



**Verizon NEBS™ Compliance: Field Use Optical  
Connector Polishing Machine**  
Verizon Technical Purchasing Requirements  
VZ.TPR.9449  
**Issue 1, August 2007**





**CHANGE CONTROL RECORD:**

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## 1.0 PURPOSE

The purpose of this Verizon Technical Purchasing Requirement document is to provide FOC testing requirements for Field Use Optical Connector Polishing Machines.

## 2.0 SCOPE

FOC Products

## 3.0 REFERENCES

<b>GR-326-CORE, Issue 3, September 1999</b>	Generic Requirements for Single mode Optical Connectors and Jumper Assemblies
<b>GR-765-CORE Issue 1, September 1995</b>	Generic Requirements for Single Fiber Single-Mode Optical Splices and Splicing Systems
<b>GR-1089-CORE, Issue 4 June 2006</b>	Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network Telecommunications Equipment

## 4.0 ACRONYMS

<b>A</b>	After
<b>APC</b>	Angled Polished Connector
<b>B</b>	Before
<b>D</b>	During
<b>DUT</b>	Device Under Test
<b>FOC</b>	Fiber Optic Components
<b>IL</b>	Insertion Loss
<b>ITL</b>	Independent Testing Laboratory
<b>OM</b>	Optical Measurements
<b>RL</b>	Return Loss
<b>UPC</b>	Ultra Polished Connector



**5.0 TEST REQUIREMENTS FOR FIELD USE OPTICAL CONNECTOR POLISHING MACHINES**

Verizon is considering using Field Use Optical Connector Polishing Machine for all applications as required. The following are the test requirements for qualifying a Field Use Optical Connector Polishing Machine. All the testing must be completed by a Verizon approved ITL.

<b>FOC -Field Use Optical Connector Polishing Machine Test Plan</b>			
<b>Task Name</b>	<b>Sample Size</b>	<b>OM</b>	<b>Test Description</b>
<b>Field Use Optical Connector Polishing Machine Qualification</b>			
<b>Connector Optical Requirements</b>	ALL		Initial Loss and Reflectance
<b>Endface Geometry Requirements (measured per GR-326)</b>	ALL		Protrusion / Undercut, Co-planarity, Endface Angle
<b>General Requirements and Objectives</b>			
<b>GR-765 3.1: Documentation</b>			
<b>3.1.1: Practices</b>			
<b>3.1.2: WIP</b>			
<b>3.1.3: Safety</b>			Non-toxic
<b>3.1.5: Preparation</b>			Provide min. length of cable required to rework connector
<b>GR-765 3.2 General Criteria</b>			
<b>3.2: Dimensions</b>			
<b>(a) Rework Dimensions</b>			Dimensional Requirements for rework product (should be comparable to the applicable Focus document)
<b>3.2.2: Compatible with Optical Connectors</b>			What manufacturers products are compatible with this polisher
<b>3.2.3: Index Matching Gel</b>			Should not be required
<b>3.2.4: Strain Relief</b>			The splicer should provide some means of strain relief when polishing the product
<b>3.2.5: Fiber Damage</b>			The splicing system should not damage the fibers during the polishing process
<b>3.2.6: Universal installation</b>			The polisher should work in all installation environments



<b>FOC -Field Use Optical Connector Polishing Machine Test Plan</b>			
<b>Task Name</b>	<b>Sample Size</b>	<b>OM</b>	<b>Test Description</b>
<b>Adaptable Clamps and Guards</b>			Should be adaptable to optimize polishing
<b>GR-765 3.3 Marking, Packaging and Shipping</b>			
<b>3.3.1: Marking</b>			
<b>3.3.2: Package Label</b>			
<b>3.3.3: Packaging and Shipping</b>			
<b>3.4: Quality (Not from GR-765)</b>			TL 9000
<b>Features, Functions, Performance Criteria</b>			
<b>GR-765 4.1 Equipment: General Requirements and Objectives</b>			
<b>4.1.1: Portability</b>			
<b>4.1.2: Carrying Case</b>			
<b>4.1.3: Surface Finish and Markings</b>			Chemical Resistance
<b>4.1.4: Display and Controls</b>			
<b>4.1.4.1: General display criteria</b>			
<b>4.1.4.2: State of charge Indicator</b>			
<b>4.1.4.3: General Control Criteria</b>			
<b>4.1.6 Features</b>			
<b>4.1.6.1: Support Equipment</b>			
<b>4.1.6.4: Settings and Adjustments</b>			
<b>4.1.7: Product Information</b>			
<b>4.1.7 (a): Instructions and Procedures</b>			Equipment should include IS sheets, Operational Instructions and polishing procedures.
<b>4.1.7 (b): Tools, Materials and Supplies</b>			List of replacement parts, tools, materials and supplies should be provided with the system
<b>Optical Performance Criteria</b>			
<b>GR-326 4.2.1 Optical Performance Criteria</b>			Loss and Reflectance
<b>GR-765 4.2.2 Optical Polish Yield (1st Time)</b>			Specify 1st time % Yield, based on Loss/RL/EFG requirements



<b>FOC -Field Use Optical Connector Polishing Machine Test Plan</b>			
<b>Task Name</b>	<b>Sample Size</b>	<b>OM</b>	<b>Test Description</b>
<b>Mechanical and Storage Environments Criteria *</b>			
<b>GR-765 4.4 Equipment: Mechanical and Storage Environments Criteria</b>			
<b>4.4.1: Initial Operation</b>			Polisher should function properly as received and be capable of polishing product that meets the requirements specified in sect. 4.21. And 4.2.2
<b>4.4.3: Shock</b>			
<b>(a): Edgewise Drop and Cornerwise Drop</b>	3A	IL/RL/%Yield I/A	3 in. drop, each corner and edge
<b>(b): Bottom Surface Drop</b>	3A	IL/RL/%Yield I/A	30 in. Drop on bottom surface of the Polisher
<b>4.4.4: Vibration, Transportation</b>	3A	IL/RL/%Yield I/A	1 sweep; 1.5G, 10HZ to 500HZ, 0.1 Octave/minute, 3 principle axes
<b>4.4.5: Storage Environment</b>	3A	IL/RL/%Yield I/A	-40° C, UC/RH, 24 Hrs; 60° C, 95% RH, 24 Hrs
<b>GR-765 4.5 Equipment: Electrical Requirements</b>			
<b>4.5.1: AC Powered Equipment</b>			
<b>4.5.2: Battery unit</b>			
<b>4.5.3: Battery Operation</b>			
<b>4.5.3.1: Battery Lifetime</b>			Define Battery lifetime in terms of polishing cycles (Room temp and 0° C)
<b>4.5.3.2: Time-out Interlock</b>			
<b>4.5.3.3: State of Battery Charge</b>			
<b>4.5.4: Electromagnetic Compatibility</b>			
<b>(a) Electromagnetic Interference</b>			Section 3 or GR-1089
<b>(b) Electrostatic Discharge</b>			Section 2 or GR-1089
<b>(c) Lightning Surges</b>			Section 4.5.9 or GR-1089
<b>(d) Electric Safety</b>			Section 7 or GR-1089
<b>4.6: Material and Consumables Criteria</b>			
<b>4.6.2 Toxicity</b>			
<b>4.6.3 Fungus Resistance</b>			
<b>4.6.4 Shelf Life</b>			
<b>4.6.5 Index Matching Material</b>			"Should not be Required"
<b>Environmental Performance (Polisher) *</b>			





<b>FOC -Field Use Optical Connector Polishing Machine Test Plan</b>			
<b>Task Name</b>	<b>Sample Size</b>	<b>OM</b>	<b>Test Description</b>
<b>GR-765 4.7: Polishing - Installation Conditions</b>			
<b>4.7.1: Low Temperature Installation</b>	1A	IL/RL/%Yield I/A	-18° C, UC/RH, Must meet Section 4.2 Req for loss/RL/Yield
<b>4.7.2: High Temp &amp; High Humidity Installation</b>			
<b>High Temp &amp; Humidity</b>	1A	IL/RL/%Yield I/A	38° C to 90% RH, Must meet Section 4.2 Req for loss/RL/Yield
<b>Condensing</b>	1A	IL/RL/%Yield I/A	35° C to 100 %RH, Must meet Section 4.2 Req for loss/RL/Yield
<b>4.7.3: High Temp, Low Humidity Installation</b>	1A	IL/RL/%Yield I/A	50° C to 15% RH, Must meet Section 4.2 Req for loss/RL/Yield
<b>4.7.4: High Altitude</b>	1A	IL/RL/%Yield I/A	12,000 ft., Must meet Section 4.2 Req for loss/RL/Yield
<b>4.7.6: Vibration During Operation</b>	1A	IL/RL/%Yield I/A	Amplitude of +/-0.003 in., 10 Hz to 55 Hz to 10 Hz, 1-minute sweep, sweeping until polishing has completed.
<b>Environmental Life Testing (Finished Product) **</b>			
<b>New product measurements</b>	2A	IL/RL Initial	
<b>End Face Geometry per GR-326</b>	2A	EFG Initial per GR-326	
<b>GR-326 4.4.2.4: Humidity/Condensation Cycle</b>	2A	IL/RL B/D/A	-10° C to 65°C, Hum @ heat, 7 days
<b>GR-326 4.4.3.1: Vibration Test (3 axis)</b>	2A	IL/RL B/A	10-55 Hz, 2 hours, 1 minute sinusoidal
<b>GR-326 4.4.3.2: Flex Test</b>	2A	IL/RL B/A	+/- 90 deg, 100 cycles
<b>GR-326 4.4.3.3: Twist Test</b>	2A	IL/RL B/A	+/- 90 deg, 10 cycles, per specified weight
<b>GR-326 4.4.3.4: Proof Test</b>	2A	IL/RL B/A	Straight pull and side pull per procedure
<b>GR-326 4.4.3.5: Trans/w applied load</b>	2A	IL/RL B/D/A	Per procedure
<b>GR-326 4.4.3.7: Impact Test</b>	2A	IL/RL B/A	Per procedure
<b>GR-326 4.4.3.8: Durability Test</b>	2A	IL/RL B/D/A	Per procedure
<b>End Face Geometry per GR-326</b>	2A	EFG Final per GR-326	



### **Terminology**

OM - Optical Measurements

B - Before

D - During

A - After

IL - Insertion Loss

RL - Return Loss

### **Optical Requirements**

Insertion Loss - Max = 0.25dB, Mean = 0.20dB

Return Loss - (APC) = 65dB, (UPC) = 55dB

Monitoring All Fibers - to be done at 1310nm/1490nm/1550nm/1625nm

### **Sample Size**

1A	1 polishing jig (max samples - 6) polished reworked once	10 Nominal Ferrule length
2A		10 Nominal Ferrule length
3A		10 Nominal Ferrule length

All references are to source documents GR-326 and GR-765.

### Notes:

1st Time Yield numbers are to be provided by the manufacture for the time being, Verizon reserves to provide a specific value at a later date.

The minimal acceptable length: defined as the max number or reworks that can be performed on a connector specified by the polisher manufacturer. This may be a physical length specification.

The Environmental Life Testing (Finished Product) is to be performed sequentially on the same group of samples.

All sequences requiring optical measurements will require end face geometry measurements after the polishing process.

- \* - The intent of this sequence is to determine if physical and environmental conditions will influence the polishing process.

The samples for these tests are to be in cable assembly format for ease in testing. "Only" one end of the assembly is to be subjected to the polishing. Each DUT will be subject to some form of endface damage, which will be verified before proceeding with the polishing.



Damage to the connector endfaces can be induced using a fine grit polishing paper (TBD) that will at a minimum induce surface defects that will require the repolishing of the enface of the connector.

\*\* - The objective of this test is to verify the results of the polishing process by evaluating the final product.

The samples will be in the form of pigtails and will be tested to a reduced set of requirements specified above with the intent of verifying there are no measurable losses induced by the rework process.