VF-45™ (SG) Ferrule-Less Interconnect Proposal

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Design Objectives

- Minimize system Costs
- Copper network as cost benchmark
- Have familiarity of an RJ-45 connector
- Comparable labor cost to UTP copper
- Match RJ-45 installation skill level
- Field mountable in less than 2 minutes
- Singlemode and multi mode, polarized
- Meet TIA Industry Standard performance requirements
- Compatible with standard glass optical fiber
- Ensure end to end connectivity (Active-Passive)
Interconnect Technologies Comparison

- **Ferrule**
  - **Round**
    - 2.5mm
      - Panduit
      - Fiber Jack
    - 1.25mm
      - Lucent
      - LC
  - **Rectangle**
    - MT
    - Mini-MT
    - Mini-MT-RJ
  - **None**
    - Amp
    - 3M
Ceramic Ferrule X-Y-Z Fiber Alignment

Concentric Components
- Core to Cladding
- Fiber to Capillary
- Capillary to Ferrule OD
- Ferrule OD to Sleeve

Length Components
- End Face Polish
- Spring Pressure
Mini-MT-RJ
X-Y-Z Fiber Alignment

Large number of tolerances to consider:

Concentric Components
• Core to Cladding
• Fiber to Capillary
• Capillary to Capillary
• Capillary to Ferrule OD
• Ferrule OD to Sleeve
• Pin or Sleeve Alignment

Length Components
• End Face Polish
• Spring Pressure

Optical Fiber
Adhesive
Precision Ferrule / Precision Alignment Pins/Holes - (Tolerance + 0.25µm)
Ferrule-Less V-Groove Technology

Very Few Tolerances to Consider:
Concentric Components
• Core to Cladding
• Fiber OD to Fiber OD

Length Components
• Minimal

Low Complexity
• Molded Plastic Parts
• No Precision Ceramic Ferrules
• No Precision Ceramic Sleeves
• No Ferrule Springs
• No Alignment Coupling/Adapter
• No Field Applied Adhesives

Optical Connection
Forward force to establish the optical contact.

Optical Fiber

Δ Fiber
3M™ Volition™ System Components

- Duplex Fiber Optic Interconnect
  - Molded plastic components
  - Look and feel of RJ-45
Improvements over benchmark SC

- Reduced Complexity
  - A few molded plastic parts
  - No ceramic ferrules
  - No collars or sleeves
  - No ferrule springs to overcome friction

CURRENT SC CONFIGURATION
3M VF-45™ (SG) Interconnect
Principle of Operation

Socket Hinging Door Plug

Optical Fibers enter the V-Grooves Alignment Area

Keystone Latch
Optical Fibers
RJ45 Latch

Optical Connection
Forward force to establish the optical contact
VF-45™ Plug Assembly

1. Optical Fibers
   - Fiber Holder / Strain Relief

2. Cable Boot

3. Shroud

4. Integral Protective Sliding Door
VF-45 Socket - Components

- VF-45 Socket
- Simple snap together components
Low Complexity

- Elimination of precision components (ferrules, sleeves)
- Elimination of alignment coupling/adapter
- Minimum component count
- Readily available materials and transferable technologies - injection molding
- Elimination of field applied adhesives
- Simplicity and efficiency of installation
Socket Termination Tools

- Two minute termination time (duplex connector)
- Minimal fiber handling - Hands Free
Beveled Fiber End Face on Patch Cord

Plug Fiber

Socket Fiber

Bevel Angle

90µm

Fiber

125±2µm

500 Reconnections
Installation Advantages

• RJ-45 style socket installation
• Patch Cords easily mass produced
  - Purchased like Cat. 5 cords
  - Employ standard glass fiber
• Efficient
  - Eliminate simplex connectors and couplings
  - Reduced training, High yield
  - Moved to an Installation improvement over SC
# VF-45 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 - Ferrules, Alignment Sleeves or Pins)</td>
<td>Low Complexity, Proven Technology</td>
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<tr>
<td>Plug and Socket (No Adapter)</td>
<td>Low Complexity</td>
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<tr>
<td>Socket Snap-In Assembly</td>
<td>Fast, Effective In-Field Termination in &lt; 2 Minutes. Ease of Use</td>
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<td>Simultaneous Two Fiber Termination</td>
<td>Duplex - Less Than Half the Time of Duplex SC Ferrule Termination</td>
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<td>RJ-45 Style Latch</td>
<td>Reduced Training with High Yield</td>
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<td>1/2 Size of Duplex SC</td>
<td>Ease of Use, Familiarity</td>
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<td>Performance</td>
<td>Panel and Electronics Density Equal to RJ-45</td>
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<td>Meets or exceeds the ANSI/EIA/TIA-568A ISO 11801 Premises Cabling and TIA/EIA and ISO/IEC Component Performance Standards</td>
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Simplex and Quad Optical Transceivers

- Reduced alignment complexity
  - Duplex fibers align direct to devices
  - Packaging automation
  - Reduced cost

- High density
  - Same as RJ-45 jack
  - Equal # of ports as copper in the hubs
Electronics

- Switches
  - 10BaseFL, 24 ports
  - 100BaseFX, 16 ports
- 10 Mb/s media converters
- 100 Mb/s media converters
- Token Ring media converters
Cable Management
Patch Panels

- 3 unit 48 ports (96 fibers)
- 2 unit 24 ports (48 fibers)
- 1 unit 24 ports (48 fibers)

• 1U extension for modular expansion to 48-ports
• 2U unit with built-in cable management
• 1U unit for high density
Wall Outlet Adapters

- Installs to wall outlet box or box eliminator
- Allows copper faceplate with up to 4 - RJ45’s
- Terminate 4 fibers per adapter (2 - VF-45’s)
- Line cord side entry for added fiber protection
Furniture Outlet

- Installs to ANSI/TIA/EIA-569-A openings
- Can attach to wall outlet box
- Terminate 4 fibers per outlet (2 - VF-45’s)
- Line cord side entry for added fiber protection
VF-45 Compatible Products

Network Hubs and Switches:
- Allied Telesyn
- BATM
- Canary Communications
- Cisco
- Garrett Communications
- Gemflex
- IMC Networks
- Olicom
- 3M Volition

Media Converter Transceivers
ASICS

Horizontal Cable:
- Corning

3M Volition Socket

Media Converters:
- Allied Telesyn
- Canary Communications
- IMC Networks
- 3M Volition

ASICS
- Davicom
- MicroLinear
- Microcom Communications

Transceivers:
- Honeywell
- Siemens
- Sumitomo

Network Interface Cards:
- Racore
- Phobos

Volition™
Cabling System
Standardization

- NCITS FC-PI Fiber Channel (SG) interface standard
- ATM Forum BTD-PHY-GOF--1.00
- IEEE 802.3z (majority support)
- TIA/EIA FOCIS-7 (Intermateability standard)
- ISO/IEC 86B FOCIS
- CENELEC TC86B XA pr EN 186 540 SG Performance standard
- ISO/IEC 11801 and TIA/EIA-568 Cabling standards (except the TO)
VF-45 Summary

- Standard Fiber Channel interface (MM and SM)
- Recognized as Breakthrough technology
- Delivers performance and *lowest* complexity (cost)
- Uses proven fiber alignment technique
- Doubles the port density (drop in replacement to RJ-45)
- Supported by the transceiver and OEM industry
- Multi-Source Availability
Recommendations

• 3M Recommends IEEE 802.5 Specify the VF-45 (SG) Interconnect for the 100 and 1000 Token Ring Draft Application Standard’s