

Modern Multi-Function Recorder Technology and Capabilities

Charlie Childs

Product Manager

Ametek Power Instruments

i-PCGRID Workshop

March 27, 2013

Modern Multi-Function Recorder

- More processing power
 - Advanced algorithms
 - Addition calculation capabilities
 - More in device data analysis
- Increased memory capacity
 - Longer duration recording
 - Additional logging capabilities
 - New data types
 - Data redundancy
- 100% Solid state
 - No moving parts
 - Less power consumption
 - Increased reliability
- High speed communication interfaces
 - Reduced data retrieval times

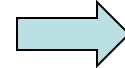
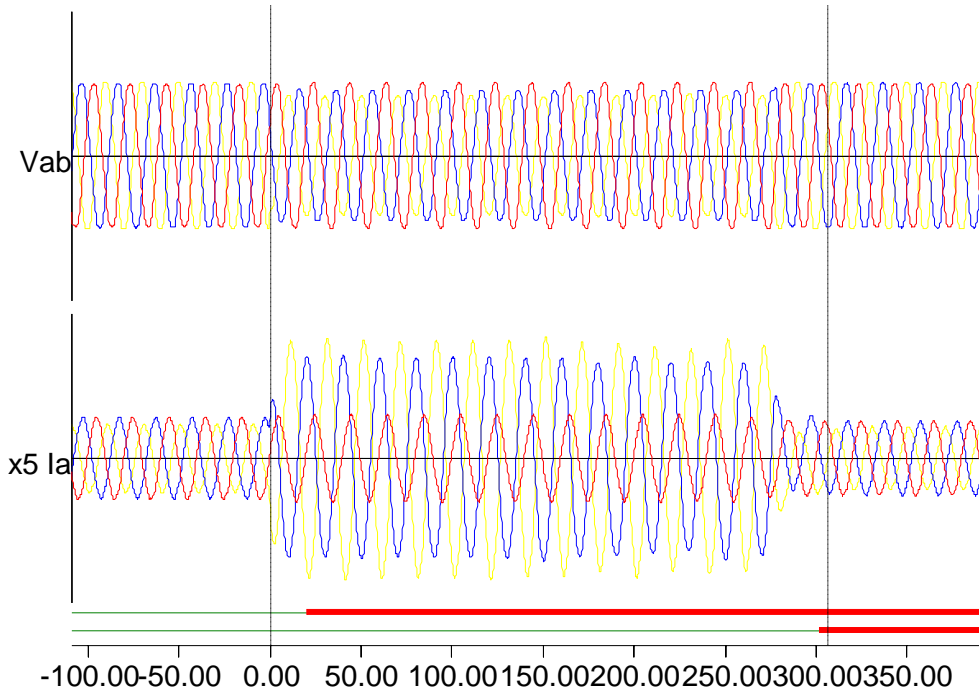
Multi-Function Recorder Capabilities

- Hi Speed Fault Recording
- Swing/Disturbance recording
- Continual loggers
 - Transient logger
 - Disturbance logger
- Power Quality Monitor
 - RMS/Frequency logger
 - Harmonics logger
 - Voltage Imbalance logger
 - Flicker logger
- IEC61850 Monitoring
- Online Breaker monitor
- Phasor Measurement Unit
- Sequence of Events recorder
- Fault location

Transient Fault Recording

- Verification of the Protection System
- Raw Data & Summarized Report
- Email notification

ESDemo3 at ESDemo3, 17:58:22.939000 Sun 04 Mar 2012 (064)
 Analogue rate of change on channel 6 'ly'



Automated Event Report

ESDemo3 3/04/2012 17:58:22

On Circuit 1: Rochester

The Fault is Phase 'Ib' to Phase 'Ic' - CLEARED by S/G!

TR-2500 Trigger: Analog rate of change on channel 6 'ly'

Min Impedance = 4.3 with SD = .2

Over-Current on Phase 'Ib' is : 816.7 A, Phase 'Ic' is : 592.8 A

Voltage Ret. on Phase 'Vbc' is 81%, 'Vca' is 90%, 'Vab' is 97%

Post-Fault current is less than Pre-Fault. Faulted circuit has been isolated!

The Disturbance lasted 270msec.

Relay operated at: 20 mSecs, which is within limits.

Switchgear operated at: 301 mS. This is late by: 86 mSecs.

Rt8 AIP
 Rt8 C/B Contact
 ms

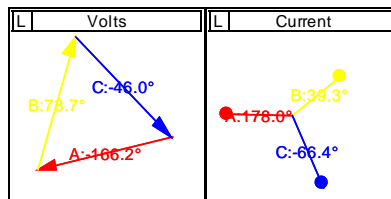
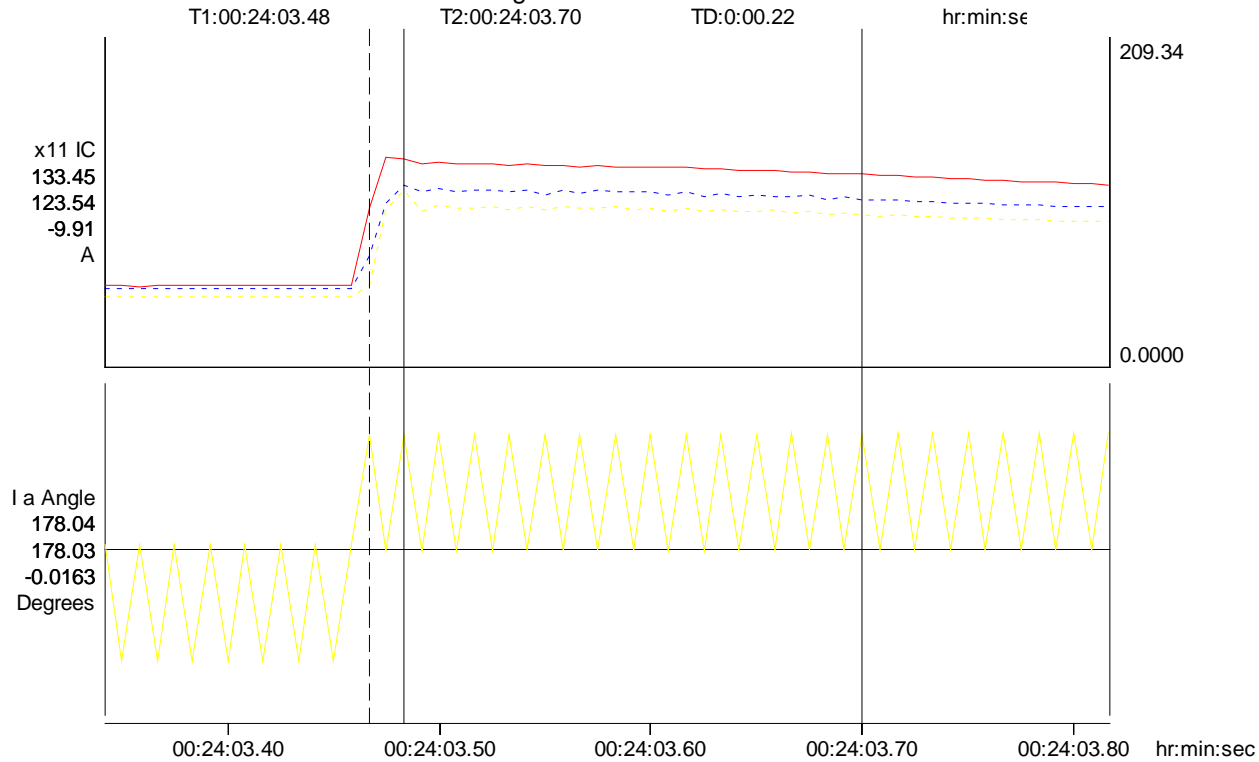
Swing/Disturbance Recording

- Longer term triggered recording
- System stability related
- Advanced trigger capabilities
 - Power & Frequency oscillation detection
- RMS and Phasor quantities recorded
 - PMU data @ 120 Hz
 - Up to 30 minute records

Swing/Disturbance Recording

Plant Service (4.61) at AMETEK, 00:24:03.466666 Wed 07 Oct 2009 (280)

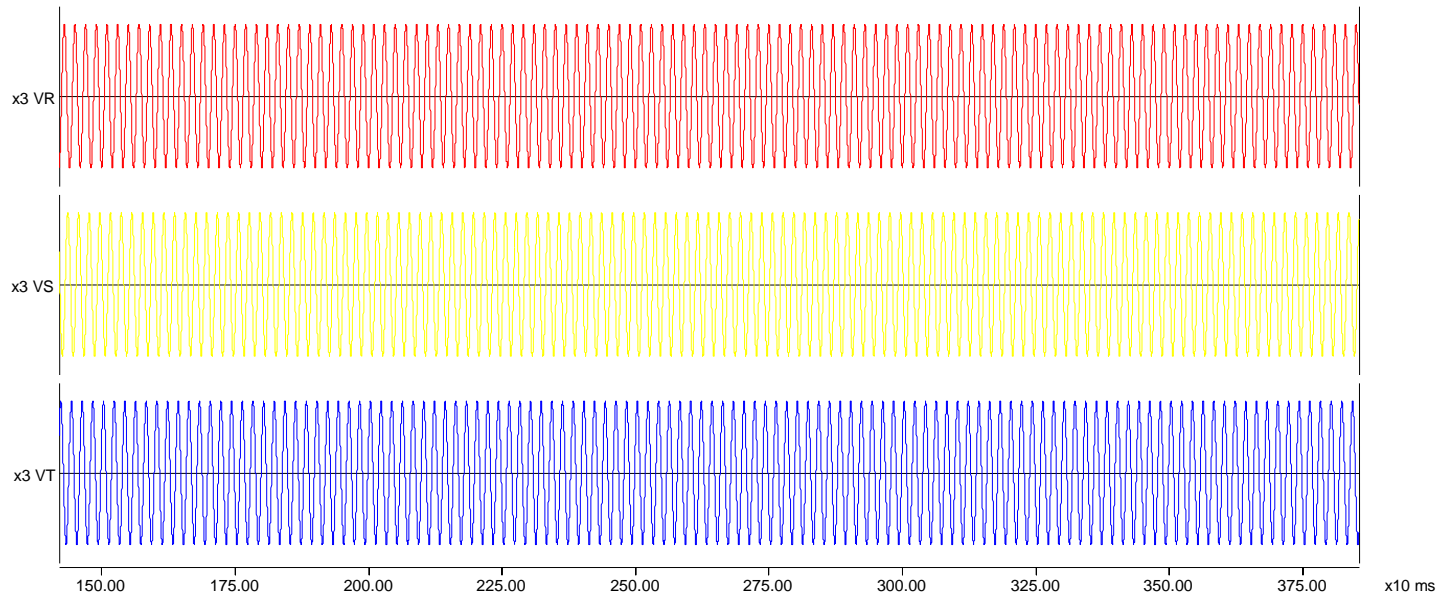
Analogue over on channel 13 'IC'



Continuous Loggers

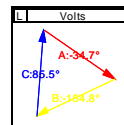
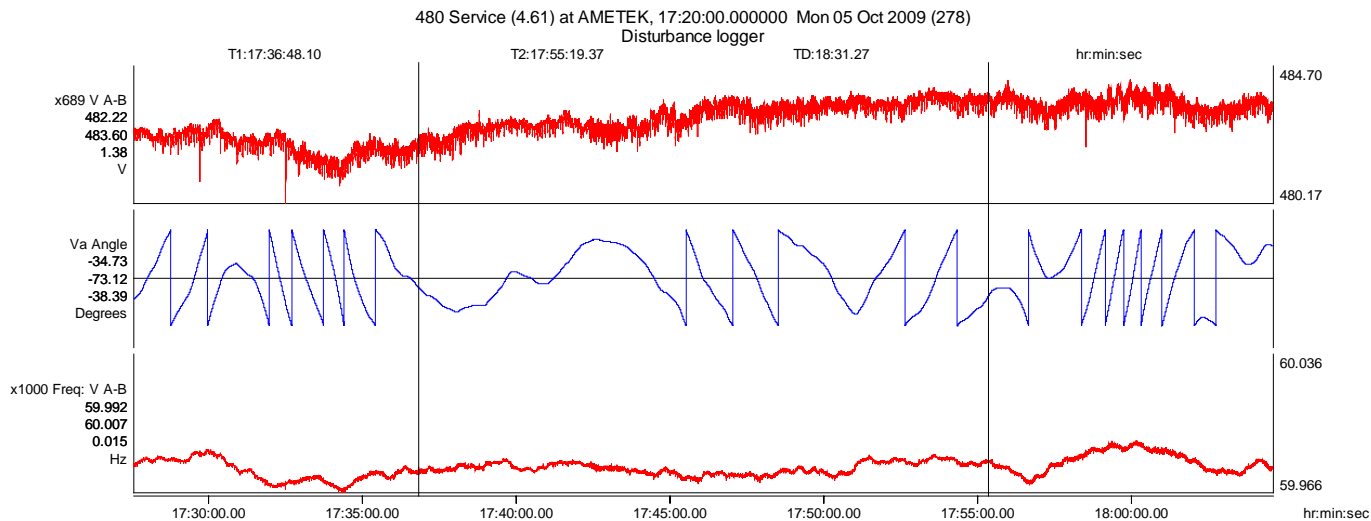
- Transient Logger
 - High speed transient data
 - 8-24 samples per cycle
 - Stored in a circular buffer (12-24hrs)
 - Lossless data compression

64974 at PT. PLN-Persero, 11:21:16.809687 Wed 29 Feb 2012 (060)
 Analogue over on channel 3 'CT IT'



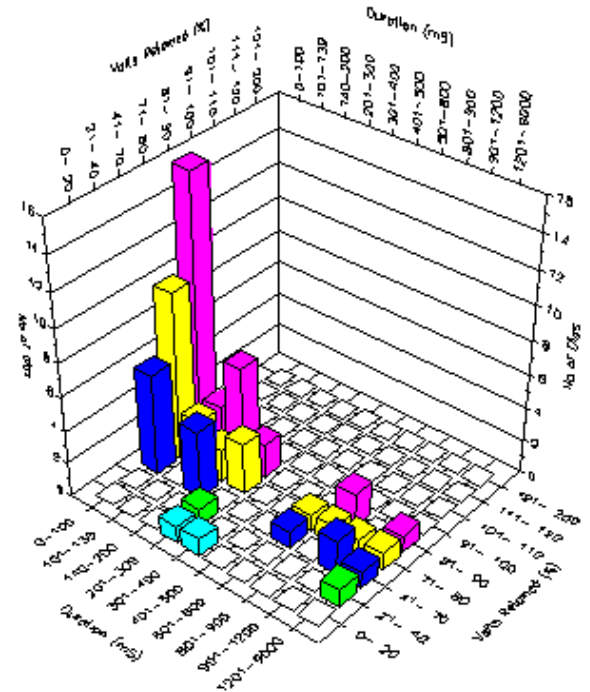
Continuous Loggers

- Disturbance Logger
 - RMS & Phasor quantities
 - PMU data @ up to 60 Hz
 - Stored in a circular buffer (2 weeks or more)

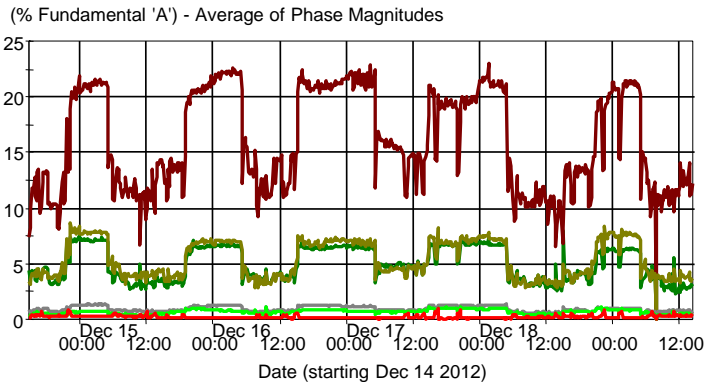


Power Quality Monitoring

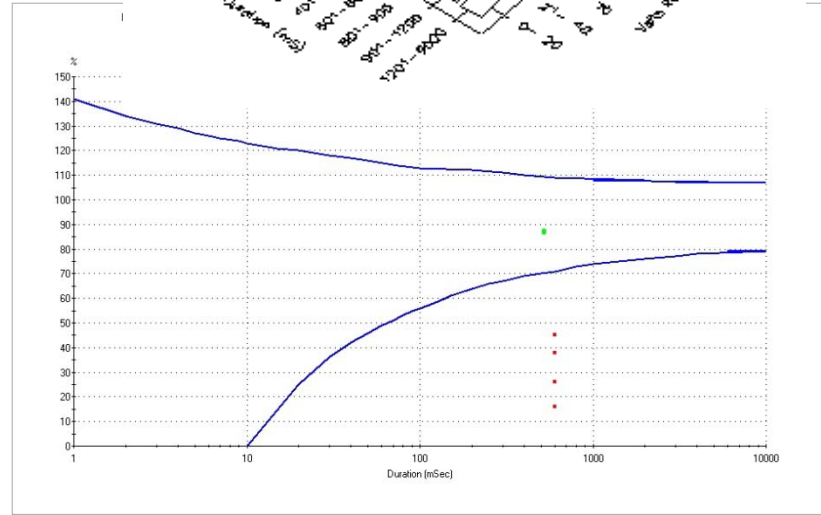
- High Accuracy PQ data – IEC61000-4-30
 - RMS/Frequency Profiles
 - Individual Harmonics to the 64th
 - Voltage Imbalance
 - Flicker
- 52 Week circular buffer
- Automated data retrieval
- Automatic compliance report generation



480 Service at Rochester (Engineering Amps)
From 14:50 on Dec 14 2012 to 14:30 on Dec 19 2012



—	3
—	5
—	7
—	9
—	11
—	13

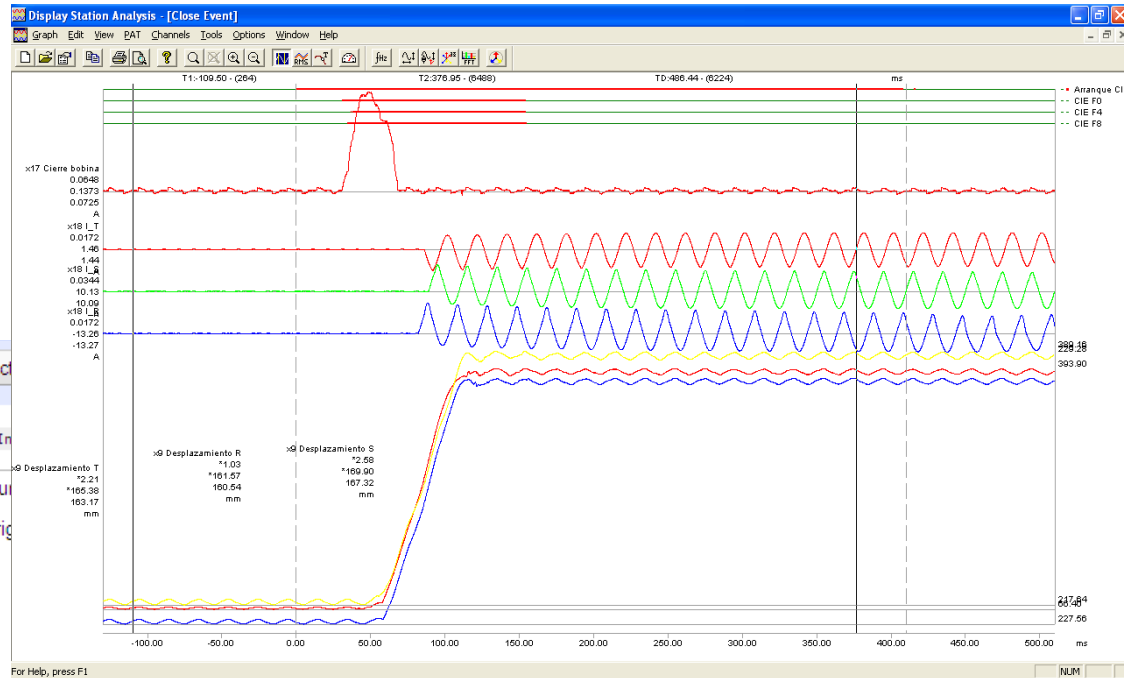


IEC61850 Capabilities

- GOOSE Message Recording
 - Subscription to GOOSE Control Blocks from multiple IED's
 - Recorded in the SER log
 - Included in all fault/disturbance records
 - Consolidation of data for event analysis
 - Reduced wiring costs
- Manufacturing Message Specification (MMS)
 - Access to event logs & data files
 - Universal data formats
- Sampled Values (SV)
 - Transport of raw point on wave data over Optical Gigabit Ethernet (Process bus)
 - Replaces copper wiring from CT's/PT's

Online Breaker Monitoring

- Monitoring of vital parameters
 - Trip Coil currents
 - Position
 - Phase current
- Detect and notify of performance changes



« Back to Inbox Archive Report spam Delete Move to Labels More act

Display Station: Coil Profiler Event Exceeds User Limits

★ charlie.childs35@gmail.com [show details](#) 3:40 PM (1 hour ago)

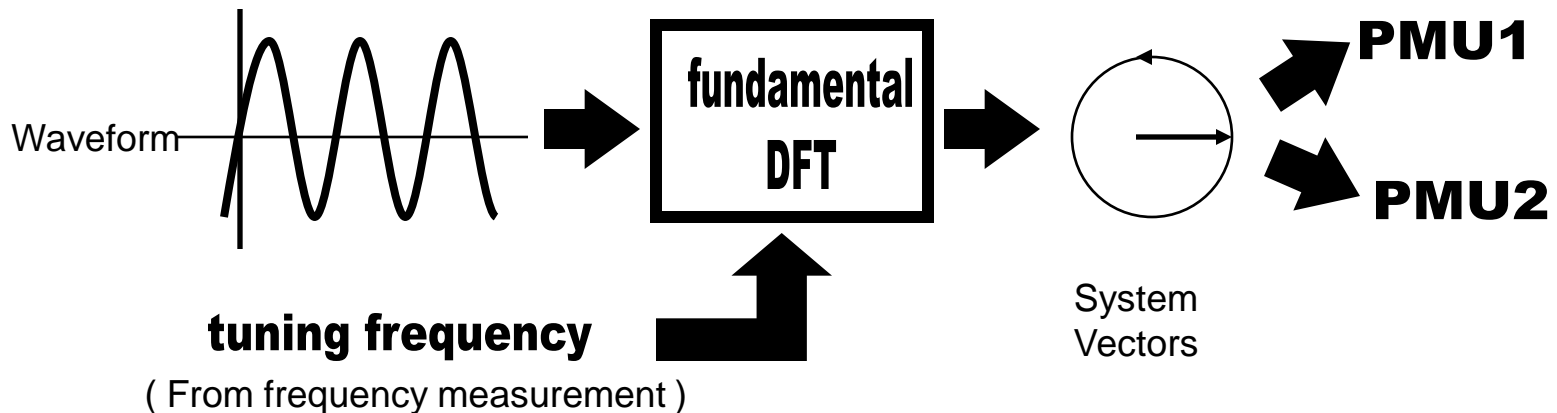
Transient record from Machine: '11kV (Portable No. 2)' at Location: '11kV Site' with Trig 'Wednesday, December 26, 2007 - 15:58:39.979'.

There were one or more Coil Profile events that exceeded limits.
Record contains 1 Coil Profile Event(s).

- Event 1 was outside limits. Pulse Amplitude was HIGH (5.66 Amps)
- Event 1 was outside limits. Pulse Duration was LONG (37 mSecs)
- Event 1 was outside limits. Pulse Area was LARGE (38832)

Phasor Measurement Unit (PMU)

- Streaming data per C37.118
 - Phasors from many circuits
 - Multiple data streams
 - Independently configurable



Summary

- Modern Multi-Function Recorders have taken advantage of technology advancements
 - Processing power
 - Memory availability
 - Reliability
- Provide Return on investment through additional functionality and automation
 - Advanced internal analysis of events
 - Providing information not just data
 - Automating notification when required