Ribbon Micro-Coax Cable Assembly, .025” centers
Project 1302
Test 257
JFS 12/10/02

Summary of Results
These results show that the cable assemblies perform well at 622Mb/s data rates. The eye pattern shows minimal closure. The crosstalk is consistent with connectors on these small pitch lengths.

The results include the effects of the mating connectors and test boards (see Test Setup).

<table>
<thead>
<tr>
<th></th>
<th>Single ended</th>
<th>Differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risetime degradation</td>
<td>431 psec</td>
<td>267 psec</td>
</tr>
<tr>
<td>Impedance mismatch at 500psec risetime</td>
<td>64 ohms max</td>
<td>84 ohms min</td>
</tr>
<tr>
<td>Attenuation at 300MHz</td>
<td>-1.5dB</td>
<td>-1.6 dB</td>
</tr>
<tr>
<td>Eye diagram opening at 622Mb/s</td>
<td>91% of input</td>
<td>85% of input</td>
</tr>
<tr>
<td>FEXT at 500psec risetime (one aggressor)</td>
<td>8.2%</td>
<td>2.3%</td>
</tr>
<tr>
<td>NEXT at 500psec risetime (one aggressor)</td>
<td>12%</td>
<td>not measured</td>
</tr>
<tr>
<td>Insulation resistance at 50 volts dc*</td>
<td>&gt; 50Gohm</td>
<td>&gt; 50Gohm</td>
</tr>
</tbody>
</table>

*between adjacent signals and between signal and ground

Test Equipment
Tektronix CSA-803/SD-24 TDR Signal Analyzer
Hewlett Packard HP-8753C, 300 KHz to 6 GHz Network Analyzer
Anritsu MP1701B 10Gb/s Pattern Generator
Avtech AVP-AV, 6 channel, bipolar Pulse Generator
Anzac differential baluns - 2MHz to 2GHz
General Radio Megohmmeter 1863
Meritec semi-rigid probes

Test Setup
The measured signal path (DUT) includes short traces on printed circuit boards and connectors mated to the assembly under test:

Near end: solder pads on pcb #1302-00401
Samtec QSH-120-01-L-D-A connector

Assembly under test: Samtec QTH-120-04-H-D-A connector
pcb #1302-00401
12” ribbon coax cable (50 ohm, .025” centers, 38awg)
pcb #1302-00401
Samtec QTH-120-04-H-D-A connector

Far end: Samtec QSH-120-01-L-D-A connector
solder pads on pcb #1302-00401
The term “fixture” throughout this report refers to measurements made through the interface cables and probes without the DUT inserted.
Single-ended Measurements

Fixture risetime 24.4 psec

Risetime degradation at pin 4
455ps-24ps = 431psec
Impedance pin 4
Top to bottom traces:
Risetime = 35 – 250 – 500 psec
Peak impedance = 82 – 71 – 64 ohms
Left side is near end connector, right side is far end connector

Impedance pin 2
Top to bottom traces:
Risetime = 35 – 250 – 500 psec
Peak impedance = 75 – 70 – 65 ohms
Left side is near end connector, right side is far end connector
Attenuation (S21) - Pin 2 (fixture has been subtracted)
Horizontal Scale: 1 Mhz to 1 GHz
Vertical Scale: 2dB/div
Markers:
1 at 1MHz = -0.10 dB
2 at 260MHz = -1.57 dB
3 at 600MHz = -6.80 dB
4 at 1GHz = -4.95 dB
Attenuation (S21) - Pin 4 (fixture has been subtracted)

Horizontal Scale: 1 Mhz to 1 GHz
Vertical Scale: 2dB/div

Markers:
1 at 1MHz = -0.10 dB
2 at 260MHz = -2.93 dB
3 at 600MHz = -7.48 dB
4 at 1GHz = -6.86 dB
Fixture at 622Mb/s 2^7-1 PBRS
Stimulus = 100 mv peak to peak
Eye height = 94 mv

Pin 4 at 622Mb/s  2^7-1 PBRS
Eye height = 86 mv

Crosstalk
Active pulse 500mv amplitude
Pin 4 quiet

<table>
<thead>
<tr>
<th>Active pins</th>
<th>2</th>
<th>6</th>
<th>1</th>
<th>3</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risetime</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360ps</td>
<td>-45mv</td>
<td>-48mv</td>
<td>-5.7mv</td>
<td>-6.2mv</td>
<td>-6.5mv</td>
</tr>
<tr>
<td></td>
<td>9%</td>
<td>9.6%</td>
<td>1.1%</td>
<td>1.2%</td>
<td>1.3%</td>
</tr>
<tr>
<td>560ps</td>
<td>-40mv</td>
<td>-41mv</td>
<td>-5.0mv</td>
<td>-5.0mv</td>
<td>-5.6mv</td>
</tr>
<tr>
<td></td>
<td>8%</td>
<td>8.2%</td>
<td>1%</td>
<td>1%</td>
<td>1.1%</td>
</tr>
<tr>
<td><strong>NEXT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360ps</td>
<td>78mv</td>
<td>78mv</td>
<td>5.2mv</td>
<td>6.0mv</td>
<td>5.3mv</td>
</tr>
<tr>
<td></td>
<td>15.6%</td>
<td>15.6%</td>
<td>1.0%</td>
<td>1.2%</td>
<td>1.1%</td>
</tr>
<tr>
<td>560ps</td>
<td>60mv</td>
<td>61mv</td>
<td>4.3mv</td>
<td>5.0mv</td>
<td>4.5mv</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>12%</td>
<td>.9%</td>
<td>1%</td>
<td>0.9%</td>
</tr>
</tbody>
</table>
Single-ended SPICE Model
(For risetimes of 500 psec or longer)

<table>
<thead>
<tr>
<th>Near end connector</th>
<th>Cable</th>
<th>Far end connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC</td>
<td>T-line</td>
<td>CL</td>
</tr>
<tr>
<td>L = 6 nH</td>
<td>Zo = 51.6 ohms</td>
<td>C = 1 pF</td>
</tr>
<tr>
<td>C = 1 pF</td>
<td>Td = 1.5 nsec</td>
<td>L = 1 nH</td>
</tr>
</tbody>
</table>
Differential Measurements

Fixture rise time 24 psec

291 ps – 24 ps = 267 psec
Skew - pins 6 and 8 = approx. 4 psec

<table>
<thead>
<tr>
<th>Trace</th>
<th>Avg(MV)</th>
<th>Horiz Desc</th>
<th>Vert Scale</th>
<th>Type 1</th>
<th>0.1 – 716.75ns</th>
<th>25.990</th>
<th>51.889</th>
<th>38.63080ns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fast</td>
<td>200µV/div</td>
<td>O2</td>
<td>–155.436ns</td>
<td>36.533</td>
<td>73.871</td>
<td>38.59680ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Data</td>
<td>152.133ns</td>
<td>10.599</td>
<td>21.190</td>
<td>38.59680ns</td>
</tr>
</tbody>
</table>

Impedance - pins 6 and 8

top to bottom traces:

Risetime = 35 – 250 – 500 psec
Minimum impedance =

52 – 73 – 84 ohms

Left side is near end connector, right side is far end connector
S21 Pins 6 and 8 (fixture has been subtracted)

Attenuation (S21) - Pin 6 and 8
Horizontal Scale: 1 MHz to 1 GHz
Vertical Scale: 2dB/div
Markers:
1 at 1MHz = -0.09 dB
2 at 271MHz = -1.69 dB
3 at 530MHz = -2.30 dB
4 at 1GHz = -4.03 dB
Fixture at 622Mb/s $2^{7-1}$ PBRS
Stimulus = 200 mv peak-peak
Eye height = 186 mv

Crosstalk
(Due to difficulty of probing the DUT differentially, only FEXT was measured and it was measured using the TDR pulse)

Active pulse on pins 2 and 4: amplitude 500mv, risetime 24psec
Pins 6 and 8 quiet
FEXT: -22mv or 4.4% at risetime of 24 psec
-11.7mv or 2.3% at risetime of 500 psec using software filter
Appendix - Short Assembly with shorter cable and short connectors
Single ended
Signal path:
Near end: solder pads on pcb #1302-00401
Samtec QSH-120-01-L-D-A connector

Assembly under test: Samtec QTH-120-03-H-D-A connector
pcb #1302-00401
6” ribbon coax cable (50 ohm, .025” centers, 38awg)
pcb #1302-00401
Samtec QTH-120-03-H-D-A connector

Far end: Samtec QSH-120-01-L-D-A connector
solder pads on pcb #1302-00401

Crosstalk, single ended
Active pulse 500mv amplitude
Pin 4 quiet

<table>
<thead>
<tr>
<th></th>
<th>Short Assy.</th>
<th>Long Assy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risetime</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>FEXT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360ps</td>
<td>-44mv</td>
<td>-45mv</td>
</tr>
<tr>
<td></td>
<td>8.8%</td>
<td>9%</td>
</tr>
<tr>
<td>560ps</td>
<td>-36mv</td>
<td>-40mv</td>
</tr>
<tr>
<td></td>
<td>7.2%</td>
<td>8%</td>
</tr>
<tr>
<td>NEXT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360ps</td>
<td>59mv</td>
<td>78mv</td>
</tr>
<tr>
<td></td>
<td>11.8%</td>
<td>15.6%</td>
</tr>
<tr>
<td>560ps</td>
<td>45mv</td>
<td>60mv</td>
</tr>
<tr>
<td></td>
<td>9%</td>
<td>12%</td>
</tr>
</tbody>
</table>
Attenuation (S21) - Pin 62 (fixture has been subtracted)
Horizontal Scale: 1 Mhz to 1 GHz
Vertical Scale: 2dB/div
Markers:
1 at 1MHz = -0.16 dB
2 at 260MHz = -2.97 dB
3 at 600MHz = -3.92 dB
4 at 1GHz = -5.04 dB