

# FIBER OPTIC FOCUS

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On August 15, 2010 the Safety, Asset Utilization & Fiber Optic Technology Group (“SAFT” pronounced “Safety”) completed ten years of injury free service for Union Pacific.

The sixteen member group, also known as the “Fiber Optic Group”, consists of its core Regional Construction Coordinators (CC’s) along with the remaining dedicated individuals who fulfill its Administration/Contracts, Engineering and Wireless Technology initiatives. For much of the ten year period Union Pacific’s Precision Measurement Vehicle staff and crews also contributed to the SAFT group’s success.

The SAFT Group is responsible for the engineering and design approval of right of way telecommunication agreements negotiated and administered by the group. The work group also manages construction activities, as well as long-term maintenance supervision of its customer’s longitudinal fiber optic communication systems along Union Pacific’s rights of way. They are also responsible for managing and marketing the construction and leasing

of wireless technology systems on towers within railroad property. In addition, the Union Pacific “Call Before You Dig” or “CBUD” system was created and is currently managed by this dedicated team.

From the very beginning of the group’s formation over 25 years ago, the guiding principle of the group has been safety. Safety is not only the internal keystone of the group’s operations but it is extended to all personnel who are affiliated with the group working in the field. The “Safety” building block has been the foundation in everything that is done. Throughout the years the SAFT program has been developed for our customers. Its successes are demonstrated within Union Pacific’s IT/ Telecom Department’s Safety program. As further reflected by Craig Johnston, Director-Fiber Optics & Asset Utilization, “through our participation in weekly safety conference calls, monthly Safety Steering Committee meetings, rotation of Safety Captain duties and through the Management Effectiveness Review–Information Technologies (MERIT) processes, we aim to stay focused as we carry out our daily activities.”

Customer personnel and their contractors, including any other individuals who enter Union Pacific’s right of way governed under the Fiber Optic Group are personally safety trained. The training is usually conducted by a Regional Construction Coordinator with a dated safety sticker provided that is to be worn on their hard hat. Rule compliance is rigorously

reinforced and anyone violating the rules faces removal from the right of way.

The Regional Construction Coordinators are the primary point of contact for field operations. “These folks, who have worked their entire railroad career in the field, have over 300 years of combined experience in the railroad industry. I believe when you have this level of expertise, combined with our program’s focus on doing every job safely, today’s safety achievement should be the result”, says Michael Shallow, Sr. Manager Fiber Optics & Asset Utilization. “Each member of the SAFT Group takes pride in this milestone and we look forward to the next accomplishment” say Shallow.

As reiterated in the SAFT group’s Home Page link to its customers (<http://www.uprr.com/aboutup/telecom/index.shtml>), the “S” is for Safety –a bedrock foundation of each of the aspects of our Program. Without a continued focus towards safe performance – both personal and facility (i.e. damage prevention) – in field operations, our program could not have continued to exist and grow.

The SAFT Group is proud of this Safety accomplishment and intends to continue its focus towards safety with innovation, hardwork and personal involvement in its daily activities.

FIBER OPTIC GROUP

**3,699**

DAYS INJURY FREE

*As of October 1, 2010*

Last FRA reportable: August 15, 2000

# Technology Upgrades Across Union Pacific's Fiber System

By: Bill Buhrman, Director Network Engineering

For more than 20 years Union Pacific Railroad has operated a Drop and Insert fiber optic system over various parts of its railroad via capacity arraignments with many of the railroad's fiber optic customers.

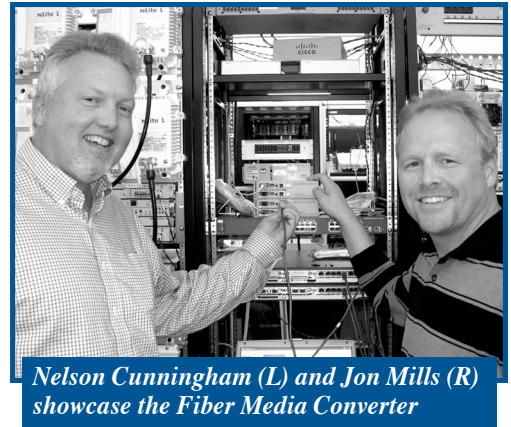
The system was originally designed as a drop and insert, using time division multiplex technology and was used to carry Unions Pacific's Centralized Traffic Control or "CTC" dispatcher radios, voice circuits and data circuits. It has been an extremely reliable system over the years.

Over time this system has become harder to maintain, and finding replacement parts have become more difficult. One of the biggest issues with this system was the fact that the traffic was fed serially from one end with very few re-routing capabilities. In the event of a fiber cut all service beyond the

fiber cut would go down. There were some rerouting capabilities, but they were manual and required personnel at different locations to manually reroute circuits from the other direction; a time consuming and labor intensive fix.

With the advancement of fiber media converters, Voice over Internet Protocol "VoIP", and "IP" networking, Union Pacific was able to begin upgrading these old drop and insert systems with newer technology. A number of issues first needed to be resolved. Union Pacific typically has access to only two dark fibers between each regeneration location. In addition, some of the legacy circuits needed to be converted to an IP capable technology.

Long range fiber media converters were found for single mode fiber, requiring only a single fiber strand. This allowed the railroad to have two



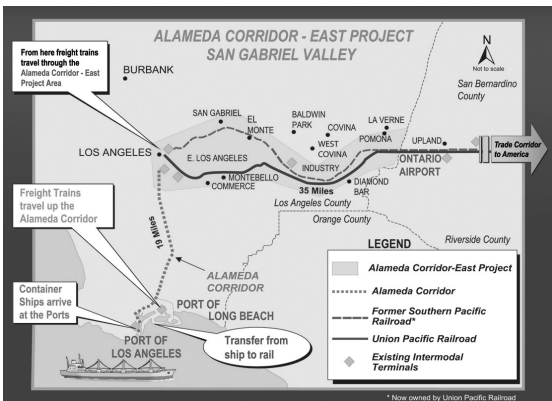
Nelson Cunningham (L) and Jon Mills (R) showcase the Fiber Media Converter

complete Ethernet paths between each location. Union Pacific also developed an in-house "Serial to Ethernet" converter allowing it to run legacy train control circuits over this IP network. The audio needed for our dispatcher radio communications was converted to VoIP using our router's VoIP technology.

Three routes in particular needed to be upgraded. First was Union Pacific's route from Memphis, Tennessee to Longview, Texas stretching approximately 360 miles with 15 regeneration locations. The second was Houston, Texas to Livonia, Louisiana, nearly 260 miles with 13

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## The ACE Projects – Nogales Grade Separation\*



California. For Union Pacific, both the Alhambra and Los Angeles subdivisions are affected by ACE projects. A grade separation at Nogales Street on the Alhambra sub was completed in 2005.

The purpose of the construction efforts is twofold. Train traffic over the 70 mile area is predicted to increase by 160 percent by the year 2020 from the Long Beach area to all points east.

A corresponding increase of 40 percent is expected for auto and truck traffic through the valley creating an additional 300 percent increase in vehicular delay. Other concerns include the increase in pollutants released by idling vehicles at grade crossings and possible delays for emergency services.

In all, the ACE projects involve safety improvements at 39 grade

crossings and eliminate 20 more with grade separations such as underpasses and overpasses. Six projects have been completed so far making the Nogales Street grade separation 7 of 9 planned to date. The San Gabriel Trench, currently in design phase planned for 2011, will involve 4 bridges over Union Pacific tracks at crossings

Safety improvements at the 39 crossings scheduled to remain at grade has been designated the "Jump Start" program. Improvements at these crossings have included the installation of active warning devices as well as measures to eliminate gate "drive arounds". Other improvements include traffic and train signage, roadway widening, and the installation of new pedestrian walkways and protection.

*All information taken from the ACE projects website at <http://www.theaceproject.org>*

A construction authority involving the San Gabriel Valley area council of governments in California has begun the latest of its projects involving Union Pacific Railroad and its fiber optic customers along rail right of way.

The "ACE" or Alameda Corridor East Construction Authority has begun the initial processes of relocating fiber optic cables along Union Pacific's Los Angeles sub near Nogales Street in Pomona,

## Union Pacific Telecom Assumes Portions of PTC Construction

Starting in September, Union Pacific's Telecom Department will begin to assume a portion of the Positive Train Control (PTC) development and construction effort. PTC is a predictive collision avoidance technology that can stop a train before an accident occurs. PTC is designed to keep a train within authorized limits on a track and under its maximum speed limit. To accomplish this sophisticated technology and braking algorithms will automatically bring PTC-equipped passenger and heavy freight trains to a safe stop. This will help prevent train-to-train collisions, over-speed derailments and casualties or injuries to the public and railway workers.

Union Pacific's version of PTCs is named VTMS or "Vital Train Management System". When functional VTMS will provide an additional layer of safety to train operations by

continuously monitoring train speeds, locations, and limits of authority with the ability to assume control of a train should it become necessary to prevent an accident. PTC sophisticated computer systems, with safety-critical software, uses GPS for determining train location. The requirements for data accuracy, availability and communications have been developing for more than a decade.

As construction of the PTC system begins on the Los Nietos Subdivision in California, Union Pacific's Signal Construction Department will hand over pole installation and a portion of the wiring to the Telecom Department.

Construction will continue on Union Pacific tracks to the Santa Barbara, Fresno, and Mojave subdivisions. Pole delivery has been contracted to an outside party with delivery to within one mile of each construction site. Pole placement will be facilitated using digger

derrick utility trucks equipped with booms and augers.

The SAFT or "Fiber Optic Group" will contribute its coordination effort by coordinating hy-rail and flagging support where needed. All of the regional Fiber Optic Construction Coordinators are Maintenance of Way and "On Track Safety" qualified. Being familiar with hy-rail, or on-track operations for the areas of the railroad that are difficult to access, the Construction Coordinators are able to provide support and experience to get the job done. Also of significant importance to damage prevention, the Fiber Optic Construction Coordinators will seek to ensure that appropriate Call Before You Dig "CBUD" tickets are in effect at each site and plan to be available to help resolve any issues that might arise from the construction processes with Union Pacific's telecommunications customers.

### Going the Extra Mile



*Left to Right: Eric Strand, Manager Track Maintenance, Phoenix, AZ, Ray Williams, Track Inspector and Tim Neumaier, Construction Coordinator.*

Track Inspector Ray Williams was inspecting track following heavy rainfall on the Phoenix sub near Agua Caliente, Arizona. While checking the rail for possible problems Ray noticed that conduit belonging to one of Union Pacific's fiber customers had become exposed. Ray took the time to notify Tim Neumaier, one of the SAFT groups Fiber Optic Construction Coordinators, and report the problem.



*Left to Right: Chad Graves, CNR Enterprises and Tim Neumaier, Construction Coordinator*

In June of this year, Chad Graves, of CNR Enterprises, a railroad contractor replacing fence along the Lordsburg sub near Bowie, Arizona had received his Union Pacific dig ticket prior to beginning his work. Chad noticed that while most of the fiber indicated to be in the area had been located, one had not. A call to Tim Neumaier resulted in the cable being quickly located allowing the fence replacement to safely proceed.

In each case, the extra effort taken by these individuals resulted in the prevention of possible damage to fiber systems belonging to Union Pacific's fiber customers. Both Ray Williams and Chad Graves were awarded "Buckle Down" awards from Construction Coordinator Tim Neumaier.

# Technology Upgrades

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regeneration locations. Third was Elko, Nevada to Winnemucca, Nevada, spanning approximately 130 miles with 5 regeneration locations.

Each regeneration location required 4 fiber media converters for every two Ethernet connections from each direction. Each regeneration also required two routers in a parallel configuration to provide location and path redundancy. Serial converters and VoIP technology was also used where circuit requirements dictated.

Making this conversion while keeping the system operational required considerable preliminary work. Routers were installed using T1's from the old TDM drop and insert system providing an Ethernet connection to each location.

This allowed the legacy circuits to be converted to IP at most of the locations before the old D&I system was taken down. The cutovers took one to two days depending on the length of the run with no significant outages.

The project was completed by the end of March 2010. With the new IP based system installed and operational the reliability of the fiber network has improved considerably. No longer can a single fiber cut take down Union Pacific's fiber network causing service interruptions and train delays. In addition, lightning strikes now are confined to single locations instead of multiple sites, all adding to increased on-time train performance and improved train speeds across the system.



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Union Pacific Railroad  
1400 Douglas St., MS0640  
Omaha, Nebraska 68179-0640