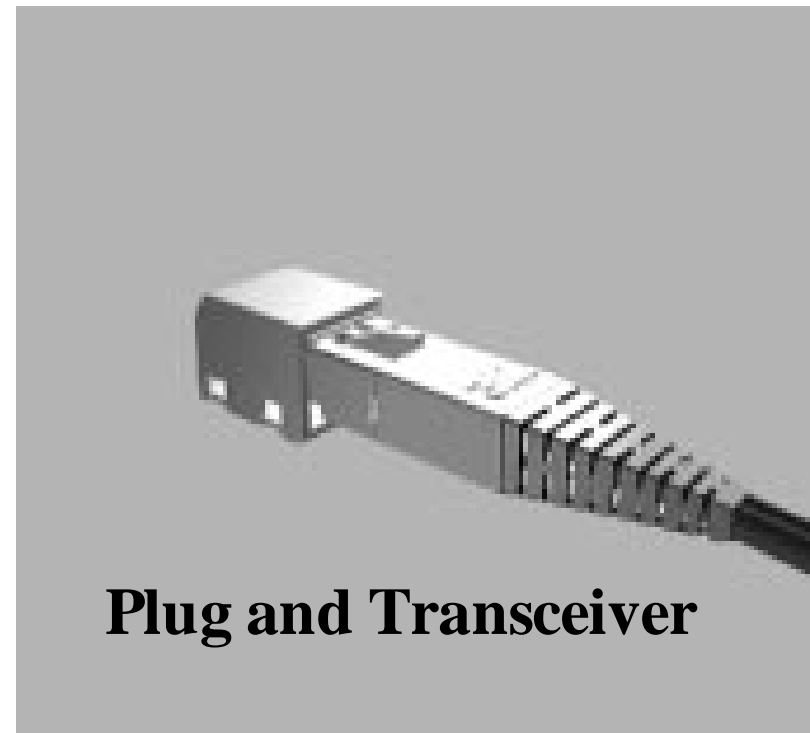
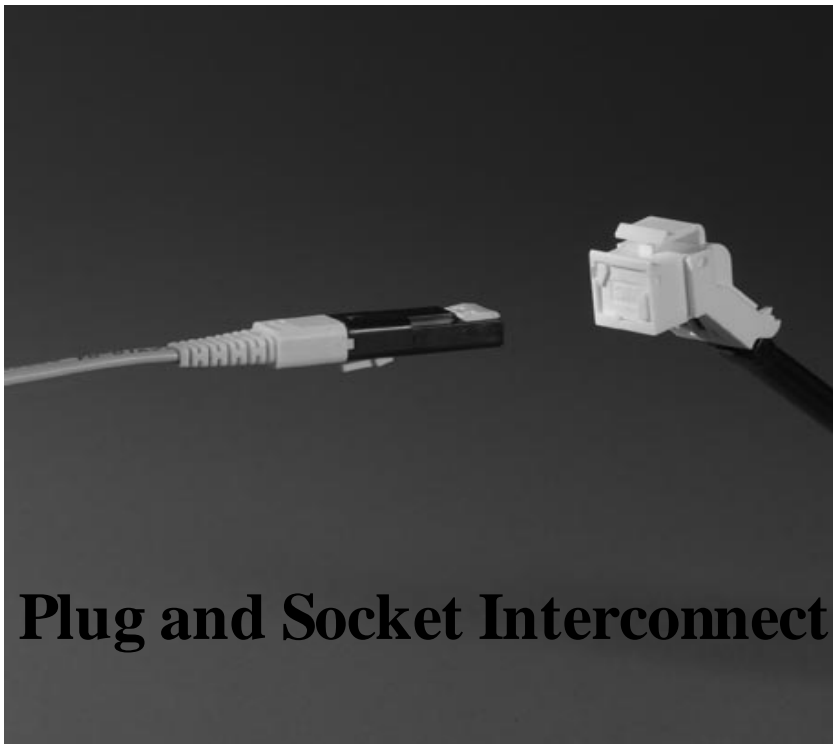


VF-45™ (SG) Ferrule-Less Interconnect Proposal

IEEE 802.5 Token Ring. November 10-12, 1998

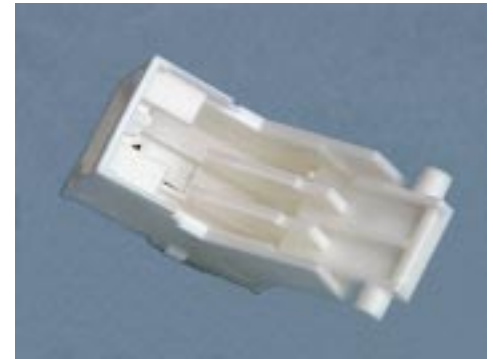
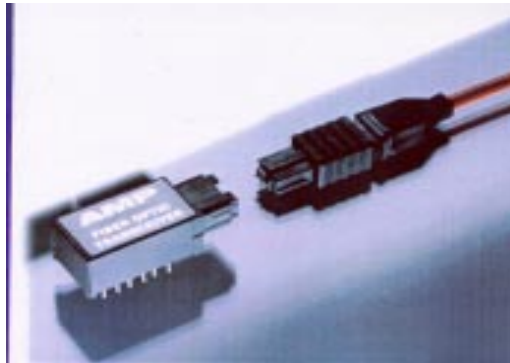
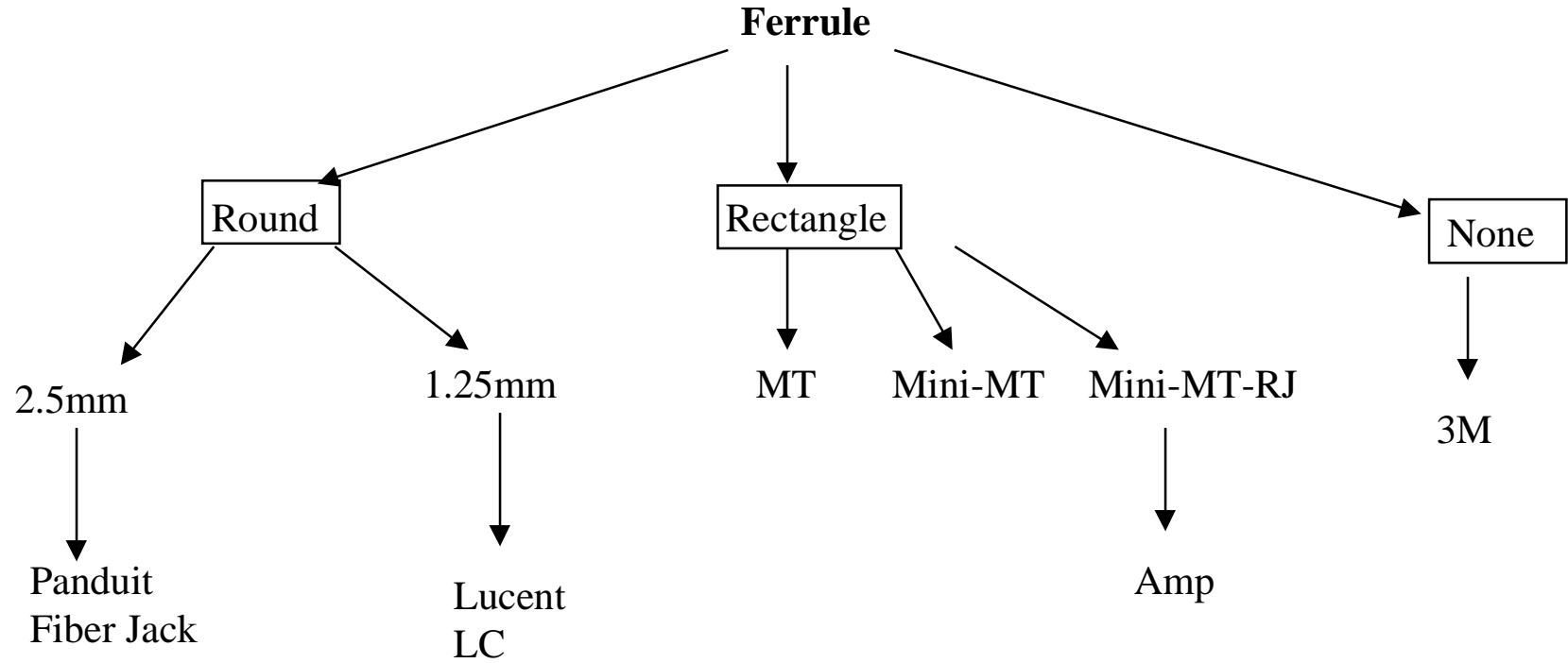
Tad Szostak - 3M Telecom Systems Division
512-984-3847; tszostak1@mmm.com
www.3M.com/volition



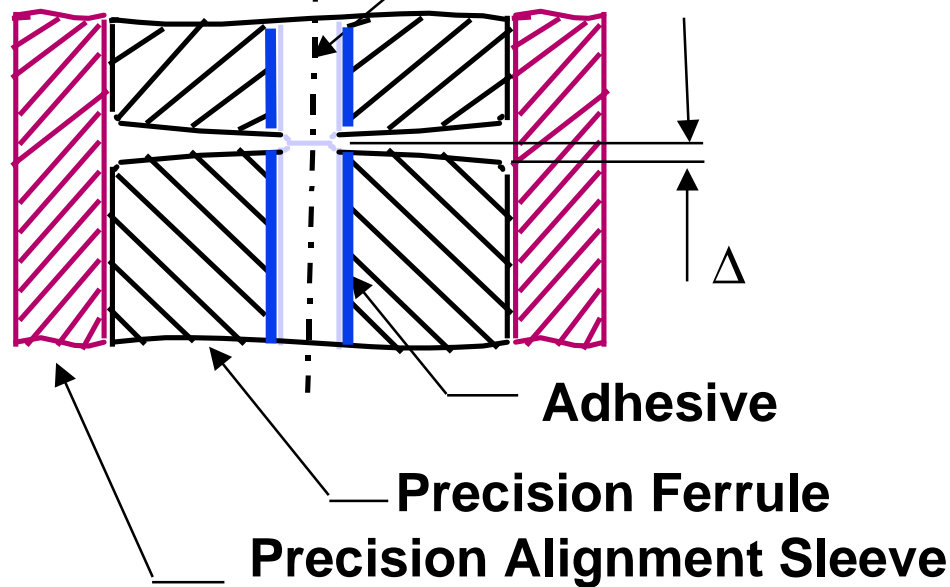
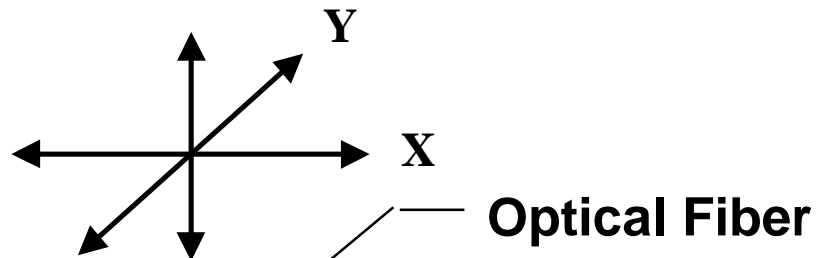
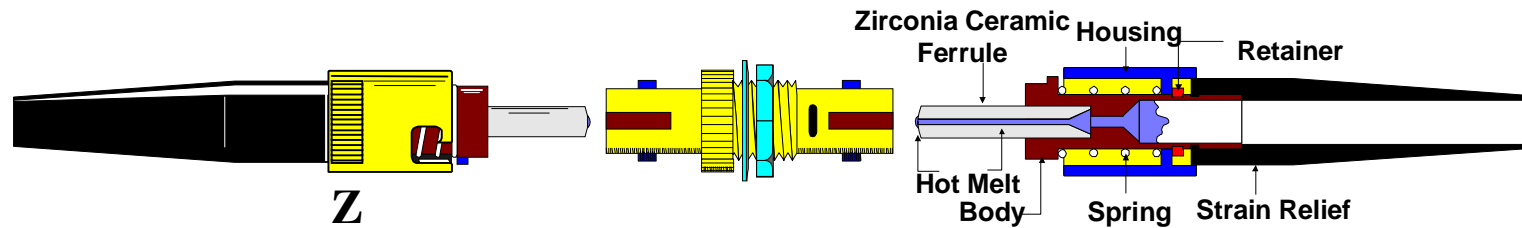
Design Objectives

- **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



Ceramic Ferrule X-Y-Z Fiber Alignment



Concentric Components

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

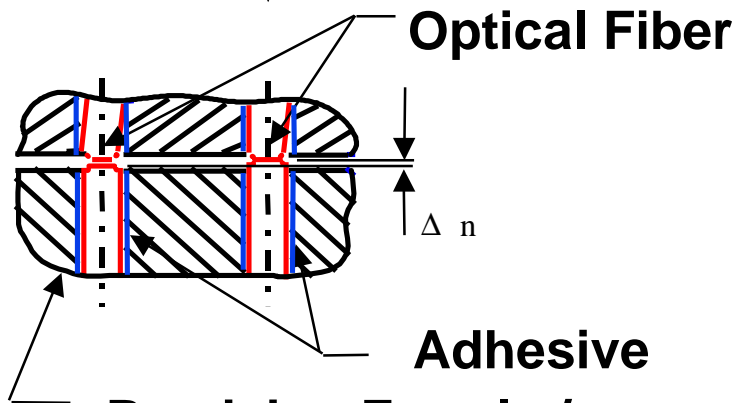
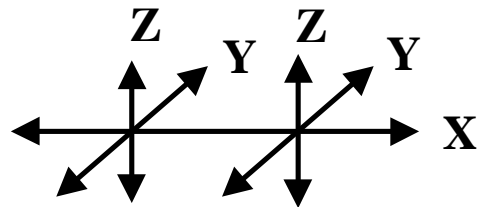
Length Components

- End Face Polish
- Spring Pressure

Mini-MT-RJ

X-Y-Z Fiber Alignment

Large number of tolerances to consider:



Precision Ferrule /
Precision Alignment Pins/Holes - (Tolerance + 0.25 μ m)

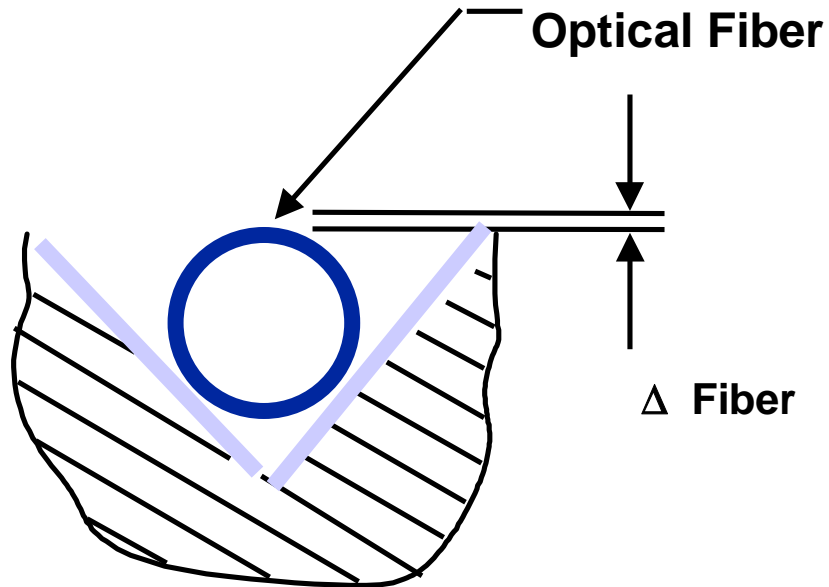
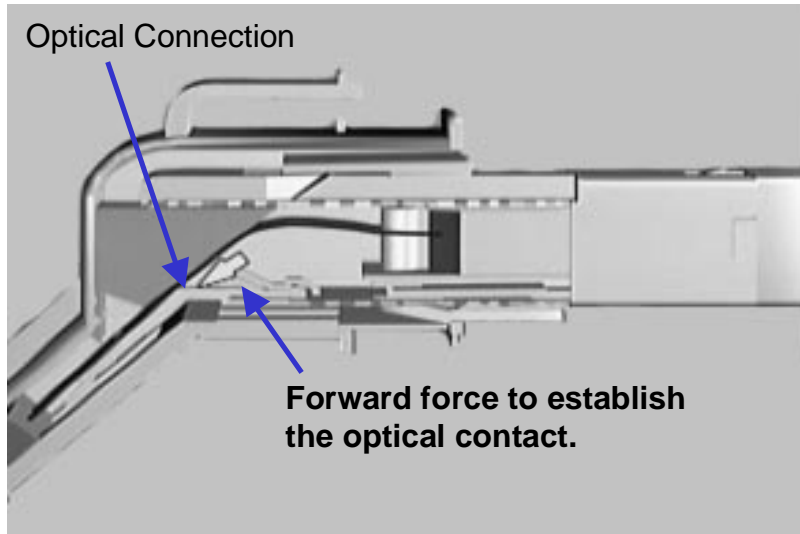
Concentric Components

- 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

Ferrule-Less V-Groove Technology



Very Few Tolerances to Consider:

Concentric Components

- Core to Cladding
- Fiber OD to Fiber OD

Length Components

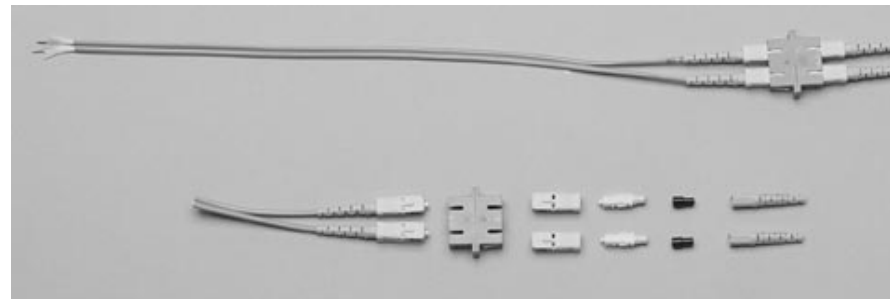
- Minimal

Low Complexity

- Molded Plastic Parts
 - No Precision Ceramic Ferrules
 - No Precision Ceramic Sleeves
 - No Ferrule Springs
 - No Alignment Coupling/Adapter
 - No Field Applied
- Adhesives**

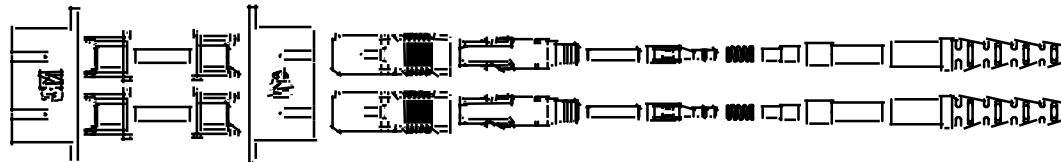
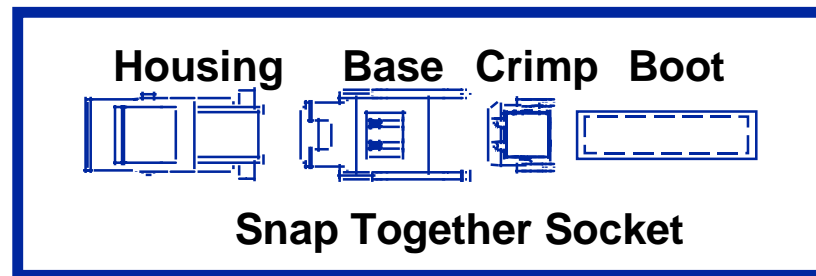
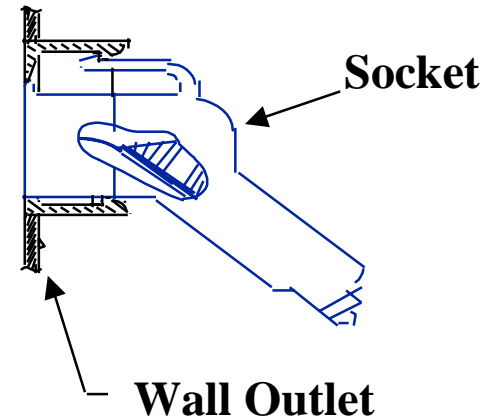
3M™ Volition™ System Components

- Duplex Fiber Optic Interconnect
 - Molded plastic components
 - Look and feel of RJ-45



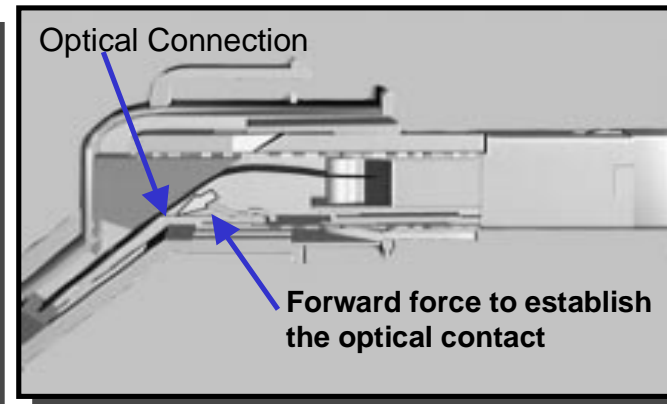
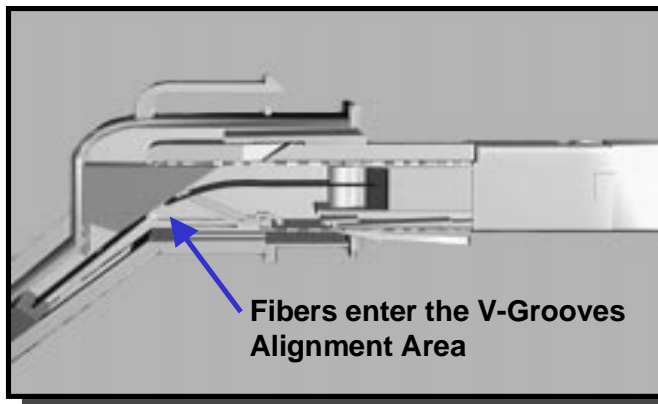
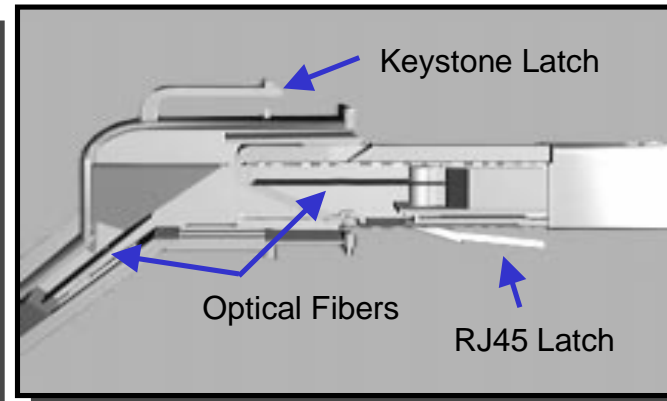
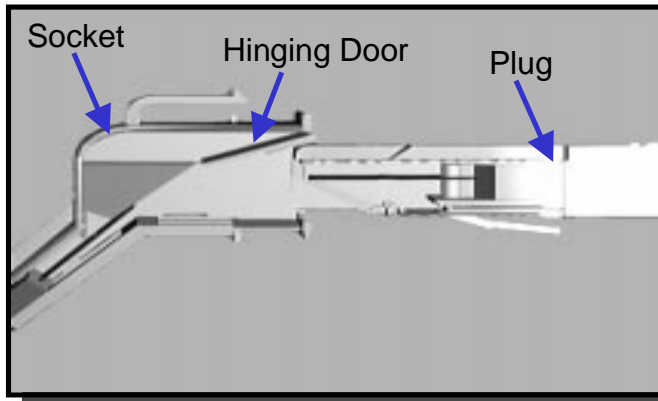
Improvements over benchmark SC

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

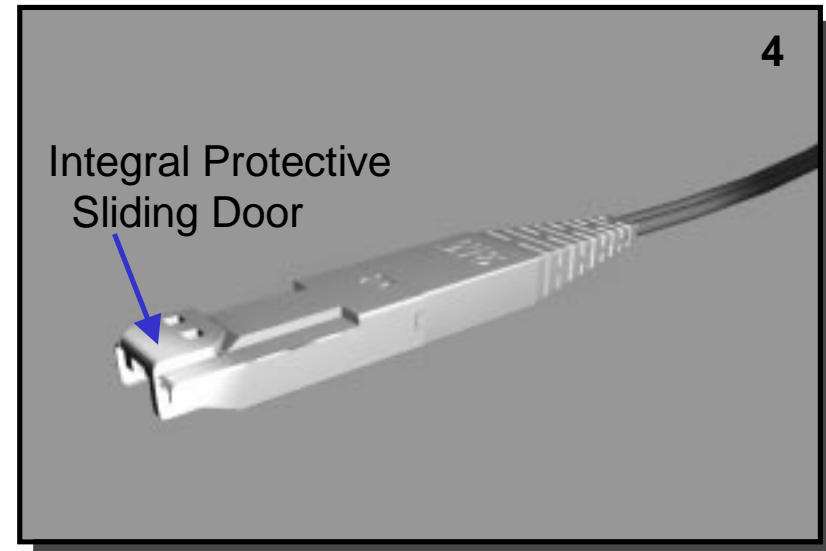
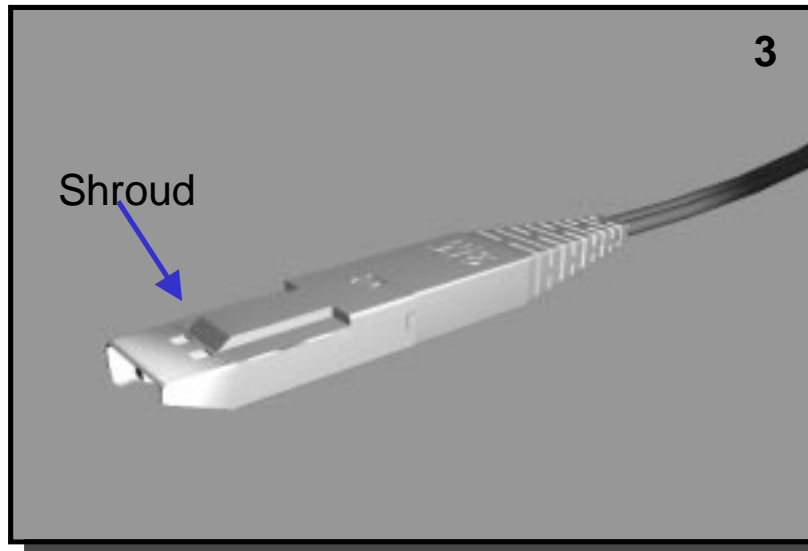
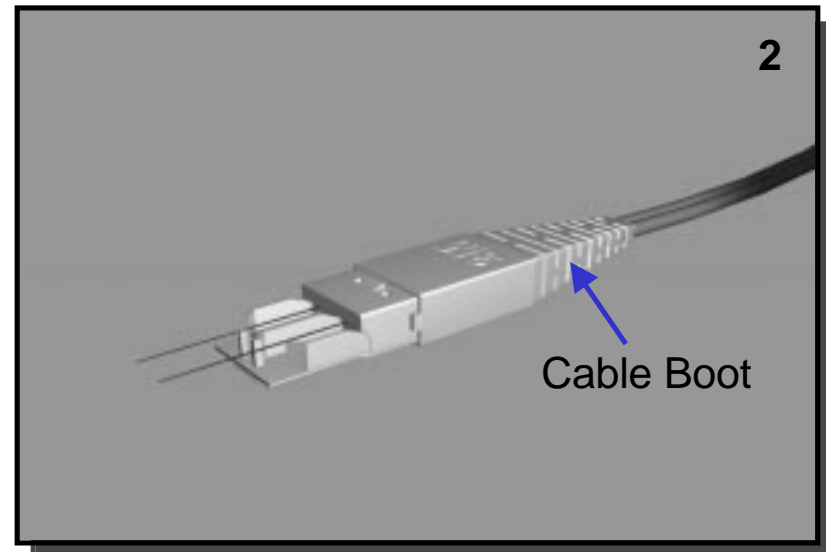
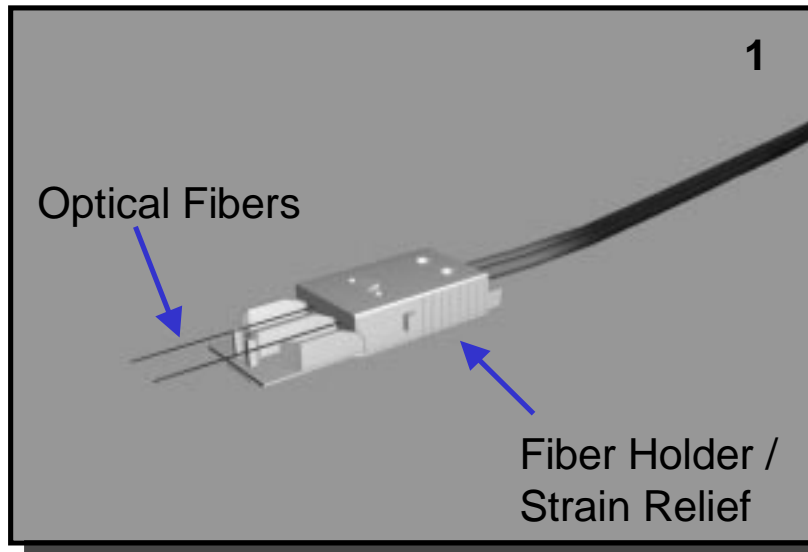


CURRENT SC CONFIGURATION

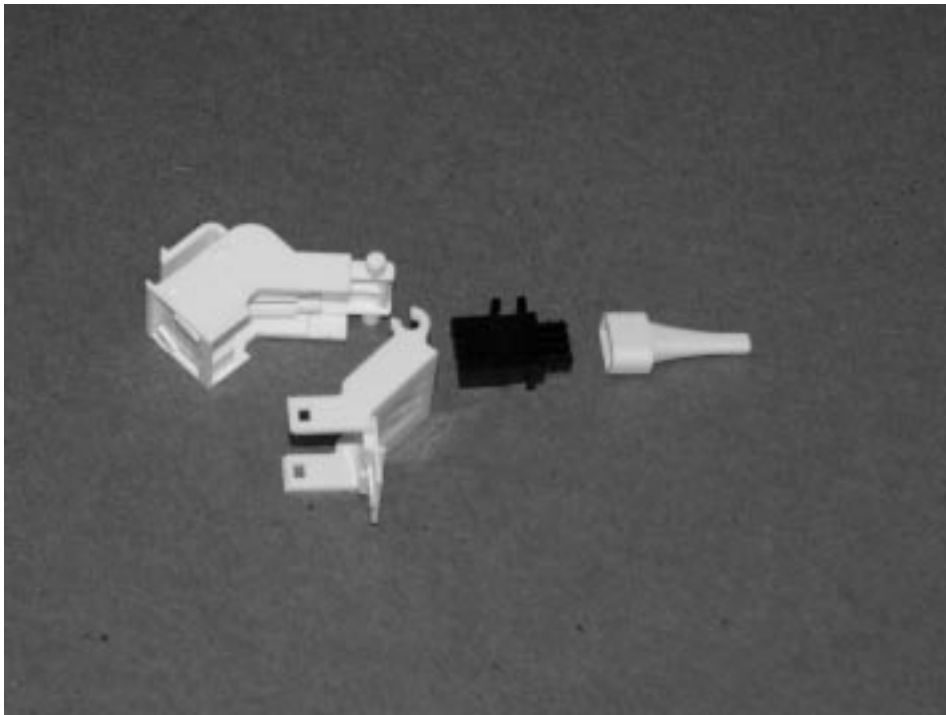
3M VF-45™ (SG) Interconnect Principle of Operation



VF-45™ Plug Assembly



VF-45 Socket - Components



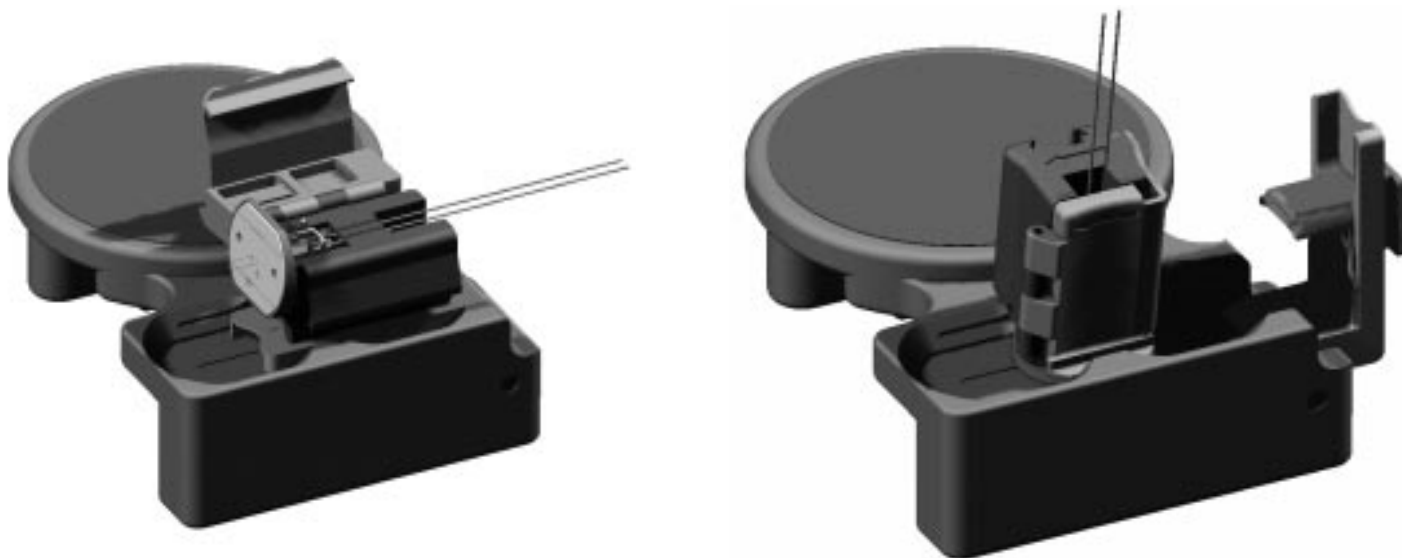
- VF-45 Socket
- Simple snap together components

Low Complexity

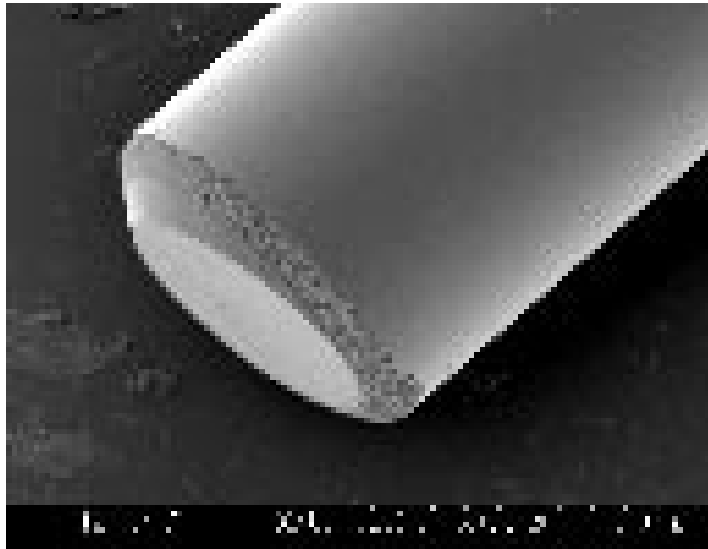
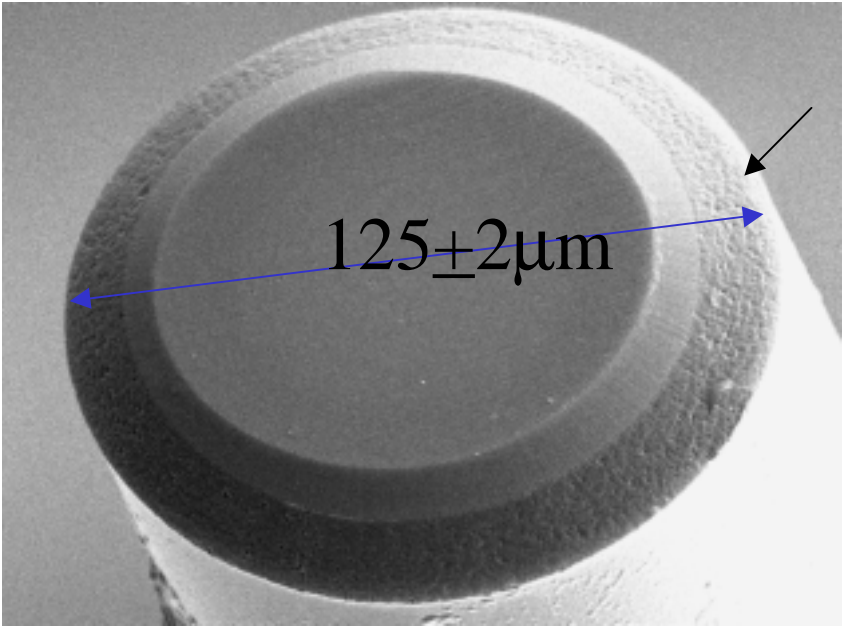
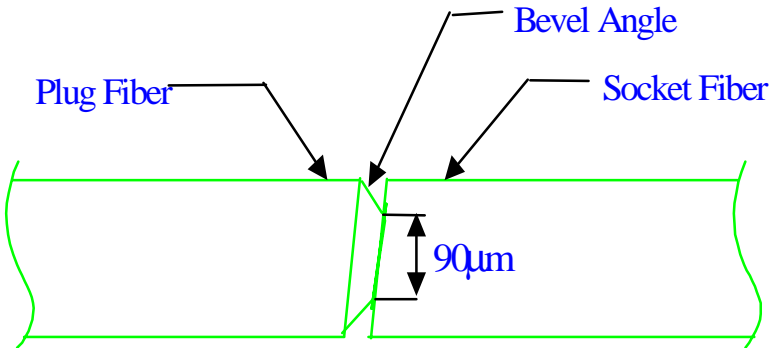
- Elimination of precision components (ferrules, sleeves)
- Elimination of alignment coupling/adapter
- Minimum component count
- Readily available materials and transferable technologies - injection molding
- Elimination of field applied adhesives
- Simplicity and efficiency of installation

Socket Termination Tools

- Two minute termination time (duplex connector)
- Minimal fiber handling- Hands Free



Beveled Fiber End Face on Patch Cord



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

Features

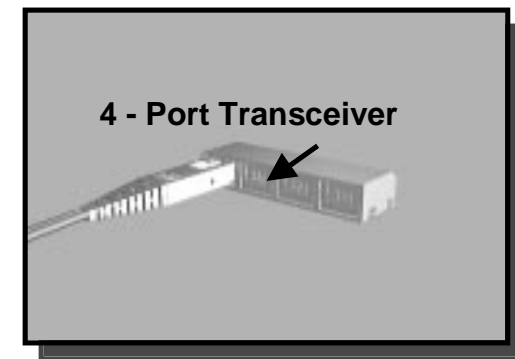
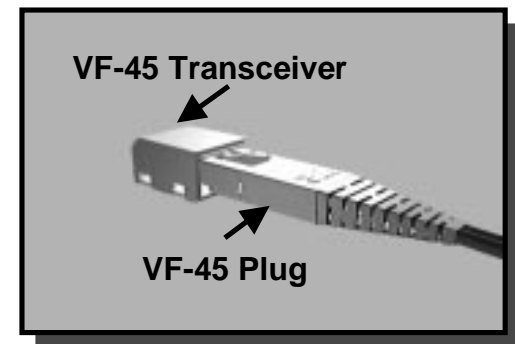
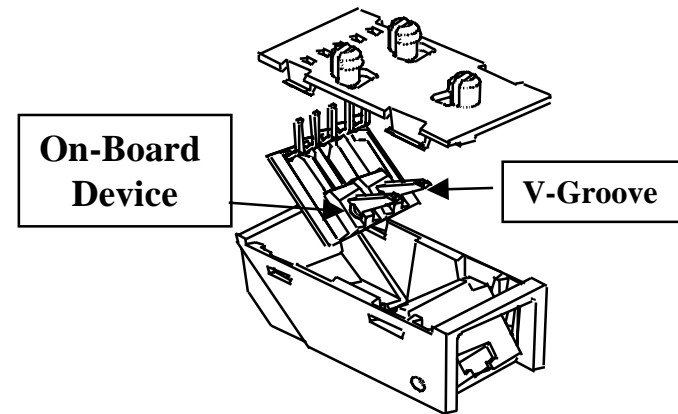
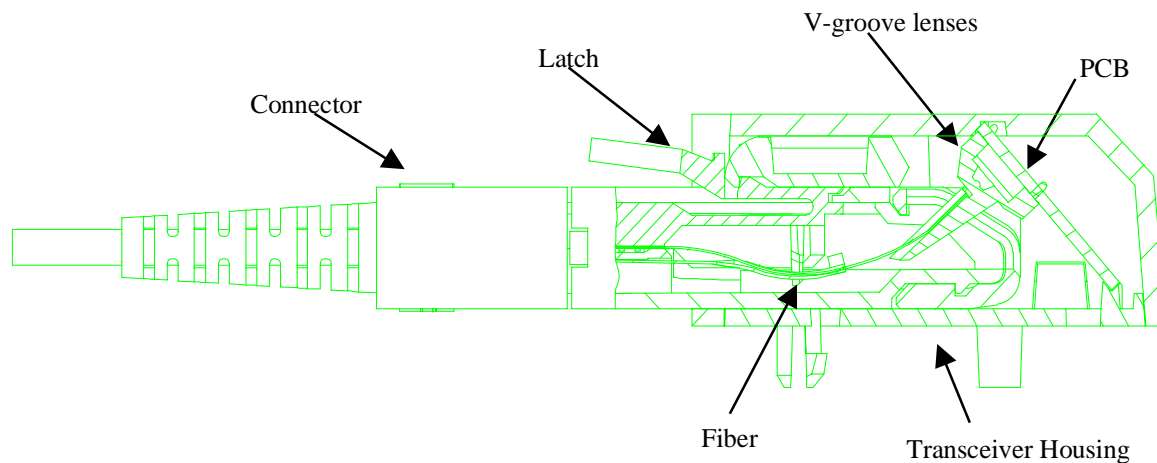
- V-Groove Self Alignment (No Precision Components - Ferrules, Alignment Sleeves or Pins)
- Plug and Socket (No Adapter)
- Socket Snap-In Assembly
- Simultaneous Two Fiber Termination
- RJ-45 Style Latch
- 1/2 Size of Duplex SC
- Performance

Benefits

- Low Complexity, Proven Technology
- Low Complexity
- Fast, Effective In-Field Termination in < 2 Minutes. Ease of Use
- Duplex - Less Than Half the Time of Duplex SC Ferrule Termination
- Reduced Training with High Yield
- Ease of Use, Familiarity
- Panel and Electronics Density Equal to RJ-45
- Meets or exceeds the ANSI/EIA/TIA-568A ISO 11801 Premises Cabling and TIA/EIA and ISO/IEC Component Performance Standards

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

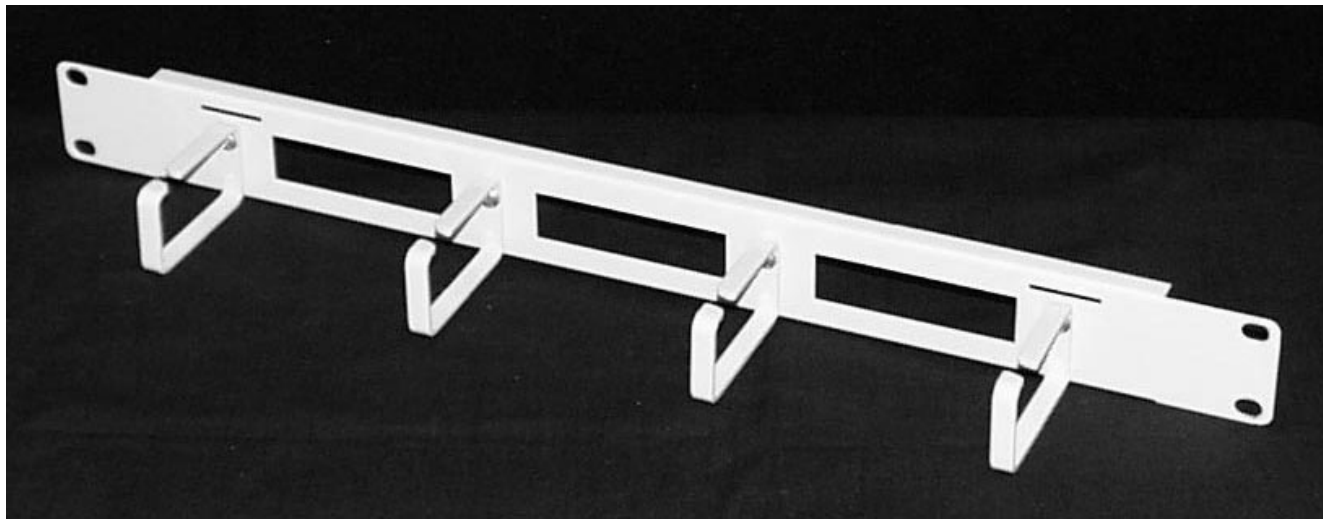
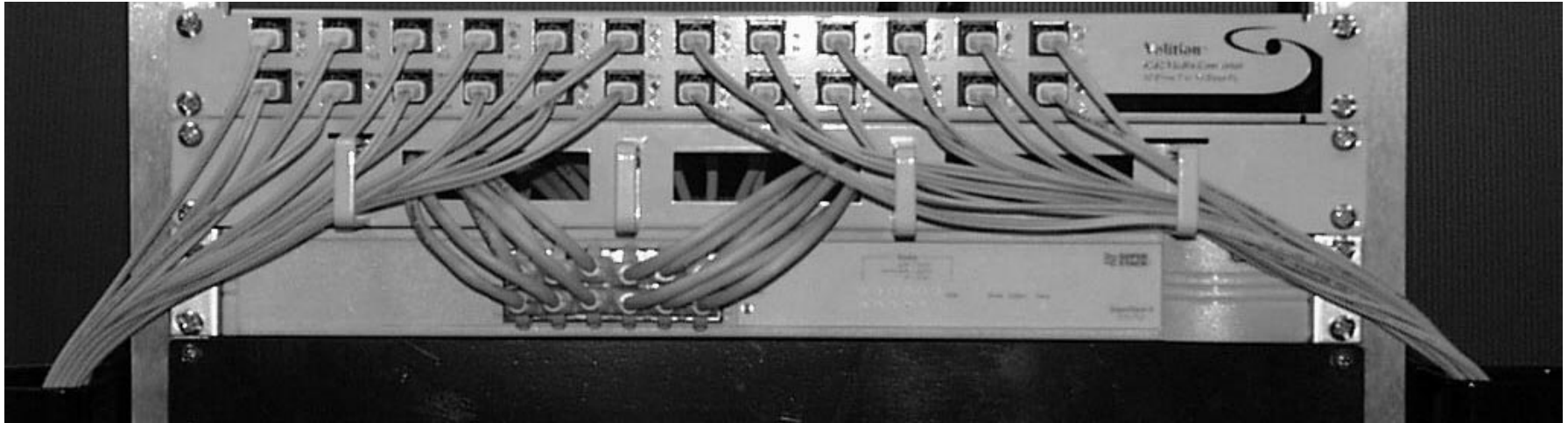


Electronics

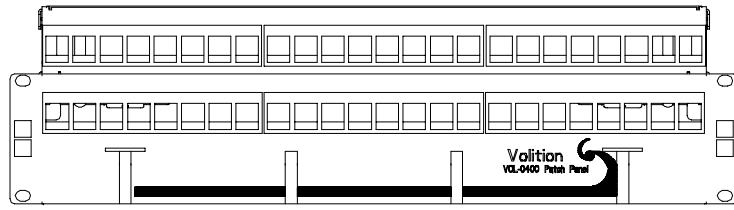


- Switches
 - 10BaseFL, 24 ports
 - 100BaseFX, 16 ports
- 10 Mb/s media converters
- 100 Mb/s media converters
- Token Ring media converters

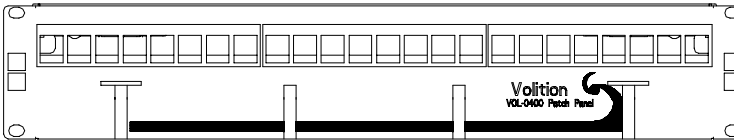
Cable Management



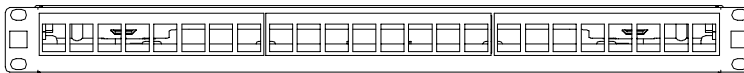
Patch Panels



– 3 unit 48 ports
(96 fibers)



– 2 unit 24 ports
(48 fibers)

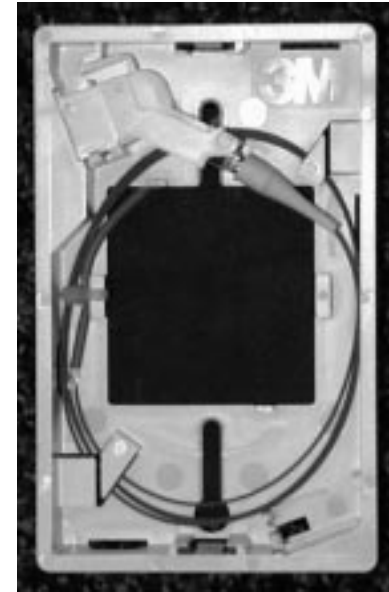


– 1 unit 24 ports
(48 fibers)

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

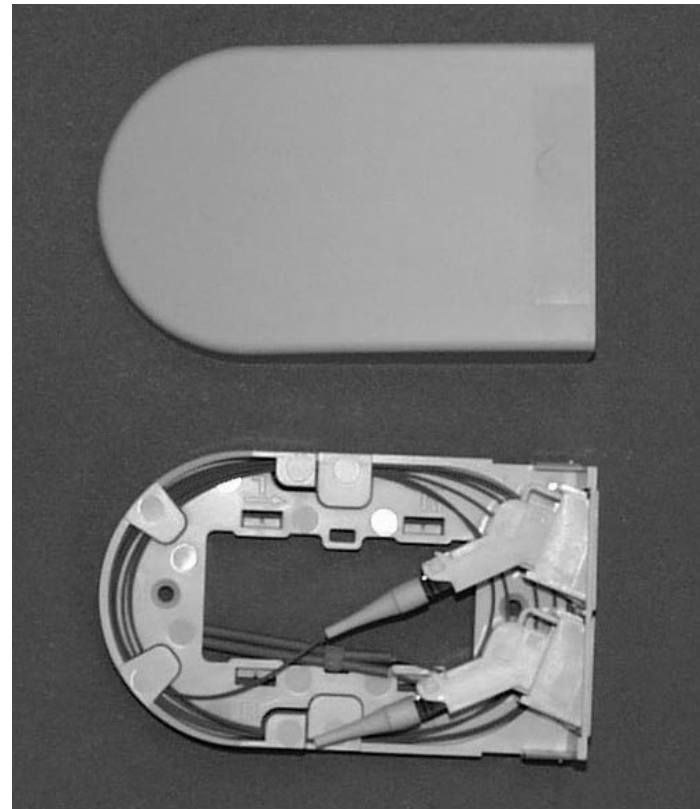
Wall Outlet Adapters

- 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
- ◆ Oliscam
- ◆ 3M Volition

ASICs

- ◆ Davicom
- ◆ MicroLinear
- ◆ Microcom Communications

Horizontal Cable:

- ◆ Corning

Media Converter Transceivers ASICs

Transceivers:

- ◆ Honeywell
- ◆ Siemens
- ◆ Summitcom

3M Volition Socket

Network Interface Cards:

- ◆ Racore
- ◆ Phobos

Media Converters:

- ◆ Allied Telesyn
- ◆ Canary Communications
- ◆ IMC Networks
- ◆ 3M Volition

Volition™

Cabling System



Standardization

- NCITS FC-PI Fiber Channel (SG) interface standard
- ATM Forum BTB-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