Backbone Fiber Optic Cable Installation

by Richard J. McConville

How the United Telephone Company of Florida engineered and constructed a project over 200 miles in length.

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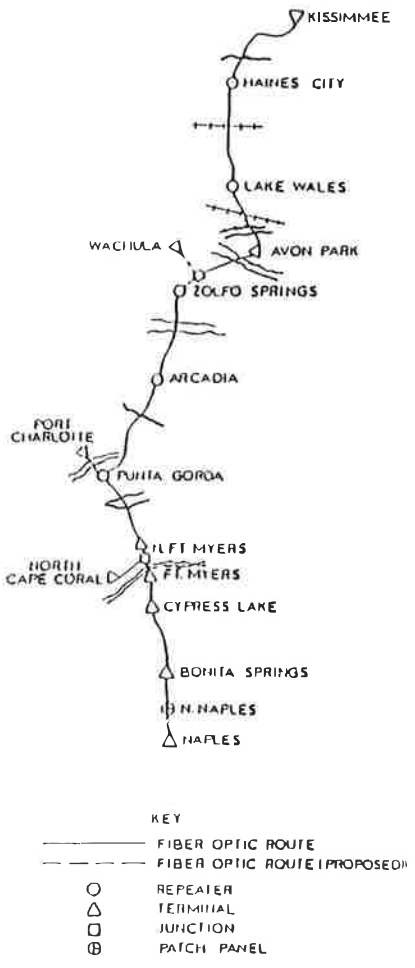
United Telephone Company of Florida's Long Range Plan for interconnecting facilities between Kissimmee in the North Division and Fort Myers in the South Division provided the opportunity to implement an ambitious fiber optic program.

This undertaking was different from any other in the company in that it involved 3 specific estimates and 27 major work orders. The cable construction crossed all four districts in the South Division and part of General Telephone Company's serving area, totalling a distance of 200 miles.

The fiber route was designed to provide the capacity to meet the private line, special service and intertoll requirements. With the addition of incremental fibers, several area reinforcement projects were accomplished very economically. A single mode fiber optic transmission system operating at 1300 nameters and electronics supplying 136 mb/s was selected to allow the Fort Myers area to share in the digital network service offering. This system is soon to be expanded to 565 mb/s.

The engineering and construction approach was based on maximizing utilization of available resources to develop a framework for comparison between existing construction methods and fiber construction methods.

Placing guidelines, established at a joint Engineering and Construction meeting, September 1984, were followed in the design and installation of the fiber cable. Upon approval of the project, the route was selected and engineering began on the fiber optic cable. Preparation of the specific estimate was the first step.



An in-depth route survey was conducted to uncover special or unusual situations that might influence the engineering and construction of the fiber cable. Points of access to the right-of-way were defined. The majority of the cable was to be placed in the road right-of-way by plowing and/or trenching. Traffic control requirements were studied and soil conditions evaluated to determine construction methods that would be suitable. Conflicts and obstructions that would have a direct influence on the selection of splice locations were identified; this exercise permitted utilizing maximum size cable reels. As a further precaution, a ripping pass (prerip) in the same direction as the cable being installed was made mandatory to locate and remove obstructions prior to plowing the cable.

It was decided to bury the cable at a depth of 42 inches in the running line and 48 inches under ditches and at road crossings. Iron pipe was placed at all state road crossings, due to the wet and sandy soil. To meet future demand for fiber, innerduct was placed in the four-inch pipes crossing under railroads, streets, streams and on bridges.

Consideration was given to placing the direct buried fiber cable in a two-inch polyethyline duct; but, after assessing the installation costs, the two-inch duct was ruled out and six-inch marker tape was chosen as an alternative. Railroad right-of-way was considered but due to its lack of proximity to the cable route and the availability of the road right-of-way, it was not pursued.

In the areas plagued with rodent problems between Zolfo Springs and Avon Park, gopher protected cable was specified. The gopher protection, along with 42-inch depth, offered maximum protection to the fiber cable.

To further reduce chances of damage, it was decided to place the splice below ground in Quazite composite splice boxes. This substructure was selected due to its light weight and load bearing capability. The splice box was buried 24 inches below ground surface. Electronic markers were placed over the splice box

for future location.

The demand for fiber optic cable was greater than the available supply throughout the undertaking; therefore, it was necessary to work closely with the manufacturer to ensure cable delivery dates were met.

In addition to ensuring cable delivery dates, permits from the Department of Transportation for the use of road right-of-way had to be acquired. The cable was routed through environmentally sensitive areas, requiring authorization from the U.S. Army Corps of Engineers, Florida Department of Natural Resources and Florida Department of Environmental Regulation. Permitting was also required by county and local municipalities. Agreements with the railroad had to be renegotiated because two railroad crossings were required and were not included in the current agreement.

A company inspector was present during all construction work performed by the contractor. When the cable arrived from the manufacturer, it was tested with an optical time domain reflectometer. It was tested again after being placed. If the cable was under unusual stress while being placed, the cable was tested before additional cable was placed from the reel. This safeguard was taken to reduce construction delays. As a result of intensive precautions, cable damage was almost nonexistent throughout the undertaking; only one six fiber cable was cut by a trencher. No other damage was incurred.

In the underground systems, the innerduct was pulled into the four-inch conduit from individual 4,000 feet reels mounted on a specially designed flatbed truck.

If there was more than adequate four-inch duct in the duct system to meet the extended service requirements, innerducts were not placed. When the top duct was available, it was used to add additional protection. All the slack was pulled toward the splice manhole. A butt splice was completed on the lightguide cable by AT&T personnel who used the bonded method while working in a splicing van. The splice was placed in a combination lightguide closure. Before splicing the cable, the ends were linked together and coiled into a 26-inch diameter coil. This method was used to allow the cable to enter and exit the manhole as one run. When the butt splice was completed, the cable re-entered the manhole and coiled easily due to the set the cable had taken while coiled. The coils were tied behind the other cables in the manhole.

The overall undertaking was divided into three sections because of facility reinforcement requirements. Section one, from Fort Myers to Punta Gorda, a distance of 25 miles, was engineered and constructed first. Punta Gorda to Port

Fort Myers, showing the fiberglass duct housing the fiber optic cable.