AMP

High Speed Data Connector (HSSDC) For 100 MBit/Sec Token Ring

John L. Hill
AMP Incorporated
July, 1998

AMP

High Performance Cable Assembly Characteristics

- Controlled/Matched Impedance Connectors and Cables
- High Speed Signals
  - Data Rates of 0.5 to 1.0625 to 2.125 to ? Gigabits per second
  - Sub-nanosecond risetimes
- Low Skew Cable
- Low Crosstalk
- Fully Shielded for Emissions Control

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High Performance Cable Assemblies Examples

- HSSDC (High Speed Serial Data Connector)
- DB9
- IEEE 1394 High Performance Serial Bus

- Applications for High Performance Cable Assemblies
  - Fibre Channel
  - Serial Storage Architecture (SSA)
  - Gigabit Ethernet

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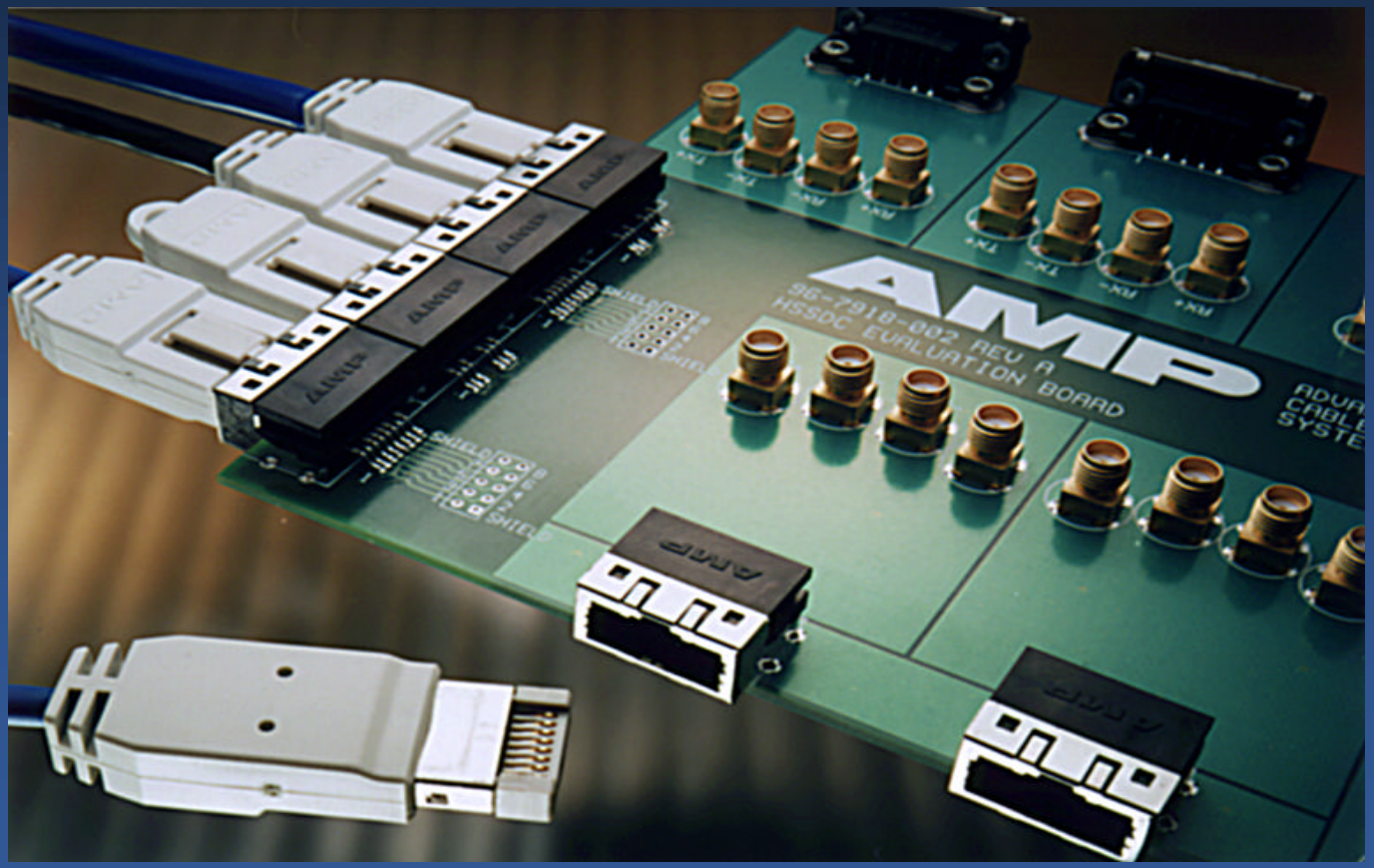
High Speed Serial Data Connector



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Standards Already Including HSSDC

- X3T11 (FC-PH3) Approved
- X3T10.1 (SSA-PH2) Approved
- IEEE 802.3z Approved

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HSSDC Available Products

- Cable Assemblies
  - Low Skew Shielded Quad Cable (#22, #24, #28, #30 AWG)
  - Equalized for long lengths
  - Fully shielded, overmolded cable plugs
- Board Mount Receptacles
  - Right Angle Surface Mount
  - Straddle Mount
  - Single & Dual Port Bulkhead Brackets

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HSSDC Applications

- Fibre Channel, SSA, Gigabit Ethernet and Token Ring
  - » Multi-user, mass storage retrieval
  - » Video editing and video on demand
  - » Data and design centers
- Storage, Servers, Workstations
- Hubs, Routers, Switches
- Host Bus Adapter and Network Interface Cards

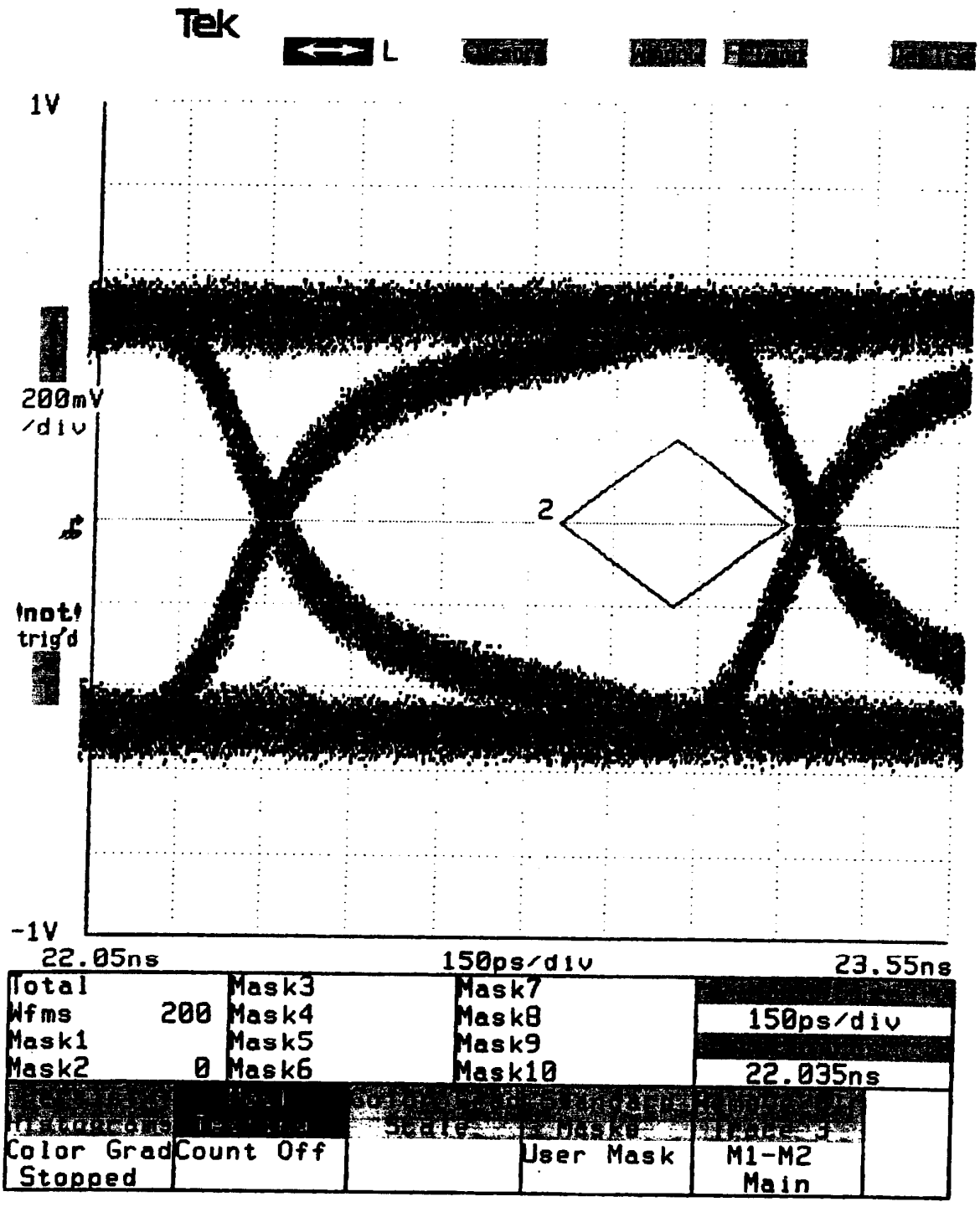
EYE PATTERN MEASUREMENTS

DATE: 6/29/98

CABLE LENGTH (Meters)	GAUGE SIZE AWG	AMP PART #	CONNECTOR TYPE	BIT RATE (Gb/s)	DATA	INPUT (Volts)	INPUT FROM PULSE GENERATOR (Volts)	EYE OPENING (Mill-volt)	DATE TESTED
5	28	636246-6	HSSDC-DB9	1.0625	PRBS	0.6	0.62	400 +	6/26/98
5	28	636246-6	HSSDC-DB9	1.0625	PRBS	1.1	1.2	400 +	6/29/98
10									
13	22	?????	HSSDC-HSSDC	1.0625	PRBS	0.6	0.64	400 +	6/5/98
13	22	?????	HSSDC-HSSDC	1.0625	PRBS	1.1	1.2	400 +	6/29/98
15	24	1-621771-0	DB9-DB9	1.0625	PRBS	1.1	1.24	400 +	6/26/98
20	22	1-621771-2	DB9-DB9	1.0625	PRBS	1.1	1.24	400 +	6/26/98
20	22	621724-6	HSSDC-HSSDC	1.0625	PRBS	1.1	1.24	400 +	6/26/98
25	22	1-621724-1	HSSDC-HSSDC	1.0625	PRBS	1.1	1.24	400 +	6/26/98
30	22	636136-1	HSSDC-HSSDC	1.0625	PRBS	1.1	1.24	400 +	6/26/98
13	22	?????	HSSDC-HSSDC	1.25	PRBS	1.1	1.24	400 +	6/25/98
15	24	1-621771-0	DB9-DB9	1.25	PRBS	1.1	1.2	400 +	6/29/98
20	22	1-621771-2	DB9-DB9	1.25	PRBS	1.1	1.2	400 +	6/29/98
20	22	621724-6	HSSDC-HSSDC	1.25	PRBS	1.1	1.2	400 +	6/29/98
25	22	1-621724-1	HSSDC-HSSDC	1.25	PRBS	1.1	1.2	316	6/29/98
30	22	636136-1	HSSDC-HSSDC	1.25	PRBS	1.1	1.2	350	6/29/98

HSSDC ⟷ DB9 AMP (636246-6) 5m, 28AWG

11801C DIGITAL SAMPLING OSCILLOSCOPE
date: 29-JUN-98 time: 10:30:57

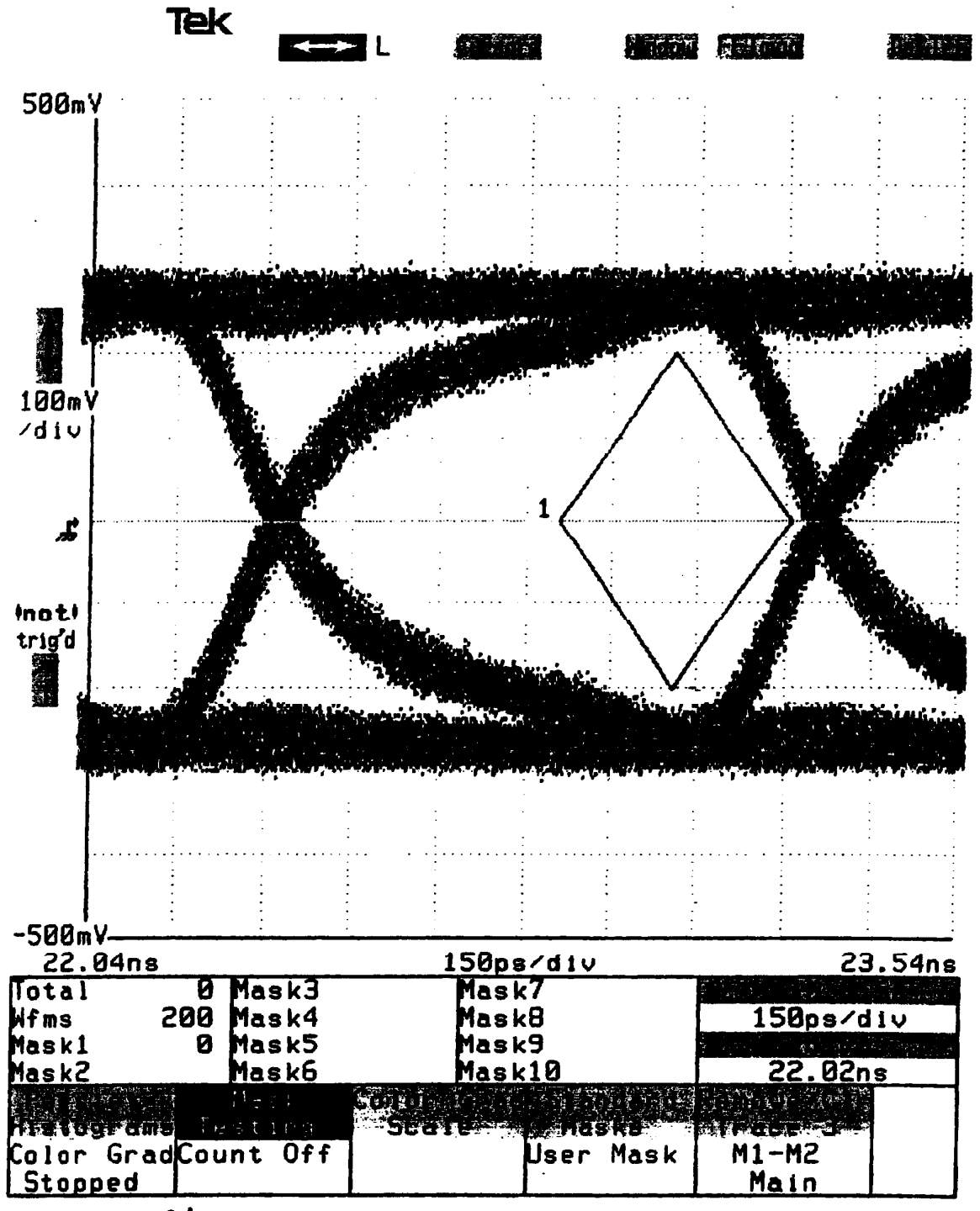


Bit Rate: 1.0625 Gb/s

Data: PRBS

Input = 1.1 V_{p-p} (8133A ; Input = [redacted] 1.2 V_{p-p})

HSSDC ⟷ DB9 AMP(636246-6) 5m, 28AWG



Bit Rate : 1.0625 Gb/s

Data : PRBS

Input : 0.6 Vp-p (8133A ; Input = 0.62 Vp-p)

HSSDC → HSSDC cable Length = 13 meters, 22 AWG

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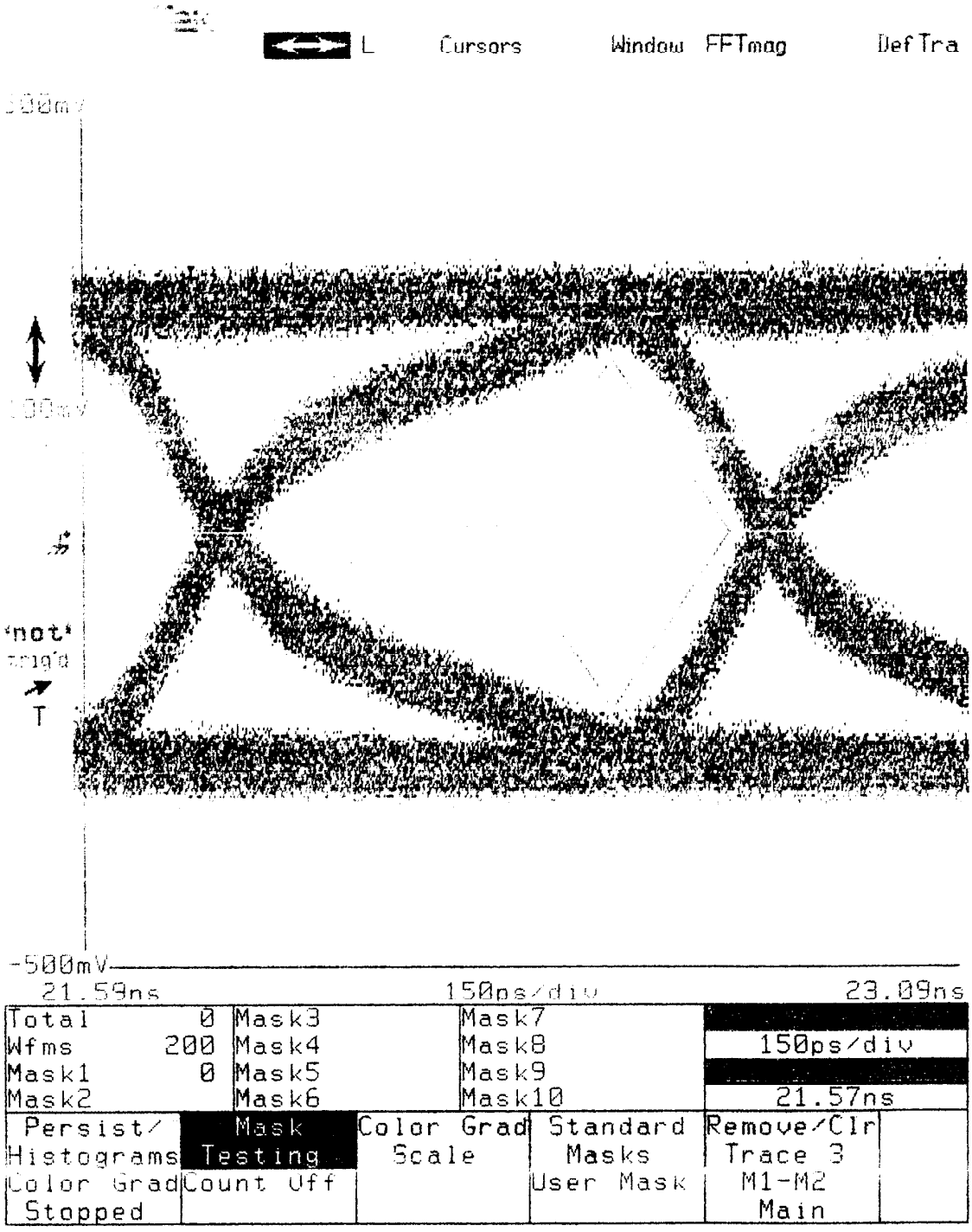
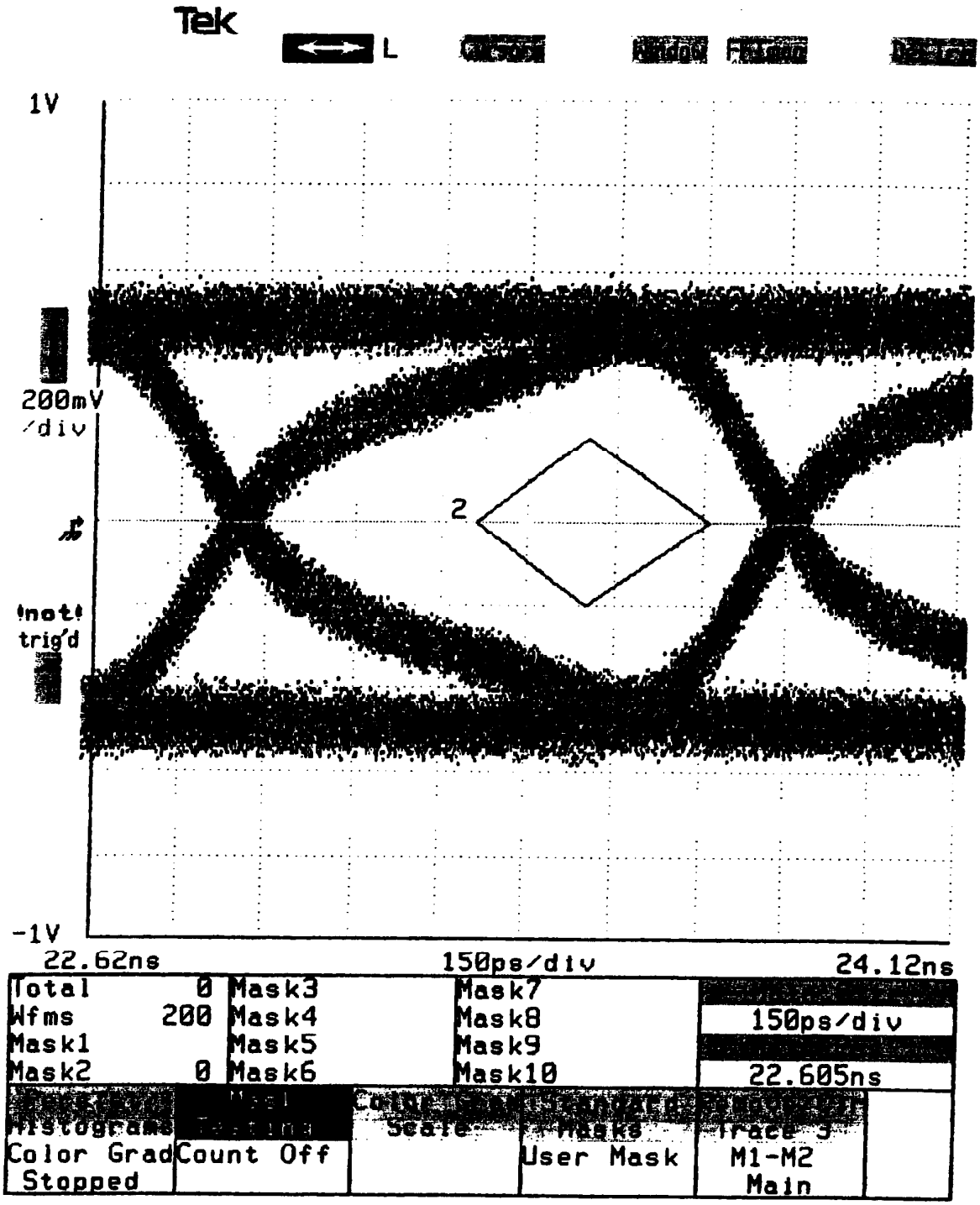


Bit Rate : 1.0625 Gb/s

Data : PRBS

Input : **0.6** Vp-p (8133A ; Input = 0.64 Vp-p)

HSSDC ↔ HSSDC 13m ; 22 AWG

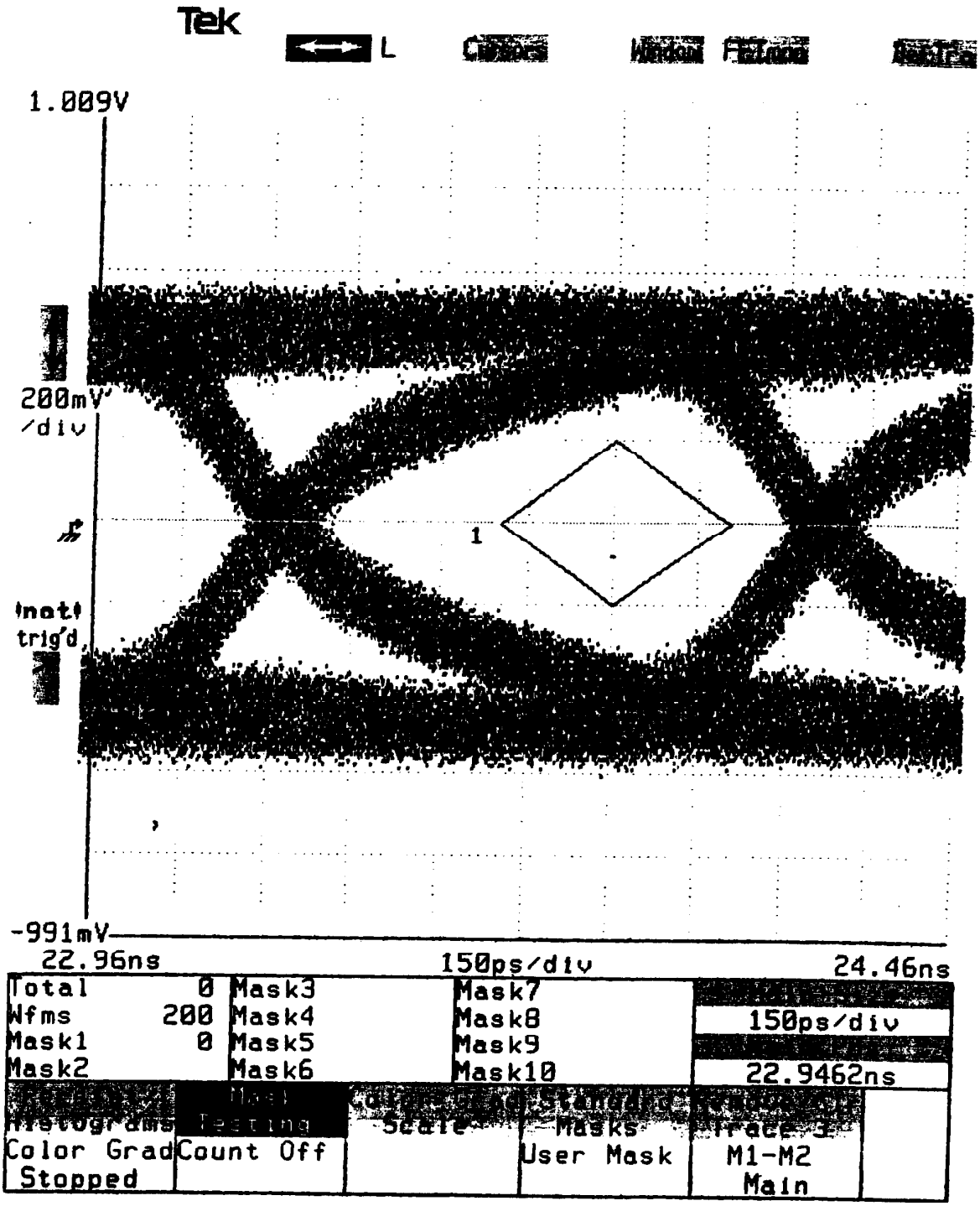


Bite Rate : 1.0625 Gb/s

Data : PRBS

Input = 1.1 V_{p-p} (8133A ; Input = 1.2 V_{p-p})

DB9 ⟷ DB9 AMP(1-621771-0) 15 meters, 24 AWG

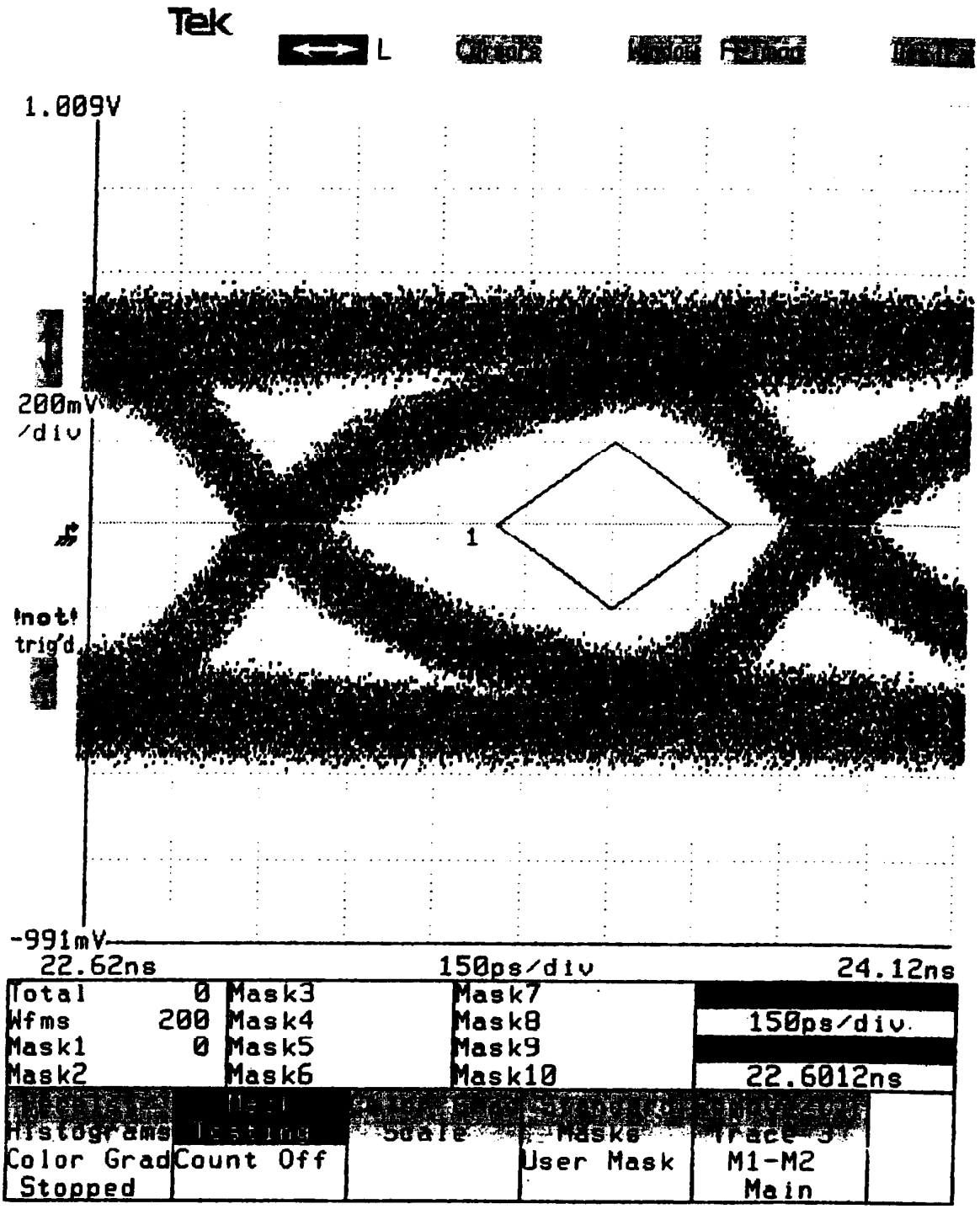


Bit Rate : 1.0625 Gb/s

Data : PRBS

Input : 1.1Vp-p (8133 A ; Input = 1.24Vp-p)

DB9↔DB9 AMP (1-621771-2) 20 meters, 22 AWG

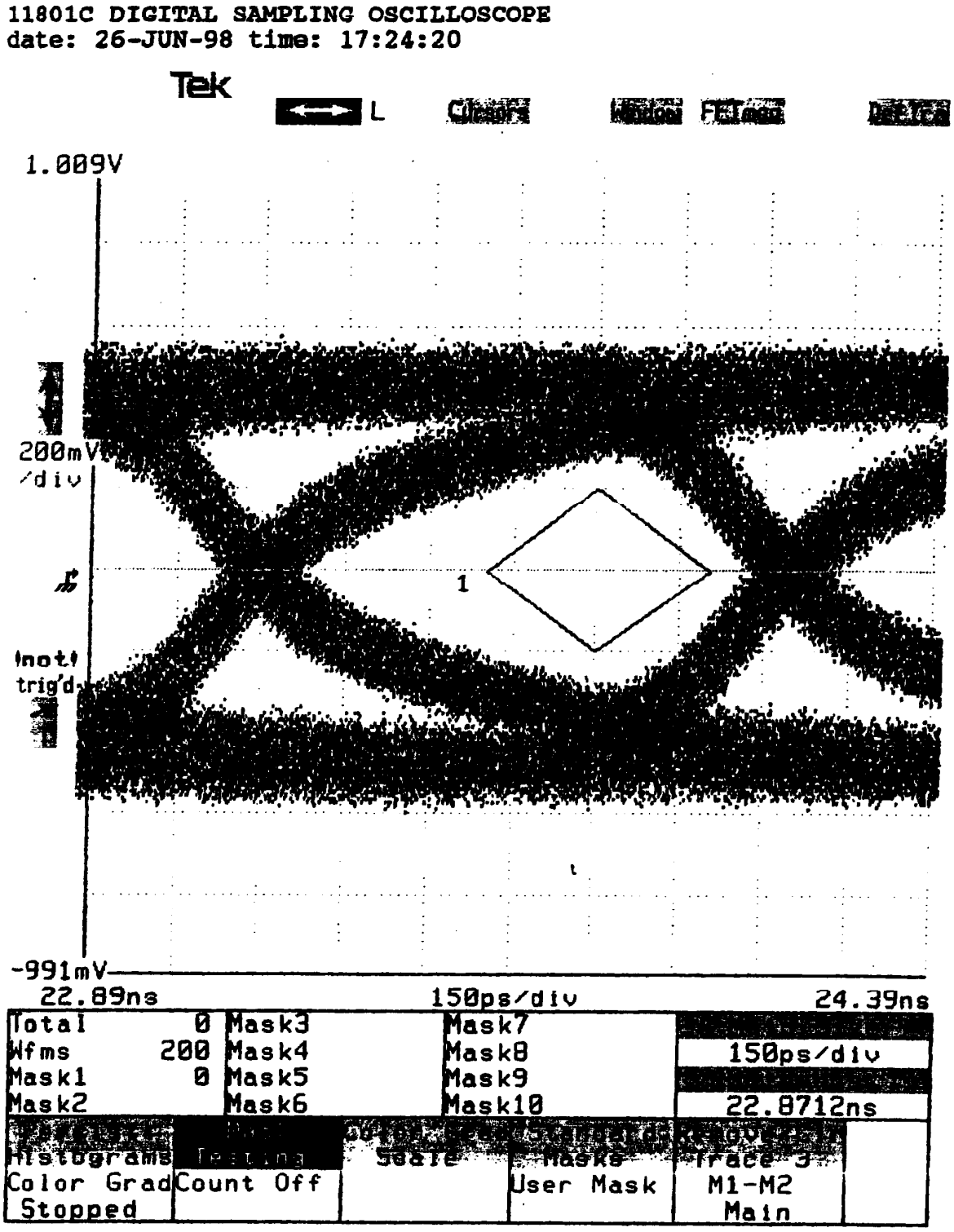


Bit Rate: 1.0625 Gb/s

Data: PRBS

Input: 1.1 Vp-p (8133A; Input = 1.24 Vp-p)

HSSDC ⟷ HSSDC AMP (621724-6) 20 Meters, 22 AWG

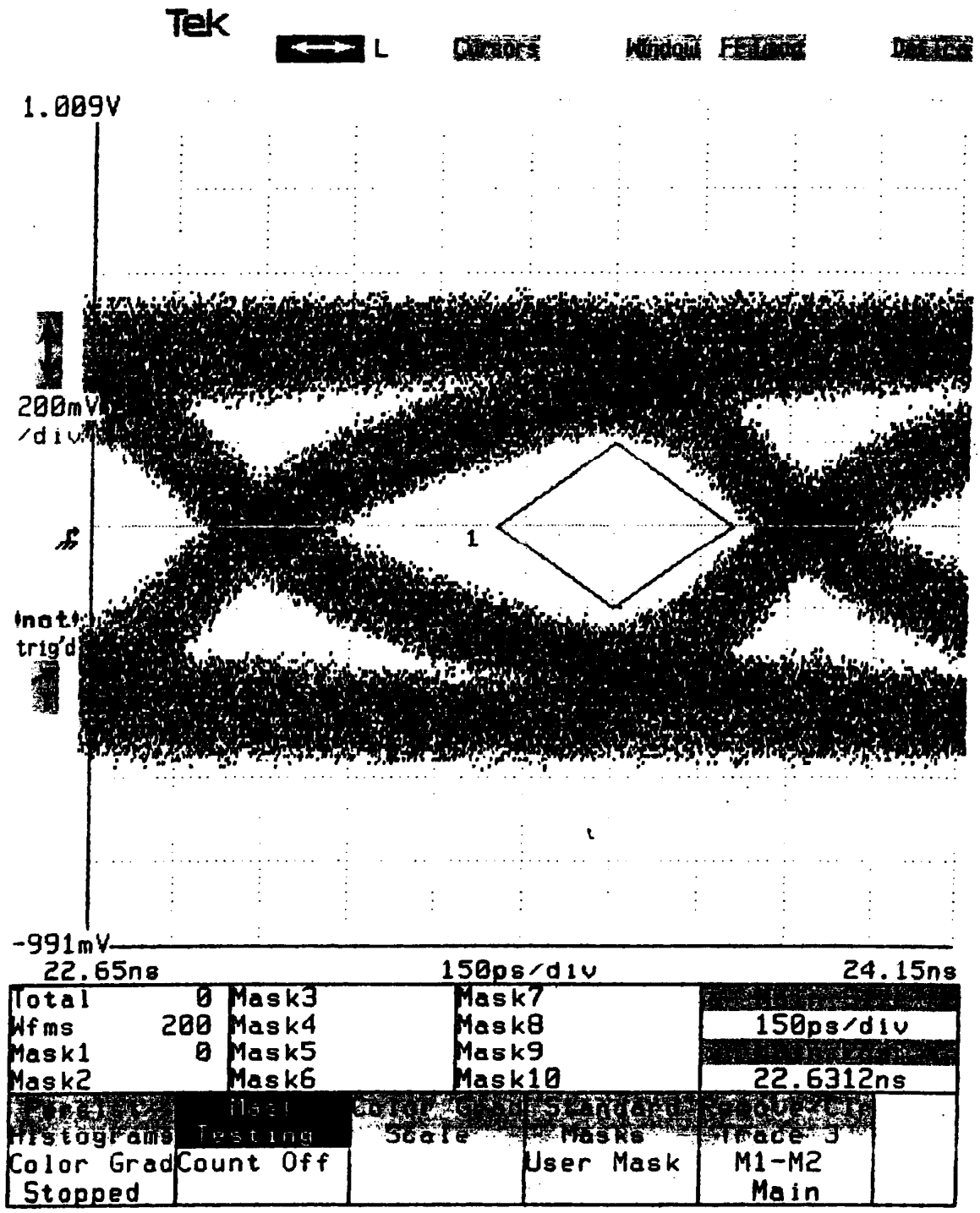


Bit Rate : 1.0625 Gb/s

Data : PRBS

Input : 1.1Vp-p (8133A ; Input = 1.24Vp-p)

HSSDC ⟷ HSSDC AMP (1-621724-1) 25 meters, 22AWG

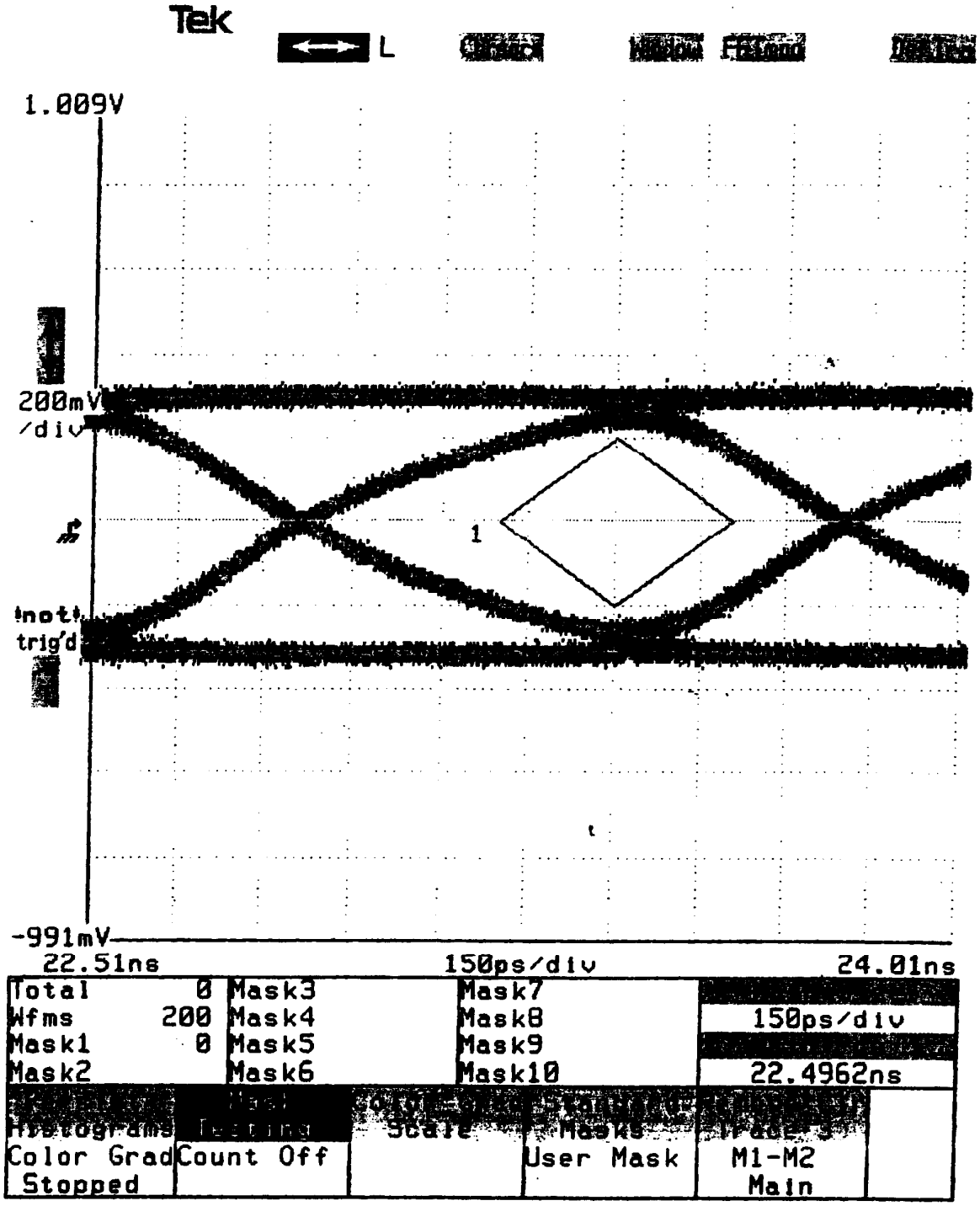


Bit Rate : 1.0625 Gb/s

Data : PRBS

Input : 1.1 Vp-p (8133A ; Input = 1.24 Vp-p)

HSSDC ⟷ HSSDC with equalizer AMP (636136-1) 30meters, 22AWG

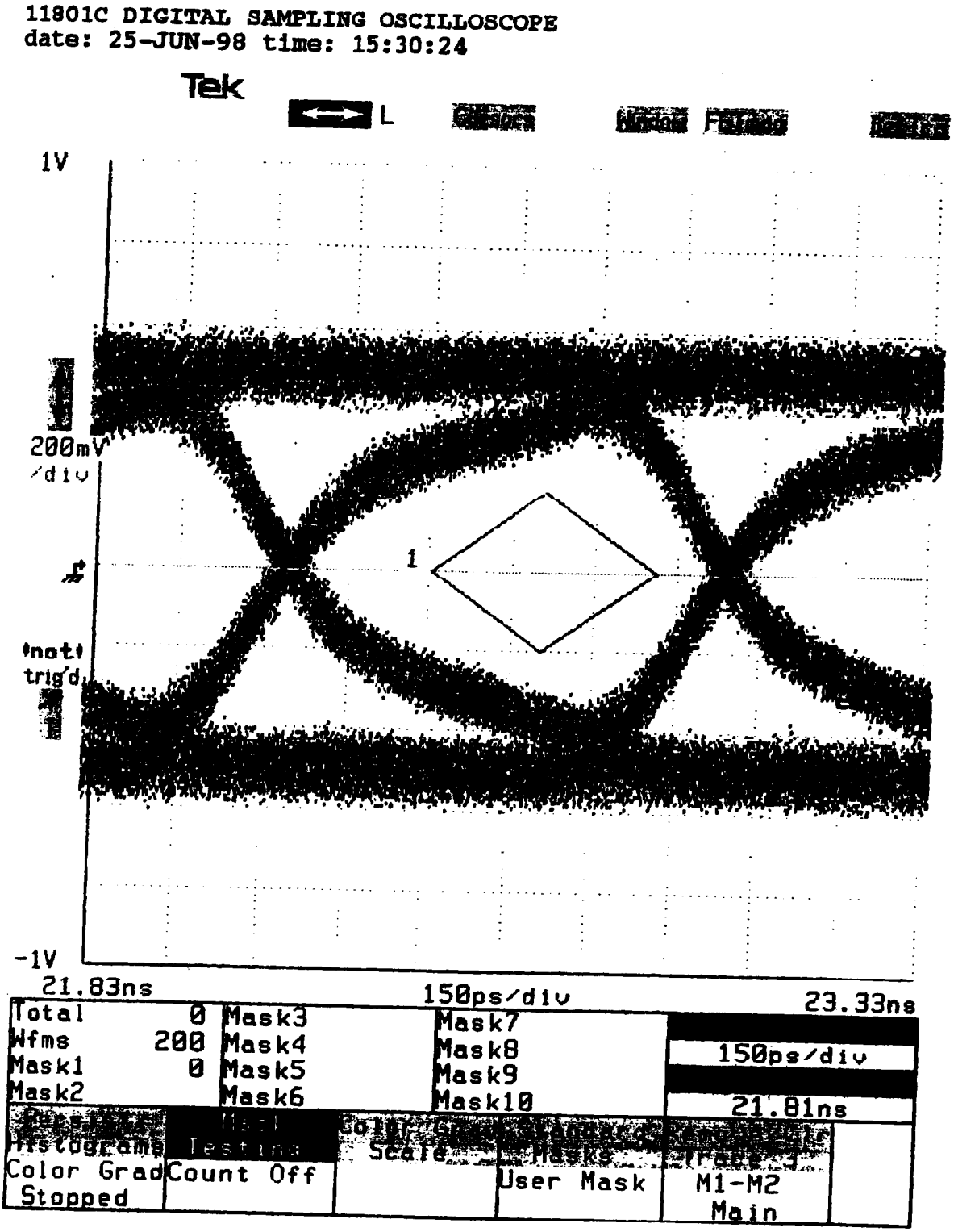


Bit Rate : 1.0625 Gb/s

Data : PRBS

Input : 1.1 Vp-p (8133A ; Input = 1.24Vp-p)

cable Length : 13 meters HSSDC ⟷ HSSDC

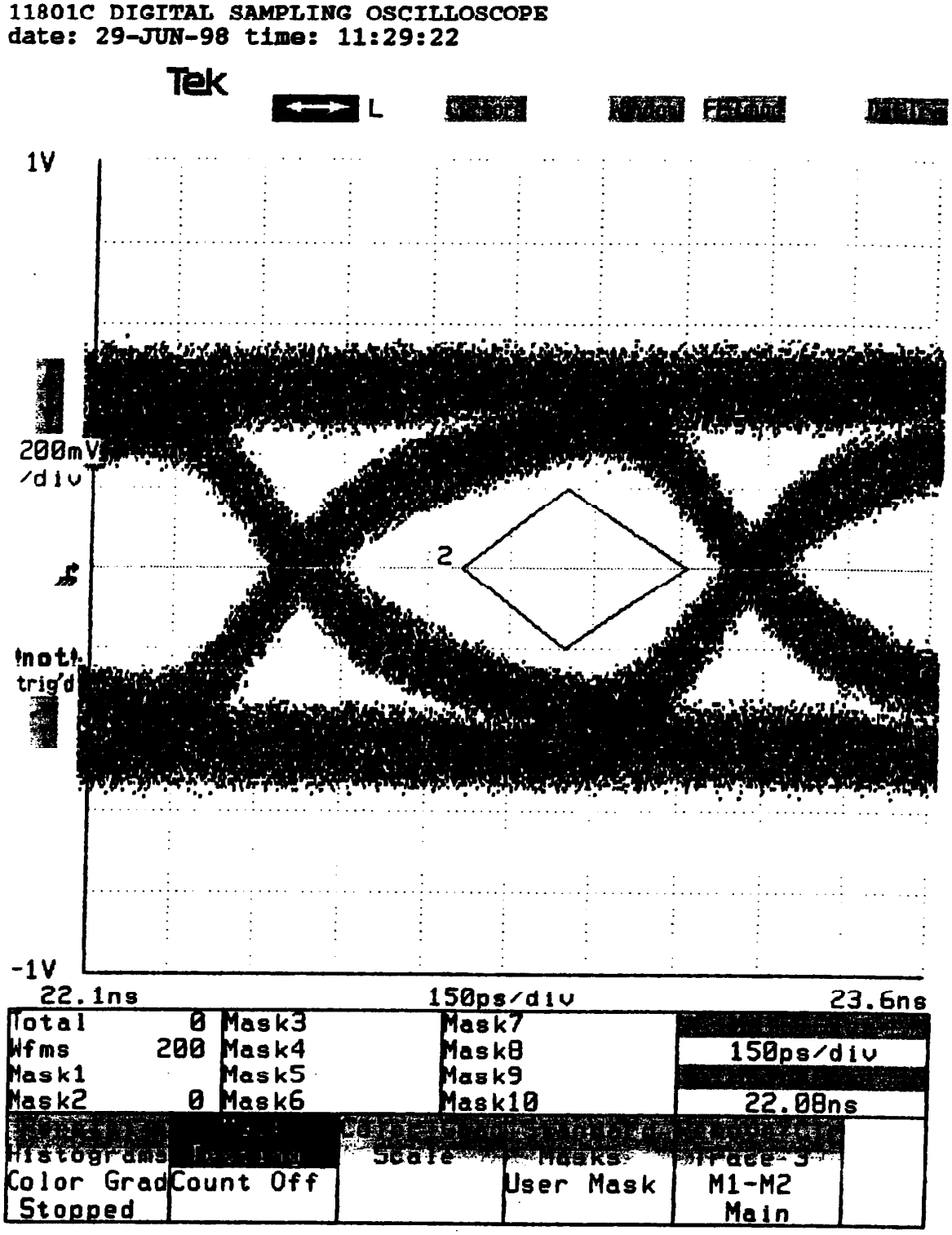


Bit Rate : 1.25 Gb/s

Data : PRBS

Input = 1.1 Vp-p (8133A ; Input = 1.24 Vp-p)

DB9 ⟷ DB9 AMP (1-621771-0) 15m ; 24 AWG

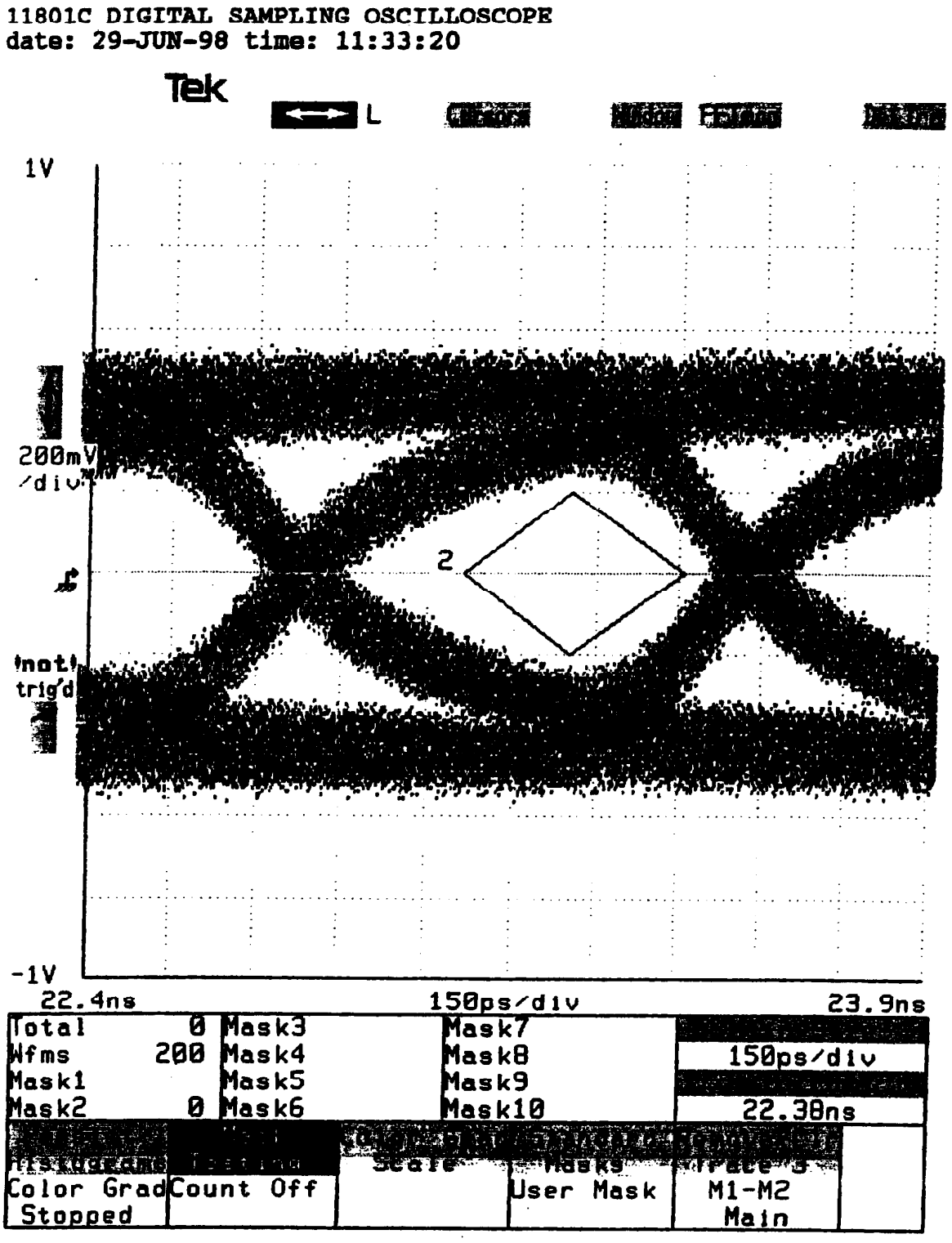


Bit Rate : 1.25Gb/s

Input = 1.1 Vp-p (8133A ; Input = 1.2 Vp-p)

Data : PRBS

DB9 ⟷ DB9 AMP(1-621771-2) 20 m ; 22 AWG

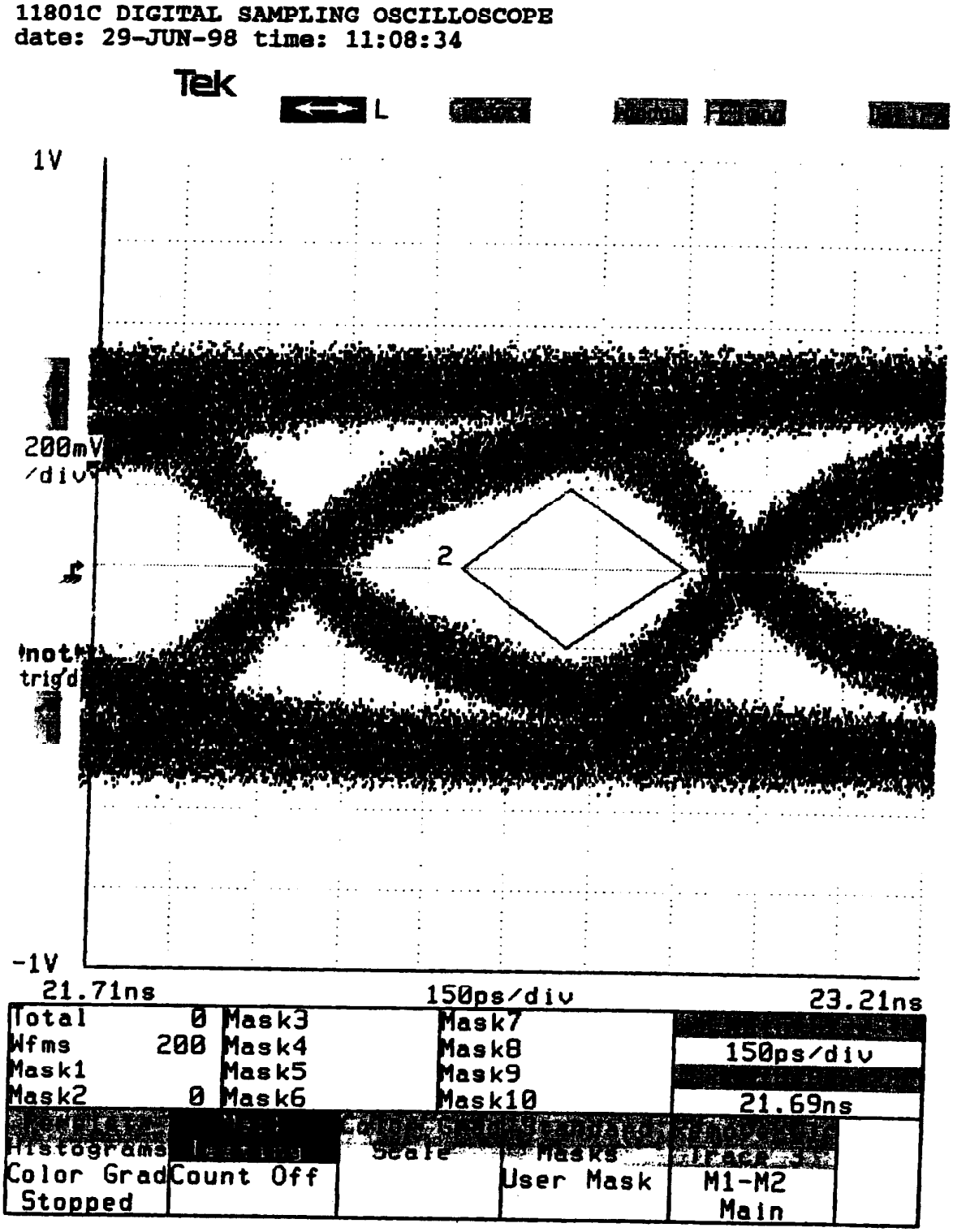


Bit Rate : 1.25 Gb/s

Data : PRBS

Input = 1.1 Vp-p (8133A ; Input = 1.2 Vp-p

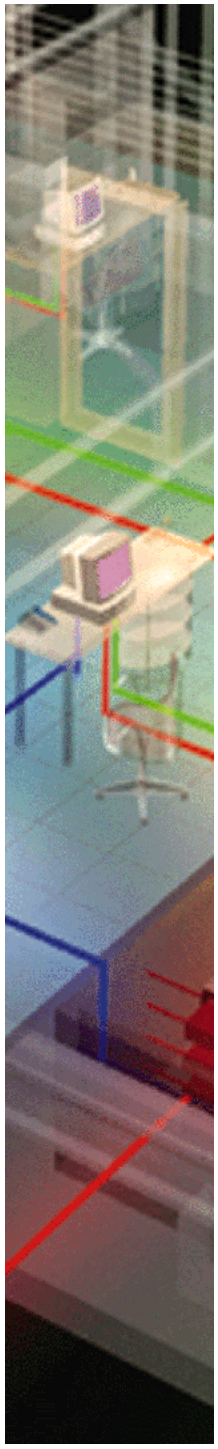
~~HSSDC~~ ⟷ HSSDC AMP (621724-6) 20m, 22 AWG



Bit Rate: 1.25 Gb/s

Data: PRBS

Input = 1.1 V_{p-p} (8133A ; Input = 1.2 V_{p-p})



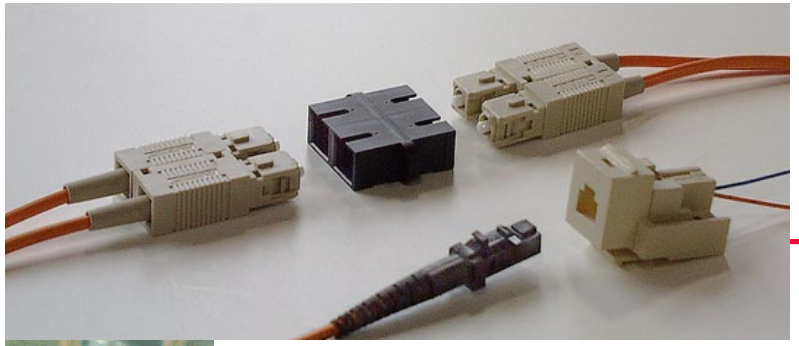
MT-RJ Connector for 100Mbps Token Ring

Ken Hall, RCDD LAN Specialist

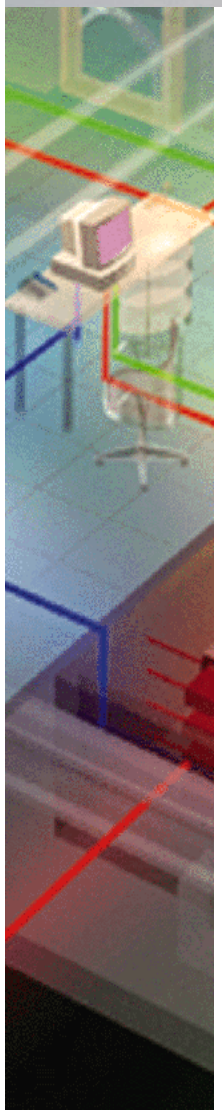
AMP Incorporated

July 1998

MT-RJ



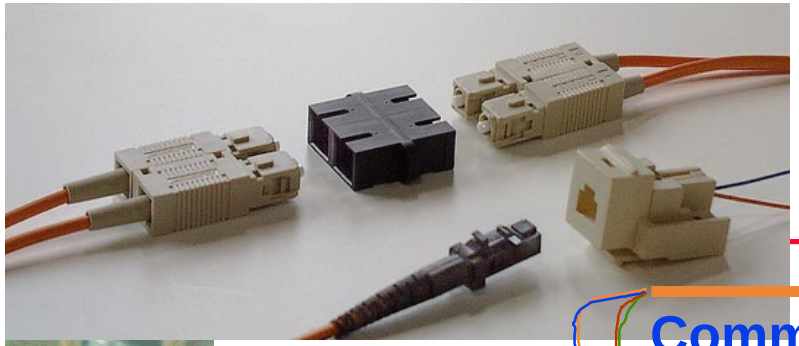
Why the MT-RJ?



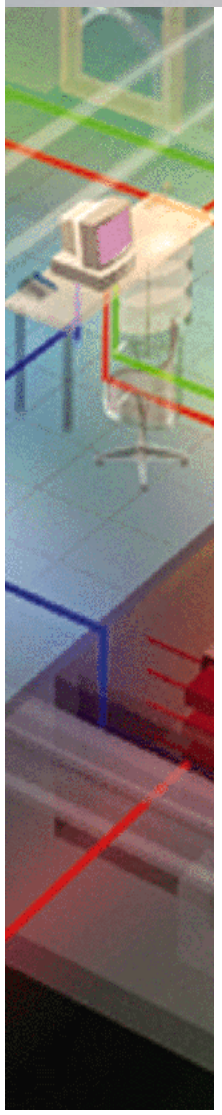
It is the best choice

- 2-fiber Connector
- Plug / Jack Design
- Snag-proof Plug Latch Design
- Drop-in Replacement for Copper Connectors
- Designed With Transceiver Manufacturers
- Half the port density of current connectors: ST & SC
- Growing Support by Network OEMs
- Singlemode & Multimode Capable

MT -RJ



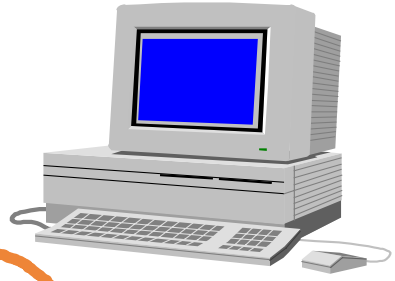
Designed from the Outset as a True System

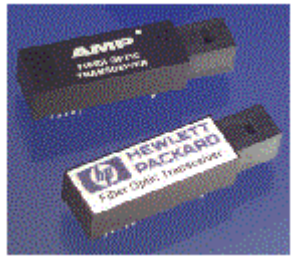


Commercially Available Fiber Cable

To Transceiver on Hub

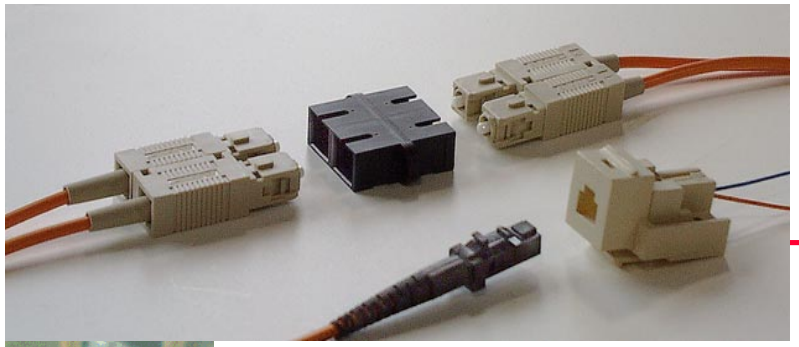
On board



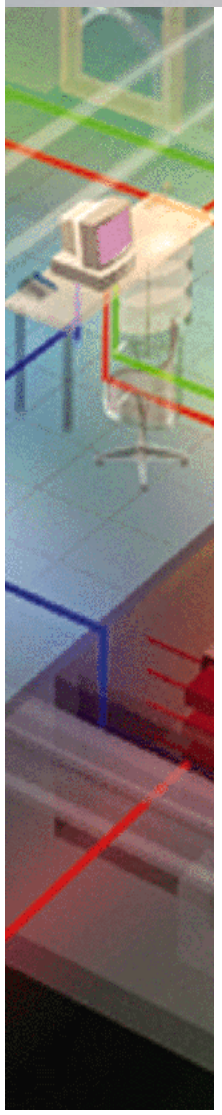


Commercially Available Fiber Cable

MT -RJ



MT-RJ Multi-Source Team



AMP

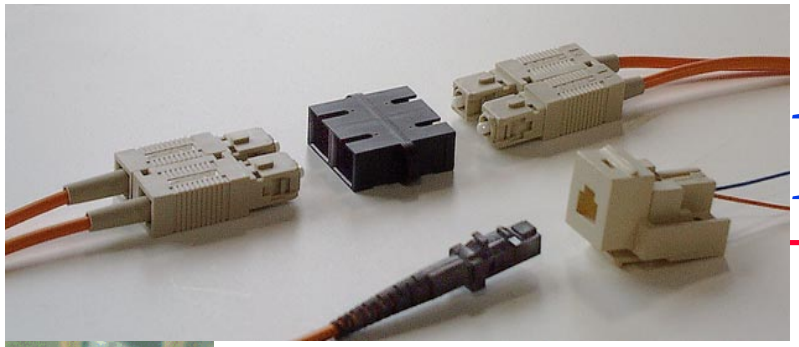
HEWLETT PACKARD

USCONEC

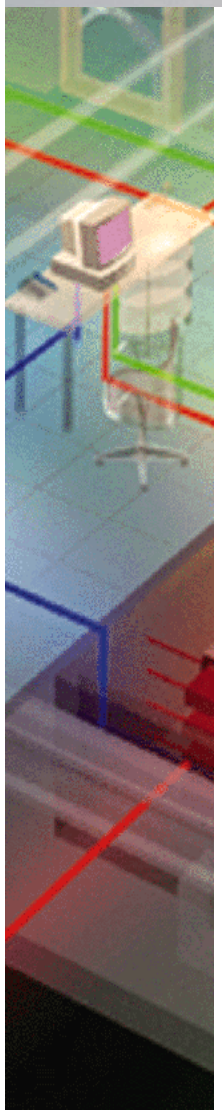
SIECOR

Fujikura Ltd.

SUMITOMO ELECTRIC
Lightwave Corp.

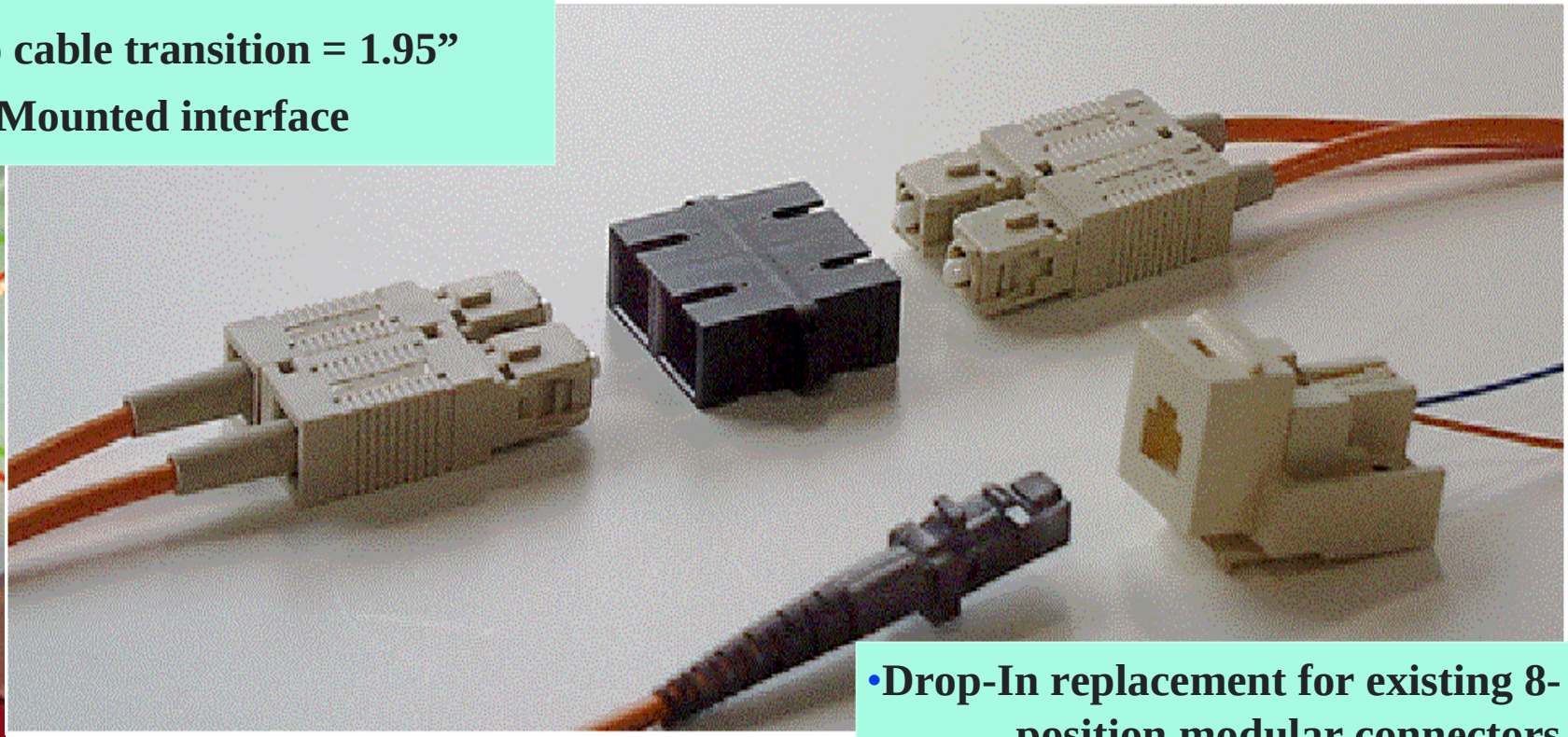


Low Complexity:
Ease of Field Installation of MT-RJ



- **No-Polish - No Epoxy Termination**
  - **Reduced number of Tools - No special tooling**
  - **No Excess Length Required at outlet or patch panel**
- **Ease of Field Testing**
  - **Attenuation is easy**
  - **Return Loss Field Verification is unnecessary.**

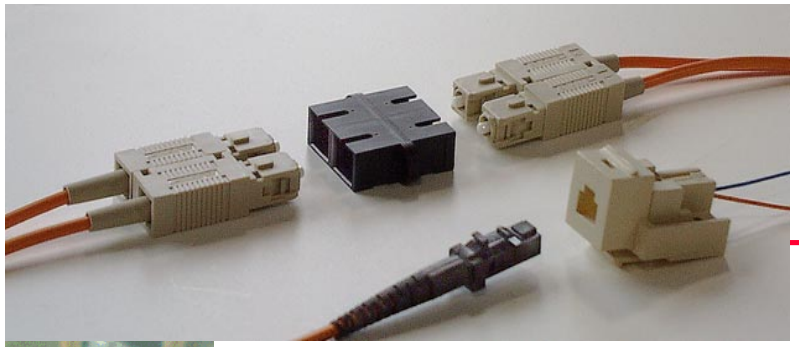
- **568SC:**
  - **Duplex Plug-Adapter-Plug Interface.**
  - **Specialized cut-outs**
  - **Depth to cable transition = 1.95”**
  - **Surface Mounted interface**



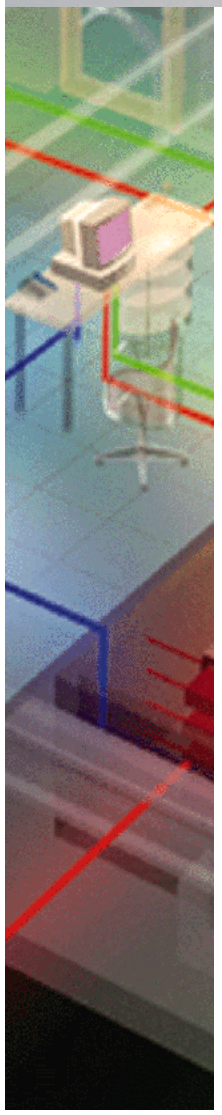
MT-RJ Plug / Jack

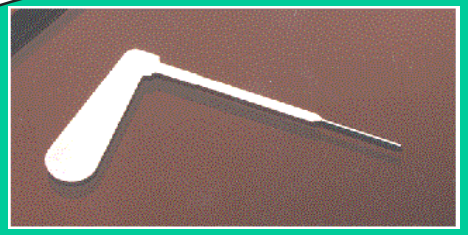
- **Drop-In replacement for existing 8-position modular connectors**
- **Depth to cable transition = .926”**
- **Fits INTO J-Box**
- **Snagless Plug Design**

MT -RJ

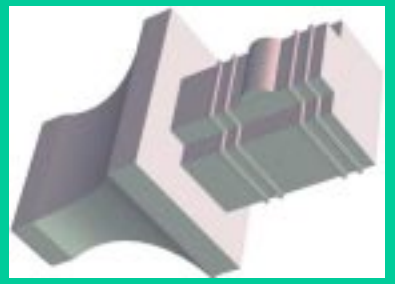


Field Installation - "Bag of Parts"

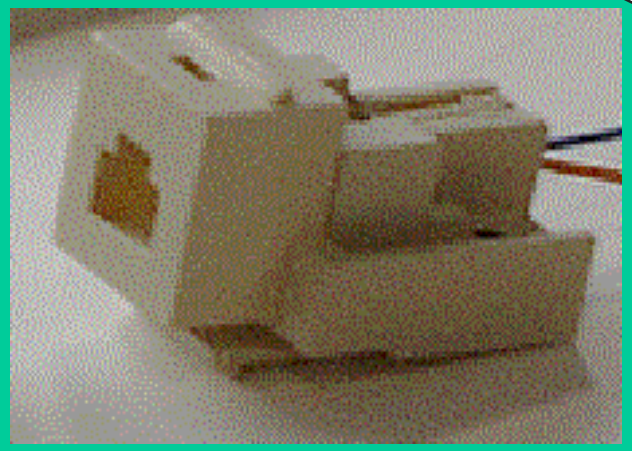




"Disposable Tool"

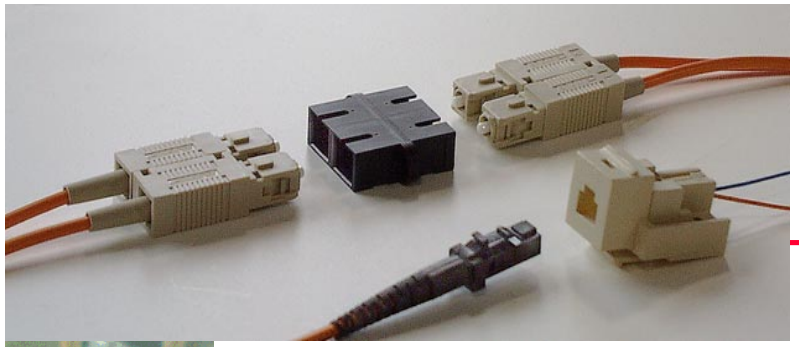


"Dust Plug"



"1 Piece Polish-Free, Epoxyless Jack"

MT -RJ



LAN Electronic MT-RJ Supporters

CABLETRON SYSTEMS

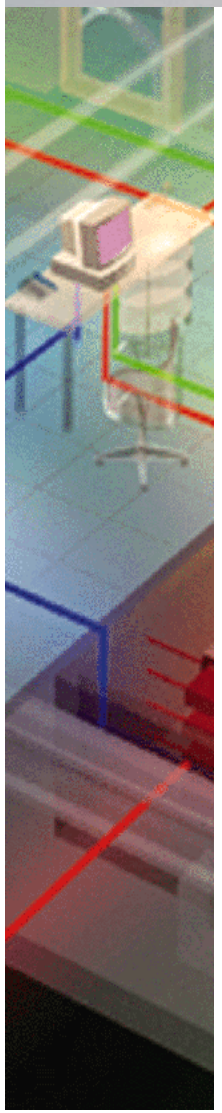
The Complete Networking Solution™

CISCO SYSTEMS

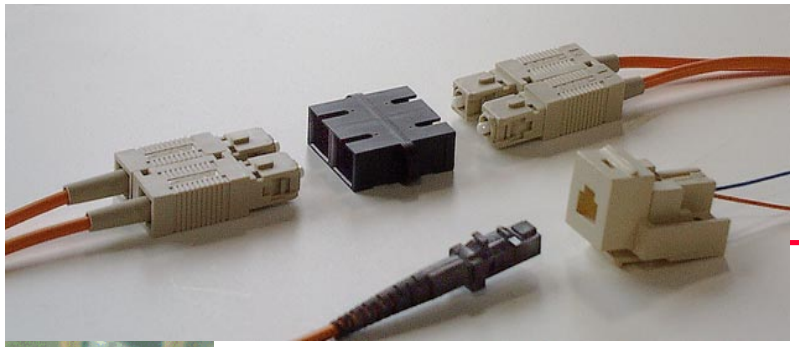
XLNT™

Also Released lines:
Bay Networks
Transition Networks

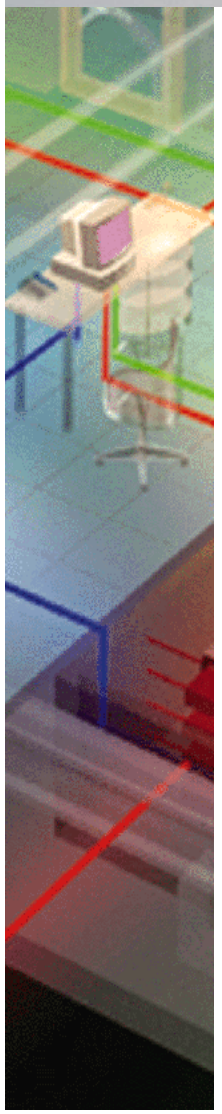
Others Releasing @ InterOp



MT-RJ



LAN Electronic MT-RJ Supporters

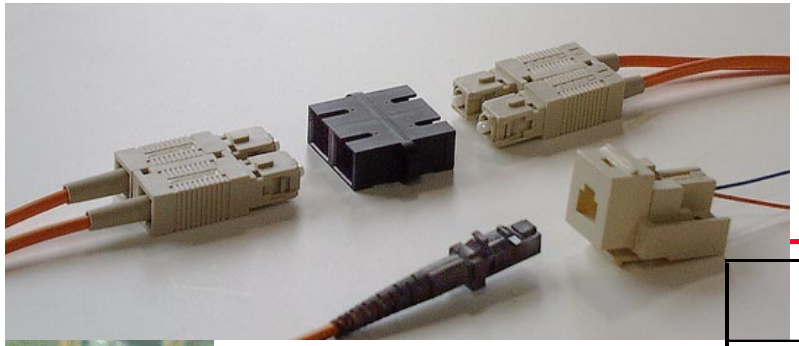


"MTRJ transceivers are essential to delivering the power of Gigabit networking to next generation LAN backbones. Only through high density FDDI and Fast Ethernet connections can gigabits of data, voice and video reach users cost effectively."

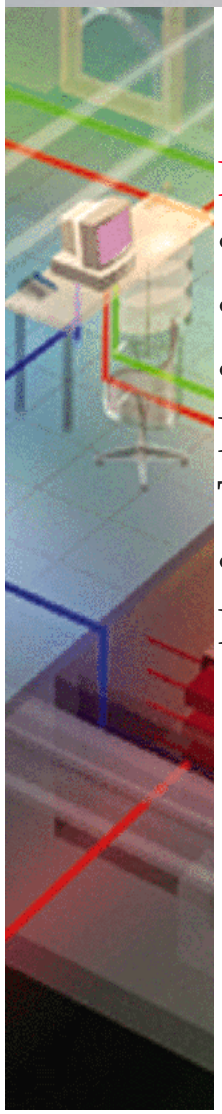
Bob Peyser, Director Product Management

XLNT™

MT -RJ



Multimode Performance: Factory Test

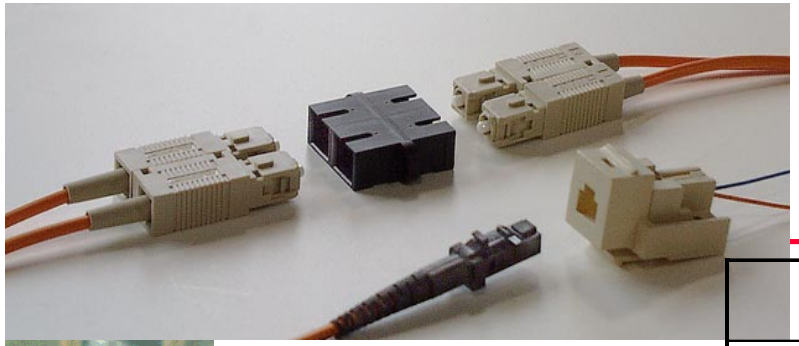


Requirements:

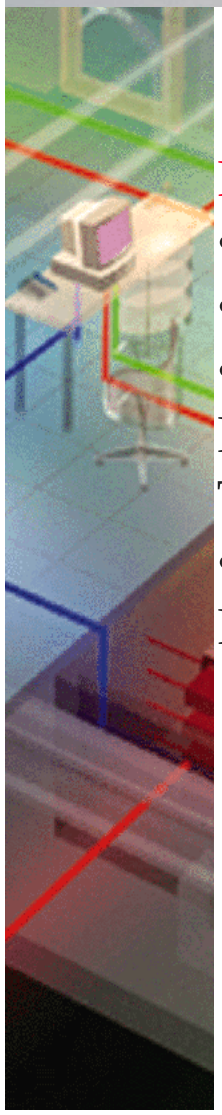
- <0.75 dB attenuation
- < -20 dB return loss
- <0.3 dB change Temp Life, Humidity & Low Temp
- <0.5 dB change Cable Retention

Test		Max Delta Change	Final Measurement
FOTP-171 Method B1	Insertion Loss	N/A	0.11 dB typ 0.19 dB max
FOTP 107	Return Loss	N/A	-42.5 dB typ -36.3 dB min
FOTP-2	Impact 8 drops / 1.5 m	N/A	0.14 dB IL -41.3 dB RL
FOTP-1	Flex 0.5 kg	N/A	0.18 dB IL -41.3 dB RL
FOTP-36	Twist 15 N at 0 º	N/A	0.20 dB IL -41.2 dB Rl
FOTP-6	Cable Retention 66 N at 0 º	0.06 dB	0.20 dB IL -41.2 dB RL
FOTP-6	Cable Retention 19.4 N at 90 º	0.06 dB	0.19 dB IL -41.2 dB RL
FOTP-185	Coupling Mech 33 N at 0 º	N/A	0.13 dB IL -41.5 dB RL
FOTP-21	Durability 500 cycles	NA	0.11 dB IL -36.3 dB RL
FOTP-4	Temp Life 60ºC/14 days	0.01 dB	0.08 dB IL -39.0 dB RL
FOTP-5	Humidity 4 days @ 95%	0.15 dB	.09 dB IL -38.9 dB RL
FOTP-188	Low Temperature -10 ºC/4 days	0.22 dB	0.13 dB IL -42.3 dB RL

MT -RJ



Singlemode Performance: Factory Test

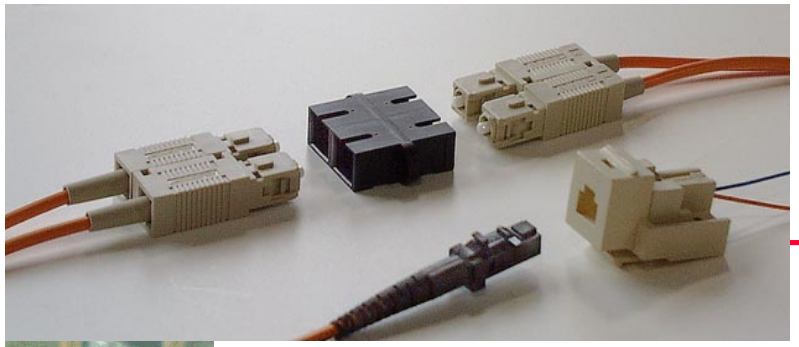


Requirements:

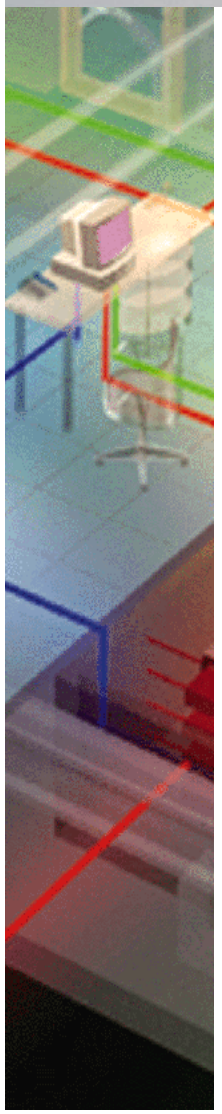
- <0.75 dB attenuation
- < -26 dB return loss
- <0.3 dB change Temp Life, Humidity & Low Temp
- <0.5 dB change Cable Retention

Test		Max Delta Change	Final Measurements
FOTP-171 Method B1	Insertion Loss	N/A	0.24 dB typ 0.52 dB max
FOTP 107	Return Loss	N/A	-44.4 dB typ - 36.2 dB min
FOTP-2	Impact 8 drops/1.5 m	N/A	0.38 dB IL -40.6 dB RL
FOTP-1	Flex 0.5 kg	N/A	0.40 dB IL -40.1 dB RL
FOTP-36	Twist 15 N at 0 degrees	N/A	0.37 dB IL -40.2 dB RL
FOTP-6	Cable Retention 66 N at 0 º	0.20 dB	0.39 dB IL -42.3 dB RL
FOTP-6	Cable Retention 19.4 N at 90º	0.11 dB	0.34 dB IL -43.2 dB RL
FOTP-185	Coupling Mech 33 N at 0 º	N/A	0.37 dB IL -45.0 dB RL
FOTP-21	Durability 500 cycles	N/A	0.35 dB IL -40.5 dB IL
FOTP-4	Temp Life 60 ºC/14 days	0.24 dB	0.29 dB IL -44.2 dB RL
FOTP-5	Humidity 4 days @ 95%	0.10 dB	0.30 dB IL -43.9 dB RL
FOTP-188	Low Temperature -10 degrees C	0.18 dB	0.29 dB IL -44.1 dB RL

MT -RJ



Susquehanna Pfaltzgraff Horizontal MM Installation



"The MT-RJ gave us the capability to utilize the existing cable plant and organize the copper and fiber at the faceplate".

"This connector technology is a vast improvement over the ST and SC connectors as it brings fiber optics into the same base system as our existing copper without having to specially adapt to the connector interface"

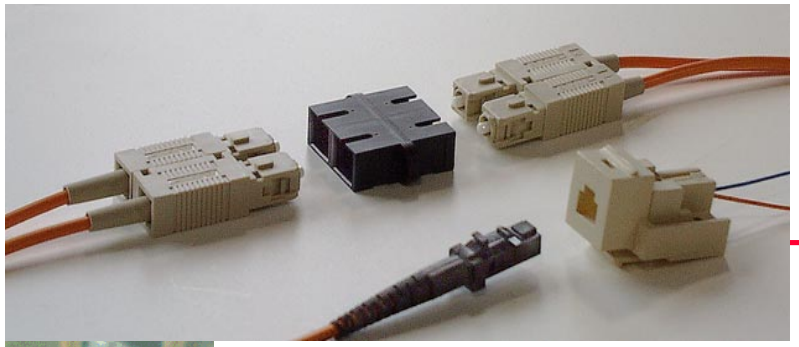
Clair Bang - Director MIS

Installation consisted of:

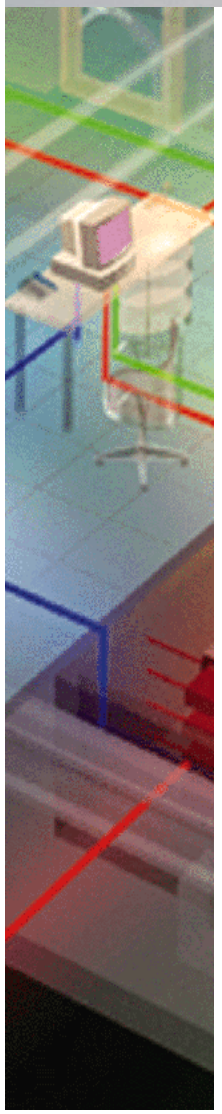
- At wall outlets:
  - 3 Category 5, 1 pair fiber
  - 24 MT-RJ duplex jacks
  - 24 MT-RJ - ST 3m cords
- In Equipment Room:
  - 1 24-port MT-RJ patch panel
  - 24 MT-RJ to ST 7m cords

Field terminations performed by: KBK Communications

MT -RJ



Penn National Insurance Backbone Installation



"The backward compatibility to copper will provide us the ability to save space both in the equipment room and at the desk in the future".

"After a short training review, my staff and I got involved in the installation of the connector and termination of the fiber. I was impressed with the ease of termination for the installation."

"... the termination of the MT-RJ is a method that we can easily use in-house for our own maintenance and installations"

Dan Morrison, Director MIS

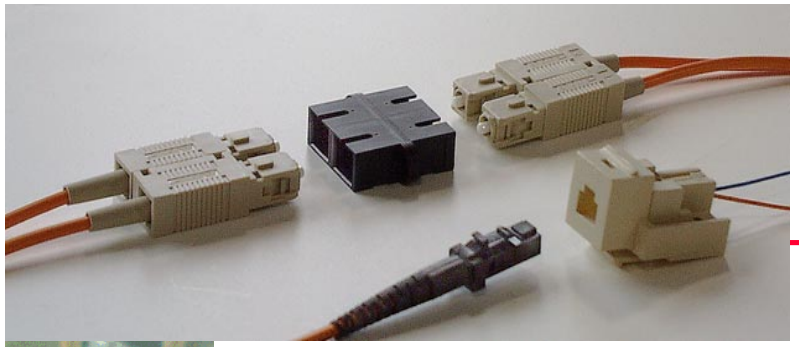
Installation consisted of:

Main Equipment Room to TC - separate floor

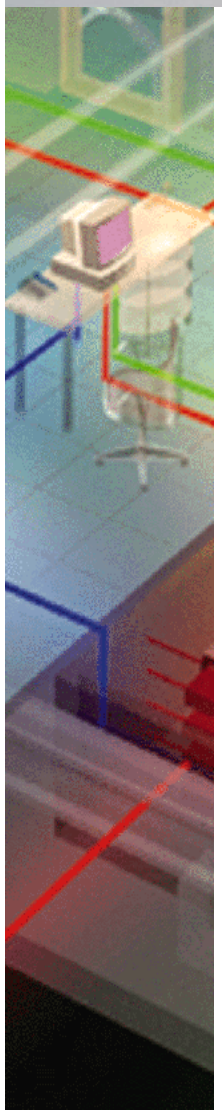
- 1 24-port (48 fiber) 1u high patch panel per cross-connect
- Standard tight buffered cable
- 48 MT-RJ - ST 7m cords

Field terminations performed by:
Penn National Employees

MT -RJ

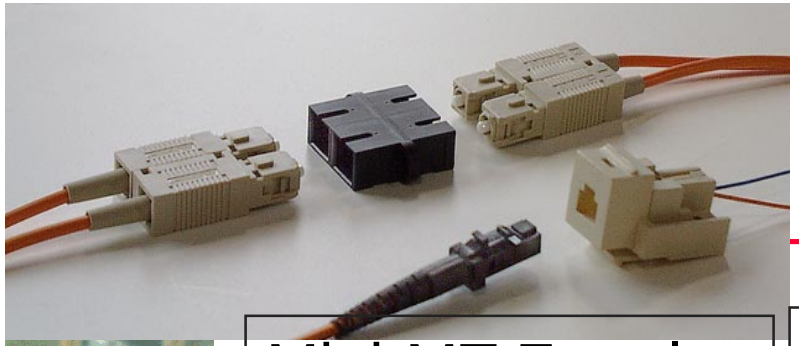


Performance: Field-Installed Testing

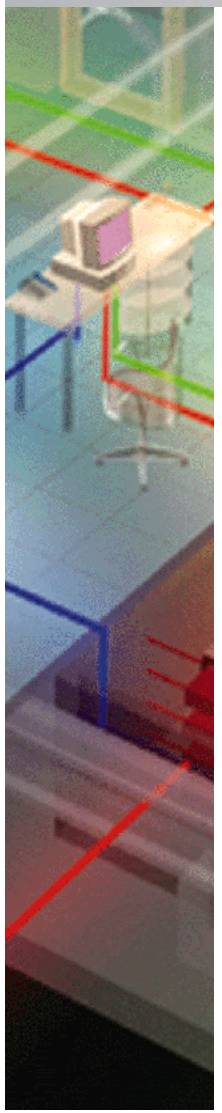


- ANSI/EIA/TIA-526-14-A Method B procedure.
- Attenuation Channel: Requirement <2.0 dB
  - Penn National…….1.25 dB typ/1.72 dB max
  - Pfaltzgraff……1.15 dB typ/1.81 dB max
- Connector Return Loss: Requirement <-20 dB
  - Penn National ….-44.6 dB typ/-43.7 dB max
  - Pfaltzgraff……...-43.9 dB typ/-42.1 dB max

MT -RJ



Suppliers and Manufacturers of MT-RJ Based Products:



Mini-MT Ferrules

- Fujikura
- Furakawa
- Sumitomo
- USConec
- EurOptics
- AMP
- Siecor

MT-RJ Transceivers:

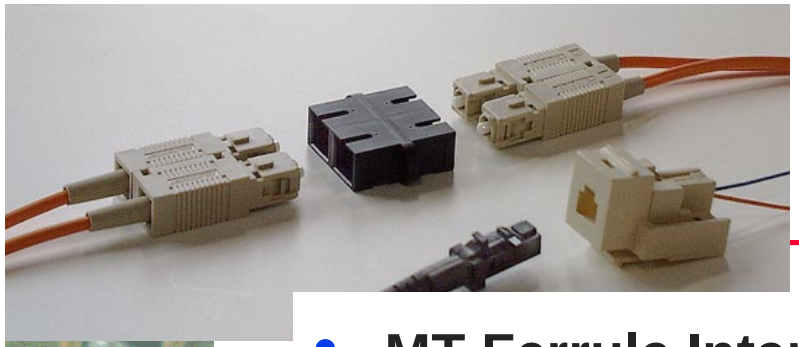
- HP
- AMP Lytel
- Fujikura
- Sumitomo
- Siemens AG

MT-RJ Connectors:

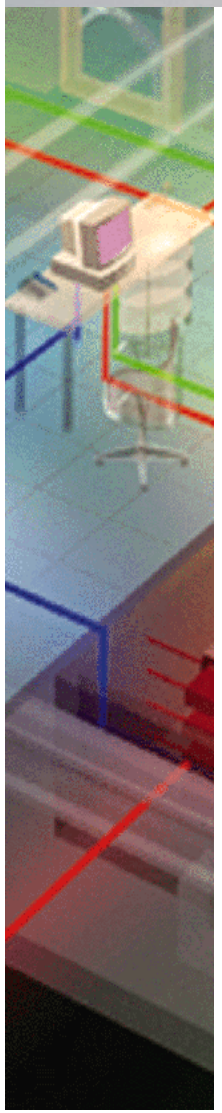
- AMP
- Siecor
- Fujikura

+ 9 Licensees Globally

MT -RJ

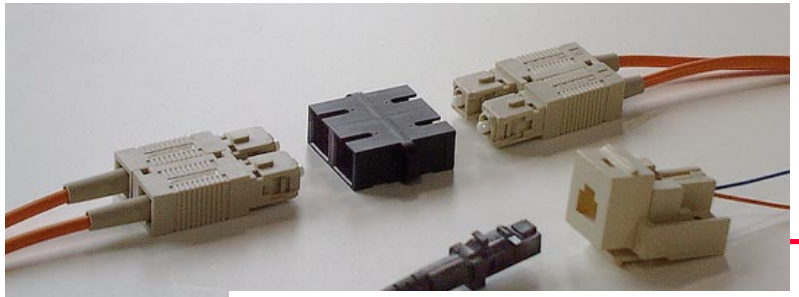


Intermateability Specs

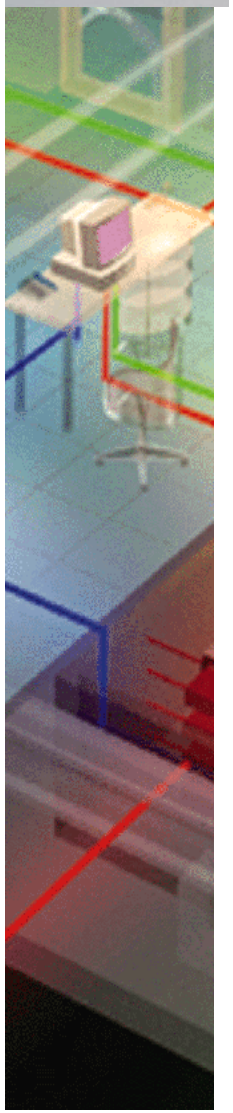


- **MT Ferrule Intermateability**
  - IEC 1754-5 MT Interface 11/96
  - IEC 1754-7 MPO Interface 11/96
- **Mini-MT Intermateability**
  - IEC NWIP submitted 3/97
  - TIA FOCIS for Mini-MT submitted 1/97
- **MT-RJ Intermateability (TIA- FOCIS-12)**
  - PN 4172 work item approved - Jan ‘98
  - Draft document to be submitted to chairman - Apr ‘98
  - Letter ballot to be distributed to committee - May ‘98
  - Comments to be discussed - Jun ‘98
- **MT-RJ Team actively involved with TIA and IEC**
- **MT-RJ Team committed to rigorously and completely defining interface.**

MT -RJ



MT-RJ



- Meets or exceeds all Testing Standards
- Multi-Level Multi-source
  - Ferrules
  - Transceivers
  - Connectors
  - Cable Assemblies
  - Network Electronics
- Interface is familiar to end-users
- Backward compatible to copper-based connecting hardware
- Application-Independent, creating migration path to 100Mbps and 1Gbps Token Ring from existing platforms

MT -RJ