Fiber Optic Characterization Testing

With the implementation of higher gigabit systems placed daily into modern optical networks, fiber characterization has become a necessary addition to the normal test data provided to the equipment provisioning technicians. Fiber characterization is the evaluation of an installed fiber path against a given set of optical requirements. Characterization testing consists of a five step process designed to evaluate the transmission ability of a selected optical fiber pair from equipment jumper to equipment jumper. A brief summary of each test element and its purpose in the FC Test Program is listed below.

OTDR Trace Data

Bi-directional OTDR trace data is necessary to evaluate the fiber for span events (splices, connections, or bends) and properly determine the fiber's length. Trace data is taken at 1550 & 1625 nm for each fiber under test. Recommendations can be made from the analysis of the OTDR data as to the correcting of any span issues before further testing can begin.

Powerloss Data

Bi-directional power meter loss data is necessary to determine the actual span loss and continuity of the fibers. Fiber powerloss testing is necessary to determine whether a span will need optical attenuation or if the proposed fiber route exceeds the allowable path dB loss. Testing is done at 1550 & 1625 nm.

Optical Return Loss

Optical Return loss is the total return loss from all path reflective events and is taken from the equipment end of each path jumper. Poor ORL creates excessive noise and feedback that in turn causes high bit error rates and decreased system performance. ORL testing is done from each equipment end jumper at 1550 nm.

Polarization Mode Dispersion Testing

Polarization Mode Dispersion is caused by the separation of individual pulses traveling through an optical fiber. This phenomenon is called birefringence. The results of PMD are that light pulses spread out over time and distance and create higher bit error rates. PMD in fiber is random due to the number of varied internal and external factors that affect the cable. Each fiber is tested 3 times and averaged due to the inconsistent nature of PMD.

Chromatic Dispersion Testing

Chromatic Dispersion is the separation of light pulses in a fiber caused by differing indexes of refraction within the various cables that make up the fiber path. The effect of this dispersion type is to create a delay between wavelengths that tends to widen the transmission pulse along the length of the fiber. CD testing includes the C and L band wavelengths for total dispersion.

Fiber Optic Characterization Projects Completed

AT&T Fiserv UVN Ring Insertion – Dallas, TX – April 2011
Test completed multi-node ring

AT&T DTCC Path Retests – Dallas, TX – January 2010
Retest of portions of the DTCC OC-192 ring during fiber equipment upgrades.

AT&T State of Texas Ring B – San Angelo, TX – December 2009
Splice and test completed path between 2 nodes.

AT&T Walmart OC-192 – Bentonville, AR – October 2009
Test completed multi-node ring

AT&T Ameritrade UVN Ring – Dallas, TX – March 2009
Test Completed multi-node UVN ring

AT&T State Farm OC-192 – Dallas, TX – February 2007
Test completed multi-node OC-192 Ring

Big Bend Telephone Co. – Alpine, TX – January 2004
PMD testing on spans between Alpine & Midland, TX