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NEXT ISSUE OF TSN

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The Future of Relay Testing: UCA 2.0 to IEC 61850

It may seem that today's protection relays, now called Intelligent Electronic Devices (IED), will become too complicated to even test in a few years. These IEDs provide data acquisition, protection, metering and control functions in a cost effective single box solution. Substation protection and controls systems can benefit from vertical optimization using a substation local area network (SLAN) to streamline complex control logic and eliminate wiring. This allows significant improvement in the functionality of the protection without any increase in the cost. As a result, these devices are beginning to gain widespread acceptance and are recognized as essential to the efficient operation and management of a modern substation.

Relays have used various communication protocols over the years (e.g. ModBus, DNP, etc.) but none of these actually "modeled" all the necessary data, status and control of the relay to give a generic description independent of the manufacturer. The first attempt at this was UCA 2.0. Although this was never an official standard, several manufacturers implemented it. Now, through cooperation between IEEE and IEC, there is an emerging standard that will incorporate the best

concepts of the UCA 2.0 specification. It is the IEC 61850 standard [2] that is in the final stages of being published this year. How is this standard different?

Relay Testing in the Future

With the full release of a true comprehensive standard defining all interfaces, object models and protocols in a substation, the field of power system device testing will quickly evolve to achieve a fully automated process. Protection devices (IEDs) applied to the power system and connected to the network will self configure in a "plug-n-work" fashion (as opposed to "plug-n-pray") with intelligent prompts to the user. Today's relay test set will become the future Universal Test Device (UTD). Connecting the UTD to the network and selecting a 61850 compliant IED, data objects are read from the IED, its purpose defined by the data structure and known applications using a Substation Configuration Language common to all IED devices. By using predefined test algorithms and functional test templates, the parameters, targets, limits and tolerances are loaded into the test templates automatically and the UTD configured to perform the required tests for that particular IED. All tests and results are recorded automatically and transmitted to the appropriate authority, then once approved it can be automatically commissioned for service. This may sound like a science fiction version of the future, but now it's just around the corner.

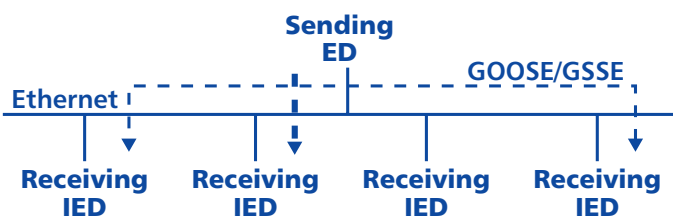


Fig. 1 Broadcast GOOSE/GSSE message
 GOOSE - Generic Object Oriented Substation Event
 GSSE - Generic Substation State Event

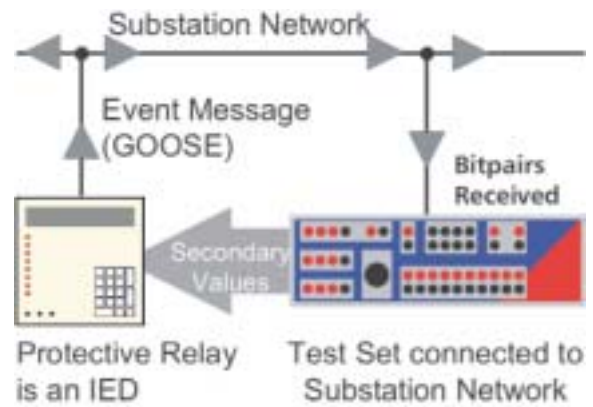
(Continued from page 1)

OMICRON electronics is at the forefront of this testing technology and will offer its customers the full benefits of adopting this new standard in their product selections. OMICRON presently offers virtual I/O testing based on the UCA 2.0 specification (see insert) and will add to this the IEC 61850 capability next year. How will you be testing your IEDs?

FOOTNOTES:

[1] UCA 2.0 is a registered trademark of EPRI and used by permission.

[2] IEC 61850 is in final approval and publication, courtesy of IEC TC57 Working Group.



OMICRON currently offers the UCA option on the CMC 256 test set

Recloser Controller Test Cable Form C Style

The new Recloser Controllers not only provide single phase protection for system faults, they also add multi-phase fault protection, under-frequency protection, detect internal problems with the Recloser switch during fault clearing, add monitoring & SCADA functions and others. Properly testing these Controllers is nearly impossible with single-phase test kits.



OMICRON electronics is introducing a 15-foot test cable that interfaces between the Form C style Recloser Controllers and the CMC 256, 156 or 56 test sets. The cable brings 3-phase current

plus trip, close, 52a and 52b status to the Controller end of the cable through the standard Amphenol connector. (3-phase voltage is also provided as breakout test leads.) Included with the cable is a diskette with a sample test plan, plus instructions for connecting the test cable and editing the sample test plan to your specific Recloser settings.

Typical Applications - The new test cable has been proven on the following Recloser Controllers:

Cooper Form 4C, Form 5C, & Form 6C, plus SEL-351R direct replacements.

The sample test plan includes the following automatic functional tests with all trip times and reclose times recorded in a single report:



- Three-phase faults, with a 4 shot to Lockout sequence test.
- Single-phase faults, with a 3 shot to Non-Lockout (Reset) sequence test.
- Under-frequency trip timing test.
- Recloser Switch internal fault-clearing malfunction test & Lockout test.

This test solution allows the Recloser Controllers to be automatically tested under realistic system conditions. The tests can be set up as a one-button test for all of the desired functions while recording all results. Customization of the tests to change settings or to deactivate any test is simple editing.

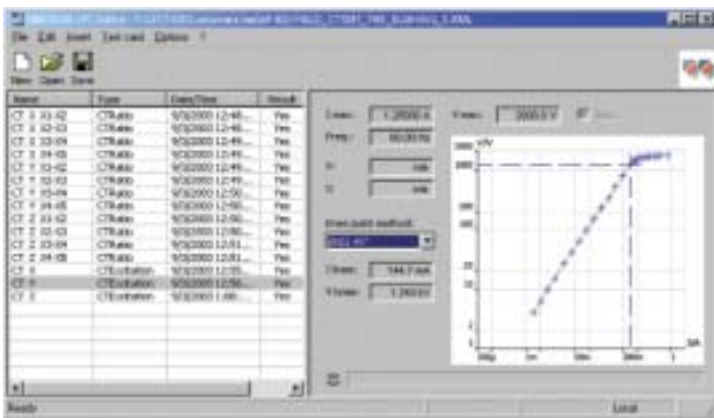
Field test results for the Cooper Form 4C, 5C, and 6C controllers as well as the SEL-351R controllers averaged 30 minutes per controller - an incredible improvement over previous test methods.

Excitation Tests on C800 CT's: New Solution

When field-testing higher class CT's, a few issues can limit the testing and skew results.

Excitation Tests: Higher Class CT's such as C800 CT's can be a problem when trying to do a Saturation or Excitation test. Two challenges with many portable CT testers can occur. One, the C800 CT typically needs well over the 1000 volts available from most CT testers to get beyond the knee of the curve and achieve saturation. Second, if the CT has multiple secondary windings the CT will require more than the 0.5 amp limit typically available at 1000 volts from most portable CT testers.

To make matters worse, when trying to do field tests, the station service voltage often fluctuates when drawing higher loads. These voltage variations can impact accuracy of the field test and/ or cause delays in reading & recording each test point; delays that can stretch these tests out to several hours per winding. A complete CT excitation test is necessary to determine the true linear operating region, the output accuracy and actual saturation level of the CT for predictable protection operations.



Excitation Test Solution: OMICRON customers have performed Excitation tests with the CPC100 on class C800 CT's with up to 4 secondary windings. The average test time per winding for the Excitation Test is under 4 minutes. Added benefit is that all of the test data is recorded automatically and can be easily downloaded to a PC. Then the reports are generated automatically including graphs, test points, and assessment.

Conclusions:

- The CPC100 is designed with capacity to spare.
- All signals are digitally generated and metered so fluctuating station service voltage does not impact test accuracy or time to perform the tests.
- Automatic test reports save time and eliminate recording errors.
- A single report for a CT, breaker or other device simplifies recordkeeping.

COMING in 2004

OMICRON will introduce the CP TD1 (Tan-Delta accessory) for use with the CPC100 in second quarter 2004.

In combination with the CPC100, the CP TD1 provides a high precision source and measurement system for Tan-Delta and Power Factor testing. Please watch for further information in our next newsletter and from your local OMICRON office.



OMICRON International Protection Testing Symposium, April 4-5, 2004 in Amsterdam

This event will focus on the latest techniques in testing power system protection and associated devices, with contributions from international experts on the subject.



FOR THE RECORD WITH **OMICRON**

A series of questions most commonly asked, and responses from OMICRON's renowned electronic test Guru...

Q: Is there a simple way to calculate the polarizing voltage of ground directional overcurrent relays?

A: When using the CMC 256, there is no need to make this calculation. There is a voltage configuration option on the CMC 256 which allows the 4th voltage to automatically provide the polarizing zero sequence voltage without any manual calculations. Specifying a fault voltage in the Overcurrent module will cause an imbalance between the 3 phase voltages and the CMC will automatically calculate the amplitude and angle for the zero sequence polarizing voltage, for any fault type selected.

Q: When testing an Alstom YTG relay in the Advanced Distance module, why do I get a voltage overload indication when having switched on the "Switch Off on Zero Crossing" option, but when this option is switched off, no overload occurs?

A: The Alstom YTG relay utilizes the phase voltages (VTs) to supply the tripping signal energy. The "Switch Off On Zero Crossing" option delays turning off the CMC voltages until the current has crossed zero therefore continuing to output voltage after the trip signal. This continued output of voltage triggers the overload from the inrush. When this switch is off, the CMC voltages are turned off immediately upon receiving the trip signal which eliminates this inrush and the overload condition.

UPCOMING EVENTS

CONCAPAN

IEEE Conference for Central America
Hotel Clarion
Tegucigalpa, Honduras
13-15 November 2003

APSCOM 2003

IEE Int'l Conference on Advances in
Power System
Control, Operation and
Management
Hong Kong Convention Center
Hong Kong
11-14 November 2003

Power-Gen International 2003

Las Vegas Convention Center
Booth #1356
Las Vegas, Nevada USA
9-11 December 2003

DistribuTech

Orange County Convention Center
Booth #1032
Orlando, Florida USA
20-22 January 2004

Middle East Electricity 2004

Dubai International Exhibition Centre
Dubai, UAE
15-18 February 2004

"WHAT'S NEW"

A new cable for easy testing of Form C style Recloser Controllers using the OMICRON CMC test sets has been introduced. See article on page 2 for more information.

