Launch Cables
How To Use Them Properly

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Agenda

• Why use Launch Cables?
• Protect the Connectors
• Cleaning and Inspection
• OTDR Configuration & Trade-offs
• Deadzone Considerations
• Measurement Examples
• Typical Launch Cable Length
Why Use a Launch Cable?

- Sometimes called a Pulse Suppressor or Launch Box
- Be able to view and measure all events especially those masked after the OTDR bulkhead
- Characterize the input and output connectors
- OTDR has highly reflective components
- Compensate for OTDR Deadzone
- Deadzone increases with wider pulse widths
Protect the Connectors & OTDR Bulkhead

- Use a 1m jumper at the OTDR bulkhead
- Clean and Clean again! & Inspect
- Contaminated or damaged connectors will cause high reflections which will saturate the OTDR detector
- Use an OTDR with APC connectors

![Diagram of connector types and their reflection levels: Mated APC < -70dB, Mated UPC < -50dB, Open UPC ~ -14.4dB, Very Big Reflection, Big Reflection, Small Reflection.]

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Fiber Cleaning

Connectors must be CLEAN!

- Reel type of cleaners work well
- Pens can clean both ferrule and bulkhead
- 80% of all failures due to not cleaning or improper cleaning

The technician will use the pens!
Fiber Scopes

- Validate that connector is clean
- Inspect – Clean if Necessary – Inspect – Then Connect – Replace if Necessary
- Field of View most important specification – must be able to view outside of the four zones
- Contamination can migrate with vibration
# IEC61300-3-35 Specification

## Single-Mode Criteria Table

<table>
<thead>
<tr>
<th>Zone</th>
<th>Description</th>
<th>Diameter</th>
<th>Allowable Defects (Dia)</th>
<th>Allowable Scratches (Width)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Critical Zone</td>
<td>25um</td>
<td>None visible at 200X</td>
<td>None visible at 200x</td>
</tr>
<tr>
<td>B</td>
<td>Cladding Zone</td>
<td>25 to 120um</td>
<td>Any &lt; 2um</td>
<td>None &gt;3um</td>
</tr>
<tr>
<td>C</td>
<td>Adhesive Zone</td>
<td>120 to 130um</td>
<td>Total of five 2um - 5um</td>
<td>None &gt; 10um</td>
</tr>
<tr>
<td>D</td>
<td>Contact Zone</td>
<td>130 to 250um</td>
<td>None &gt; 10um</td>
<td>Any scratch OK</td>
</tr>
</tbody>
</table>

![Diagram showing zones A, B, C, D]
OTDR Configuration

The Optical Time Domain Reflectometer (OTDR) is an instrument that uses the inherent backscattering properties of an optical fiber to detect faults and categorize its condition. The OTDR sends high-power pulses of laser light down the fiber and captures the light that is reflected back (much like a radar system). By measuring the timing and power levels of the return pulses, the instrument correlates the reflected information with physical locations along the fiber and displays a “trace” that shows optical power versus distance. Attenuation of the fiber is displayed as the slope of the trace. Interruptions such as splices, connectors, bends, breaks or flaws in the fiber appear as transitions (“events”) that represent their nature and location.
OTDR Trade-Offs Pulse Width

Larger pulse width (more energy into the fiber) - Results in lower resolution

Smaller pulse width (less energy into the fiber) - Results in higher resolution

Longer distance measured

Shorter distance measured

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OTDR Event Deadzone

Event Deadzone; typically specified at 1m at smallest pulse width

- The ability of the OTDR to resolve between two reflective events such as poor connectors and overlaid fiber events
- Resolution is quoted at the narrowest pulse width, this results in the poorest dynamic range.
- Measured at 1.5dB from the peak of the -45dB pulse

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Event Deadzone Considerations

Two pulses closer together than the event deadzone

Results in one pulse being displayed

Using a shorter pulse width will result in the ability to measure two closely spaced events

Wider pulse widths are needed to measure longer fibers
OTDR Attenuation Deadzone

Attenuation Deadzone; typically specified at 4m

- The ability of the OTDR to measure a backscatter event (fusion splice) after a reflective event.
- Measured at 0.5dB from the noise floor of the -45dB pulse

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If you Don’t Use a Launch Cable

- If you don’t use a launch cable, some events may not be measurable, especially if the Fiber Under Test (FUT) is damaged or has low optical power.
- Using a 5ns PW and Bulkhead reflector, some reflective events with loss may be visible, but you need more optical energy to be injected.
- Using a 300ns PW and Bulkhead reflector, some reflective events may still be measurable, but they are wider, and this results in the deadzone getting longer.
- Can’t see the End of FUT with these pulse widths.

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If you Don’t Use a Launch Cable

OTDR

Fiber Under Test

Using a 5ns PW

Reflective Event with Loss

Using a 1us PW

Event Not Seen

Bulkhead

Can't see End of FUT

Wider pulse width used but this results in the deadzone getting longer

End of FUT

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Measurement Using a Launch Cable

OTDR
Launch Cable
Launch Cable

1m Patchcord

Bulkhead
Start of FUT

Fiber Under Test
End of FUT

1m Patchcord
Reflective Event with Loss
End of Launch Cable

Clean & Protect the Launch Cable Connectors

These reflections will be small if the connectors are clean & in good condition.
How Long of a Launch Cable Is Needed?

Set the Range & Pulse Width to be able to see entire fiber & sufficient backscatter

- \( c = \frac{d}{t} \)
- Propagation of light in fiber = 0.2m/ns
- ~10X pulse width (sufficient backscatter required to measure insertion loss)
- Using too long of a launch cable will reduce resolution of the measurements

<table>
<thead>
<tr>
<th>Pulse Width (ns)</th>
<th>Launch Cable Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>30</td>
<td>100</td>
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<tr>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>1,000</td>
<td>2,000</td>
</tr>
<tr>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>10,000 &amp; 20,000</td>
<td>2,000*</td>
</tr>
</tbody>
</table>
Summary

- Use a launch cable to reduce the effects of the OTDR deadzone
- Be able to measure events that might be hidden by the OTDR probe pulse; troubleshooting & qualification
- Be able to characterize the input and output connectors
- Clean and protect the connectors
- Select the correct length for optimum results