Fiber Optic Testing Worksheet

Name: __________________________________________

Duplicate this worksheet for each termination type.

Continuity

1. What does the visual tracer test? __________________________

2. How far will it reach? __________________________

3. What problem will it solve when connecting up all the different fibers and equipment in a network?

Microscope Inspection

Which way do you want to look at the fiber to see:

- Fiber centering in the ferrule hole __________________________
- Polishing finish __________________________
- Cracks __________________________

Microscope Inspection:

Sketch what you see

Measuring Optical Power:

1. Which optical measurement is absolute and which is relative?

   Power  ___Relative    ___Absolute
Loss

___Relative  ___Absolute

2. Which is the higher power?

0dBm  or  -30dBm ?
0dBm  or  +10dBm ?

3. Convert to 0dBm to Watts.

0dBm = ________

Single Ended Loss Test (FOTP-171)

Objective:
What is a single-ended cable plant loss test and where is it used
How to set the reference for loss testing
Differences in measurements by direction and modal distribution

Use the single ended test method to test your launch and receive jumpers that you will use to test the cables you will terminate later.

A single-ended test uses a matching “launch” cable on the source to mate with the cable under test. This tests only the connector of the cable being tested which is connected to the launch cable, plus any loss in the cable itself (which is too small to measure in our short cables we use in this exercise.)

Set test reference value

1. Using the “Alco Pads”, clean the ends of all the connector ferrules and replace the dust caps.
2. Attach one of the ST-ST cables to the source’s 850 nm LED. This will be the launch cable
3. Turn the source and meter on
4. Use the power meter to measure the power out of the launch cable.
5. If the source power is adjustable, adjust the source power to a even number like -30.0 dBm and record it here and on the worksheet _______dBm (1) or use the meter function to set the power level to “0 dB.” This is your “0 dB” reference power for loss measurements.
6. Disconnect the launch cable from the power meter.
Measure single ended loss

1. Attach a ST-ST splice bushing to the end of the launch cable.
2. Attach one end (A) of the cable to be tested to the launch cable.
3. Attach the other end (B) of the cable under test to the power meter.
4. Measure the output of the second cable and record it on the worksheet ______dBm (2)
5. Calculate the loss: ___dBm (2) - _____dBm (1) = ___loss in dB, end A

Measure opposite direction

Reverse the cable being tested and test the other direction
Measure the output of the cable under test______dBm (3)
Calculate the loss: ____dBm (3) - _____dBm (1) = ____dB loss, end B
Is there a difference in the two measurements? How much ____dB? Why?

Repeat the procedure above with the cables reversed, that is, the launch cable becomes the cable being tested and the cable just tested becomes the launch cable. Record the data on the worksheet

Determine the effects of mode power distribution

Repeat the single ended test, testing the cable in the same direction, but change the modal power distribution in the launch cable using a mandrel wrap.

Measure a cable using the method above and record the loss: ______ dB
Set that cable aside so you know which end was tested.
Measure the output of the launch cable as when setting a “0 dB” reference.
Wrap the launch cable five times around a ~13 mm (0.5”) mandrel.
Measure the output of the launch cable again. What happened?
Use the output of the launch cable with the mandrel wrap as your “0 dB” reference and repeat the tests of the cable, comparing the difference in losses measured. What was the result? ______ dB. Why?


**Single-Ended Loss Testing**

**Test 1. One direction**

<table>
<thead>
<tr>
<th>Reference power level ______ dBm (1)</th>
<th>meter reading dBm (2)</th>
<th>loss in dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable tested one way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable reversed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Test 2. Reverse Direction**

<table>
<thead>
<tr>
<th>Reference power level ______ dBm (1)</th>
<th>meter reading dBm (2)</th>
<th>loss in dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable tested one way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable reversed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Test 3. Mandrel wrap**

<table>
<thead>
<tr>
<th>Reference power level ______ dBm (1)</th>
<th>meter reading dBm (2)</th>
<th>loss in dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable tested one way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable reversed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Why is this called a “single-ended” test? ____________________________.

_____________________________________________________________
2. Were the results the same when the cable was reversed? Why?

3. Were the results the same when the mandrew wrap on the launch cable was used? Why?

Double Ended Cable Plant Loss test (OFSTP-14)

Objective:
What is a double-ended cable plant loss test and where is it used
How to set the reference for loss testing
Differences in measurements by direction and modal distribution

Installed fiber optic cable plants are generally tested in a double-ended test covered by TIA OFSTP-14 for multimode fiber and FSTP-7 for singlemode fiber which tests both end connectors and all the fiber optic cables and other components in between.

Measure double ended cable loss
Measure the output of the launch cable or use the meter function to set the power level to “0 dB.” This is your “0 dB” reference power for loss measurements.
Attach a ST-ST splice bushing to the end of the launch cable.
Attach one end (A) of the cable to be tested to the launch cable.
Attach a ST-ST splice bushing to the other end (B) of the cable being tested.
Attach a second cable to the end of the cable being tested to become the receive cable.
Attach the other end of the receive cable to the power meter.
Measure the output of the cable and record it on the worksheet _____dBm (2)
Calculate the loss: _____dBm (2) - _____dBm (1) = _____loss in dB, end A and B.
Measure the other direction
Reverse the cable being tested and test the other direction
Measure the output of the meter _____dBm (3)
Calculate the loss: ____dBm (3) - _____dBm (1) = ____dB loss, end B
Is there a difference in the two measurements? How much ____dB? Why?

Effects of reference methods

Loss with Method A (2 cable reference) _______ dB
Loss with Method B (1 cable reference) _______ dB
Loss with Method C (3 cable reference) _______ dB

What causes the difference?

Why use different methods?

Determine the effects of mode power distribution
Measure the cable loss for the cable under test, then use a mandrel wrap on the launch cable as in the single-ended test, reset the “0 dB” reference and test again. What was the result? Why?
Double-Ended Loss Testing

Test 1. One direction

Reference power level _____ dBm (1)  

<table>
<thead>
<tr>
<th></th>
<th>meter reading dBm (2)</th>
<th>loss in dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable tested one way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable reversed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test 2. Reverse Direction

Reference power level _____ dBm (1)  

<table>
<thead>
<tr>
<th></th>
<th>meter reading dBm (2)</th>
<th>loss in dB</th>
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<tr>
<td>Cable tested one way</td>
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</tr>
<tr>
<td>Cable reversed</td>
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<td></td>
</tr>
</tbody>
</table>

Test 3. Effects of reference methods

Loss with Method A (2 cable reference) _____ dB
Loss with Method B (1 cable reference) _____ dB
Loss with Method C (3 cable reference) _____ dB

Test 3. Mandrel wrap

Reference power level _____ dBm (1)  

<table>
<thead>
<tr>
<th></th>
<th>meter reading dBm (2)</th>
<th>loss in dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable tested with plain launch cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable tested with mandrel wrap on launch cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Why is this called a “double-ended” test?
   ________________________________________________________________
   ________________________________________________________________

2. Were the results the same when the cable was reversed? Why?
   __________________________
   ________________________________________________________________
3. What is the difference in the loss measured with the three different reference methods?

_________________________________________________________________________________
_________________________________________________________________________________

OTDR Testing

Objectives:
The appropriate applications of an OTDR
The correct way to set up the OTDR
How to analyze traces on the OTDR
OTDR problems and limitations

Setup
With the OTDR or using the OTDR Simulator, describe the results of changing the following parameters:

Range ____________________________________________________________________________

Wavelength _______________________________________________________________________

Pulse width _______________________________________________________________________

Number of Averages __________________________________________________________________

Index of Refraction __________________________________________________________________

Testing
If you tested the same cable plant with an OTDR and an OLTS, what was the difference in the measurements? ___________________________________________________________________

If you have a highly reflective event, did you see a “ghost”? _____ How did you tell it was a ghost? ___________________________________________________________________