Impedance Tests of Meritec's Laminated Flat Cable (FFC) and Teflon Ribbon Cable (FRC)

Purpose:

To determine the impedance of various pitches of FFC and FRC when used with and without shielding. The impedances were also measured using various combinations of side-by-side signal (S) and ground (G) conductors, namely S, SG, GSG, SS and GSSG. The shields were also connected to Ground (G) or left floating as noted in the Results.

Equipment:

Tektronix CSA-803/SD-24 TDR
Meritec Test Board 600773 with interconnecting pins to interface with cable conductors
Precision 50 ohm airlines and interconnecting cables

Samples:

All samples tested were 36 inches long. Cable insulation is laminated polyester (FFC) except where noted as Teflon (FRC).

Test Procedure:

The cables were connected in the various combinations of signal and ground using the Meritec Test PC board with interconnecting pins soldered to the conductors. The near end measurements were taken at 1nsec into the cable and the far end measurements were taken at 1 nsec from the far end. Near end is the end connected to the TDR. Far end is the opposite end, which was left unterminated.

Test Setup Schematic: *see last page*

Measured Results:

Unshielded

Configuration	SG	GSG	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)
0.5mm Teflon	130	90	130
0.5mm	105	70	100
0.6mm	130	88	125
0.8mm	153	108	160
1.0mm	110	82	116
1.25mm	127	89	124

Aluminum Foil Shield – Floating Shield

Configuration	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	45	37	47	47
0.6mm	46	35	49	49
0.8mm	44	34	46	47
1.0mm	29	23	30	30
1.25mm	25	20	28	30

Aluminum Foil Shield – Shield Grounded at Near End

Impedance decreases over length of cable – average between near and far end is reported except for S. Here only the far end value is reported because of the large mismatch at the near end.

Configuration	S	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	28	31.5	30.5	47.5	48
0.6mm	27	31.5	30.5	48	48.5
0.8mm	26	29	27.5	47	47
1.0mm	18	21	20	30.5	29.5
1.25mm	16	15.5	17.5	28	30

Aluminum Foil Shield – Shield Grounded at Far End

Impedance nearly constant over length of cable – average between near and far end is reported. S configuration is not reported because impedance is very high and varies a great deal from near to far end.

Configuration	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	43	35.5	47.5	47.5
0.6mm	44	34.5	48	48.5
0.8mm	41.5	33.5	47	47
1.0mm	27	21.5	30	29.5
1.25mm	25	20	28	30

Aluminum Foil Shield – Shield Grounded at Both Ends

Impedance decreases over length of cable – average between near and far end is reported except for S. Here only the far end value is reported because of the large mismatch at the near end.

Configuration	S	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	27	31	30	48	47.5
0.6mm	26	31.5	30.5	48	48.5
0.8mm	25	29	28.5	47	47
1.0mm	16	22	19.5	29.5	30
1.25mm	18	17.5	17.5	28	30

Silver Ink Shield – Shield Floating

Impedance increases over length of cable – average between near and far end is reported. S configuration is not reported because impedance is very high and varies a great deal from near to far end.

Configuration	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	55	41.5	59	58
0.6mm	57.5	44	61	61
0.8mm	58.5	45	61	61.5
1.0mm	38.5	30	40.5	41
1.25mm	37	28.5	39	39

Silver Ink Shield – Shield Grounded at Near End

Impedance increases over length of cable – average between near and far end is reported.

Configuration	S	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	34	34.5	34	59	58
0.6mm	33.5	35.5	35	61	61
0.8mm	33	34.5	34	61	61.5
1.0mm	23	24	24	41	40.5
1.25mm	21	22	22	39	39

Silver Ink Shield – Shield Grounded at Far End

Impedance increases over length of cable – average between near and far end is reported. S configuration is not reported because impedance is very high and varies a great deal from near to far end.

Configuration	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	51	41	59	58
0.6mm	52.5	43.5	61	61
0.8mm	53	43	61.5	61.5
1.0mm	36	30	41	41
1.25mm	35	28.5	39	39

Silver Ink Shield – Shield Grounded at Both Ends

Impedance increases over length of cable – average between near and far end is reported.

Configuration	S	SG	GSG	SS	GSSG
Pitch	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Single ended Impedance (ohms)	Differential Impedance (ohms)	Differential Impedance (ohms)
0.5mm	36	35.5	34.5	59	58
0.6mm	33.5	35.5	35	61	61
0.8mm	33	34.5	34	61.5	61.5
1.0mm	23	24	24	41	40.5
1.25mm	21	22.5	22	39	39

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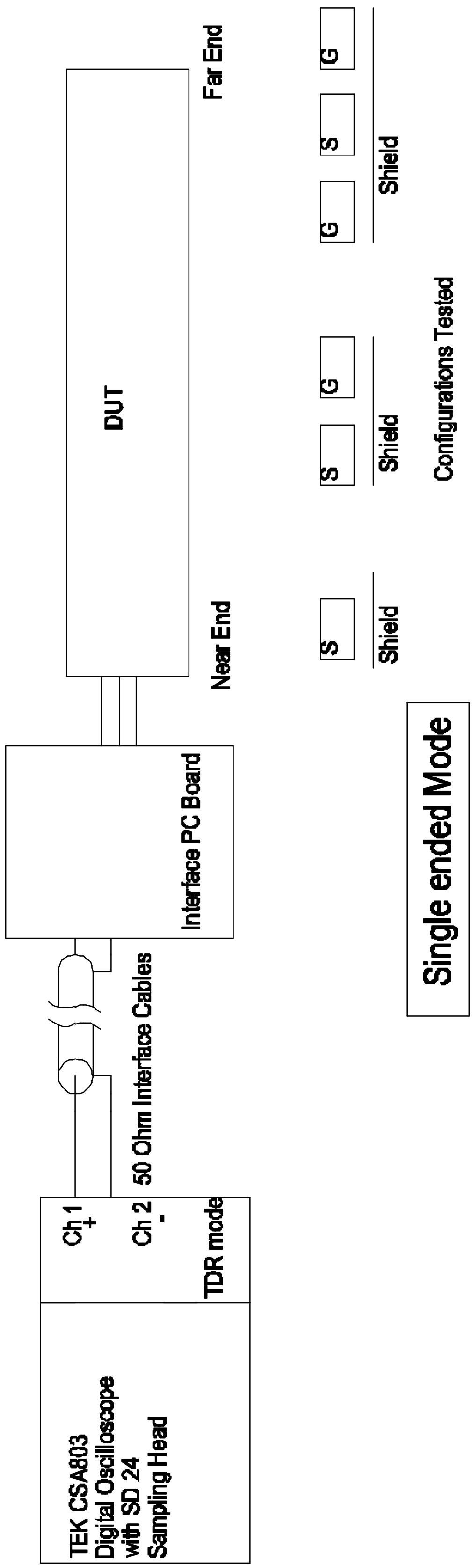
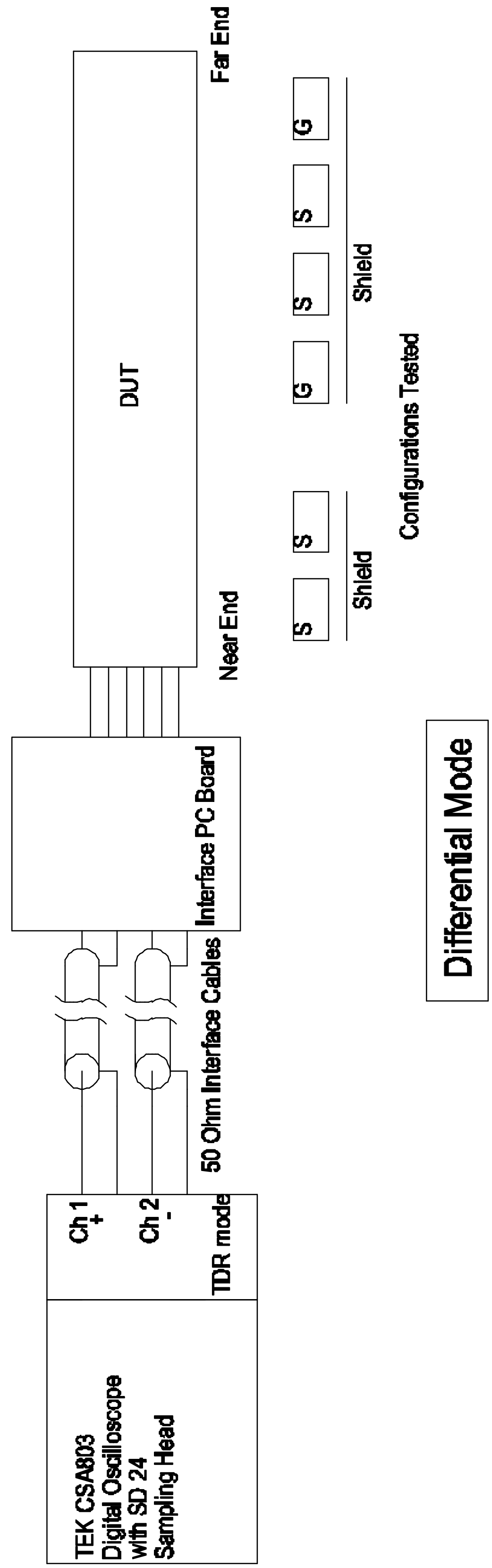

TEK CSA803
Digital Oscilloscope
with SD 24
Sampling Head
Ch 1
+
Ch 2
-
TDR mode
50 Ohm Interface Cables
Interface PC Board
Near End
DUT
Far End
S
Shield
S
G
Shield
G
S
G
Shield
Configurations Tested
Single ended Mode


TEK CSA803
Digital Oscilloscope
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TDR mode
50 Ohm Interface Cables
Interface PC Board
Near End
DUT
Far End
S
S
Shield
G
S
S
G
Shield
Configurations Tested
Differential Mode