Mini-MT Connector

from

The Transceiver Vendors' Perspective

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IEEE 802.3z
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Transceiver Vendor Objectives

- Respond to the needs of the market
- Sell product to the market
- Minimize the number of optical interfaces supported
- Have Capability - - - Will Deliver

Market Request

- How can more optical ports fit on a typical PC board card edge?
- Can you make it as least as dense as the RJ-45?

  and of course

- Reduce cost

Vendor Response

- Many new small form factor optical interfaces presented under non-disclosure agreements.
- Transceiver vendors and networking equipment vendors raise concern about interface proliferation.
- Search for public forum to decide which new interfaces should be supported.

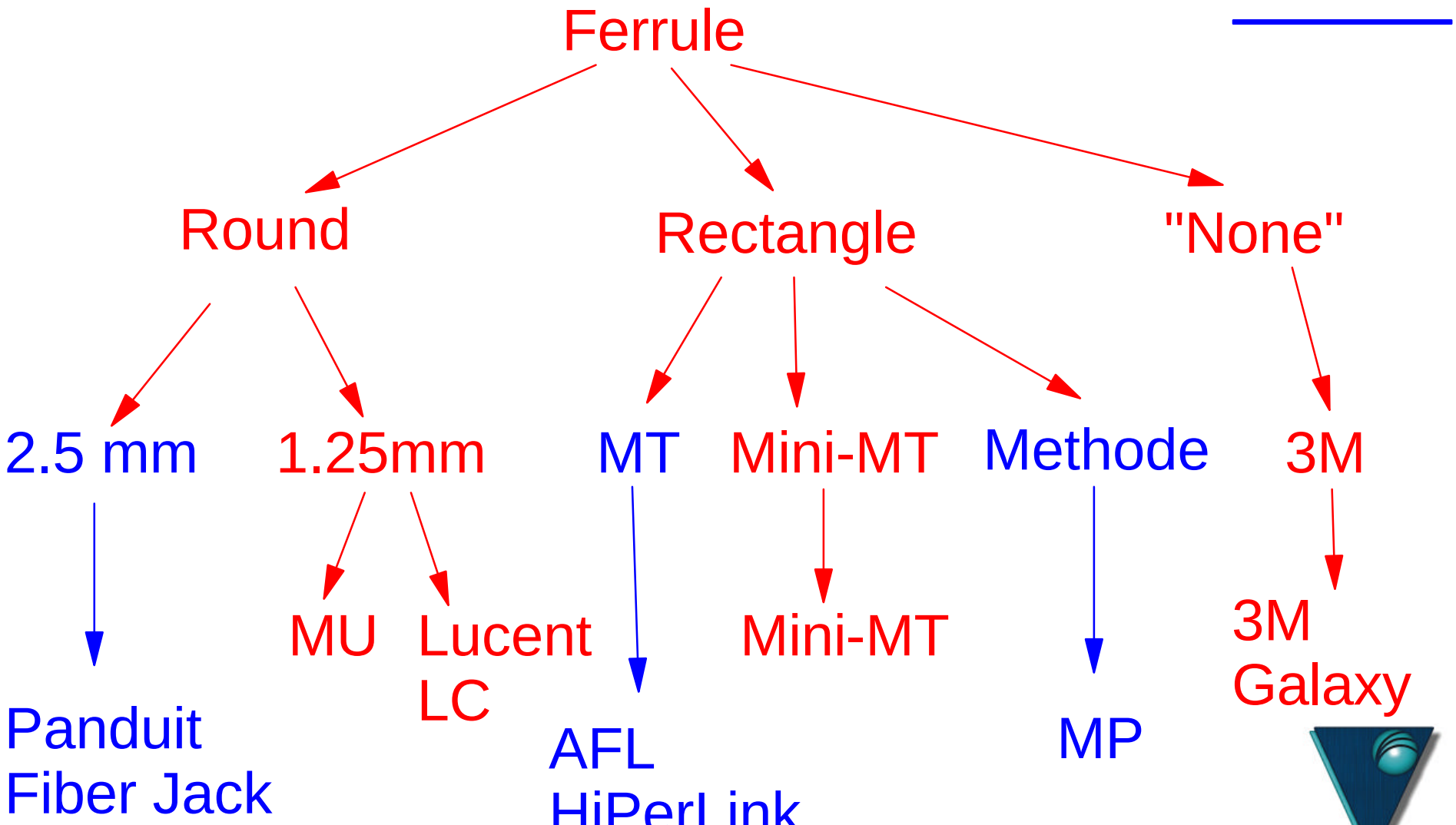
- Vixel makes small form factor module presentation to IEEE Gigabit Ethernet in January 1996.
- IEEE Gigabit Ethernet expresses interest

Choosing a new Optical Interface

- A new standard with a defined schedule is identified (IEEE 802.3z).
- NCITS T11 committee agrees to host:
  - Jan. 1996 - Gigabit Ethernet expresses interest in new optical interface
  - Feb 1996 - X3T11 decides to host new optical interface standard and sets schedule.
  - April, June, August - set requirements
  - August and October - Proposals made
  - Dec - Clarify proposals
  - Feb. - Vote at fibre channel
- March '97 - IEEE 802.3z decision point

- "Half the Cost & Half the Size"

The Seven Proposals



10/96 Fibre Channel Chooses Critical Few Decision Criteria

	plenary vote 10/9/96
– COST (Total system cost)	41
– Technical Risk	22
– Size	32
– Multi-source	24
– Market Acceptance;	22
Current Availability; and	3
Meets Requirements	Requirement

Fibre Channel Plenary Vote

- Each connector was voted against each other using motions

	For	Aga	Abstain
• Lucent LC vs. 3M Galaxy	13	34	23
• 3M Galaxy vs. Mini-MT	30	27	17
• Close vote ==> propose to keep both	20	31	17
• Make 3M Galaxy a future FC variant	37	16	17

- Interpretation:
  3M connector looks interesting; promises low cost
  Too early to kill the technology
  Vote for it to give it a chance in the market
  Fibre Channel has plenty of chances to add another connector

Key Decision Issues for Transceiver Vendors

- Single mode / Multimode Capability
- Size
  - port spacing
  - module height
- Installed connector cost
- Transceiver cost
- Time to market / Standardization
- Risk --- Technical and Market
- Electro-magnetic Shielding
- Competition / Continued Engineering Evolution
  - multisourcing environment

Single Mode / Multimode Capability

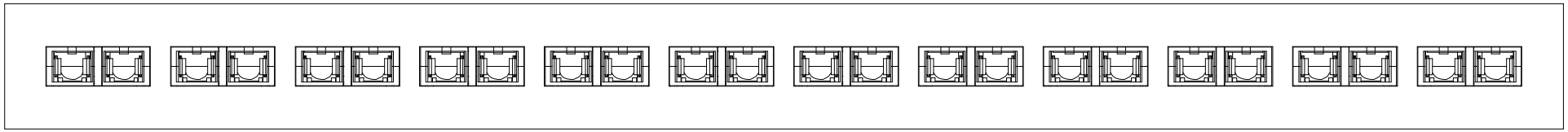
- 1000BASE-LW
  - One module for both single mode and multimode fiber applications
  - MUST have common connector
- All existing glass fiber interfaces have both single mode and multimode capabillty.
  - Common transceiver footprints for MM and SM
- Small Form factor interface must robustly work for both SM and MM.

Size

- Port Spacing
  - Meet the equivalent spacing of RJ-45 harmonica designs ==> 0.55 inches
  - Transceiver module width should control port spacing
- Height: Maximum height of module 9.8 mm
  - Enable mezzanine card configurations
  - Improved airflow in new dense system configurations
- Panel Opening
  - Minimize panel opening for EMI containment

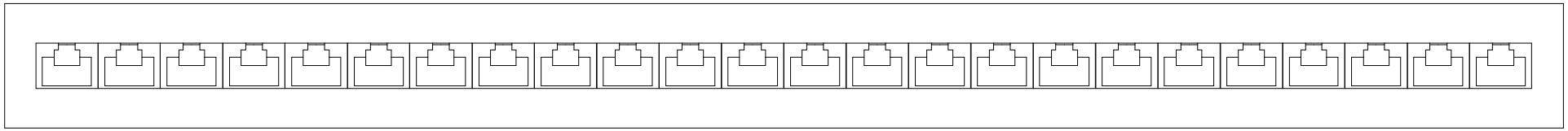
The Port Density Opportunity - 2X optical port density

Duplex SC Port Spacing at 1.2 "



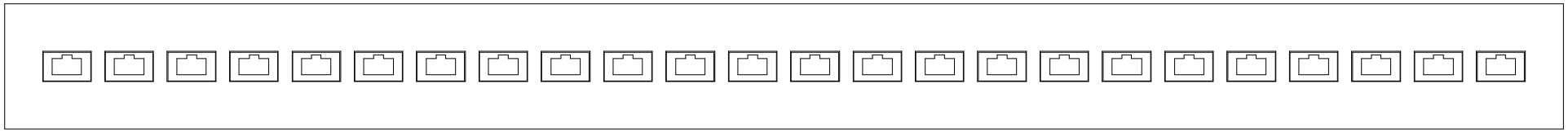
12 ports

RJ-45 Port Spacing at 0.55 "



24 ports

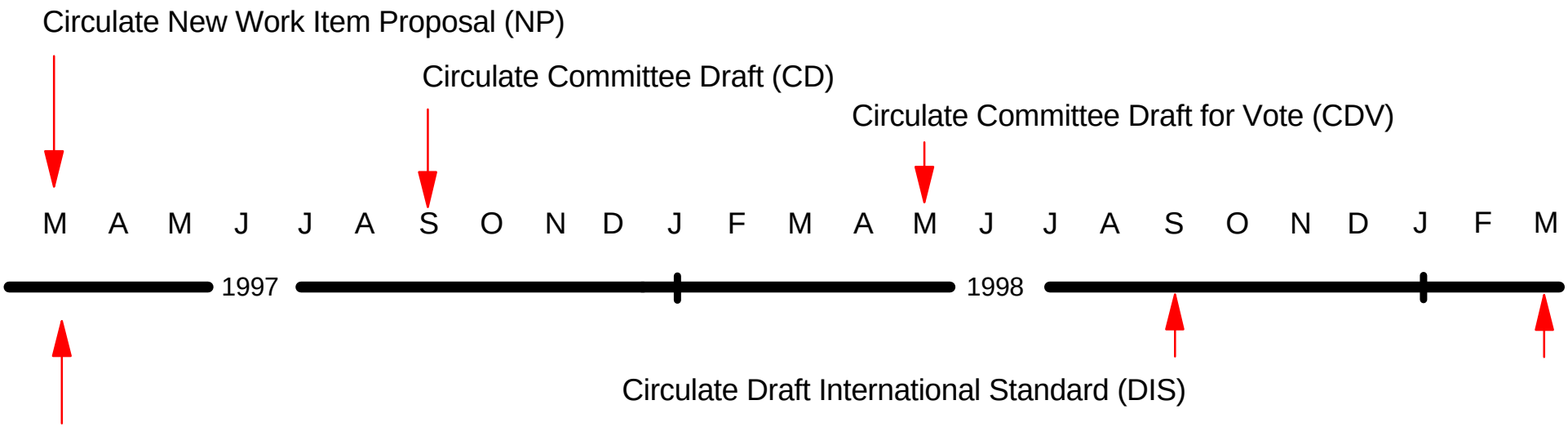
Mini-MT Port Spacing at 0.55 "



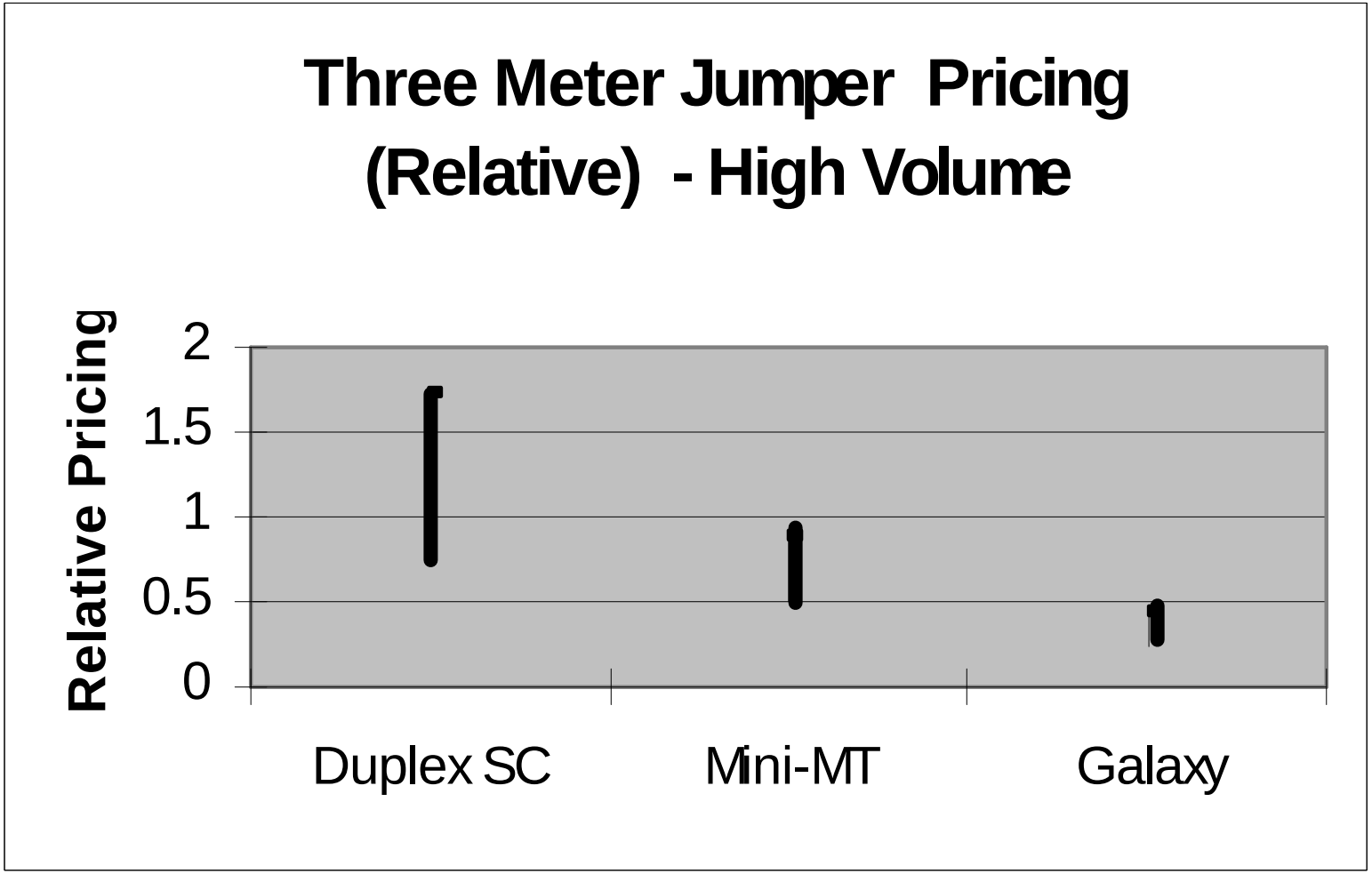
24 ports

Note: 15 " panel length shown

The Optical Interface Standards Time Line - IEC



Relative Pricing - Misleading?



Transceiver Cost

- Multimode
  - No significant difference between interface options
  - Today approximately $0.70 used in pieceparts to guide the ferrule into alignment with optical axis (both Tx and Rx)
  - $0.70 is minimal effect; thus connector options can't make significant price impact.
- Single mode
  - Alignment to a solid assembly (ferrule) has significant cost reduction opportunities using technologies such as silicon wafer board construction.
- Volume and competitive pricing will drive actual price reduction

Technical Risk

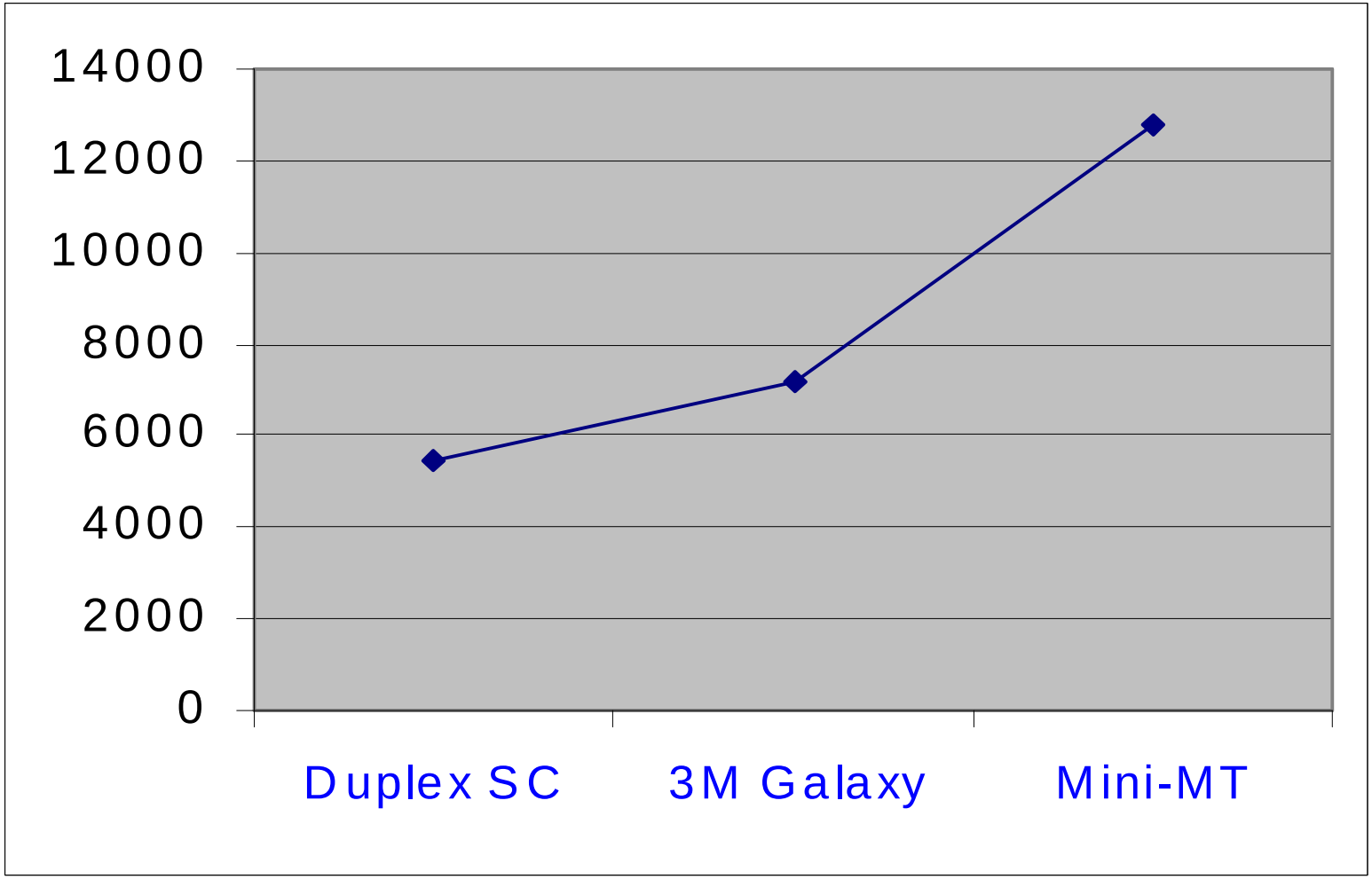
- **Mini-MT Connector**
  - **NONE ==> Uses proven technology**
  - **Supported by NTT, Siecor, AMP, Fujikura, Furukawa, Sumitomo, Europtics, US Conec (i.e. multiple strong competitors)**
  - **Uses existing licensing of MT technology; IEC standards for MT exist today.**
- **Galaxy Connector**
  - **Not enough information on single mode to complete assessment**
  - **Will dust/ cleanliness be an issue in the field? (esp SM) (especially where forced air can draw dust into crevices)**
  - **Is a Galaxy transceiver compatible with a process wash?**
  - **Only factory termination of jumpers due to chamfer polish?**
  - **9.8 mm high module may require "S" bend complexity.**

Market Issues

- Mini-MT
  - Existing proven connector technology
  - Guaranteed to have full range of products in short period of time.
  - Connector cost difference is not significant in backbone premise, wide area network, and telecom markets.

- Galaxy
  - Will robustness of the interface need to be sold?
  - Galaxy is a solution for fiber to the desk where the real competition is copper.

Cut-off Frequency (MHz) for Rectangular Opening



Competition / Continued Engineering Evolution

- Open design environments for both the connector and transceivers.
- Mini-MT is already used telecom market
  - Detachable pigtails / surface mount designs
  - Single mode connectored modules
  - NTT considering for fiber to the home/curb
- Excellent broad base of support.

- Volume / Competition is the key to success

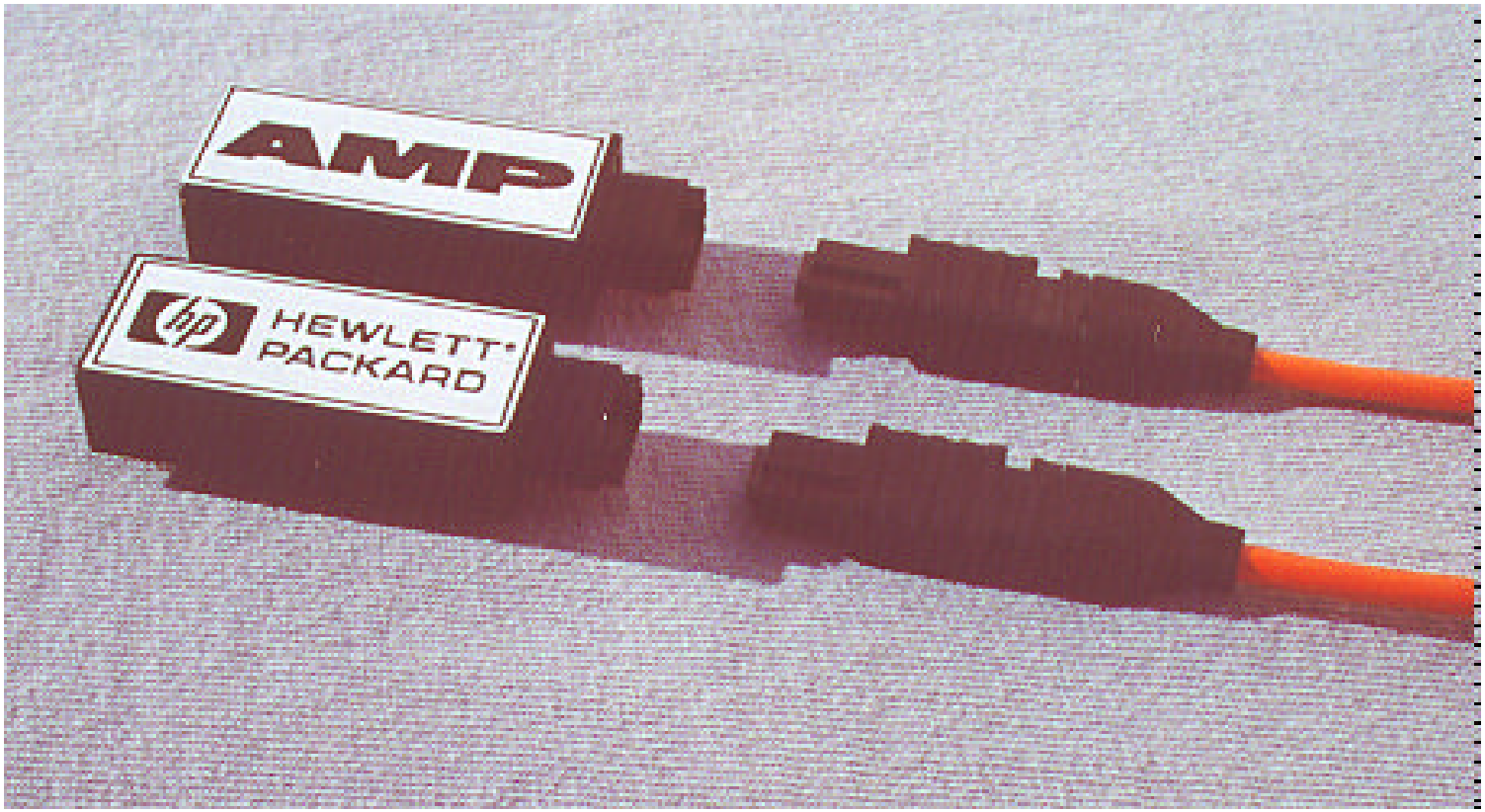
Conclusion

- After
  - Evaluation of market needs
  - Evaluation of new interface offerings

- AMP/Lytel, Fujikura, Hewlett-Packard, and Vixel

  Recommend the Mini-MT interface to the IEEE 802.3z committee.

The Mini-MT Transceiver Multisource



10 Pin Transceiver Pin Function Definitions

10 and 20 Pin Part Versions

Two versions of this transceiver are intended. The 10 pin version is intended for applications where the extra features of the 20 pin version are not required. The 20 pin version provides extra pins for features beyond data in and out such as recovered clock and laser transmitter monitors and alarms. See Package Outline Drawing for Pin Positions within the Package.

Pin Number	Symbol	Functional Description	Logic Family
MS	MS	Mounting Studs - The MS are provided for transceiver mechanical attachment to the circuit board. They must be connected to a floating pad on the circuit board which is not tied to signal or chassis ground.	N/A
1	RD-	Received Data Out Bar	PECL
2	RD+	Received Data Out	PECL
3	SD	Signal Detect	PECL
4	Vee_r	Receiver Signal Ground	N/A
5	Vcc_r	Receiver Power Supply	N/A
6	Vcc_t	Transmitter Power Supply	N/A
7	TD+	Transmitter Data In	PECL
8	TD-	Transmitter Data In Bar	PECL
9	Vee_t	Transmitter Signal Ground	N/A
10	TDis	Transmitter Disable: Optional Feature Do not connect if unused.	

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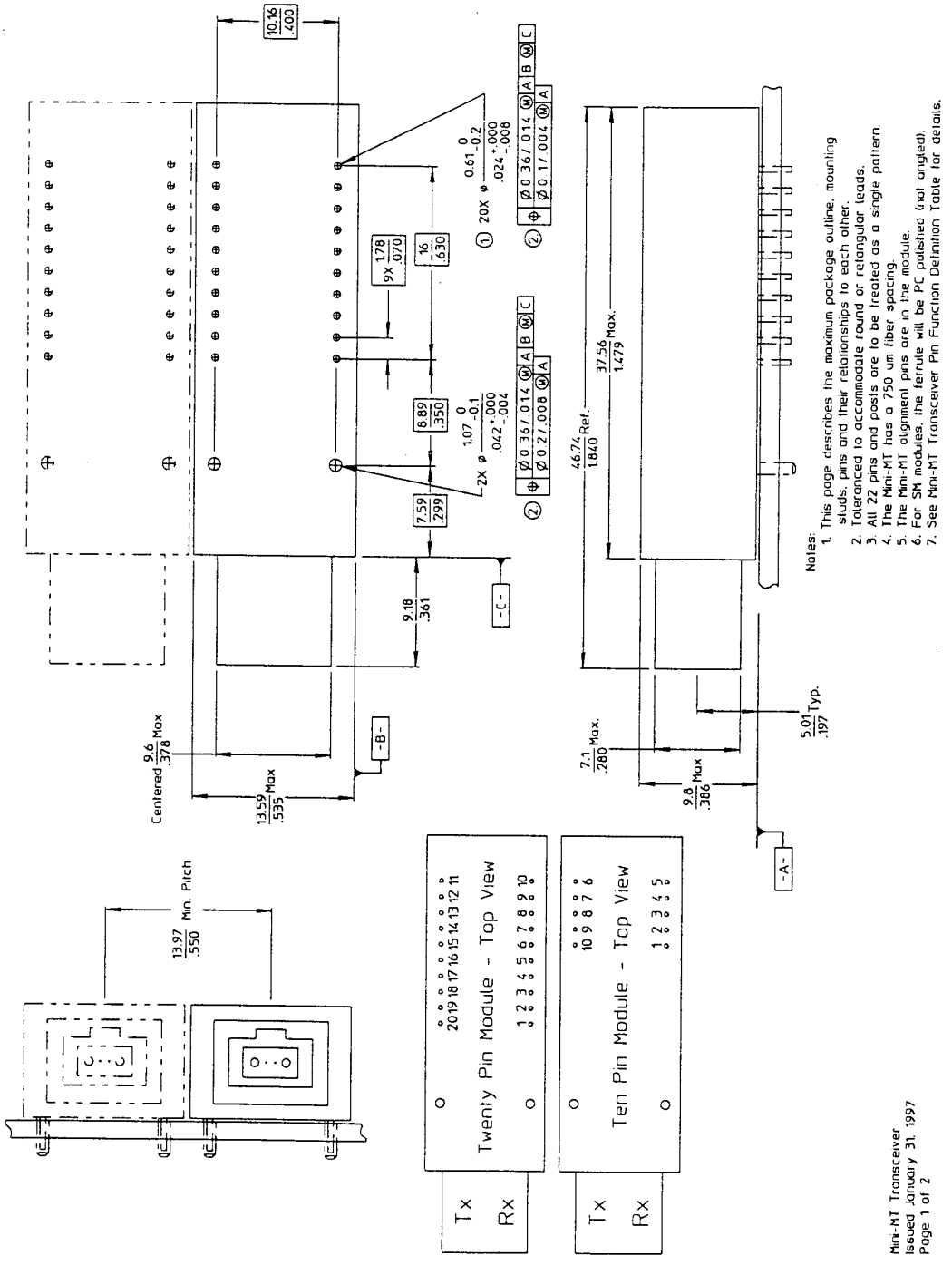
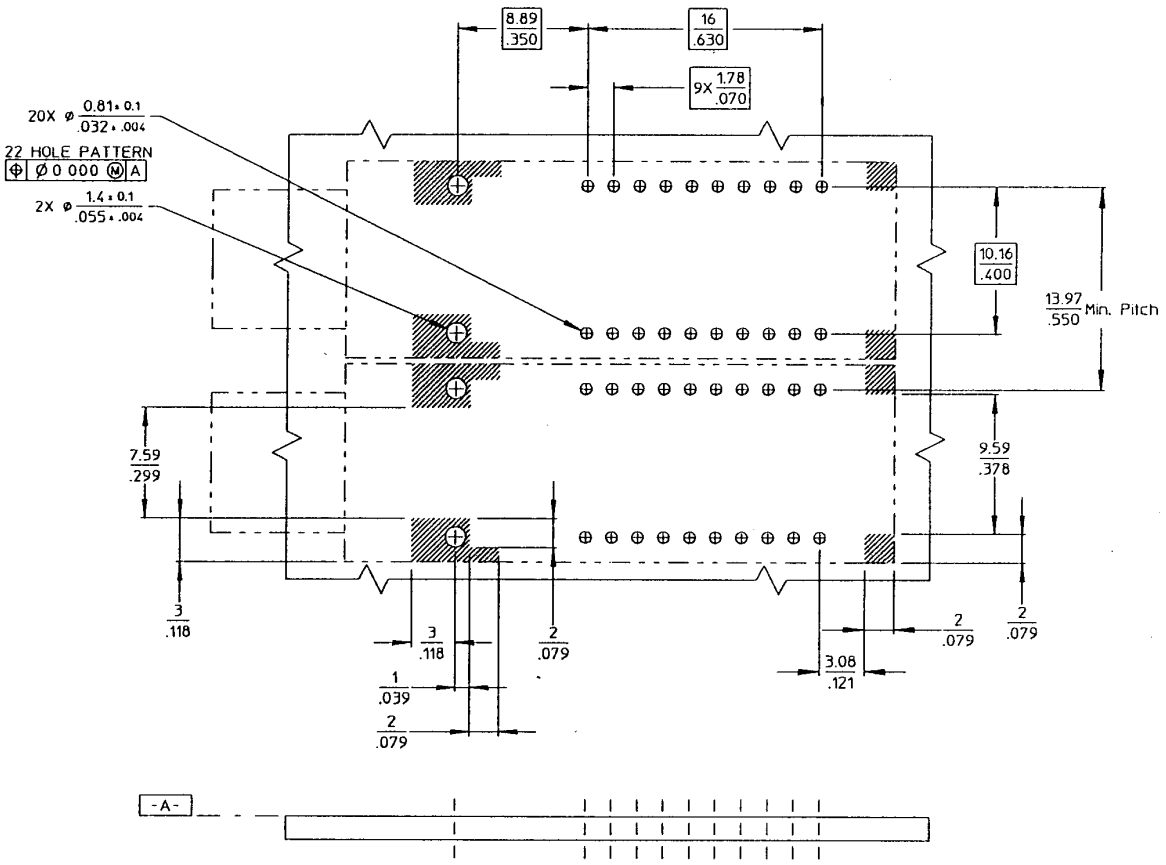
1		Optional feature reserved for future use. Do not connect.	TBD
2	Ref Clk	Reference Clock: Optional Feature Do not connect if unused.	PECL
3	Lck Ref-	Lock to Reference Clock Bar: Optional Feature Do not connect if unused.	PECL
4	Clk+	Received Recovered Clock Out: Optional Feature Do not connect if unused.	PECL
5	Clk-	Received Recovered Clock Out Bar: Optional Feature Do not connect if unused.	PECL
6	RD-	Received Data Out Bar	PECL
7	RD+	Received Data Out	PECL
8	SD	Signal Detect	PECL
9	Vee_r	Receiver Signal Ground	N/A
10	Vcc_r	Receiver Power Supply	N/A
11	Vcc_t	Transmitter Power Supply	N/A
12	TD+	Transmitter Data In	PECL
13	TD-	Transmitter Data In Bar	PECL
14	Vee_t	Transmitter Signal Ground	N/A
15	TDis	Transmitter Disable: Optional Feature Do not connect if unused.	
16	Pmon	Laser Diode Optical Power Monitor: Optional Feature Do not connect if unused.	
17		Optional feature reserved for future use. Do not connect.	TBD
18	Lmon(+)	Laser Diode Bias Current Monitor (+): Optional Feature Do not connect if unused.	
19	Lmon(-)	Laser Diode Bias Current Monitor (-): Optional Feature Do not connect if unused.	
20		Optional feature reserved for future use. Do not connect.	TBD



Maximum Package Envelope Drawing

User Printed Circuit Board Layout



Notes:

1. This page describes the recommended circuit board layout for the Mini-MT Transceiver placed at .550 spacing.
2. The hatched areas are keep-out areas reserved for housing standoffs.
3. 20 pin module shown, 10 pin module requires only 12 PCB holes.