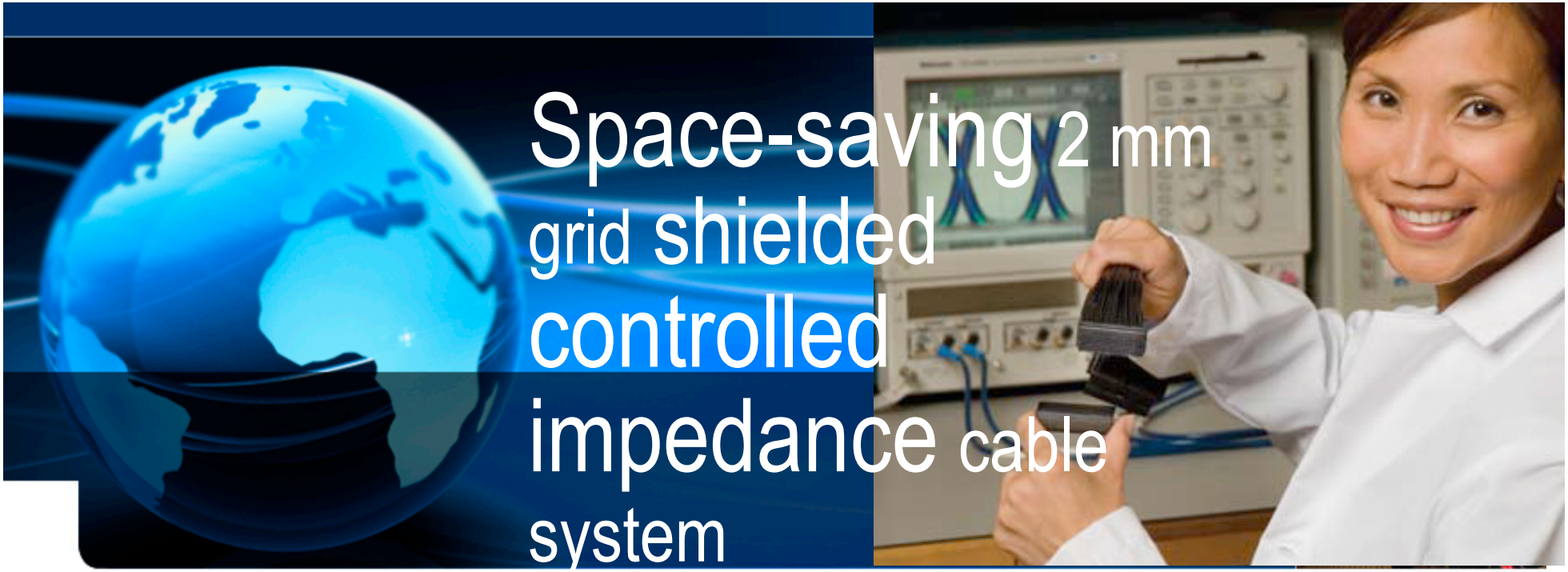
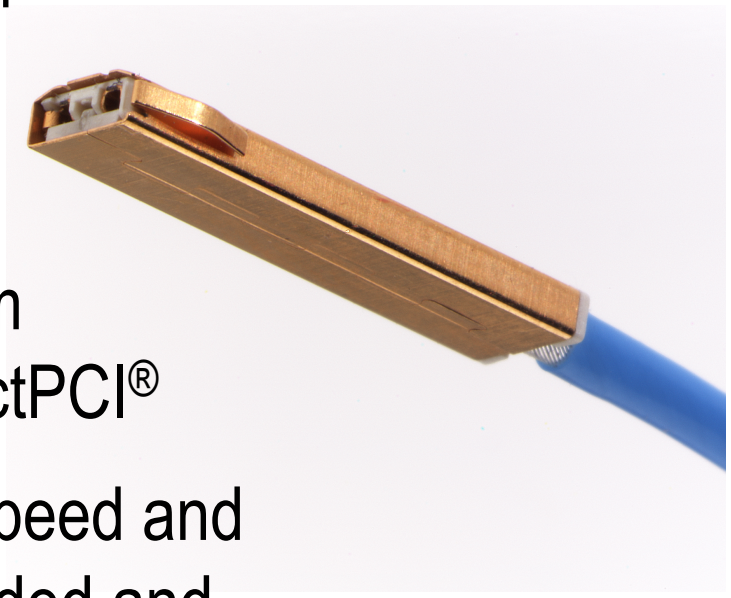


Introduction

- Purpose
  - *To demonstrate how the components in the kit can be use for testing and characterizing the signal integrity of the 3M™ SCI Latch/Eject Headers 2 mm and 3M™ SCI Coaxial and/or Twin-axial Cable Assemblies 2 mm.*
- Objectives
  - *Highlight key performance features and describe applications for the 3M SCI Latch/ Eject Headers 2 mm and 3M SCI Coaxial and/or Twin-axial Cable Assemblies 2 mm.*
- Content
  - *22 pages*
- Learning Time
  - *15 minutes*

3M™ SCI Cable Assembly 2 mm System Overview

- Shielded Controlled Impedance (SCI) is a fully shielded, high performance transmission line assembly system
  - *50 Ohm coaxial, single-ended*
  - *100 Ohm twinaxial, differential pair*
- Mates with industry-standard 2 mm headers, e.g. Latch/Eject, CompactPCI®
- Provides upgrade path to higher speed and better crosstalk than standard molded and IDC cable assemblies



SCI and Popular Coax Connectors Compared

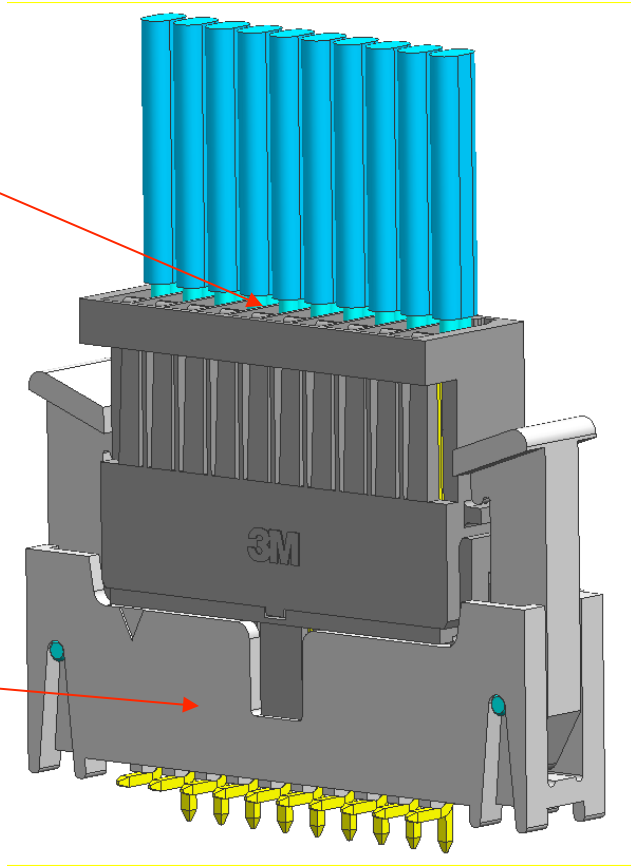
SCI	*BNC*	*SMA*	*SMB*	*MMCX*	*MCX*
≤ 6 GHz	*4 GHz*	*12 GHz*	*4 GHz*	*6 GHz*	*6 GHz*

- SCI offers:
  - *Performance – wide frequency range*
  - *Space saving – board footprint, equipment panel*
  - *Ease of use – mates with standard and impedance controlled headers*
  - *Customization – with 3M applications engineering support*

3M™ SCI Cable Assembly 2 mm System Carrier

3M SCI Cable Assemblies 2 mm plugged into a 3M™ Carrier, 9300 Series

3M™ Latch/Eject Header 2 mm, 1552 Series



3M™ SCI Latch/Eject Header 2 mm Development Kit

3M™ SCI Development Kit Descriptions

Description*	Series
2 mm SCI Latch/Eject SMT Vertical Header (*without* PCB test board).....	9401
2 mm SCI Latch/Eject SMT Vertical Header soldered to PCB.....	9402
2 mm SCI Latch/Eject PTH Vertical Header (*without* PCB test board).....	9403
2 mm SCI Latch/Eject PTH Vertical Header soldered to PCB.....	9404

** For additional development kit ordering information see 3M Data Sheet TS-2298*

3M™ SCI Development Kit Contents

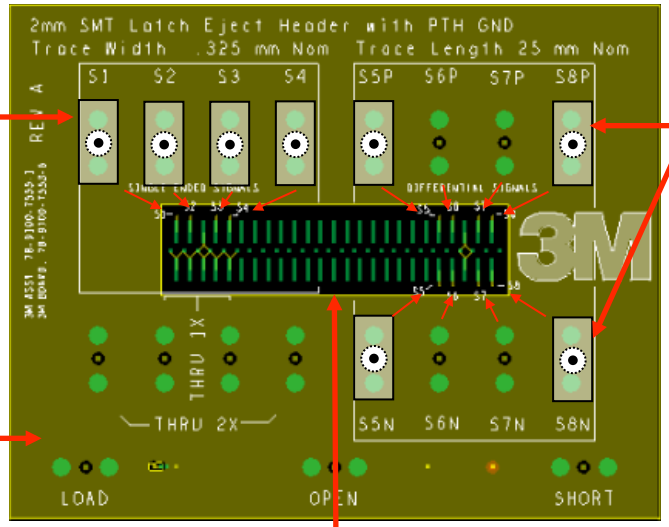
- SCI Cable Assemblies 2 mm, differential and single-ended (twinaxial and coaxial), 24” length
- 2x25 surface mount or through-hole Latch/Eject Headers 2 mm
- 2x25 carrier used for bundling together the SCI cable mount connectors
- Optional specialized printed circuit board for testing
- SMA connectors for testing, mounted on the PCB for development kits that include a printed circuit board (9402 and 9404 Series)
- SMA connectors specified for development kits that do not include a printed circuit board (9401 and 9403 Series)

9402 Test Board Layout for SMT Latch/Eject Header

Single-ended Test Locations
SMA to Header traces

4 pre-installed SMA connectors identified by white rectangles

SMA Connector SMT pads for optional Calibration traces (7 places shown)



Differential Signal Test Locations
SMA to Header traces

4 pre-installed SMA connectors identified by white rectangles

4 additional SMA pads available for end user connector installation

Latch/Eject Header <u>SMT</u> Pads
(2x25 places shown)
Note: Header will be pre-installed

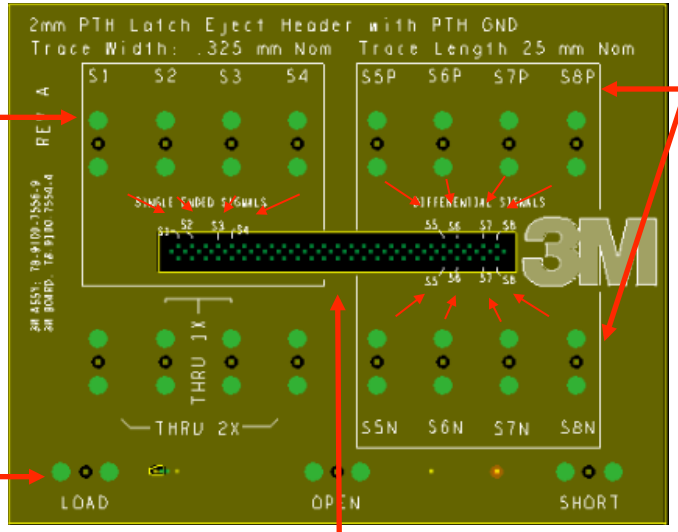
See Latch/Eject Header Data Sheet TS-2199 for additional information.

9404 Test Board Layout for PTH Latch/Eject Header

Single-ended Test Locations
SMA to Header traces

4 pre-installed SMA connectors identified by white rectangles

SMA Connector SMT pads for optional Calibration traces (7 places shown)



Differential Signal Test Locations
SMA to Header traces

4 pre-installed SMA connectors identified by white rectangles

4 additional SMA pads available for end user connector installation

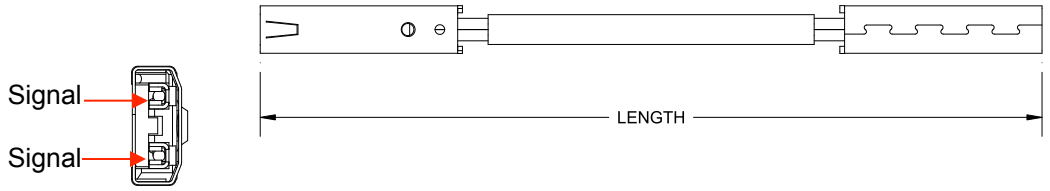
Latch/Eject Header <u>PTH</u>
(2x25 places shown)
Note: Header will be pre-installed

See Latch/Eject Header Data Sheet TS-2199 for additional information

3M™ SCI Cable Assemblies 2 mm in the Kit

SCI Twin-axial Cable Assembly 2 mm PN 98-3030-058-024.0-0 [3 each]

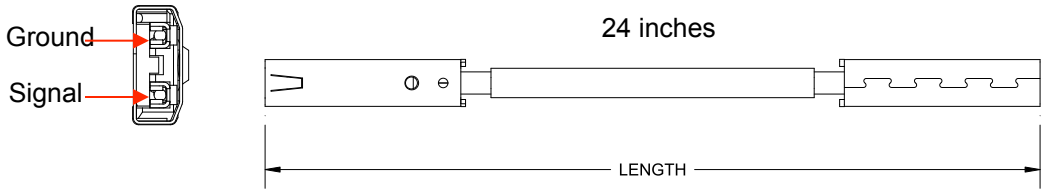
AWG 26(1) 100 Ohm Low Capacitance Twin-axial Cable with 2 mm SCI Connectors each end.



24 inches

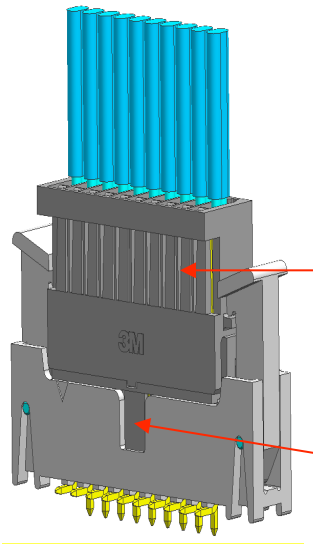
SCI Coaxial Cable Assembly 2 mm PN 98-2929-027-024.0-0 [3 each]

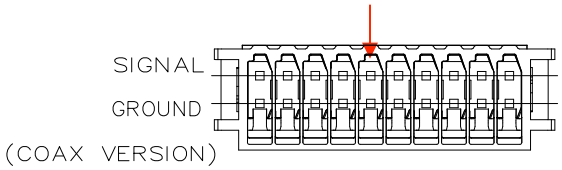
AWG 26(7/34) 50 Ohm Low Capacitance Coaxial Cable with 2 mm SCI Connectors each end.



See 3M™ Cable Assembly Specification TS-2105 for additional information

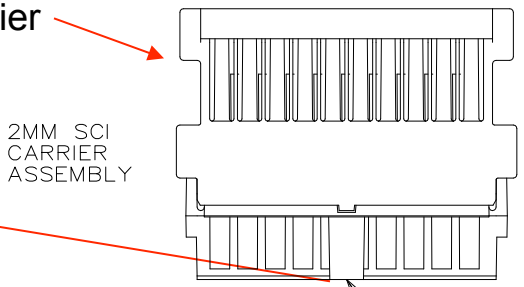
3M™ SCI Carrier 2 mm Orientation





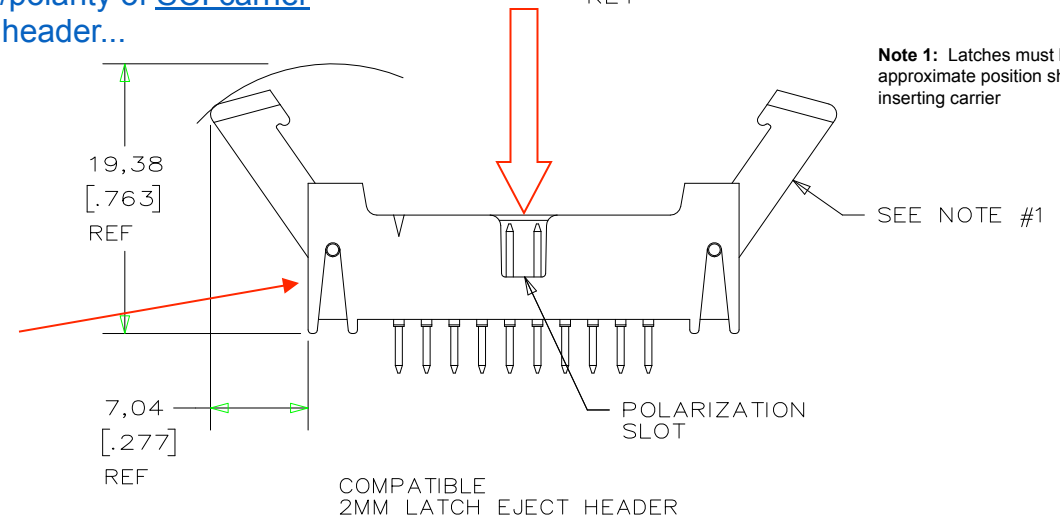
Note 1: Orientation/polarity of SCI connector when inserting into top of carrier...

Carrier



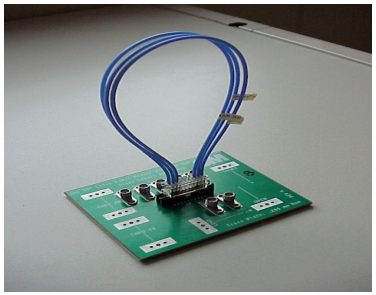
Note 2: Orientation/polarity of SCI carrier when inserting into header...

2mm Latch
Eject Header
(See TS-2199)



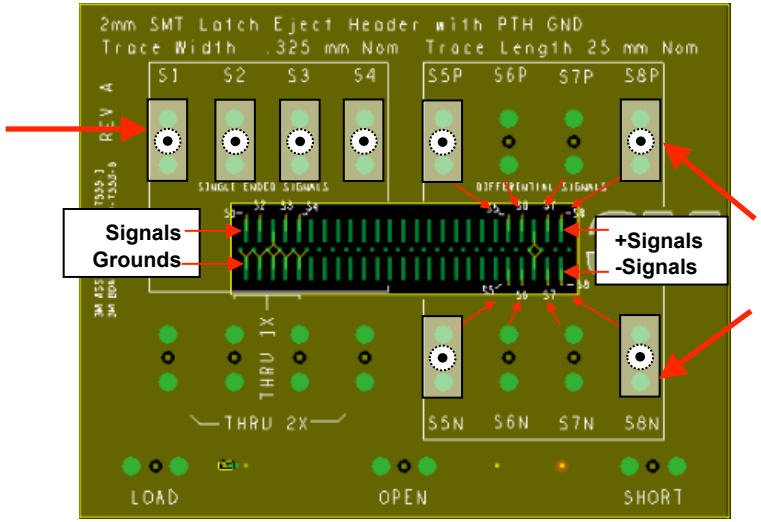
Testing Guidelines for 9402 and 9404 Series

- Single-ended or differential signal integrity testing can be performed at locations as shown here...



Single-ended Channels

S1
S2
S3
S4



Differential Channels

S5P/S5N
S6P/S6N
S7P/S7N
S8P/S8N

Note: SMA connectors to be installed on S6 and S7 channels by end user.

Testing Options Using the 9402 and 9404 Series

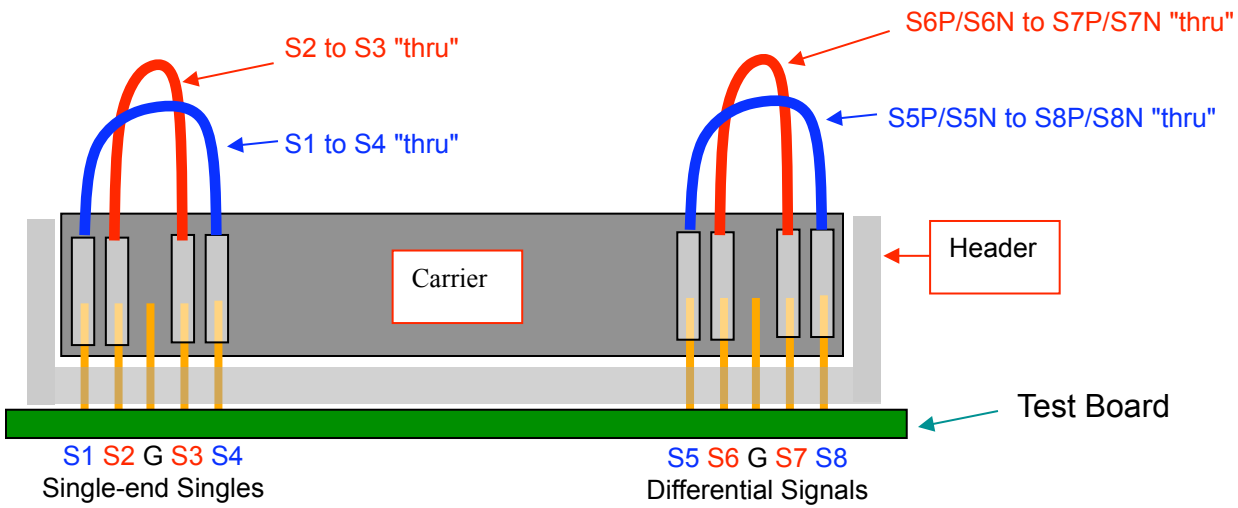
TDR/TDT Testing:

- **Note 1**: 35ps step input to board typically results in approx 38-40ps rise time at header.
- **Note 2**: Impedance of SMA connections typically 50 +/- 5Ω at 40ps rise time.

Network Analyzer ("S-Parameter" and Eye Pattern Testing):

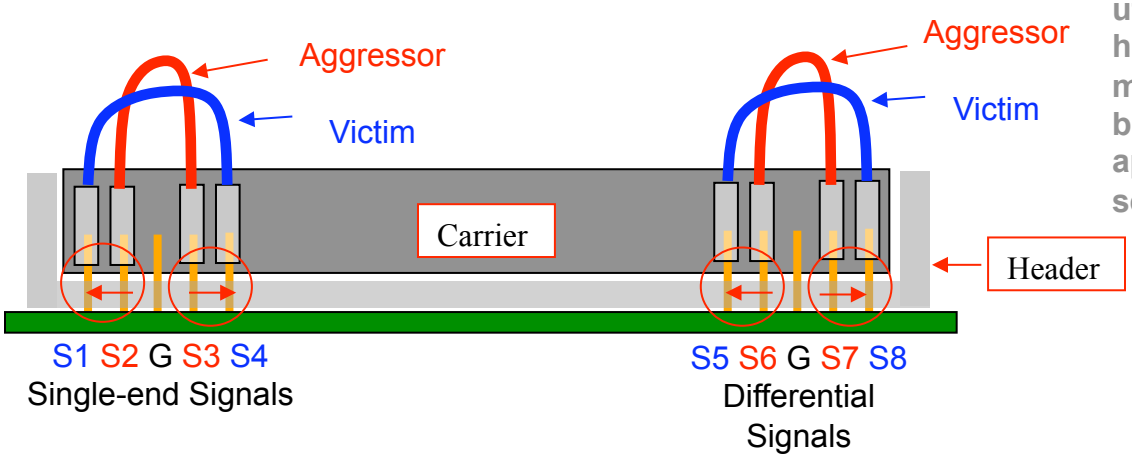
- **Note 3**: SMA and test board losses will be included in measurement unless calibrated out using calibration traces and structures provided.
- **Note 4**: End user will need to install SMA connectors for calibration traces in order to eliminate board loss and impedance mis-match of SMA connections.

Examples of TDT, S-Parameter and Eye Pattern "through" test set-up on the same board:



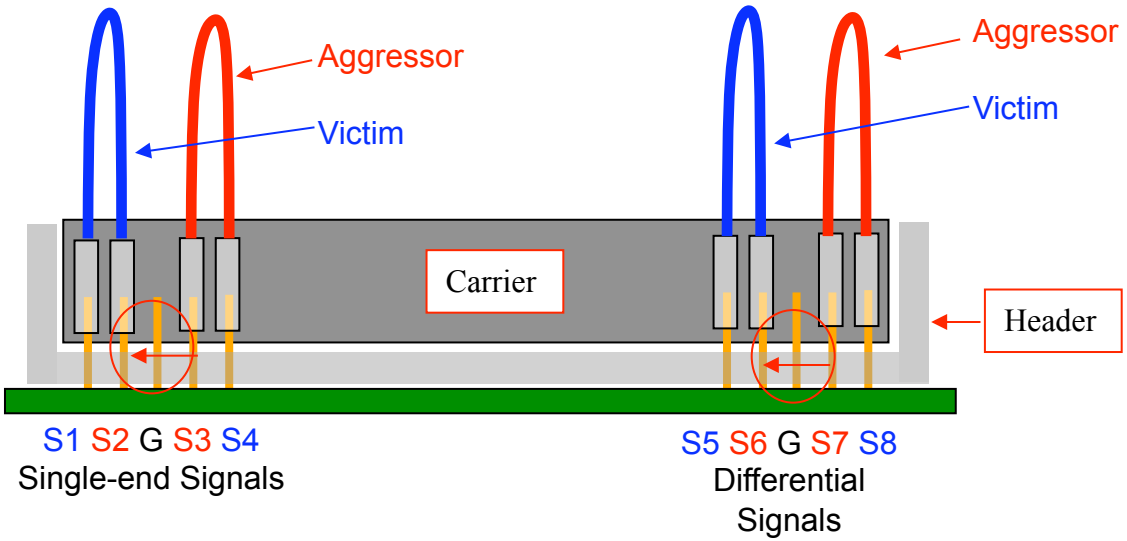
Testing for Crosstalk

Test Setup example for "two adjacent aggressors" on the same board...



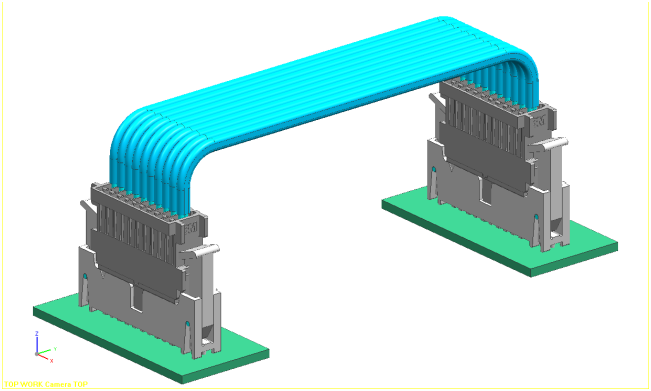
NOTE: Example test setups shown below utilize one test board; however, multiple boards may be purchased for board-to-board applications utilizing separate ground planes.

Test Setup example for a "single aggressor separated by grounded position" on the same board...



Representative Crosstalk Performance

SCI Cable Assembly interconnecting two 2 mm Latch/Eject Headers:



Electrical Performance (Header + Carrier + SCI Connector + 12 ins. Cable)

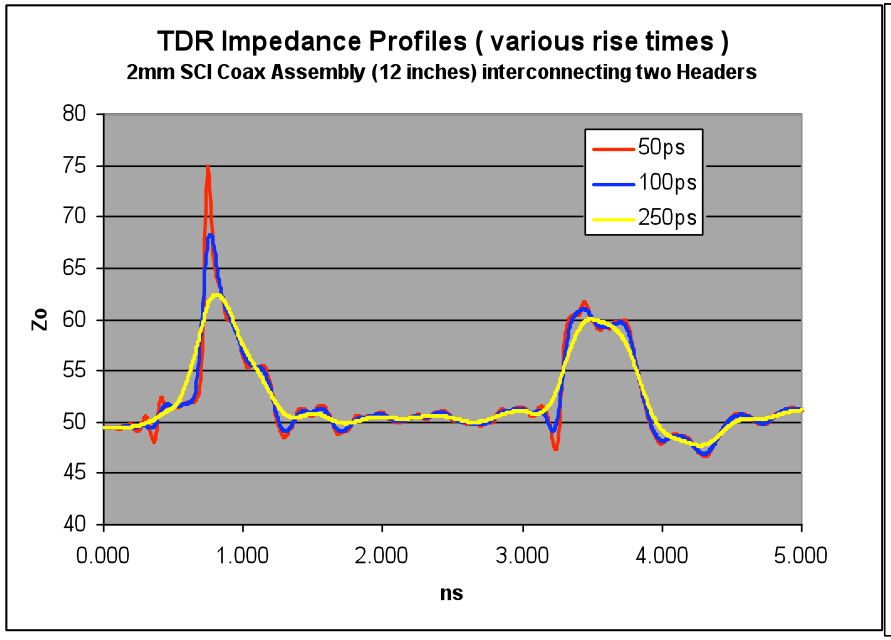
		Differential		Single Ended	
Rise Time (ps)		Near End Crosstalk	Far End Crosstalk	Near End Crosstalk	Far End Crosstalk
Increasing Speed ↓	250	2.7%	2.2%	1.9%	3.4%
	100	5.8%	5.1%	4.2%	6.6%
	50	7.6%	7.7%	5.4%	8.9%

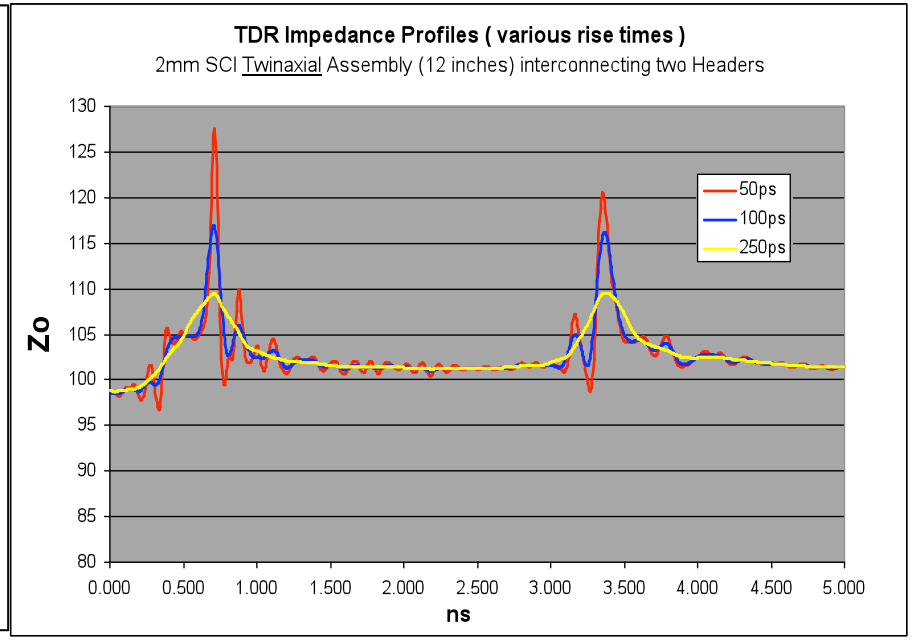
Low Crosstalk at typical rise-times

Representative Impedance Profile

SCI Cable Assembly 2 mm (12 inches) interconnecting two Latch/Eject Headers:

TDR profiles at various rise times:

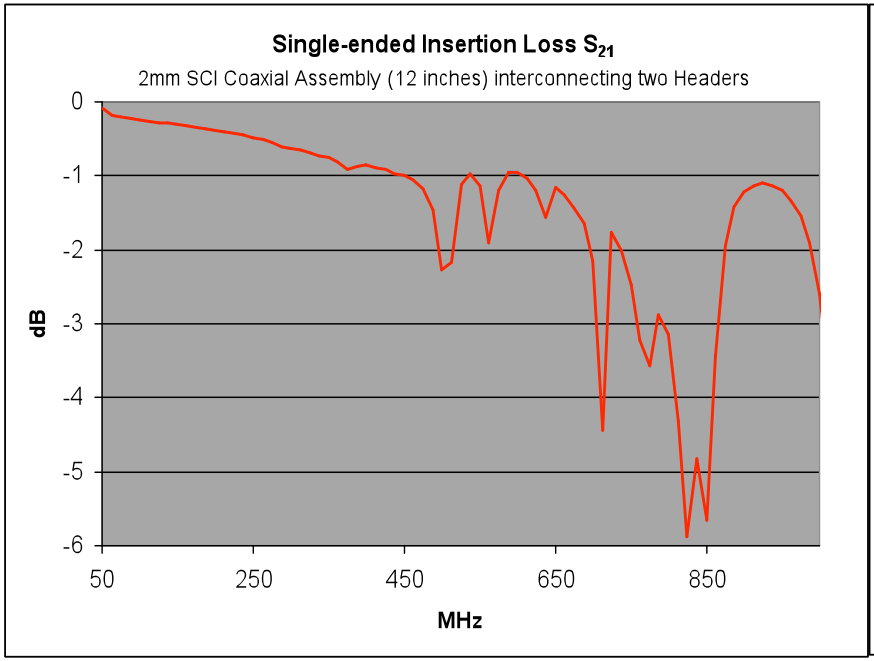


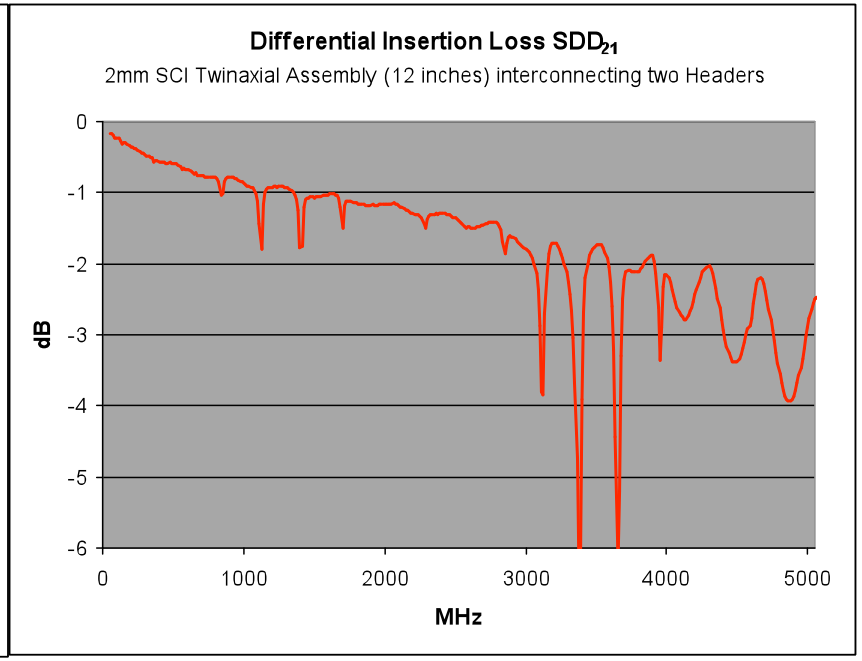


Representative Insertion Loss (S-Parameter)

SCI Cable Assembly 2 mm(12 inches) interconnecting two Latch/Eject Headers:

Insertion Loss (S-Parameter) examples:



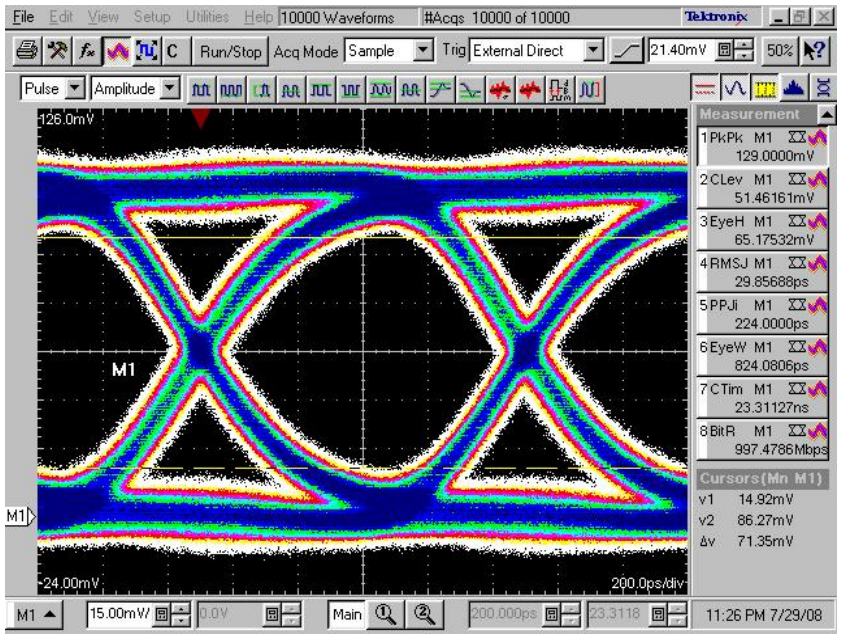


Representative Bandwidth Performance

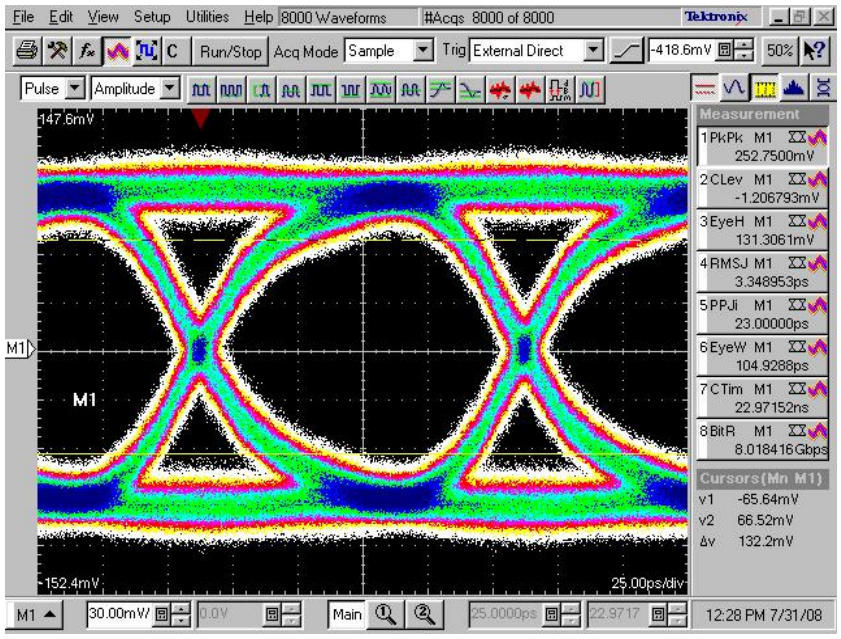
SCI Cable Assembly 2 mm(12 ins.) interconnecting two Latch/Eject Headers:

Eye Pattern Examples:

1 Gbps Single-ended (50% eye height)



8 Gbps Differential (50% eye height)



3M™ SCI 2 mm Development Kit Summary

Description*	Series
2 mm SCI Latch/Eject SMT Vertical Header (*without* PCB test board).....	9401
2 mm SCI Latch/Eject SMT Vertical Header soldered to PCB.....	9402
2 mm SCI Latch/Eject PTH Vertical Header (*without* PCB test board).....	9403
2 mm SCI Latch/Eject PTH Vertical Header soldered to PCB.....	9404

** For additional development kit ordering information see 3M Data Sheet TS-2298*

Technical Assistance and Information

- Website: www.3M.com/highspeed
  - *TS-2199 Data Sheet for 1552 Series 2mm Latch/Eject Header*
  - *TS-2105 Data Sheet for SCI Cable Assemblies and Carriers 2 mm*
  - *TS-2298 Data Sheet for Design Kits with Test boards, Cable Assemblies and Headers*
- 3M e-Tech Service Mailbox:
  - *esd-interconnect-etechservice@mmm.com*
- Customer Service 1 (800) 225-5373

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