

EnergyPro

6 channel Energy Datalogger

User's Guide



CANDURA
instruments

EnergyPro User's Guide

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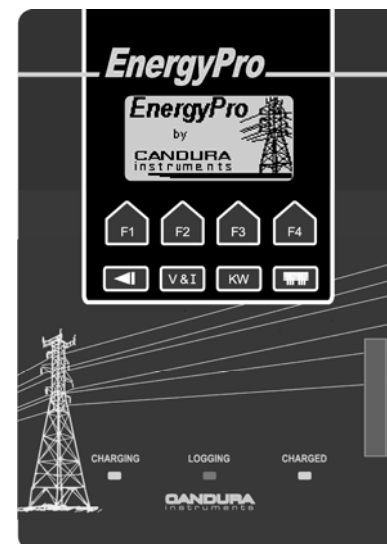
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Introduction

The **EnergyPro** represents leading edge technology in operator interfaces. The **EnergyPro** will assist in determining a proper three phase connection and will automatically correct for many common connection mistakes (ie: Voltage leads on wrong phases, reversed CTs, etc.). Data can be viewed in real time on the front panel, or for more detail, Candura Instruments' PowerView software can be used to examine data collected by the **EnergyPro**.

The **EnergyPro**:

- Records RMS voltage, RMS current and power.
- Has graphical display.
- Is designed to IEC 1010 specifications.



The **EnergyPro** is a 6 channel energy data logger. It monitors 3 phases of voltage and current and calculates the neutral current.

A memory card interface is used to store recorded data on a removable memory card. The **EnergyPro** will not begin a survey without a memory card installed. Once a survey has been started the memory card may not be removed until the survey has been stopped.

Safety

Although this instrument is designed to be as safe as possible, safety is ultimately the responsibility of the operator. This instrument should only be operated by suitably qualified and authorized personnel.

Please read and UNDERSTAND the following information before operating this instrument


- The **EnergyPro** uses a membrane keypad that could be damaged if a sharp object is brought into contact with it. This may expose the operator to potentially hazardous voltages.
- Frequently inspect the test leads and the instrument for damage. If the instrument shows any signs of physical damage or functions improperly, it should not be used.
- Never work alone with high voltage circuits. Ensure that a qualified observer is mindful of your activities.
- When performing any measurements involving high voltage circuits, all connections should be made to the circuits while the power is off. To ensure personal safety, the test leads and related connectors should not be handled while the circuit is energized.
- Do not attempt to measure any voltage higher than the maximum rating of 300V RMS. Failure to observe the maximum rating could result in damage to the equipment or personal injury.
- Refer servicing of this instrument to qualified personnel only. Potentially lethal voltages may be present inside the case. If any of the protective circuitry is improperly repaired, the safety of this product could be compromised.
- Do not expose the **EnergyPro** *directly* to outdoor elements.
- If the unit requires cleaning, use only a slightly dampened towel. Disconnect supply power before cleaning.
- The following international symbol is used on the equipment and in this manual:



See explanation in manual to find out the nature of the potential HAZARD and any actions to be taken.

Firmware Feature

Connection Check

Before a survey is started the user can confirm the voltage and current connections from the hook-up screen (press the  button). See the Hook-Up Configuration section of this manual for more details.

RMS Data Storage

The **EnergyPro** stores RMS data at set intervals which can be adjusted from 1 second to 30 minutes. The minimum, maximum and average values are stored at the end of each storage interval. The averaged values are calculated from the sum of the RMS values (updated every second) over the preceding storage interval. The minimum and maximum values are updated every second over the preceding storage interval.

Power Calculations

The power calculations are updated every second. Only the averaged values of power are recorded. Power factor displayed is the true power factor (not the displacement power factor which is determined from the phase angle shift between voltage and current) and is calculated as the ratio of the real power (KW) divided by the apparent power (KVA).

Frequency

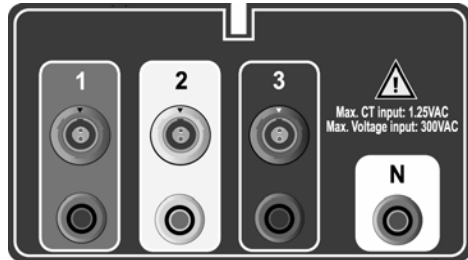
The system frequency is measured from the signal on V1 input and is updated every second. The minimum, maximum and average values are stored at the end of each storage interval.

Energy Usage Display

The **EnergyPro** displays the total energy usage during the survey. The total KWHR and the average KW/HR are displayed.

Logger Connection

Connection panel



The voltage and current connections are colour coded according to individual phases.

Either clamp CT's or a Flex CT's may be used to monitor current.

LED Indicators

Green Charging LED indicator

The Green Indicator will come on when voltage is greater than 85V on the channel 1 input. The battery will charge when channel 1 voltage is greater than 200V. This LED is visible from the outside of the enclosure.

Red Logging LED Indicator

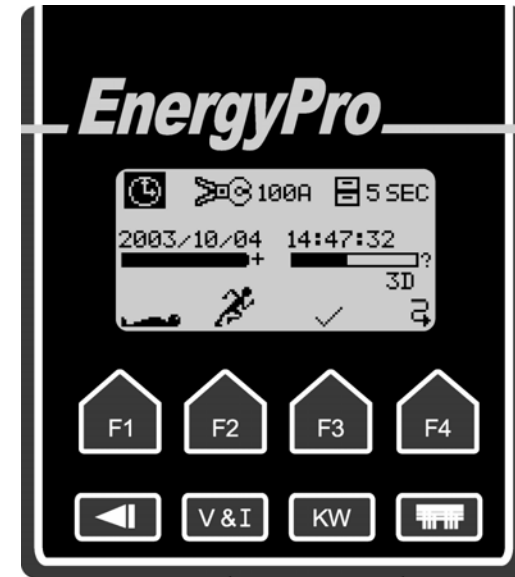
This Red LED will flash when the logger is recording data. This LED is visible from the outside of the enclosure.

Green Charged LED indicator

This Green LED will come on when the internal battery of the logger is fully charged. This LED is visible from the outside of the enclosure.

Logger Operation

Main Screen







The main screen of the **EnergyPro** is a collection of icons that provide access to various configuration setup screens. It also displays general status of the logger such as battery charge state, available memory, and logging status.

The top row of keys change function depending on the active screen on the display. In the main screen, the scroll key \square (F4) is used to navigate the top row of icons, when an icon is highlighted pressing the checkmark key \checkmark (F3) selects the function. This enables setting the time, the CT range, and the storage rate.

In the middle section of the main screen, there are two status bars displayed below the date and time field. The right status bar indicates memory used, and the left status bar indicates battery charge state. Below the memory status bar is the maximum survey duration in number of days. This number will change depending on the storage rate and memory card size.

Logger Operation





The three icons in the top row of the main screen access the basic configurations of the logger:

-  ▪ Clock icon - Set clock.
-  ▪ Clamp CT icon - Set clamp CT range. This setting must match the clamp range being used.
-  ▪ Flex CT icon - Set Flex CT range. The Flex CT range options are 20A, 200A and 2000A. The range setting is internal. There are no external switches to charge.
-  ▪ Filing cabinet icon - Set storage rate,

The main screen displays the CT range and storage rate beside their respective icons. Once a change is made, the value beside the icon will be updated automatically. For changes in storage rate, the maximum survey duration display under the memory status bar will also be updated automatically.

Example: The main screen display shown at the beginning of this section indicates that the logger is set for 100A clamp CT's and 5 seconds storage rate. The survey duration is 3 days.


The bottom row of keys have fixed functions:

-  ▪ Return to the main screen.
-  ▪ Display voltage, current, power factor and frequency.
-  ▪ Display real, reactive and apparent power (total energy consumption is accessed from this screen by pressing F3).
-  ▪ Display the hook-up configuration.

Logger Operation

Turning On and Off

The logger is turned on by pressing any key on the keypad for 1 second. Once the logger is on, a title screen will appear on the display, following by the main screen.

The logger is turned off by pressing the sleep key  (F1) from the main screen.

The **EnergyPro** draws a small amount of power from the V1 measurement channel for power and to charge the internal battery. The **EnergyPro** will shut itself off after 2 minutes of idle time if it is not recording data and the voltage on V1 is less than 200V. While recording the **EnergyPro** will minimize power consumption by:

- i. Turning off the LCD backlight after 2 minutes of no activity on the keypad.
- ii. Turning off the LCD totally if battery capacity is low and after 2 minutes of no activity on the keypad.
- iii. If the **EnergyPro** is not being used for an extended period of time, connect V1 to 240V once a month for 8 hours to ensure the internal battery remains charged.

Memory Card

If there is no memory card the **EnergyPro** will not record data and the 'running' icon will not appear on the main screen. When a memory card is inserted the 'running' icon will appear and the **EnergyPro** is ready to record data. When recording is started the **EnergyPro** reformats the memory card and any data from a previous survey will be erased.

The memory card should NEVER be removed while data is being recorded. ALWAYS stop recording before removing the memory card, otherwise data on the card may be corrupted.

Logger Operation

Clock Setup



The clock setup screen will appear when the clock icon on the main screen has been selected. The scroll key (F4) is used to scroll through the fields: year, month, day, hour, minute or second. The + and - signs (F1 and F2) are used to increase or decrease the value. Press the checkmark key (F3) to confirm changes and return to the main screen.

Logger Operation

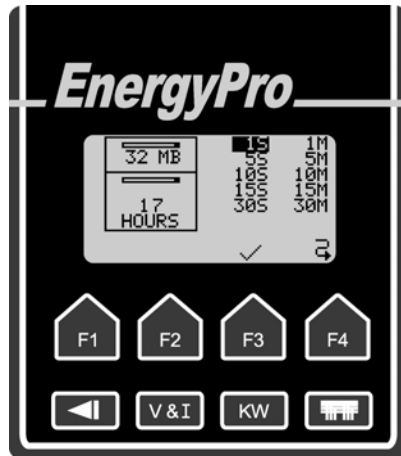
Clamp Setup



The clamp CT setup screen will appear when the clamp CT icon on the main screen has been selected. The scroll function key (F4) is used to select the desired clamp range. The checkmark key (F3) is used to confirm the selection and return to the main screen.

Logger Operation

Storage Rate Setup



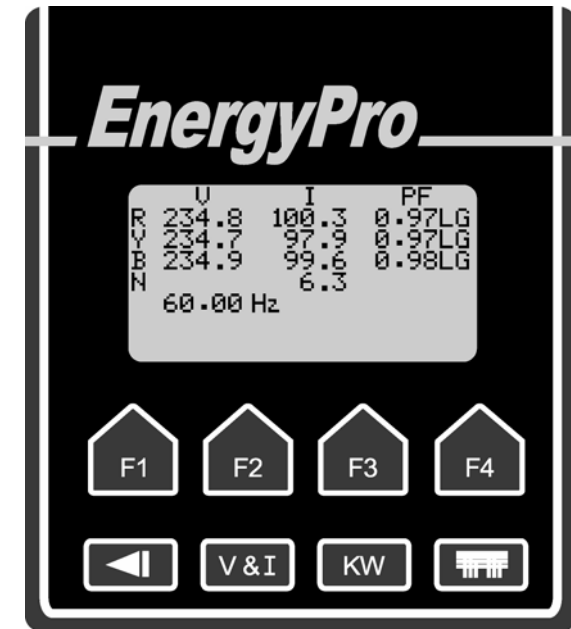
The storage rate setup screen will appear when the filing cabinet icon on the main screen has been selected. The scroll key (F4) is used to select the storage rate for the survey. The maximum survey duration, displayed in the lower drawer of the filing cabinet, will change when the storage rate is changed. The checkmark key (F3) is used to confirm the change and return to the main screen.

The length of the maximum survey period for each storage rate is calculated based on the size of the memory card. For example, a 1GB memory card can have the following survey durations:

Storage rate	Maximum Survey duration
1 Second	11 Days
5 Seconds	55 Days
10 Seconds	111 Days
15 Seconds	166 Days
30 Seconds	333 Days
1 Minute	666 Days
5 Minutes	3333 Days
10 Minutes	6666 Days
15 Minutes	10000 Days
30 Minutes	20000 Days

Logger Operation

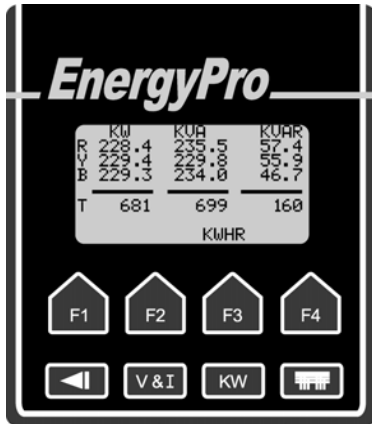
Voltage / Current / Power Factor Display



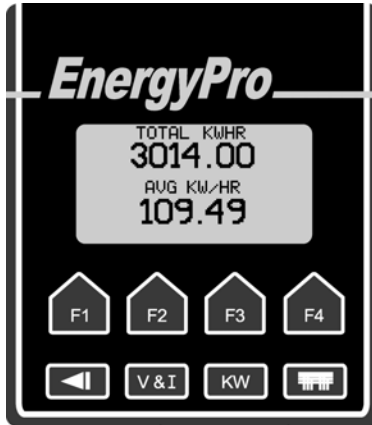
The voltage/current/power factor screen will appear after pressing the **V&I** button. It displays RMS voltage, RMS current, and power factor for each phase. Leading power factor is displayed with "LD" and lagging power factor is displayed with "LG". It also displays frequency and calculated neutral current.

Logger Operation

Power Display



The Power screen will appear when the **KW** button is pressed. It displays real, apparent and reactive power for each phase.

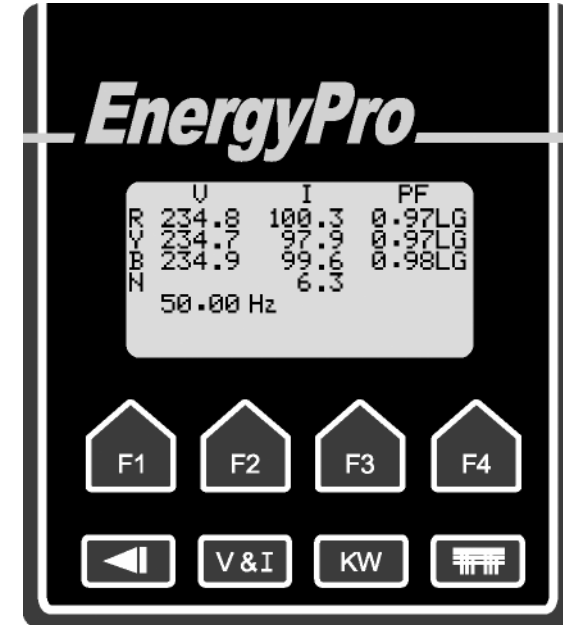


The KWHR key (F3) selects the total energy consumption screen.

The total energy consumption screen is zeroed at the start of each survey. The maximum KWHRs that can be accumulated is 9999999KWHR.

Logger Operation

Hook-up Configurations



The hook-up screen will appear when the **[Hook-up]** button is pressed. Before a survey is started this screen can be used to check the voltage and current connections. In many cases the **EnergyPro** can automatically correct for wrong voltage or current connections. The **EnergyPro** can recognize three different connection types: one voltage and one current (1V1I), one voltage and three currents (1V3I) and three voltage and three currents (3V3I). In order for the automatic detection of these configurations there must be voltage and current present in each of the phases being measured.

1V1I

This is for a single phase circuit. The **EnergyPro** assumes that V1 and CT1 are connected to the same phase. The **EnergyPro** can detect and automatically correct for a reversed CT clamp.

Logger Operation

1V3I

This is for a three phase circuit where one voltage and three currents are measured. The **EnergyPro** assumes that:

- i. V1 is connected to one of the three phase voltages with the correct polarity.
- ii. CT1 is connected to the Red phase with the correct polarity.
- iii. The power factor is greater than 0.5, leading or lagging.
- iv. The difference in power factor between any of the phase is ± 30 degrees.

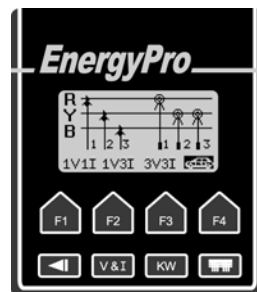
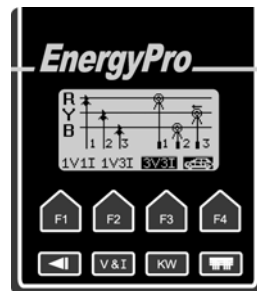
3V3I

This for a three phase circuit where three voltages, line to neutral, and three currents are measured. The **EnergyPro** assumes that:

- i. V1 is connected to one of the three phase voltages with the correct polarity
- ii. CT1 is connected to the Red phase with the correct polarity
- iii. The power factor is greater than 0.5, leading or lagging
- iv. The difference in power factor between any of the phases is +/- 30 degrees

Automatic Configuration

When the “auto” icon is pressed the **EnergyPro** will examine the voltage and current inputs to determine the phase relation between the voltages and currents. The voltage lead and CT icons will be rearranged according to the **EnergyPro** determinations. If the voltage and current connections are correct for one of the three configurations (1V1I, 1V3I or 3V3I) or if the **EnergyPro** can compensate for any misconnections (ie. reversed CT, two phases exchanged, etc.) the appropriate configuration description on the bottom of the screen will be highlighted.

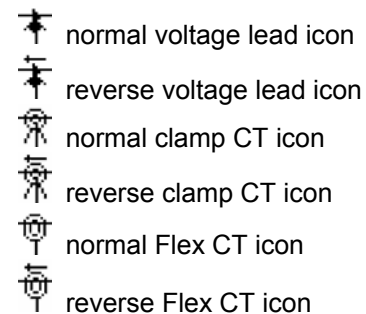


Logger Operation

If the **EnergyPro** cannot identify the connection type or compensate for a misconnection then the voltage lead and CT icons will be rearranged according to the **EnergyPro** determinations but there will be no configuration description highlighted. On the main screen the “running” icon will be replaced by a “connection” icon and start recording will be inhibited.

Pressing F1, F2 or F3 in the connection screen will override the automatic configuration function and allow start recording. An example when this might be done is when measuring three different single phase loads, V1 would be connected to the voltage and the three CTs would be connected to three different loads all on the same phase. The automatic configuration function would show the three CTs connected to the same phase but would not allow recording to start as the 1V3I configuration is reserved for three phase systems. Pressing F2 will force the 1V3I configuration and allow recording to start.

Connection Icons:



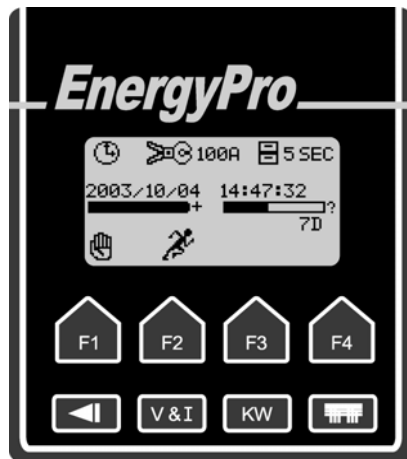
If the voltage or current icon disappears from the screen then the voltage or current is too low. If the voltage or current icon is flashing then the voltage or current signal is too high.

Logger Operation

Start and Stop logging

Before logging, make sure that all connections from the voltage leads and current clamps are secured to the **EnergyPro**. Remember to insert a memory card and make sure all configurations are set properly.

To start recording press and hold the F2 key while in the main screen (under the 'running' icon) for 5 seconds. The 'checkmark' icon and the 'scroll' icon will disappear and the 'sleep' icon will be replaced by a 'stop' icon.



The **EnergyPro** will start recording on an even minute or half minute. While waiting for the recording to synchronize to the time the 'running' icon will be animated to 'run' on the spot. After the first record is recorded the 'running' icon will be animated to move across the bottom of the screen and the red 'logging' LED will flash.

To stop recording press and hold the F1 key while in the main screen (under the 'stop' icon) for 5 seconds. When the recording has stopped the main screen will return to the normal setup display.

Data Download

Recorded data is transferred from the **EnergyPro** to a computer using the memory card. When logging has been stopped the memory card can be removed from the logger. The memory card can be inserted directly into a card reader or, with a PCMCIA adapter, it can be inserted into a PCMCIA slot in a laptop computer. Run **PowerView** and select 'File', 'Open' and then go to the drive that has been configured for the memory card. If there is data on the card you will then see a file that can be opened. After opening the file a directory and file name (you can keep the same file name) must be selected for the processed file.



Notes



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