Tollefson, Gene - CILR-4

From: Street, Michael A - TNTB-TPP-2
Sent: Tuesday, September 03, 2002 8:28 AM
To: 'Francisco Salgado'
Cc: Tollefson, Gene - CILR-4; Taylor, Carson - TOM-PPO2-2
Subject: RE: Message to Mr. Street

Dear Professor Salgado:

I packed up the FOIA material (Request # 02-047) on Friday August 30, 2002 but missed the mail pick-up time. Thus, the package will go out today.

The answere you questions below:

a) BPA does not use powerline carrier on 500 kV lines because of its low reliability. Most of the lines covered by our our fault locator system are 500 kV lines. We do also cover some sub-grid 230 kV lines and one long 125 mile 115 kV line. The 115 kV line had powerline carrier on in at one time. The PLC was replaced by a radio link about 5 years ago. So I did have some experience trying to do fault locator coupling in the presence of PLC. The fault locator "looks" for transients in the bandwidth of about 20 to 350 kHz. Unfotunately this frequency range includes teh range of PLC frequencies. I tried using a notch filter to filter out the PLC energy, but the filter severely distorted the the coupled waveforms and cause some transient detection errors. I had better luck using current transformer coupling.

b,c) The majority of our fault locator sites use CVT coupling. I have attached a copy of a paper I wrote for our maintenance people about fault locator coupling. A printed copy is also included in the mailing. This paper provides the details on teh questions you are asking. In short, we use the power line carrier (F) tap, because we are looking for high frequency siganals. The metering or relay output is not suitable for fault locator coupling due to its low bandwidth. I also did some experimenting with current transformer coupling. Initially, I did not consider CT coupling to be suitable because I perceived the substatoin CT's as not having enough bandwidth to pass the traveling wave high frequency components. After some experimentting, I found that it worked well. I will attach some information about CT coupling in another e-mail. We have 9 sites taht use CT fault locator coupling.

Sincerely,

Mike Street
Electronics Engineer
Telecommunications Engineering Group
Bonneville Power Administration
Vancouver, WA USA

-----Original Message-----
From: Francisco Salgado [mailto:fmsalgado@uol.com.br]
Sent: Sunday, September 01, 2002 5:50 PM
To: Street, Michael A - TNTB-TPP-2
Subject: Message to Mr. Street

Tollefson, Gene - CILR-4

From: Street, Michael A - TNTB-TPP-2
Sent: Friday, August 30, 2002 11:08 AM
To: 'fmsalgado@uol.com.br'
Cc: Tollefson, Gene - CILR-4; Taylor, Carson - TOM-PPO2-2; Thomas, Randi R - TNTB-TPP-2; Coleman, Debra A - TNT-TPP-2
Subject: Request for Fault Locator information

Dear Professor Salgado:

I have been asked to respond to your Freedom-of Information-Act request #02-047 for several papers about the BPA Power Line Fault Locator. Unfortunately I have not been successful in locating the papers you have requested. However, I have located other material which contains the information you had requested. I will copy this information and mail it to you today. There will be no cost to you for this material.

Dennis Erickson and Joe Andres, Authors of BPA document titled "Automatic Fault Locator Using Microtime" are no longer employed by BPA. I inherited the Fault locator project in 1985 and was involved in its completion. Since 1985, our department has changed office locations about 5 times. During each move, I have cleaned out my old paper storage. I have spent extensive time searching my own files as well as our department files, but was unable to find the Erickson/Andres paper. I am quite certain I recycled my copies during one of the last 5 moves. This paper described the initial work done developing a Fault Locator remote prototype which was ultimately built by BPA. This was in the days prior to GPS precise timing. BPA has had several vintages of traveling wave fault locator systems dating back to the 1940's. The installation of our current system began about 1987 prior to when economically priced GPS receivers were available. This new system was known as the "Fault Location Acquisition Reporter" or FLAR system. BPA constructed fault locator remotes which evolved from the prototype design described by the Erickson/Andres paper. What I am sending you are pertinent parts of the FLAR remote instruction manual that I completed in 1989. In a nutshell, the FLAR remotes had a counter/latch which was driven by an voltage controlled crystal oscillator (VCXO). When a fault transient was detected at a remote site (Substation) it was time-tagged and stored in a memory until it could be retrieved by the master computer at the control center. The crystal oscillator was synchronized to a master 10 MHz oscillator at the control center. This synchronization was done initially by producing a synchronizing pulse with 100 second period derived from the master oscillator. This synchronizing pulse was then broadcast to the FLAR remotes on a wideband (240 kHz) on the BPA FDM (analog) network. Later, the master synchronizing pulse was produced by a GPS receiver at the control center. In the 1990's, when GPS receivers became economically available BPA began installing them to perform the functions of the older remotes. Today we have 45 FLAR remotes. 12 of these are still the older style, while the rest are GPS receivers which have time tagging capability. Eventually, the older, BPA built remotes will be replaced with GPS receivers. We use TRUETIME model XL-DC GPS receivers equipped with a time-tagging board as a remote. You can view this equipment on their website (www.truetime.com) We call it "The GPS FLAR remote".

The other paper that I wrote as an internal communication eventually evolved into a paper I delivered at the 1990 PTTI conference. I believe Mr. Bill Zimmerman of the BPA Library has sent you a copy of this paper.

I hope this information will satisfy your needs. If you have any further questions please contact me.

Sincerely,

Michael A. Street
Electronics Engineer
Telecommunications Engineering Group
Bonneville Power Administration
Vancouver, WA 98666 USA