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Energy studies with the Fluke 1735 Power Logger

Application Note

The rising cost of energy means that optimal use of energy has become even more critical.

The first step in managing energy is understanding 'how much and when' energy is being used. To discover that, you need a power logger. The logger captures voltage, current, power, power factor and energy, displays the measurements, and in logging mode stores them over time.

Then, using software, you can graph the measurements and highlight times when extreme or unexpected energy consumption is happening. For example, if energy is being consumed at night or at weekends, perhaps the HVAC system needs to be re-programmed?

Once you have this kind of power and energy profile, you can highlight potential areas for energy savings.

Conduct the initial energy study at the main utility power supply/service entrance. Once you've measured overall power, then conduct more focused studies throughout the facility to profile individual loads and estimate their effect on your electricity bill.

Recording current and power with the Fluke 1735

The compact, rugged Fluke 1735 Power Logger is an excellent tool for performing energy studies.

- It includes flexible current probes for connecting around multiple conductors or bus bars.
- It has a PC interface and software for downloading measurements to a Windows-based PC and creating professional reports for your electrical plans.
- It measures voltage on three phases and current on three phases and neutral.
- It records multiple parameters that can help determine system load, including voltage, current, frequency, real power (kW), apparent power (kVA), reactive power (kVAR), power factor, and energy (kWh).

Performing a load study with the Fluke 1735 takes just five steps:

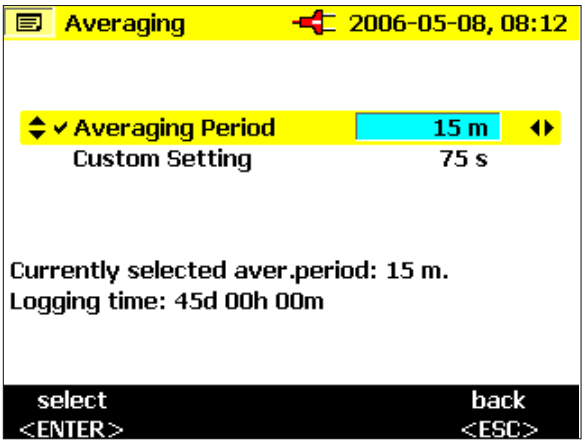
1. Hook up to the feeders or service.
2. Set power system parameters.
3. Set the recording time.
4. Start recording.
5. Download and review the measurements.

1. **Hook up to the feeders or service.** Using proper personal protective equipment, connect the Fluke 1735 to 120 V line power and secure the area so no one will tamper with your setup. For a 3-phase wye system there will be eight connections:
   - Three phase voltages
   - Neutral voltage
   - Three phase currents
   - Neutral current
2. **Set power system parameters.** Set the Network Topology to wye or delta, to match the system you are recording. Verify the nominal voltage (Mains Voltage) and line frequency are correct.
3. **Set the recording time.** Set the Fluke 1735 to 15-minute averaging intervals and a 30-day recording duration.
4. **Record the data.** In the W (power) position the Fluke 1735 will record a min, max, and average of these values every 15 minutes:
   - Power in Watts for each phase and total
   - Reactive Power in VARs for each phase and total

   - Apparent Power in VAs for each phase and total
   - Power Factor for each phase and average
   - Averages of Energy in kWh and Reactive Energy in kVARh

The trend screen will appear and plot a new minimum, maximum and average on the display every fifteen minutes, moving from left to right as shown in Figure 3.

After 30 days, disconnect the Fluke 1735 from the source, take it to your computer, use the serial cable to connect it, and download the data into the Power Log Software included with the unit.



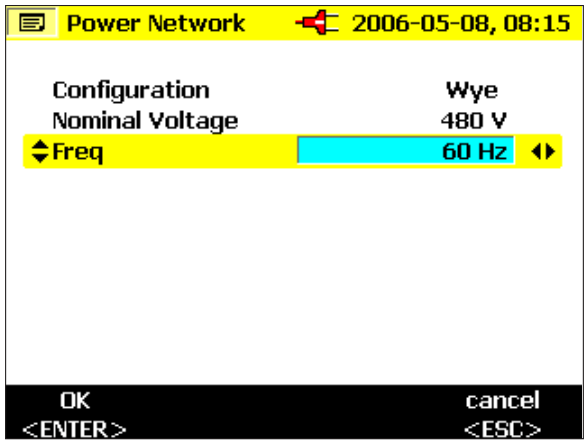


Figure 1 & 2. Sample setup screens for recording time and parameters.

5. **Download and review the measurements.** For 30 days of recording, with a measurement every 15 minutes, you will have 2880 sets of measurements. Use Power Log to graph this data, find the average current or power on each phase, compare the three phases and report the largest number. Figure 4 shows three phase-current recordings, zoomed in to show detail.

   Power Log has a built-in report generator that includes graphs of current and real power. Your report can range from a single current or power number to a full-blown document with graphs and tables. But the ultimate goal is still the same: Get an accurate picture of the system load, help design a safe upgraded system and satisfy electrical authorities.

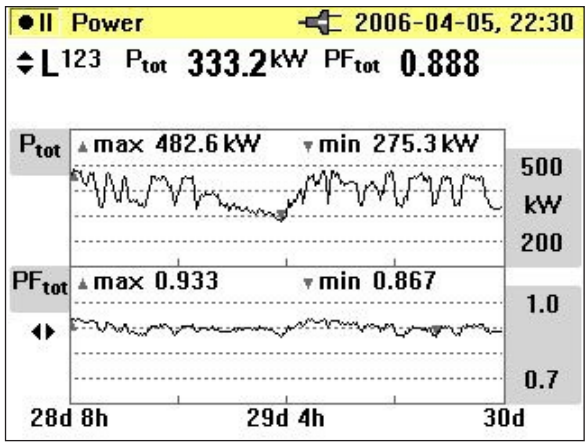


Figure 3. An example of the recorder screen at the end of the duration, verifying all data is being stored.

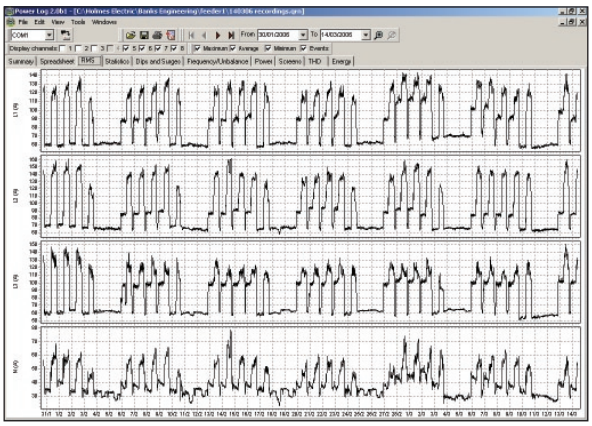


Figure 4. Power Log graphs showing detailed current records.

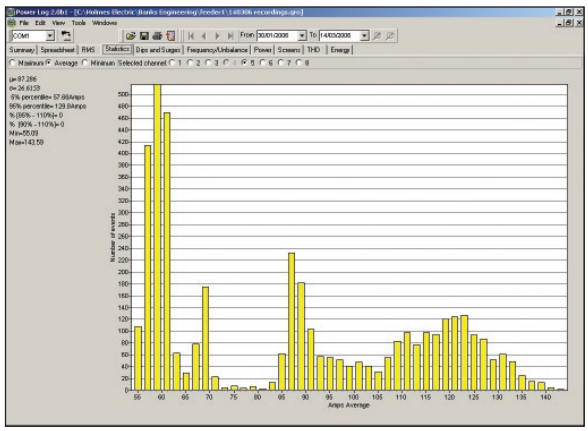


Figure 5. Power Log statistics view showing average current.

Why does power factor matter?

Large utility customers (typically those with 100 kW+ loads) contract to buy their power based on power factor (the utility requires these big customers to do this to ensure they get paid an amount of money that truly reflects the cost of the infrastructure they need to install to service the customer). Usually the utility requires the customer maintains a power factor of 0.95 or more (this will vary depending on the contract), if the customers power factor goes below the agreed level an additional charge is made to the customer. So power factor has a direct effect on the customers bill.

What is power factor?

Power factor is the ratio of working power or energy (kilowatts or kW) to apparent or total power (kilovolt-amperes or kVA) delivered by the utility. It measures how effectively total delivered power is being used. A high power factor signals effective utilization of electrical power, while a low power factor indicates poor utilization of electrical power. However, this is not to be confused with energy efficiency or conservation which applies only to energy or kW. Improving the efficiency of electrical equipment reduces energy consumption but does not improve the power factor.

What causes a low power factor?

The main contributors to low power factor are motors operated at less than full load. This often occurs in cycle processes such as saws, conveyors, compressors, grinders, etc.—where a motor must be sized for the heaviest loads. HVAC fans often have a low power factor due to running at reduced load.

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The Fluke 1735: Three-phase Harmonics and Event Recording

The Fluke 1735 is the ideal electrician's tool for recording and analyzing power and energy in commercial and industrial facilities. In addition to recording power parameters for load studies, the Fluke 1735 also:

- Shows voltage and current waveforms on its integrated scope display
- Measures and monitors harmonic distortion caused by electronic loads
- Captures voltage dips and swells caused by load switching and faulty equipment

Included accessories:

- Soft carrying case
- 4 flexible current probes (15 A/150 A/3000 A)
- Power Log Software
- Voltage leads and clips
- Color localization set
- PC interface cable
- Universal ac adapter
- Printed English manual
- Multi-language manual on CD-ROM

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