	17.9	21.13	32.15	35	41.27	54	73	92	5% DC loss from cable, connectors and terminators
Worst case, no driver tolerance					35 mV					-5 mV receiver required - Adaptive Active Filter - no eye pattern
Cable roll off to 60% signal -60 mV crosstalk & Noise										
Trans FB 22% to assert (60%)	46.56	58.08	62.976	79.68	84	93.504	112.8	141.6	170.4	mV signal at the receiver minus cable loss
	35.904	46.272	50.6784	65.712	69.6	78.1536	95.52	121.44	147.36	10% DC loss from cable, connectors and terminators
Trans FB 25% roll off to 60%	51	63	68.1	85.5	90	99.9	120	150	180	mV signal at the receiver minus cable loss
	39.9	50.7	55.29	70.95	75	83.91	102	129	156	10% DC loss from cable, connectors and terminators
Trans FB 33% roll off to 60%	64.32	77.76	83.472	102.96	108	119.088	141.6	175.2	208.8	mV signal at the receiver minus cable loss
Trans FB 40% roll off to 60%	73.2	87.6	93.72	114.6	120	131.88	156	192	228	mV signal at the receiver minus cable loss
	59.88	72.84	78.348	97.14	102	112.692	134.4	166.8	199.2	10% DC loss from cable, connectors and terminators
					75 mV	(((V+VFB)*.6)-Vfb)-60)				**46 mV receiver required, 60 mV Crosstalk and System Noise**
20 mV @ receiver	20	20	20	20	20	20	20	20	20 mV	**Adaptive Active filter required, eye pattern**
80 mV @ receiver	80	80	80	80	80	80	80	80	80 mV	99-295 wide pulse
100 mV @ receiver	100	100	100	100	100	100	100	100	100 mV	**Bold Black does not work without Adaptive Active Filter**

Purple 20 mV receiver - active Filter

Driver Assymetry caclulations   **Red 80 mV receiver**

	370	410	427	485	500	533	600	700	800	
No Fall back - toleranced 10%	-22	-16.4	-14.02	-5.9	-3.8	0.82	10.2	24.2	38.2	**Blue 100 mV receiver**
Precomp off	-27.18	-22.14	-19.998	-12.69	-10.8	-6.642	1.8	14.4	27	10% DC loss from cable, connectors and terminators
Improved Tolerance driver asymmetry		10%			-10 mV					-35 mV receiver required - Adaptive Active Filter - no eye pattern
Cable roll off to 60% signal -60 mV crosstalk & Noise										Recommended -100 mV Adaptive Active Filter
Trans FB 22% to assert (60%)	10.56	19.68	23.556	36.78	40.2	47.724	63	85.8	108.6	mV signal at the receiver minus cable loss
	2.124	10.332	13.8204	25.722	28.8	35.5716	49.32	69.84	90.36	10% DC loss from cable, connectors and terminators
Trans fb 25% roll off to 60%	15	24.6	28.68	42.6	46.2	54.12	70.2	94.2	118.2	
	6.12	14.76	18.432	30.96	34.2	41.328	55.8	77.4	99	10% DC loss from cable, connectors and terminators
Trans fb 33% roll off to 60%	28.32	39.36	44.052	60.06	64.2	73.308	91.8	119.4	147	136.5 245.04 10% DC loss 33% - additive asymetry
	18.108	28.044	32.2668	46.674	50.4	58.5972	75.24	100.08	124.92	10% DC loss from cable, connectors and terminators
Trans fb 40% roll off to 60%	37.2	49.2	54.3	71.7	76.2	86.1	106.2	136.2	166.2	mV signal at the receiver minus cable loss
	26.1	36.9	41.49	57.15	61.2	70.11	88.2	115.2	142.2	10% DC loss from cable, connectors and terminators
Trans fb 50% roll off to 60%	52	65.6	71.38	91.1	96.2	107.42	130.2	164.2	198.2	
	39.42	51.66	56.862	74.61	79.2	89.298	109.8	140.4	171	10% DC loss from cable, connectors and terminators

DC & AC Loss (((0.9*(V*.9)-23)+(Vfb*.9))*0.6)-(Vfb*.9))-60   **Adaptive Active filter required**
((((0.9*V)-23)+Vfb)*0.6)-Vfb-60   **10 mV receiver needed minimum**
Drive tolerance calculation   **Recommended 0 mV Adaptive active filter**
          Fall back change minimum 45 mV receiver   50 mV with 500 mV minimum

Seagate numbers limits configuration

	370	410	427	485	500	533	600	700	800	
Trans fb 22% roll off to 70%	55.768	70.024	76.0828	96.754	102.1	113.8612	137.74	173.38	209.02	10% DC loss from cable, connectors and terminators
Trans fb 25% roll off to 70%	58.765	73.345	79.5415	100.6825	106.15	118.1785	142.6	179.05	215.5	10% DC loss from cable, connectors and terminators
Trans fb 33% roll off to 70%	67.756	83.308	89.9176	112.468	118.3	131.1304	157.18	196.06	234.94	10% DC loss from cable, connectors and terminators
Trans fb 40% roll off to 70%	73.75	89.95	96.835	120.325	126.4	139.765	166.9	207.4	247.9	10% DC loss from cable, connectors and terminators
Trans fb 50% roll off to 70%	83.74	101.02	108.364	133.42	139.9	154.156	183.1	226.3	269.5	10% DC loss from cable, connectors and terminators

DC & AC Loss (((0.9*(V*.9)-23)+(Vfb*.9))*0.7)-(Vfb*.9))-60   **SPI-3 receiver levels are marginal, limits system loss**
Fall back change minimum 110 mV receiver   115 mV with 500 mV minimum   **70 mV Receiver needed for minimum**

500mV

150mV

875mV

0.60 is the roll off
measure on systems

875mV

0.60 X (500 +375) =525

-375 mV

525
-375
150 mV
-60 mV System noise
90 mV

-500 mV

Va vs Vn with an Ideal Load

800

700

600

Vassertion / **Vnegation**

Richard Uber's chart

Legend:
- spi 3 min
- spi 3 max
- red min
- red max
- blue min
- blue max
- pink min
- pink max

SPI-4 proposal to limit the strong driver to 500 mV minimum

SPI-3

	320	340	400	427	485	500	600	700	800	Millivolt drive
Nominal Voltage										
SPI-2/3 driver	320	340	400	427	485	500	600	700	800	**320**
Isolated Transition	164	178	220	238.9	279.5	290	360	430	500	mV signal at the receiver minus cable loss
SPI-3 Receiver signal	**130.4**	**142.3**	**178**	**194.065**	**228.575**	**237.5**	**297**	**356.5**	**416**	15% cable loss
100 mV @ receiver	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	mV
										Minimum signal at the receiver

Tolorance driver

	320	340	400	427	485	500	600	700	800	
SPI-2/3 driver	320	340	400	427	485	500	600	700	800	320
Cable roll off to 85% signal										mV
Trans FB min to assert (85%)	122.18	130.91	157.1	168.8855	194.2025	200.75	244.4	288.05	331.7	mV signal at the receiver minus cable loss
SPI-2/3 calculations	**94.853**	**102.2735**	**124.535**	**134.5527**	**156.0721**	**161.6375**	**198.74**	**235.8425**	**272.945**	15% cable loss **First step min 320 mV**
Should be SPI-2/3	**76.635**	**83.1825**	**102.825**	**111.6641**	**130.6519**	**135.5625**	**168.3**	**201.0375**	**233.775**	25% cable & system loss

Additional Data on backplane losses shows that SPI-2 and SPI-3 should have been 25% loss.
Minimum drive level did not work in the worst case.