

Multi-purpose measurement tools help utilities increase service and protect revenue

Application Note

Electric utilities are working harder than ever to stay competitive, manage capacity, and protect revenue. To differentiate themselves from competitors, many utilities are offering power quality and other efficiency-related services. As a result, new power quality measurement tools are reflecting this same multi-purpose field service ethic.

The three-phase analyzers that technicians already use to measure power factor and trend power quality now offer user-settable ratios for displaying readings

as if measuring at the primary side of PTs and CTs. They also verify revenue meters.

Enough revenue meters are out of tolerance that a 2001 Electric Power Research Institute study estimated meter-related losses at \$5 million to \$20 million per year for a medium sized U.S. utility.

Using a multi-purpose analyzer such as the Fluke 430 Series allows utility technicians to offer more customer services in less time and quickly audit revenue meters during each site visit.

Power quality, power factor, and demand management

New handheld three-phase power quality analyzers like the Fluke 430 Series are rated for use at the service entrance and will trend data easily, without setup.

To support detailed yet efficient assessments of substations and customers' power, new analyzers:

- Measure voltage, current, frequency, power, power factor, power consumption (energy), unbalance and flicker, harmonics and inter-harmonics on all three phases and neutral
- Log events like dips, swells, and interruptions
- Trend all measurements on-screen, with automatic scaling
- Check conformity to EN50160 limits or to custom limits
- Capture 40 waveforms showing detailed dips, swells, interruptions or transients
- Meet 600 V CAT IV, 1000 V CAT III safety standard required for measurements at the service entrance
- Transfer stored measurements to the PC



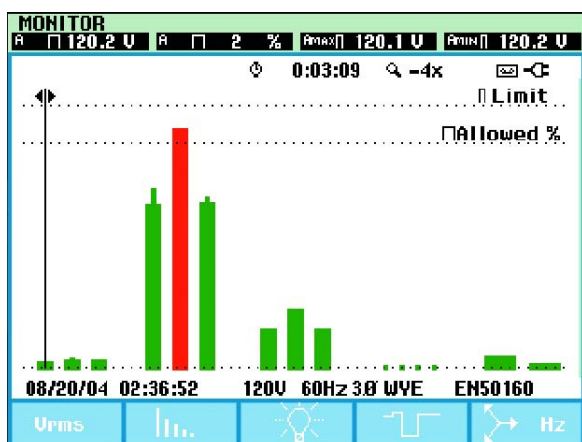
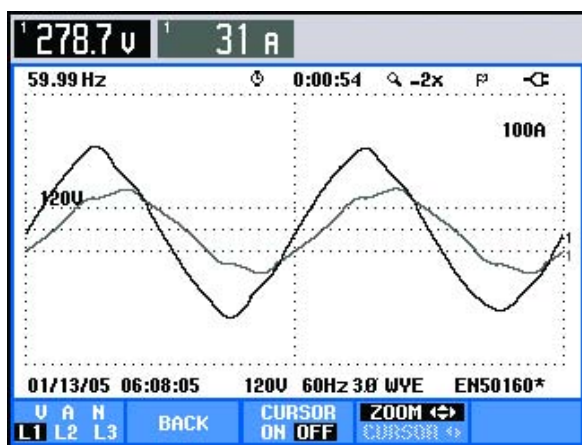
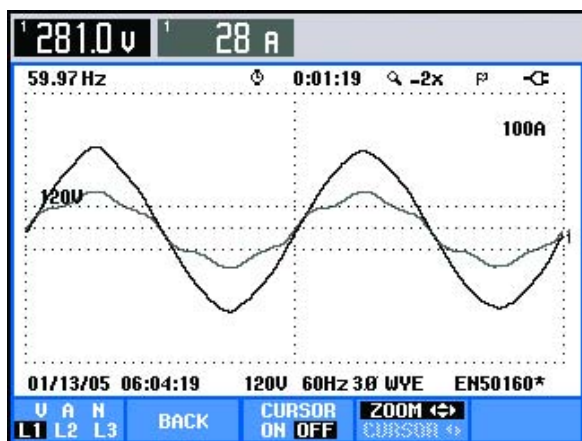


Figure 1. The Monitor function on the Fluke 430 Series allows technicians to check overall power quality against standards—or verify custom-set limits—and to show the customer a clear and convincing go/no-go screen.



2A

Figure 2. Large consumers can install power factor correction or harmonics mitigation that affects the distribution system. Utilities can perform before and after readings to help customers evaluate solutions and to check for impact on distribution. **Figure 2A** shows current lagging voltage at the service entrance of a commercial building. **Figure 2B** shows the same service entrance after applying power factor correction. Applying the correction results in a 10 % reduction in current consumption, but also results in somewhat higher current distortion.



2B



Flexible connections for current and potential transformers

The Fluke 430 Series in particular can be connected directly to low voltage services, including 120 V/240 V, 480 V, and 600 V. It can also connect in parallels with primary metering using PT or CT loops and a set of precision 5 A current clamps. Technicians can set custom scale factors, to display readings in primary units. The analyzers support all standard power configurations:

- Single-phase 120/240 V
- Three phase grounded wye
- Three phase delta
- Three phase high leg delta
- Three phase open leg delta
- Single phase and 3 phase IT

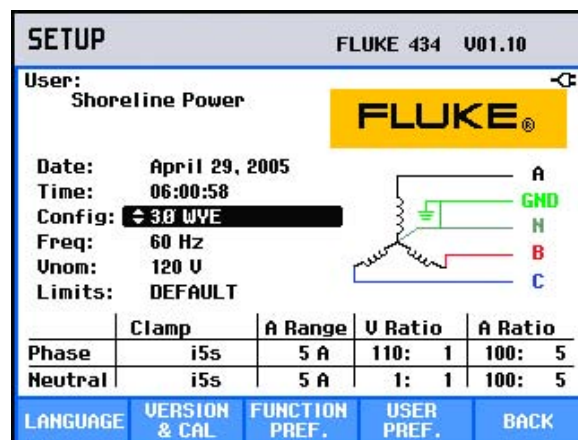


Figure 3. The main setup screen shows probe connections and scale factors for CTs and PTs.

Revenue meter verification

The meter verification test is similar to a hand-switch verification and can quickly uncover tolerance problems. On new analyzers, technicians use a soft-key to conduct the test, with no configuration or accessories needed. The verification can be performed on any electromechanical meter or electronic meter that has an indicator or rotating disk.

Figure 4 shows the Power and Energy display on the Fluke 430 Series. Technicians connect the analyzer and then press the soft-key labeled "MANUAL COUNT +1" to increment the counter each time the marker passes on the revenue meter. Figure 4 shows the results after three revolutions of a meter (pulses). In this case, the value observed from the revenue meter was 4.9 % lower than the 3.148 kWh measurement on the Fluke 434.

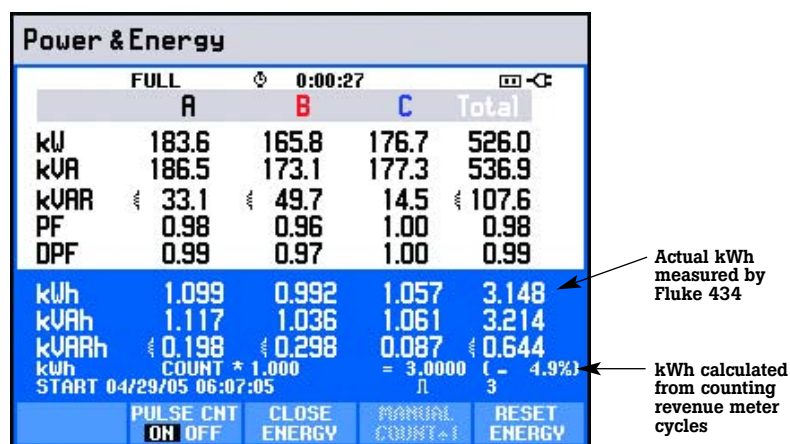


Figure 4. The Fluke 434 uses four voltage and four current inputs to accumulate and display actual kWh, kVAh and kVARh. Actual values from the Fluke 434 can be easily compared to the revenue meter.



Here's how the manual measurement works:

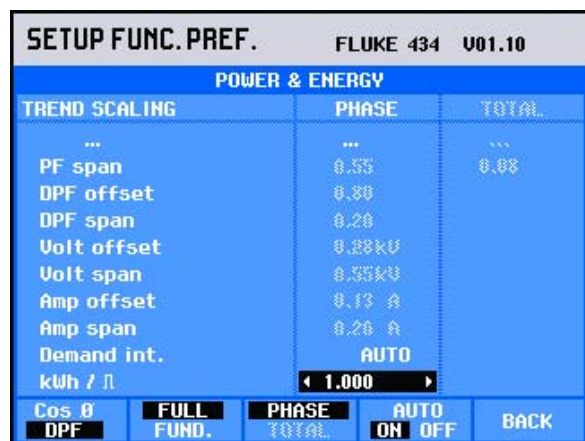


Figure 5. Setting the pulse constant to correspond to the revenue meter.

1. Set the scale factors

Set CT and PT scale factors on the analyzer, if necessary. (See Figure 3.) Under the FUNCTION PREFERENCES for the Power and Energy Function, set the pulse constant on the analyzer to match the pulse constant on the revenue meter (K_h). Use the down arrow button to see the pulse constant as shown in Figure 5. Connect the 430 in parallel with the revenue meter.

2. Setup the energy measurement

Select the Power & Energy mode from the main menu and press the Hold/Run softkey twice. Press the TIMED softkey, then specify the number of pulses to count before holding the results on the display. Press START to return to the Power and Energy Screen. Press the ENERGY softkey to open the Energy display. Make sure Pulse Counting is turned on.

TIMED START			
Stop on:			
◊ Duration	30 m		
◆ KYZ kWh count	3		
Start date:	Year	2005	
	Month	5	
	Day	7	
Start time:	Hours	22	
	Minutes	42	
CANCEL			START

Figure 6. Setting the number of pulses to count.

3. Perform the verification

Press the RESET ENERGY softkey to reset the energy counter as the marker passes on the revenue meter. Press the MANUAL COUNT + 1 softkey each time the marker passes.

4. Read the results

After the number of rotations specified in step 2 above, the display will hold. Read the meter error, in percent, from the lower right part of the screen.

Some utilities make a practice of auditing large customer power meters once a month to safeguard revenue. New, multi-purpose power quality analyzers make this kind of personalized field service far more efficient, and feasible. They also provide more customer-friendly data, offering new ways to add value to customer service.

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Printed in U.S.A. 5/2005 2464475 A-US-N Rev A