PROPOSAL

for the

New, Low Cost, Small Form Factor
Optical Interconnect System

IEEE 802.3z
Gigabit Ethernet

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Low Cost, Small Form Factor Optical Interconnect Proposal - Outline

Precision Components
- None
(Injected Molded Parts)

Precision Components
- 4 Ferrules
- 2 Sleeves

CURRENT SC CONFIGURATION
(BENCHMARK)
End Users Key Requirements Summary

- **Significant Improvement over SC**
- **Low Cost** (50% of Duplex SC)
  - components
  - installation (in-field, factory)
- **Small Size** (50% of duplex SC)
  - High Density (Reduced Real Estate, Cross Section)
  - PCI Mezzanine Height
  - Fiber Spacing
- **Duplex/Polarized**
- **Multi Mode** (62.5 and 50 µm)
- **Performance** Compliant with ISO 11801 and TIA-568A
  Premises Cabling Standards
- **All Source Technologies**
- **No Keying/Keying for Safety**
- **Dust Protection**
- **Ergonomics** (Fingers Access, Alignment)
3M Low Cost, Small Form Factor Optical Interconnect Proposal - Attributes Controlling Optical Performance/Cost

**Benchmark SC**
(Cylindrical Ferrule's)

**MT Like**
(Rectangular Ferrule)

**3M (Galaxy)**
(No Ferrules)

Optical Performance:
X-Y-Z Fiber Alignment

Typ. Tolerance:
- Multi Mode - 3 µm
- Single Mode - 0.8 µm
3M Low Cost, Small Form Factor Optical Interconnect Proposal - Patch Cord/Plug, Assembly Sequence

1. Optical Fibers
   - Fiber Holder / Strain Relief

2. Cable Boot

3. Shroud
   - Integral Protective Sliding Door

(Images of assembly sequence steps 1 to 4)
3M Low Cost, Small Form Factor Optical Interconnect Proposal - Socket Assembly

1. Optical Fibers
   Fiber Holder (Snap action fiber gripping)

2. Fiber Alignment
   V-Groove Housing
   Integral Hinging
   Protective Door

3. Housing Base

4. Keystone Latch
   RJ45 Latch
3M Low Cost, Small Form Factor Optical Interconnect Proposal - Principle of Operation

1. Socket, Hinging Door, Plug
2. Keystone Latch, Optical Fibers, RJ45 Latch
3. Fibers enter the V-Grooves Alignment Area.
4. Optical Connection, Forward force to establish the optical contact.
3M Low Cost, Small Form Factor Optical Interconnect Proposal - Typical PCI Card Applications
3M Low Cost, Small Form Factor Optical Interconnect Proposal - System Solution

1. Horizontal Cable
2. 3M Transceiver
3. Network Interface Card
4. Installation Kit
5. 3M Socket
6. Wall Box & Face Plate
7. Test Equipment
8. Patch Panel
9. Network Hub or Switch
10. 3M Socket (6) Wall Box & Face Plate

3M TSD
3/10/97
# 3M Low Cost, Small Form Factor Optical Interconnect Proposal - Features and Benefits

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>V-Groove Self Alignment (No Precision Components Including Ferrules, Alignment Sleeves or Pins)</td>
<td>Low Cost, Proven Technology (Optical Fiber Splicing)</td>
</tr>
<tr>
<td>Plug and Socket (No Adapter)</td>
<td>Low Cost</td>
</tr>
<tr>
<td>Three Piece Snap-In Assembly (No Adhesives, Curing)</td>
<td>Fast, Cost Effective In-Field Termination in &lt; 2 Minutes. Ease of Use.</td>
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<tr>
<td>Fiber Bow - Maintains Optical Contact</td>
<td>Low Cost, Performance, Simplicity and Ease of Termination</td>
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<tr>
<td>Duplex/Multiple Fiber Connection</td>
<td>Duplex - Half the Time/Cost of Duplex SC Termination</td>
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<td>RJ-45 Style Latch</td>
<td>High Density - Half the Size of Duplex SC</td>
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<tr>
<td>Performance</td>
<td>Ease of Use, Familiarity, Cost Effective Hardware</td>
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<td></td>
<td>Compliant with ANSI/EIA/TIA-568A ISO 11801 Premises Cabling and TIA/EIA and ISO/IEC Component Standards</td>
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3M Low Cost, Small Form Factor Optical Interconnect Proposal - Licensing and Availability

- 3M/Honeywell Will Provide Licensing in Accordance with ANSI Licensing Policy
- ANSI, ASC X3T11, Fibre Channel Gigabit interface standard
- ANSI/TIA/EIA FO-6.3 Component Standardization in Process
- ANSI/TIA/EIA TR-41.8.1 Premises Cabling (568A) in process
- Multiple Sourcing Discussion in Process

Availability:
- Production, Beginning 2nd Quarter of 1997
3M Low Cost, Small Form Factor Optical Interconnect Proposal - Cost

Proposed Interconnect **Cost is Presently Seven Times Lower Than** the Industry Benchmark **Duplex SC** Due To:

- Elimination of All Precision Components (Ferrules and Sleeves)
- Elimination of Alignment Coupling/Adapter
- Minimum Component Count
- Use of readily Available Materials and Transferable Technologies (Injection Molding)
- Elimination of Adhesives and Corresponding Accessories
- Simplicity and Efficiency of Installation
The Outlined Proposal Meets or Exceeds the End User’s Development Criteria’s and Performance Requirements

The Proposal Applied Cost is Presently Seven Times Lower Than the Industry Benchmark, Duplex SC

The Performance and Reliability Values are Based on the Extensive Testing

3M and Honeywell Propose to the IEEE, 802.3z Gigabit Ethernet Committee to Accept This Contribution as Basis for the Development of a New, Low Cost, Small Form Factor Optical Interconnect
ATTACHMENTS

3M (GALAXY) PROPOSAL
### Material
- **Connector**: Engineering Thermoplastic UL-94 VO
- **Boot**: Thermoplastic Elastomer

### Specification

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Condition/Requirement</th>
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<tbody>
<tr>
<td>Attenuation</td>
<td>&lt; 0.75 dB Max, 0.5 dB Typical</td>
</tr>
<tr>
<td>Mating Durability</td>
<td>500 Cycles, &lt; 0.75 dB Max</td>
</tr>
<tr>
<td>Strength of Coupling</td>
<td>&gt; 33 Newtons, &lt; 0.75 dB Max</td>
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<tr>
<td>Cable Retention</td>
<td>Tensile Load &gt; 66 Newton&lt;br&gt;Side Pull &gt; 6.6 Newton, &lt; 0.75 dB</td>
</tr>
<tr>
<td>Flex</td>
<td>100 Cycles, +/- 90 degrees, 0.5 kg, &lt; 0.75 dB Max</td>
</tr>
<tr>
<td>Twist</td>
<td>10 Cycles, +/- 2.5 revolutions, 15 Newtons, &lt; 0.75 dB Max</td>
</tr>
<tr>
<td>Cold</td>
<td>-10 C for 96 hours, &lt; 0.3 dB increase</td>
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<tr>
<td>Heat</td>
<td>+60 C for 14 days, &lt; 0.3 dB increase</td>
</tr>
<tr>
<td>Thermal Cycling</td>
<td>-10 C to 60 C, 5 Cycles, &lt; 0.3 dB increase</td>
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<tr>
<td>Vibration</td>
<td>10 to 55 Hertz, 2 hours each axis, &lt; 0.3 dB increase</td>
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**Note**: Performance compliant with the above specifications.

- Insertion Loss Statistics: 0.31 dB Mean Loss, 0.10 Standard Deviation
Proposal for the Low Cost, Small Form Factor Optical Interconnect

PLUG PROPOSAL

SOCKET

SC DUPLEX PLUG
SC DUPLEX PLUGS

SC DUPLEX ADAPTER

CURRENT SC CONFIGURATION
Proposal for the Low Cost, Small Form Factor Optical Interconnect - Assembly

CURRENT SC CONFIGURATION

PROPOSAL
Proposal for the Low Cost, Small Form Factor Optical Interconnect - Principal of Operation
Proposal for the Low Cost, Small Form Factor Optical Interconnect - Plug

CURRENT SC CONFIGURATION
Proposal for the Low Cost, Small Form Factor Optical Interconnect - Coupling/Socket

PROPOSAL

CURRENT SC CONFIGURATION