

ELITE*pro*[™]

&

DATA*pro*[™]

Operator's Guide

ELOG 2009[™] Software

Including

AutoHost[™] 5.3

AutoPoll[™] 5.7

Software Release Date: October 17, 2009

Manual Revision Date: March 2, 2010

Congratulations!

You now own one of the world's most versatile, accurate, feature-rich and lowest priced power/energy logger (**ELITEpro**[™]) or multiple purpose data logger (**DATApr**[™]).

Both the **ELITEpro**[™] and the **DATApr**[™] loggers share many features including the operating software, **ELOG 2009**[™]. This manual describes the software and operation of both loggers.

Most of the time, the description of features in this manual applies equally to both loggers. In some cases, a feature or description applies only to one logger. To provide clarity when that occurs, the logger type for which a description applies will appear in curly brackets such as: {**DATApr**}.

What's New in ELOG 2009[™] ?*

A number of new features have been added to ELOG, some obvious and some subtle. Here is a description of the more obvious ones:

1. **New Graphics Package:** It's now extremely easy to customize your graphs, from colors to fonts. Professional results are possible with a few clicks of the mouse.
2. **Friendly Ports[™]:** ELOG displays available Windows COM ports with easy-to-understand device descriptions. Find the appropriate port quickly and easily.
3. **Multiple Logger Access:** Access multiple loggers simultaneously from a single PC.
4. **Fill Missing Records:** Designed for use with Line-Powered ELITEpro instruments, ELOG can now fill in "0" for time gaps resulting from a power loss.
5. **Windows[®] 7 Compatible:** Works with both Windows[®] 7 and Vista (32 and 64 bit versions)
6. **+ Much More:** As always, there have been a number of changes made to make the software a little more consistent, easier to use, and bug free. You'll probably not even notice most of these subtle improvements!

Enjoy these new features!

As always, we appreciate your comments and suggestions.

541.388.4774 or info@DENTInstruments.com

**These are new features added since ELOG 2004. For a list of all the features that have been added to previous versions of ELOG go to www.DENTInstruments.com or give us a call.*

ELITE^{pro}™ & DATA^{pro}™ Logger

SAFETY SUMMARY AND SPECIFICATIONS

This general safety information is to be used by both the Logger operator and servicing personnel. DENT Instruments, Inc. assumes no liability for user's failure to comply with these safety guidelines.

The **DATA^{pro}™** is an Over-voltage Category II device.

The **ELITE^{pro}™** is an Over-voltage Category III device.

CAUTION: THIS LOGGER MAY CONTAIN LIFE THREATENING VOLTAGES. QUALIFIED PERSONNEL MUST DISCONNECT ALL HIGH VOLTAGE WIRING BEFORE USING OR SERVICING THE LOGGER.



Warning: Use of this device in a manner for which it is not intended may impair its means of protection.

SYMBOLS ON EQUIPMENT



Denotes caution. See manual for a description of the meanings.



When connecting the **ELITE^{pro}™** Logger to an AC load, follow these steps in sequence to prevent a shock hazard.

1. Connect the CTs to the channel jacks on the Logger.
2. Connect the CTs to the phases being monitored.
3. If equipped with an external wall transformer, connect it next.
3. Connect the voltage leads to the different phases. **Connect the Ground (Green) wire first (if equipped), then the Neutral wire**, then the remaining phase wires in any order.



DENOTES HIGH VOLTAGE. RISK OF ELECTRIC SHOCK. LIFE THREATENING VOLTAGES MAY BE PRESENT. QUALIFIED PERSONNEL ONLY.



ELITE^{pro}™ : DO NOT EXCEED 600V. This logger is equipped to monitor loads up to 600V.

Exceeding this voltage will cause damage to the logger and danger to the user. Always use a Potential Transformer (PT) for loads in excess of 600V. The ELITE Logger is a 600 Volt Over Voltage Category III device.



USE SHUNTED CURRENT TRANSFORMERS (CTs). Do not use unshunted CTs, only use shunted CTs with a 333mV maximum output. A serious shock hazard and logger damage can occur if unshunted CTs are used.

SENSOR LIMITATIONS



Temperature: Use only 10K OHM NTC thermistors. Use of other sensors may damage the logger. Consult factory for suitability of non-DENT Instrument supplied sensors.



Pulse: Use only "dry contact" non-energized pulse inputs. Use of energized pulse initiators can cause damage to the logger and a potential shock hazard to the user.



Current: Use only shunted current transformers (CTs). The 4C **DATApro™** uses shunted, voltage output current transformers. Do not use unshunted CT's, only use shunted CT's with a 333mV maximum output. A serious shock hazard and logger damage can occur if unshunted CTs are used.



Contains Lithium batteries. Dispose of properly.



Equipment protected throughout by double insulation (IEC 536 Class II)

No accessories are approved for use with the **ELITEpro™** or **DATApro™** other than those specified in the DENT Instruments product literature and price sheets.

If the Logger appears damaged or defective, first disconnect all power and sensors from the logger. Then please call 541.388.4774, or email tech support at techhelp@dentinstruments.com for assistance.

ELITE^{pro}™ TECHNICAL SPECIFICATIONS

3 Voltage Channels	0-600 Volts AC or 0-800 Volts DC, Higher AC voltages can be measured with a Potential (voltage) Transformer
4 Current Channels	0-333 mV AC or 0-600 mV DC, Corresponding to 0-6,000+ Amps depending on current transformer selected
Current Transformers	Uses voltage output CTs (0-333mVAC) for maximum safety. Compatible with DENT Instruments DATA^{pro} ™ and Energy Logger CTs
Measurement Type	True RMS using high-speed Digital Signal Processing (DSP)
Line Frequency	60, 50, or 400 Hz and DC
Harmonic Sensitivity	1st through 50th
Waveform Sampling	128 times per cycle
Measurements	Volts, Amps, kW, kVAR, kVA, and Power Factor <i>Maximum, Minimum, Average, (All Parameters) also kWh, kVARh, kVAh, Ah</i>
Harmonics	DC and Fundamental through 50 th (odd and even), Total Harmonic Distortion, Crest Factor, for both Current and Voltage.
Waveform Capture	Voltage, Current, Power
Accuracy	Better Than 1% (<0.5% typical) for V, A, kW, kVAR, kVA, PF exclusive of sensor error
Resolution	12 bit A/D plus sign (1 part in 4,096): 0.01 Amp, 0.1 Volt, 1 watt, 1 VAR, 1 VA, 0.01 Power Factor
Memory	128 kBytes standard (~25,000 readings), or 512 kB (~100,000 readings)
Memory Types	Ring (continuous, write newest over oldest), or Linear (stop when full)
Recording Intervals	3, 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1, 12, 24 hours
Indicators	2 LEDs: Green to signal when logging, Red to signal low battery
Communication	
Direct	RS-232 to PC via 9 pin null modem cable (USB adapter available)
Communication Rate	1200, 2400, 4800, 9600, 19200, 28800, 57600 baud
Modem	Internal 1200, 2400, 4800, 9600, 14400 baud, auto-answer, auto-dial modes
ELOG Software	Programs Logger, Displays Current Metered Values, Retrieves Data
Data Formats	ASCII and Binary
Power	Internal Lithium Battery; For external power use a Listed (US/Canada) or Certified (non-US) power supply rated 9 VDC minimum 150 mA and marked 'Class 2,' 'Limited Power Source,' or 'LPS'
Battery Life	~3 years, LED indicator of low battery charge

Analog Sampling Rate3 seconds on external DC power, 1 minute when on internal battery

Clock.....Crystal controlled internal Real Time Clock, 20 ppm (<1 min/month)

Mechanical

Operating Temperature-7 to + 60 °C (20 to 140 °F)

Humidity5% to 95% non-condensing

Enclosure.....Indoor: High Impact ABS Plastic, UL 94-V0 flame rating

.....Outdoor: Weather tight enclosure, Polycarbonate UL 94-V2 flame rating

Weight.....0.4 kg (11 ounces) without modem

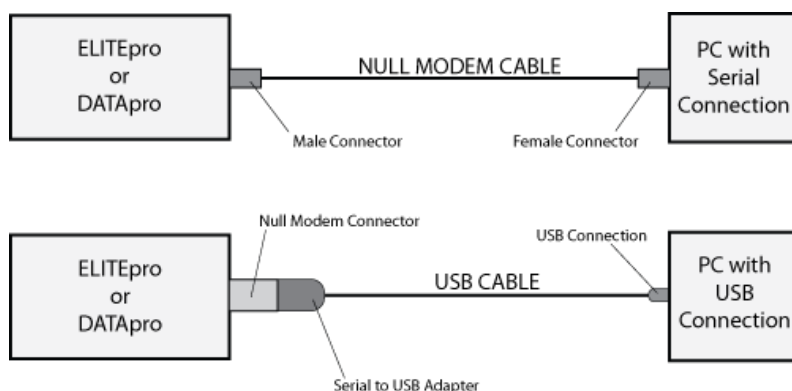
Dimensions8 X 15 X 6 cm (3.2" X 5.9" X 2.4") Indoor Enclosure

Connections to the ELITE^{pro}

The ELITE^{pro} has four wire leads for making temporary connections to voltage sources. On the end panel with the voltage leads there is a two piece, eight (8) pin Phoenix connector where sensors are terminated. The section with the screws and wire terminations may be removed by grasping both sides of the connector and pulling firmly away from the logger. Each pair of pins is a channel input as indicated on the logger. Of each pair, the left-most pin while facing the logger is the (+) or high side and the right-most pin is the (-) or low side. The 2nd, 4th, 6th and 8th pins are connected together and to the logger ground which is the same as the ground pin on the RS-232 port.

The other end panel of the logger has a DB-9 connector that is the RS-232 serial port. This port is where the provided Null Modem cable (or USB to Serial Adapter plus Null Modem Connector) is connected. Unlike a standard serial cable, the transmit and receive lines are crosslinked on a null modem cable. *Be sure to only use a null modem cable with your logger.* If you need a replacement, or if your computer does not have a serial port and you need a USB to Serial Adapter, please contact the factory for assistance. Two types of connections are detailed below:

Note: A Standard Serial cable will not work properly. Only use a Null Modem Cable to connect your instrument to a PC.



Note: Do not use a Null Modem Connector **and** a Null Modem Cable. Using both will essentially create a serial connection and will not work properly.

Two other connectors may appear on the long side of the logger. An RJ-11 jack provides access for a telephone line if the logger is equipped with a modem. An RJ-45 jack provides access for an Ethernet cable, if the logger is equipped with an Ethernet card. A 3.5 mm jack is also provided to allow for connecting external 9VDC power to the logger.

Minimum System Requirements for the ELITE^{pro}

Computer: PC or equivalent

Operating System: Windows® 7 (32 or 64 bit), Vista (32 or 64 bit), XP or 2000

CPU: Pentium Class 1 GHz or higher recommended

RAM: 512 MB or higher recommended

Hard Drive: 50 MB minimum available

Graphics: SVGA or higher resolution (800 x 600)

Communications Port: One Serial Port or one USB Port (with adapter)

CD Drive: One CD or DVD drive required for software installation.

DATApro™ TECHNICAL SPECIFICATIONS

Model 1T/3P: 1 Temperature & 3 Pulse Recording Channels

1 Temperature Channel-40 to +70 °C (-40 to 160 °F) Extended Range Sensors: -50 to +125°C
.....0.1 °C Resolution, Uses interchangeable, high-accuracy Thermistors

3 Pulse Channels.....Interrupt driven, Maximum input frequency 10 Hz

Model 2T/2P: 2 Temperature & 2 Pulse Recording Channels

2 Temperature Channels-40 to +70 °C (-40 to 160 °F) Extended Range Sensors: -50 to +125°C
.....0.1 °C resolution, Uses interchangeable, high-accuracy Thermistors

2 Pulse Channels.....Interrupt driven, Maximum input frequency 10 Hz, ±1 Count Resolution

Model 4C: 4 Channel Current Recorder

4 AC Current Channels.....0.05-6,000 Amps, Depending on Current Transformer, .01 A resolution

Current Transformers Uses voltage output CTs (0-333mV) for maximum safety. Compatible with
DENT Instruments **ELITEpro™** and Energy Logger CTs

MeasurementsTrue RMS using high-speed digital signal processing (DSP) techniques

Line Frequency60, 50, or 400 Hz and DC

Harmonic Sensitivity1st through 50th

Waveform Sampling.....128 times per cycle

Model 4P: 4 Channel Pulse Recorder

4 Pulse Channels.....Interrupt driven, Maximum input frequency 10 Hz, Resolution ±1 Count

Model 4Vdc: 4 Channel Low Voltage DC Recorder

4 DC Voltage Channels0-10 Volts DC, 0.01V Resolution

Model 4Ma: 4 Channel Milliamp Recorder

4 Milliamp Channels.....4-20 mA or 0-25 mA inputs, 0.025mA Resolution

Model 4T: 4 Channel Temperature Recorder

4 Temperature Channels-40 to +70 °C (-40 to 160 °F) Extended Range Sensors: -50 to +125°C
.....0.1 °C resolution, Uses interchangeable, high-accuracy Thermistors

Specifications Common to All Models Of DATApro™

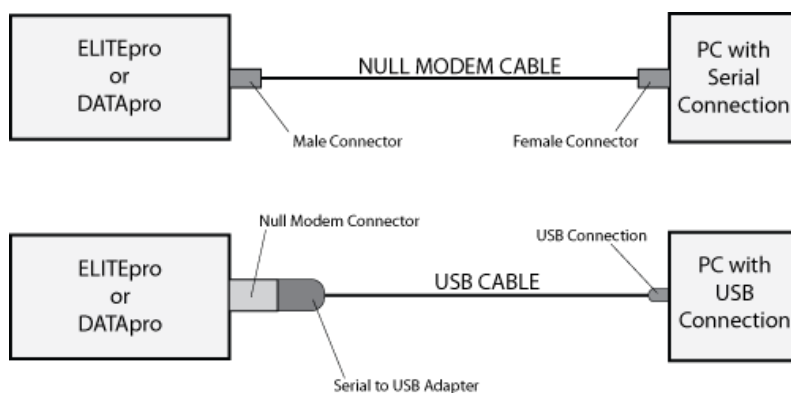
Number of Channels	4
Measurements	Maximum, Minimum, Average, Instantaneous (Temperature, Current, Milliamps and Volts DC), Count, Run-Time, Duty-Cycle, On-Time (Pulse/Digital)
Resolution	12 bit A/D Plus Sign (1 part in 4,096): 0.01 Amp, 0.1 °F or °C, 1 Count
Analog Sampling Rate	1 second on external DC power, 1 minute when on internal battery
Digital Sampling Rate	10 Hz Maximum, Interrupt driven
Accuracy	Better Than 1% (<0.5% typical) exclusive of sensor error
Memory	128 kBytes standard (~25,000 readings), or 512 kB (~100,000 readings)
Memory Types	Ring (continuous, write newest over oldest), or Linear (stop when full)
Recording Intervals	3, 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1, 12, 24 hours
Indicators	2 LEDs: Green to signal when logging, Red to signal low battery
Communication	
Direct	RS-232 to PC via 9 pin null modem cable (USB adapter available)
Communication Rate	1200, 2400, 4800, 9600, 19200, 28800, 57600 baud
Modem	Internal 1200, 2400, 4800, 9600, 14400 baud, auto-answer, auto-dial
ELOG Software	Programs Logger, Displays Current Metered Values, Retrieves Data
Data Formats	ASCII and Binary
Power	Internal Lithium Battery, For external power use a Listed (US/Canada) or Certified (non-US) power supply rated 9 VDC minimum 150 mA and marked 'Class 2,' 'Limited Power Source,' or 'LPS'
Battery Life	~3 years, LED indicator of low battery charge
Clock	Crystal controlled internal Real Time Clock, 20 ppm (<1 min/month)
Mechanical	
Operating Temperature	-7 to + 60 °C (20 to 140 °F)
Humidity	5% to 95% non-condensing
Enclosure	Indoor: High Impact ABS Plastic, UL 94-V0 flame rating Outdoor: Weather tight enclosure, Polycarbonate UL 94-V2 flame rating
Weight	0.4 kg (11 ounces) without modem
Dimensions	8 X 15 X 6 cm (3.2" X 5.9" X 2.4") Indoor Enclosure

Connections to the DATApro™

The DATApro™ has four connectors. On one of the two small ends of the logger there is a two-piece, eight (8) pin Phoenix connector where sensors are terminated. The section with the screws and wire terminations may be removed by grasping both sides of the connector and pulling firmly away from the logger. Each pair of pins is a channel input as indicated on the logger. The left-most pin while facing the logger is the (+) or high side and the right-most pin is the (-) or low side. The 2nd, 4th, 6th and 8th pins are connected together internally and also to the logger ground which is the same as the ground pin on the RS-232 port. If the logger accepts more than one type of sensor, the location and type of sensor is indicated on the logger panel as follows: T = Temperature sensor; P = Pulse or digital sensor, C = Current transformer.

The other end panel of the logger has a DB-9 connector that is the RS-232 serial port. This port is where the provided Null Modem cable (or USB to Serial Adapter plus Null Modem Connector) is connected. Unlike a standard serial cable, the transmit and receive lines are crosslinked on a null modem cable. *Be sure to only use a null modem cable with your logger.* If you need a replacement, or if your computer does not have a serial port and you need a USB to Serial Adapter, please contact the factory for assistance. Two types of connections are detailed below:

Note: A Standard Serial cable will not work properly. Only use a Null Modem Cable to connect your instrument to a PC.



Note: Do not use a Null Modem Connector **and** a Null Modem Cable. Using both will essentially create a serial connection and will not work properly.

Two other connectors may appear on the long side of the logger. An RJ-11 jack provides access for a telephone line if the logger is equipped with a modem. An RJ-45 jack provides access for an Ethernet cable, if logger is equipped with an Ethernet card. A 3.5 mm jack is also provided to allow for connecting external 9VDC power to the logger.

Minimum System Requirements for the DATApro™

Computer: PC or equivalent

Operating System: Windows® 7 (32 or 64 bit), Vista (32 or 64 bit), XP or 2000

CPU: Pentium Class 1 GHz or higher recommended

RAM: 512 MB or higher recommended

Hard Drive: 50 MB minimum available

Graphics: SVGA or higher resolution (800 x 600)

Communications Port: One Serial Port or one USB Port (with adapter)

CD Drive: One CD or DVD drive required for software installation.

Quick Start: Get Up and Running in a Few Minutes!

The Quick Start applies to both the ELITE*pro* and the DATA*pro* though the example given below is for an ELITE*pro*. Where the DATA*pro* differs significantly, a note in curly brackets { } is shown.

Important: To set up the ELITE*pro* or DATA*pro* Logger for ANY monitoring, session four things must be done:

- 1. Current Transformers (CTs) must be connected to one or more of the channel inputs (unless doing voltage-only measurements); {DATA*pro* —connect any appropriate sensor}**
- 2. Line Voltage connections must be made for *any* voltage *or* power measurements (but not for current only measurement); {DATA*pro*—not applicable}**
- 3. A Setup Table that tells the Logger *how* and *what* to measure must be created and loaded into the Logger**
- 4. Data Logging must be turned "ON"**

This section will get you up and running quickly with your new Logger. You will learn how to set up a **Single Phase, 2 Wire** power measurement session using the ELITE*pro* Logger and ELOG software.

If you want to connect the ELITE*pro* to a load, see the section *Power Measurements, 1 Phase 2 Wire* for how to properly wire the current transformer (CT) and AC voltage input to the load. This Quick Start chapter assumes the CT and AC input are already connected to the load.

TECH TIP: To complete this Quick Start you do not need to have the ELITE*pro* Logger connected to an actual load. You can do a mock setup at your desk just to get a feel for how the computer software and logger work.

Connecting Current Transformers



Connect the CT to the green (Phoenix) connector on the logger end panel. Use the left-most pair of connections which is channel one. The high (+) wire of the CT (the white, banded or numbered wire depending on CT type) should go to the left screw terminal of each channel input. The low (-) CT wire (the black or unbanded wire) should go into the right screw terminal of the channel input. See also the introduction to *Connecting Sensors and Configuring Channels* on page 5.

Setting up the Logger using a Computer


Install Software: ELOG 2009™

1. Place the ELOG CD into the appropriate drive.
2. The CD will auto-run when inserted into your computer. Answer the questions on the screen.

Setting up an ELITEpro™ for a Single Phase, 2 Wire Load

1. Double click on the ELOG 2009 shortcut on the PC Desktop
(Note: ELOG 2009™ works with Windows 2000, XP and Vista, but *not* older versions of Windows)
2. With the ELOG 2009™ application open, click on **File**, then **New > Setup Table File > OK**
3. At **Select a Setup Table Type** choose the type of Logger: ELITEpro™ (4 Channel) and click **OK**
4. Set **Integration Period** to 1 Minute (or other as desired)
5. Set the **Line Frequency** to 50 or 60 Hz as appropriate
6. (Optional) Under the **Setup Table Description**, type "Quick Start Setup," Click the  button
7. Next click on the Single Phase Two Wire speed button: 
8. Enter the current transformer (CT) value corresponding to the CT chosen. The CT value is the maximum input (primary) rating of the CT in amperes and is printed on the CT, then click **OK**.
9. (Optional) Select **Name** with mouse, then type "110V Load"
10. Click anywhere in the white box under **Volts** button, and then choose **A-Average** or other parameters to be recorded as desired.
11. Repeat the selection for **Amps**, **kW** (kilowatts), **kVA** (kilovolt-amps), **PF** (power factor), and **kVAR** (kilovolt-amps reactive). You can choose any combination of values to record: Average, Minimum, Maximum, and Integrated average (e.g., kWh). You may need to use the scroll bar at the bottom of the screen to access power factor (PF) and kVAR.
12. Use **File > Save As** to save the Setup Table to the computer hard drive, name the table "Sample"

Downloading the Setup Table into the Logger

1. Connect the null modem, RS-232 cable into the serial port on your computer. Then connect the other end of the cable into the DB 9-pin connector on the logger that is labeled RS-232. (See the Application Notes for tips on using a USB port.)
2. From the software main menu, select **Logger > Communication > Direct Connect (Null Modem Cable)**.
3. The connect message should appear. If it does not, click on **Tool > PC Setup...** and change the Direct Connect variables as appropriate. The most frequent problem is that the wrong communication port (Com 1, Com 2...) or baud rate (1200, 2400,...) is specified. See also the *Most Commonly Asked Questions* section of this manual.
4. After connecting to the logger, click on the  button.

5. Select **Overwrite ACTIVE Table**.

ELOG 2009™ automatically initiates logging when a Setup Table is downloaded to the Logger. At the prompt select: **Continue Logging**.

6. You are now collecting data!
7. Use **Logger > Display Present Readings > Show As Text** to view the real-time values being measured by the Logger.

Note: *When the logger is not in use, Data Logging should be turned off to conserve the battery.*

Retrieving and Viewing the Data

1. Allow the logger to collect several minutes of data.
2. If the PC is still connected to the logger with the serial cable, click on **Logger > Retrieve Data...**
3. ELOG will ask you to save the data and will assign a filename and a default directory. If you wish, make any necessary changes. Otherwise, click Save.
4. The downloaded data will appear automatically.
5. Use **Data > Data File Summary** to view a text summary of the data.
6. Use the **Data > Create New Graph...** command to make graphs of the data as desired.

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SECTION 1

SETTING UP AND USING THE ELITE^{pro}TM and DATA^{pro}TM LOGGERS

Introduction

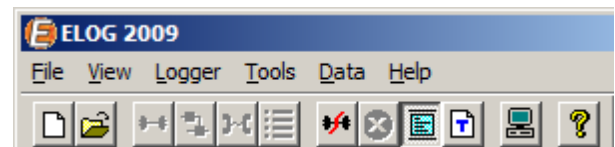
The ELITE^{pro} and DATA^{pro} instruments are interval data recorders that can be used to measure and record a wide variety of physical parameters (volts, watts, temperature, 4-20 mA and more). Despite their small size and relatively low-cost, these instruments are very sophisticated, accurate and versatile.

The measurements are stored in on-board memory in a time series format, or time bins, at an interval selected by the user. The time bins can be as short as every 3 seconds or as long as every 24 hours. Regardless of the storage interval selected, the logger is sampling its sensors every three seconds when on external power from the included wall transformer or every minute when using its internal battery. These readings are then used to determine the average (or maximum or minimum) value that is stored in each time bin.

The Loggers require a computer (PC) and special software (ELOG) for initial setup and later data retrieval and analysis. To use the ELOG software it must first be installed on your computer. Do this by putting the CD into the appropriate drive. The CD is auto-loading; follow the directions on the screen.

When the ELOG software is run, the MAIN MENU will appear which consists of one line of standard Windows menus structures and a lower line of "hot buttons" that can access many of the most commonly used software functions with just one click of the mouse.

MAIN MENU



Step 1: Communicating with the Logger — Direct Serial Connection

Since the ELITE^{pro} and DATA^{pro} Loggers have no direct user interface on them, all communication must happen through a PC using either the serial port on the logger or through the internal modem, if equipped. If desired, a USB port on your PC may also be used. See the **Application Notes** for a description.

If equipped with a modem, see the section *Remote Communication Via Telephone* at the end of this chapter for more details on using modems.


If communication is over an Ethernet LAN, see the section *Communication Via Local Area Network (Ethernet)* also at the end of this chapter.

To make a direct connection from the PC to the logger, use the supplied **null modem cable** to connect from the logger's serial port (a DB-9 connector) to the serial port on the PC. If necessary, use a 9 to 25 pin adapter on the PC.

TECH TIP: Most communication problems are a result of ELOG trying to communicate with the logger at the wrong speed or from the wrong computer port. Use Tools > PC Setup to change these values.

Start the ELOG software and select **Tools > PC Setup...** from the menu. A screen similar to the one below will appear:

In the lower left-hand box, **Direct Connect**, configure the computer serial connection. Verify that the com port corresponding to where the serial cable is connected on the PC is selected (for example, COM 1, 2, 3...) and that the baud rate is set to that of the logger.



TECH TIP: Quickly set up the PC by clicking on the  **PC Setup** button on the screen.

The default baud rate for the loggers is 57600. ELOG does have an automatic baud search feature, which it will use if the first connection attempt does not succeed.

After configuring the PC, use **Logger > Communication > Direct Connect (Null Modem Cable)** to connect the PC to the logger.

A connect message similar to the one below will appear on the bottom of the screen:

Use **Logger > Connection > Terminate Connection** to end the communication with the logger.

TECH TIP: To quickly connect, use the  **Direct Connect** hot button on the screen and use the  **Disconnect** hot button to disconnect from the logger.

Step 2: Setting Up The Logger For A Metering Session

"Setup Table" is the name given to the file that is used to configure the Logger for a monitoring session. The **ELITEpro** and **DATApro** Loggers are very flexible meters that can monitor a wide variety of parameters using a large number of different sensors {**DATApros**} and over a wide range of currents, voltages and service types {**ELITEpro**}. A meter that is this flexible must be "told" how the operator wants it to be used, what it is to record, and at what intervals. The file that contains this information is called a Setup Table.

Setup Tables are created on the PC and then stored on the hard disk (or floppy disk) with a .sut file name extension. From there they may be stored in the Logger immediately or at a later time (but prior to beginning the monitoring session). Once created, a Setup Table may be stored on the PC hard disk and sent into any number of loggers. Setup Tables may also be retrieved from a Logger, modified if desired, saved or resent to the logger.

TECH TIP: It is usually best to communicate at the highest baud rate possible. For a direct or network connection, that is 57600 baud. If the logger is not already set to 57600, use the menu item **Logger; Logger Baud Rate...** to change the logger to 57600. You will then be prompted to update the PC baud rate as well. Click **Match Baud Rates**.

New and saved (on the PC) Setup Tables are accessed through the **File > New** or **File > Open** commands respectively. To access a Setup Table in a logger, first connect the PC to the logger as described above and then use the menu command **Logger > Retrieve Logger Setup Table** to view, edit, save to disk or resend to the logger after modifying.

When using **File > New** or **File > Open** the first window asks what kind of file you want to open or create. Choose **Setup Table File**, then **OK**.

Creating a New Setup Table: The ELOG software works with a variety of DENT Instruments products (including **ELITEpro** and **DATApro** Loggers). When creating a new Setup Table, the software first asks for what device. If the logger type you wish to configure is not shown in the window, use the arrow key to open the drop-down box and select the correct logger type. If you are currently connected to a logger, the software will assume that you want to create a Setup Table for *that device and will not prompt you for a logger type*. Selecting **New** will bring a Setup Table with default parameters as described below.

Opening an Existing Setup Table:

After clicking on **File > Open** and selecting **Setup Table File**, a folder window will appear from which you may navigate to find the Setup Table you desire. The default folder is set from the **Tools > PC Setup** menu.

The Setup Table consists of two "pages" that are accessed by clicking on the **Back** or **Next** buttons located in the "hot button" line at the top of the screen or by using **Ctrl + Page Up** or **Ctrl + Page Down**.

The screenshot shows the 'STable1' configuration window. At the top, there are three buttons: 'Back', 'Next', and 'Send to Logger'. The window is divided into several sections. On the left, 'Setup Table Device Type' is set to 'ELITEpro', and 'Line Frequency' is set to '60 Hz'. On the right, 'Setup Table Description' is empty, and 'Integration Period' is set to '15 Minutes'. Below these, there are two main sections: 'Logging' and 'Calculated Days Until Memory Exhausted'. The 'Logging' section has 'Start' set to 'Immediately' (with date and time pickers for 02/05/03 and 15:31:00) and 'Stop' set to 'Never (Ring Memory)' (with date and time pickers for 02/05/03 and 15:31:00). The 'Calculated Days Until Memory Exhausted' section shows 'Standard Memory Option' as 426 Days 15.92 Hours and 'High Memory Option' as 1777 Days 18.58 Hours.

Page 1, LOGGER SETUP: *This page allows you to define generic Logger attributes.*

Setup Table File Name: (Stable1 in this example) The Table name is not editable from this menu but may be changed when the Table is saved to the hard disk using either the **Save** (first time) or **Save As** buttons.

Setup Table Device Type: This shows what type of Logger for which the table was configured (**ELITEpro**, **DATApro 1T/3P**, etc.). It is also not editable and is determined when the setup table type is selected.

Setup Table Description: (Optional) User-defined description of the Setup Table (20 character limit). This is helpful for the user to identify different Setup Tables.

Line Frequency: 60 Hz or 50/400 Hz. Default is 60 Hz. (Note: this field does not appear with all logger types)

Integration Period: This tells the logger at what time intervals data is to be stored in the memory. For example, if the integration period is set for 30 minutes and average watts is being monitored, then every 30 minutes the logger will record in its memory the average power use (watts) for that channel over the preceding 30 minute interval, based on about 600 measurements of the monitored power draw. If Maximum (and/or Minimum) values are being recorded the highest (and/or lowest) of those 600 readings will also be saved.

The default integration period is fifteen minutes. The choices are 3, 15, 30 seconds, 1, 2, 5, 10, 15, 20 and 30 minutes, 1, 12 and 24 hours.

LOGGING

This feature controls when the logger will begin collecting data and when it will stop. The default values are start logging immediately (as soon as the setup table is sent to the logger) and to stop logging never.

Logging Stop: Never (Ring Memory) means the memory is set in a "Ring" or continuous loop. When the memory fills, the oldest records will be replaced with the newest records. This is also called circular memory. It is most useful for long term metering projects.

Logging Stop: When Memory Is Full may also be set to stop logging when the logger memory fills, this is "Linear" memory and is also known as "stop when full."

Delayed Logging Start/Stop: Another option is to set the recorder to start and/or stop logging at a future date and time. Click the button next to the delayed start or stop and enter the date and time desired. Times should be set in a 24 hour format, e.g., 2:30 pm should be entered as 14:30.

CALCULATED DAYS UNTIL MEMORY EXHAUSTED


ELOG provides a convenient feature that calculates the length of time required to fill the memory for any setup table. The feature is dynamic so that any time any parameter in setup table affecting the memory duration is changed, then the Calculated Days Until Memory Exhausted is updated. This allows the operator to know in advance how long the memory will last. You can also check whether your instrument is a Standard or High Memory model. See instructions on Page 111.

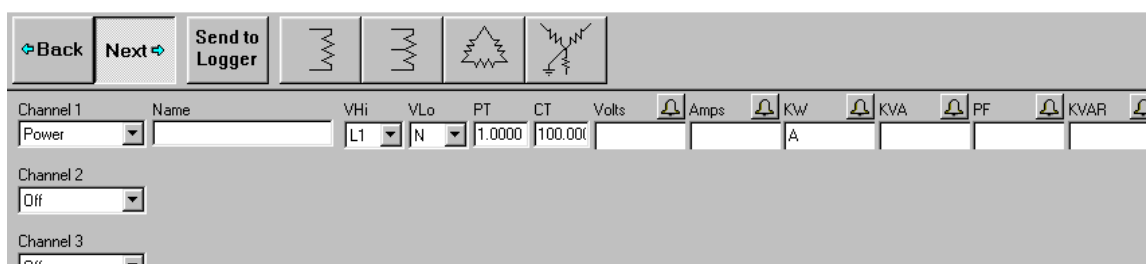
Select  with your mouse or use the Page Down key to go to the next screen.

Page 2, CHANNEL SETUP:

The **ELITEpro** and **DATApro** Loggers have four configurable hardware channels corresponding to the current transformers {**ELITEpro**} or other sensors {**DATApro**}. The second page is different for the two kinds of loggers and described separately below.

ELITEpro CHANNEL SETUP: Any combination of volts (V), amps (A), power (kW), volt-amps (kVA), volt-amps-reactive (kVAR), and power factor can be recorded for each power channel. See the specific sections of *CONNECTING SENSORS AND CONFIGURING CHANNELS: Power Measurements* for how to properly configure the Setup Table for single-phase, 3-phase 3-wire, 3-phase 4-wire services.

Click on the  by each channel and then click **Power** to turn on each channel as desired. These channels refer to the current transformer inputs {**ELITEpro**} or sensor inputs {**DATApro**}. It is usually helpful to click on the maximize button in the upper right hand corner of the Setup Table window.



Channel	Name	VHi	VLo	PT	CT	Volts	Amps	KW	KVA	PF	KVAR
Channel 1	Power	L1	N	1.0000	100.00			A			
Channel 2	Off										
Channel 3	Off										

Configuring a Power Channel

When configuring the power channel, the following options can be set:

- Name:** (Optional) Name the channel so it best describes the location or item being monitored, such as "Water Heater" or "Pump L1 Phase" (20 characters maximum).
- VHi:** High-side voltage. This is the "high" voltage that will be measured with respect to the reference "low" voltage (VLo). Choices are: L1, L2, L3, Neutral.
- VLo:** Low-side voltage; reference for AC voltage. Choices are: L1, L2, L3, Neutral.
- PT:** Potential Transformer turns ratio. This is used when a step-down transformer is needed to measure AC voltages greater than 600V. The default is 1.000. See *Monitoring Voltages Greater Than 600V* for use of this parameter.
- CT:** The primary current rating of the current transformer. The default is 100 amps. The value to be used is printed on the CT.
- Volts, Amps, KW, KVA, PF, and KVAR:** To record any or all of these values, use the mouse to select the Average, Minimum, Maximum, integrated hourly value and/or Instantaneous recording flags. To access KW, PF, KVAR and the Notes, if not shown on the screen, use the mouse to click on the right arrow of the scroll bar at the bottom of the screen.
- Notes:** (Optional) 80 characters for notes.



(Optional) Sets high and low alarm conditions. See also, the section on Alarms

Power Summation Channels: Channels 5 and 6 are called *Power Summation Channels*. They combine the data from 2 or more power channels (also called "hardware" or "physical channels") and are used primarily for calculating *total system* volts, amps, kW, kVA, power factor, and kVAR in polyphase or multiple single phase systems. Channel 5 *automatically* appears when 2 power channels are turned "on." When 3 or 4 power channels are turned "on," Channel 6 will also *automatically* appear in the setup table.

TECH TIP: If only 1 power channel is turned on, then Channels 5 and 6 will **not** appear on the computer screen. If 2 power channels are turned on, then only Channel 5 will appear.

The Power Summation Channels are most often used to record total system power parameters on three phase loads. They may also be used to optimize the memory of the Logger. Instead of collecting data from two (or more) separate channels, the Power Summation Channel(s) can be configured to collect *and* combine the data from 2 or more channels.

To combine channels and maximize memory use, turn off all of the recording flags for the individual hardware channels (Volts, Amps, kW, kVA, PF, and kVAR). Default recording flags are Average Watts. At the Power Summation Channel, select the channels to be added in the **Combine Channels** box and then set the recording flags as desired.


Example Setup Table for a 3-phase 4-wire (Wye) connected load using Power Summation Channels to optimize Logger Memory.



Use the speed button on the second page of the Setup Table to quickly create the 3-phase 4-wire setup. At the prompt, enter the size (primary current rating) of the three CTs that will be used. The following setup table will be created:

Channel	Name	VHi	VLo	PT	CT	Volts	Amps	KW	KVA
Channel 1	Power	L1	N	1.0000	100.000				
Channel 2	Power	L2	N	1.0000	100.000				
Channel 3	Power	L3	N	1.0000	100.000				
Channel 4	Off								
Channel 5	Power Sum	Combine Channels 1,2,3						A	


NOTE: To view PF, kVAR, and Channel Notes to the right of the screen, use the scroll bar at the bottom.

When finished with the channel definition page of the Setup Table, use the button  to send the Setup Table to the logger and make it the active table. You may also use **File > Save** (to disk), or **Save As** (to disk with a different name or folder) if you also desire to keep the Setup Table on the PC. Once sent to the logger, it may also be retrieved, edited or saved using **Logger > Retrieve Logger Setup Tables**.

TECH TIP: If a standard setup table is created using one of the speed buttons, then a new speed button appears. This button, when clicked will produce a schematic image of how to connect the ELITEpro to a load. It can be printed and carried into the field for easy reference during installation.

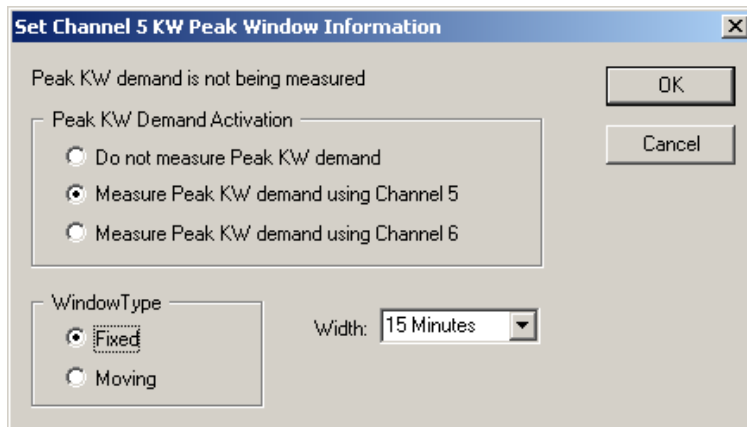


KWh, kVAh, and kVARh Totalizer Registers {ELITEpro only}: Whenever any recording flag (Average, Minimum, Maximum, or Total) for any parameter (kW, kVA, or kVAR) is turned on for channels 5 or 6 then the totalizer (cumulative kWh, kVAh, and kVARh) for that channel and that parameter is also active. The Peak kW Demand and Totalizer registers apply only to summation channels 5 and 6. The values are shown in the Data File Summary which is generated from a downloaded data file. See also the description of Data File Summary in the Data section.

Peak kW Demand Register: The Peak kW Demand Register is set by clicking on the “peak” symbol, , shown in the Channel 5 & 6 kW recording flag area. A new window then opens to set the desired Peak kW options.

Only one channel of Peak kW Demand can be set at a time. Either Channel 5 or Channel 6 but not both.

TECH TIP: For single phase loads set channel 5 to be the “sum” of channel 1 only (or other single channel) to get Peak kW Demand.



The Peak kW offers two types of “Windows,” Fixed and Moving. A fixed demand window means that the window occurs at the same place within the hour. For example, a 15 minute demand window would always have a time stamp of xx:00, or xx:15, or xx:30, or xx:45.

A Moving demand window, in contrast, could be any rolling 15 minute (for example) period in the hour. So, the Moving window can have a time stamp of xx:00, xx:01, xx:02, xx:03, ...xx:59.

Note: The time stamp associated with a Peak kW Demand in the Data File Summary is the beginning time of the peak period.

What is the difference? The Moving window is more accurate than the fixed. For example, a peak 15 minute demand may actually occur over a period that spans 6 minutes before the hour to 9 minutes after the hour. A fixed window would “split” that demand over the xx:45 and the xx:00 periods and report whichever is highest. The moving window would accurately capture the true 15 minute peak. The moving window Peak kW Demand is almost always larger than the Fixed window Peak kW.

Why use one type over the other? The Moving window is more accurate than the Fixed window and also better replicates the kW Peak as indicated by older style thermal demand meters. However, many modern electronic meters do not have the capability to measure Peak kW Demand with a moving window. If it is desired that the ELITEpro data be compared to a utility meter, the ELITEpro can be set to match whichever method the utility meter uses.

The width of the Peak kW Demand window is also selectable. There are 12 choices available from 1 minute to 60 minutes. The most common demand interval is 15 minutes and that is the ELOG default setting.

Note: The width of the Peak kW Demand window is independent of the Integration interval. For example, the ELITEpro could be set to a 1 hour integration interval but still record the highest 15 minute demand.


DATApro CHANNEL SETUP

All **DATApros** have 4 input channels and come in a variety of dedicated “flavors.” Currently available models include the:

1T/3P	(1 temperature measurement channel and 3 pulse counters)
2T/2P	(2 temperature and 2 pulse counters)
4T	(4, Temperature Channels)
4C	(4, AC current measurements)
4M	(4, 0-25 ma or 4-20 ma inputs)
4V	(4, 0-10Vdc inputs)
4P	(4, pulse counters)

Consult with DENT Instruments for availability of other types of **DATApros**.

A variety of parameters can be monitored with the **DATApros** including pulse counting from pulse initiating meters (gas, electric, water, steam), temperature, AC current, and process signals such as 4-20 mA and 0-5 or 0-10 Vdc. See also the section **DATApro: CONNECTING SENSORS AND CONFIGURING CHANNELS**.

Click on the  by each channel in the Setup Table and then the sensor type (Temperature, 4-20mA and so on) to turn on each channel as desired.

Examples of the “Page 2” of the **DATApro** Setup Tables are shown below.

For Temperature and Pulse Loggers (Models 1T/3P, 2T/3P, 4T, and 4P)

Channel 1	Name	Slope	Offset	Units	Record	Channel 1 Notes
Temperature	Sample Temperature	1.0000	0.0000	Fahrenheit	A	
Channel 2	Name	Sensor	Scale	Units	Record	Channel 2 Notes
Contact/Pulse	Sample Pulse Counter		1.0000		C	

TECH TIP: It is usually helpful to click on the maximize button in the upper right hand corner of the Setup Table window.

For 4-20 and 0-25 mA Loggers (Model 4M)

Channel 1	Name	Sensor	Slope	Offset	Units	Record	Channel 1 Notes
4 - 20mA	4-20 mA Sensor		1.0000	0.0000	Units	A	
Channel 2	Name	Sensor	Slope	Offset	Units	Record	Channel 2 Notes
0 - 25mA	0-25 mA Sensor		1.0000	0.0000	Units	A	

For AC Current Loggers (Model 4C)

Channel 1	Name	CT	Record	Channel 1 Notes
Current	AC Current	100.00	A	

For DC Voltage Loggers (Model 4V)

Channel 1	Name	Sensor	Slope	Offset	Units	Record	Channel 1 Notes
0 - 10Vdc	0-10 Vdc Sensor	Any	1.0000	0.0000	VoltsDC	A	

Configuring a DATApro™ Channel

When configuring the power channel, the following options can be set:

Name: (Optional) Name the channel so it best describes the location or item being monitored, such as "Water Temperature" or "Pump L1 Phase" (20 characters maximum).

Slope: When scaling is required to convert raw sensor output (such as millivolts) into engineering units (such as pressure) slope and offset may be used. [Not on Pulse or CT channels]

Offset: Used with Slope to scale the raw sensor output into engineering units. [Not on Pulse or CT channels]

Scale: Scale factor for pulse channels to convert raw pulses into engineering units. [Pulse channels only]

Units: (Optional) Use this field to specify the engineering units that will appear as a column heading with the data.

CT: The primary current rating of the current transformer. The default is 100 amps. The value to be used is printed on the CT. {DATApro 4C only}

Record: To record any or all of these values, use the mouse to select the Average, Minimum, Maximum, Integrated hourly value {4C} or Instantaneous recording flags.

Notes: (Optional) 80 characters for notes.



Sets high and low alarm conditions. See also, the section on Alarms

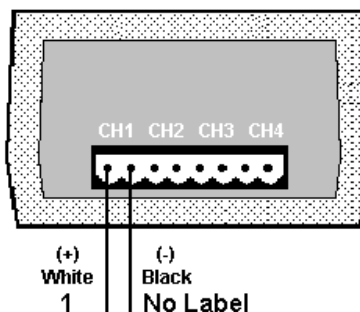
See also Section 4, **DATApro CONNECTING SENSORS AND CONFIGURING CHANNELS** for more information on using the DATApros.

Step 3: Connecting the ELITEpro™ To a Load

This section is intended to provide a brief overview. See also Section 3, **ELITEpro: CONNECTING SENSORS AND CONFIGURING CHANNELS** for a more detailed treatment.

CAUTION: THIS LOGGER MAY CONTAIN LIFE THREATENING VOLTAGES. QUALIFIED PERSONNEL MUST DISCONNECT ALL HIGH VOLTAGE WIRING BEFORE USING OR SERVICING THE LOGGER. OBSERVE ALL CAUTION AND WARNINGS DESCRIBED IN THE SAFETY SECTION AT THE BEGINNING OF THIS MANUAL.

After storing a Setup Table into the logger it may be connected to a load for measurement. First connect the Current Transformers (CTs) to the appropriate channels on the Logger. **ELITEpros** use CTs with stripped and tinned, bare terminated wires. The CT leads need to be connected to the green Phoenix termination block as shown in the diagram below using a small screwdriver:



Each channel consists of two terminals or pins. For each channel, the left connector pin is the positive or high-side wire and the right pin is the negative or low-side. When using DENT Instrument supplied current transformers, connect them as follows:

Split-core CTs (removable leg)—The white CT wire is (+) and the black wire is (-).

Clamp-on CTs (clothes-pin type)—The banded wire with a number one (1) is the (+) wire and the unbanded wire is (-).

Next connect the CTs to the phases being monitored. Be careful to observe proper CT orientation. If an arrow is shown on the CT label, it should be pointed towards the load. Otherwise, use the instructions printed on the CT.

NOTE: Correct polarity is required to insure proper phasing of the CT.

If equipped with an external wall transformer, connect it next.

Lastly, connect the voltage leads to the different phases. Connect the White, Neutral wire, first then the remaining voltage sense (phase) wires.

ELITEpro™ and DATApro™

Turning Logging (data collection) On and Off: When a Setup Table is stored in a logger, data logging automatically begins unless canceled by the user or the delayed logging start feature is used. At any other time, logging may be turned on or off by use of the Logger; Logging ON/OFF... menu command. When logging is on, the green LED on the logger end-panel should flash every 5 seconds.

TECH TIP: When not in use, Logging should be turned off to extend the battery life.

Clearing Logger Memory: Use the menu command Logger > Clear Logger Memory... to reset the logger memory before a monitoring session.

Setting the Logger's Real Time Clock: The ELITEpro logger has an internal, crystal-controlled real-time clock. To set the clock's date and time, use the menu command Logger > Logger Clock. You may set the clock manually or have it automatically synchronized to the PC's internal clock.

NOTE: The logger clock can only be set using a MM/DD/YY HH:MM:SS format and uses a 24 hour (military) format. For example, 6 pm should be represented as 18:00. Entering 6 for the hour is interpreted as 06:00

Editing The Logger Description Line: The logger has the provision for an optional 20-character description that stays in the logger. The description line is often used to identify a logger, the logger location or the load the logger is monitoring. Use Logger > Edit Logger Description Line to change the description.

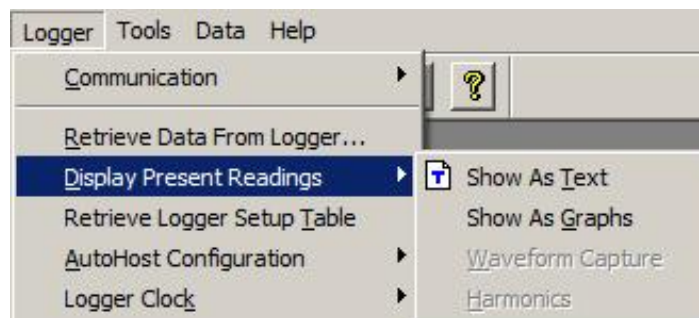
Step 4: Verifying Installation and Viewing Data In Real Time

Viewing Data In Real Time includes viewing the parameters that may be recorded such as temperature, volts, amps, kW, kVAR, kVA, and power factor. With the **ELITEpro**, it is also possible to view the actual voltage, current and power waveforms as well as the harmonic values out to the 63rd order and Total Harmonic Distortion (THD), Crest Factor, and Peak Value.

Viewing Recorded Parameters

The recorded parameters may be viewed in either a graphical or text format. Graphical is most useful for watching long-term trends of a single parameter. The graphical format can be thought of as an electronic, paperless chart recorder. The text format is most useful for viewing all parameters measured by the logger (even those not being recorded) and is often used for verifying proper installation of the logger.

After connecting the logger to a load, it is often useful to look at the parameters the logger is measuring. Connect a PC to the logger serial port and establish a direct connection. Then, using **Logger > Display Present Readings**, the current values on the logger inputs can be seen through one of four choices.



Show As Text: When this option is selected, a screen similar to the one below is shown {**ELITEpro**}. All of the channels that are turned on are displayed simultaneously. If the parameter is being recorded by the logger, it will be shaded green, as are the kW values shown on the following page. For a Power Channel, that means you will be able to see all six power parameters (V, A, kW, kVA, PF, and kVAR) even if only one of the parameters is being recorded. For a **DATapro** channel there is only one column of data displayed and up to four rows (one for each channel).

This feature is very useful for verifying correct installation of the Logger.

Instantaneous Channel Values

Serial Number: E7C39 Description: DENT ELITEpro Logger EPROM Ver: IL400.064

CH	Channel Type	Channel Values					
1	POWER	117.8 V	598.82 A	70.563 kW	70.570 kVA	1.00 PF	-1.351 kVAR
2	Off						
3	Off						
4	Off						

Line Frequency: 60.0 Hz ■ = Parameter Logged ■ = Parameter Alarm Display Update: ON

Memory Remaining: 536.97 Days Battery State: OK Logger Date: 04/23/09 Logging Is: Off Sampling

Memory Used: 0.0% Battery Volts: 3.55 V Logger Time: 16:44:29 Memory Type: Ring Integration Period: 15 Minutes Exit

This screen provides information about:

- The real-time data (which can be paused for cross-channel comparisons)
- The Line Frequency as measured from Channel 1 on L1
- How many days the memory has remaining before filling
- The logger battery condition (and if equipped, internal modem battery)
- The logger clock's current date and time
- Whether or not the data logging is turned on
- How much memory has been used
- Type of memory: Linear (Stop When Full) or Ring (Continuous)
- The integration period
- If a measurement is an alarm condition

TECH TIP: {ELITEpro or DATApro 4C} If no current transformer is connected to a channel that is turned "on," nonzero readings will be displayed. You can use this feature to verify a current transformer connection. If the CT is connected but shows a "0" for a value, then the CT is probably connected but the monitored load is turned off. On the other hand if a constant (usually unreasonably high) value for current is displayed, a CT wire may have come off of the logger.

Use Display Present Readings To Verify Correct Installation

The Display Present Readings feature may also be used to verify the proper installation of the logger. This is particularly important for the **ELITEpros** where the number of CT and voltage connections increases the chance of an incorrect connection. Using the **Display Present Readings > Show As Text** command, all measured parameters, whether being recorded or not, are displayed. Look for wattages (including sign) and power factor that makes sense.

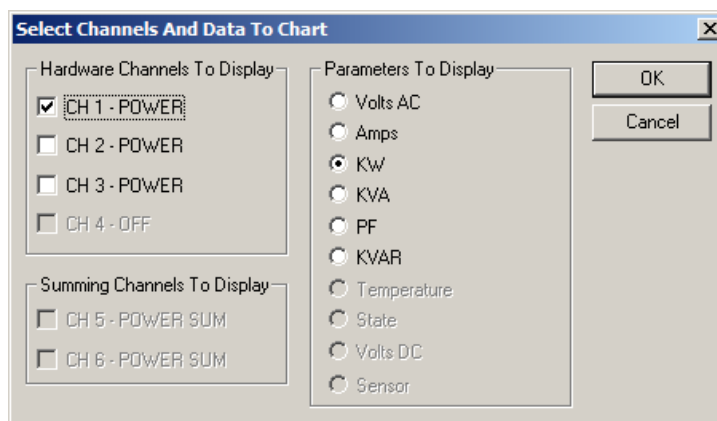
For example, in a single phase 2- or 3-wire or three phase 4-wire installation, the kW reading for each channel and any Power Sum channels should be positive. A negative kW reading usually implies that a CT is placed backward on the wire. It may also mean that the load being measured is actually *supplying* electricity, as from a generator. This is often seen in solar and wind generator systems or where there are backup generators.

TECH TIP: For three phase 3-wire systems when using the two watt-element monitoring approach, a negative kW on any phase may not be a problem. If the three phase system's average power factor is less than 0.66, then the kW on one of the phases will be negative. This is normal. In this case, the combined channel (5 or 6) total kW should still be positive.

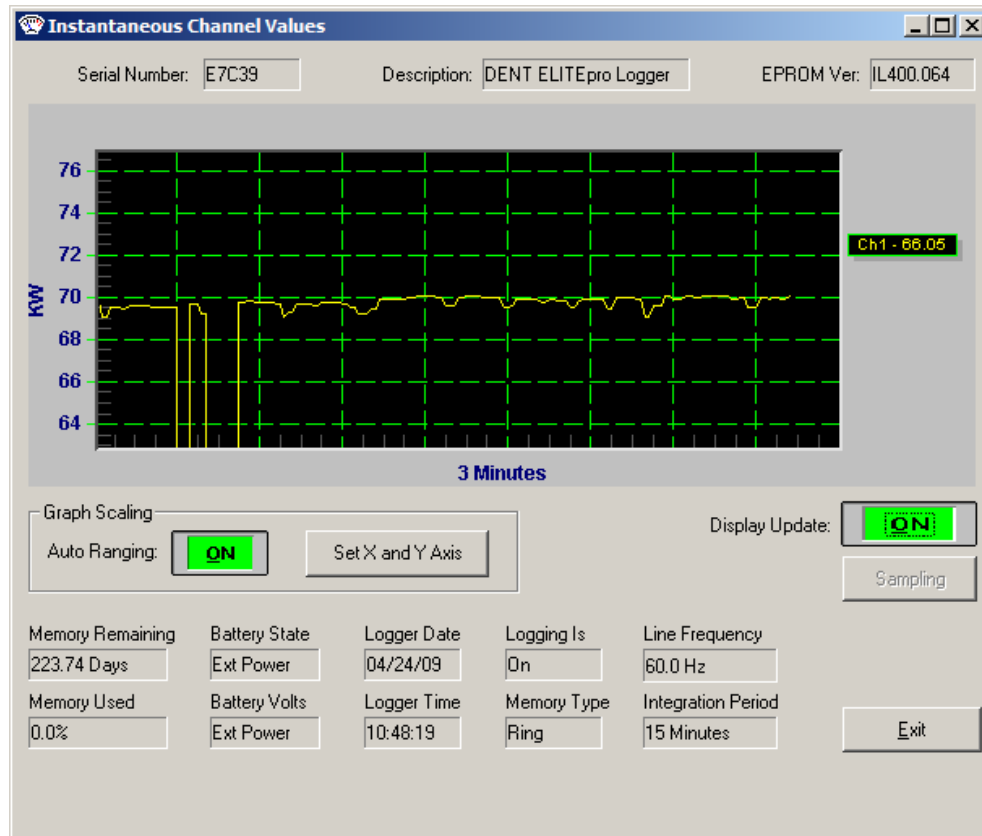
Also look at the power factor readings. These numbers phase and total for 2 and 3-wire single phase systems and all 4-wire systems should be a reasonable number. Reasonable depends on the load being monitored but typically .8 – 1.0 is seen. For 3 phase 3-wire systems, the channel 5 or 6 total power factor should also be a reasonable number.

Discerning a problem through power factor measurement alone is difficult as a load that is dominated by unloaded motors can have power factors below 0.6. Usually, power factor readings below 0.4 indicate the voltage lead is not connected to the same phase that the CT is connected to.

Show As Graphs: This feature is similar to the text version described above but shows the data in a graphical format. After selecting this option, a screen such as the one following appears. Among the hardware channels to display will be all of the channels that are currently turned on in the logger. Selecting one or more Hardware Channels makes the **Parameters To Display** panel active and you may choose one variable to graph. You can only choose one variable at a time unlike the text option where you will see all parameters displayed simultaneously. This is because of differences in scaling and to reduce clutter on the graph. For example, you could display kW from 4 channels simultaneously but not kW and KVAR even if from the same channel.



After selecting **OK**, a graph similar to the following appears:

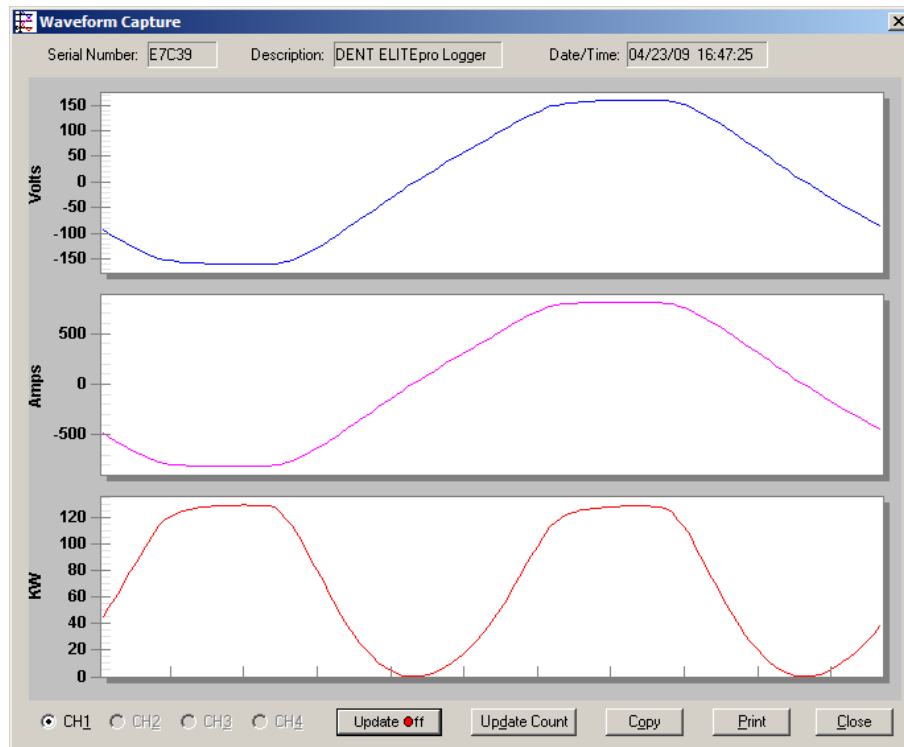


This graphical presentation is very similar to paper strip chart recorders. The graph begins on the left edge and moves to the right. Upon reaching the right edge, the whole graph scrolls to the left with each new reading so that the most current data values are always shown and the older points slide off the left edge. By using the **Set X** feature, the amount of data shown can be varied from 1 second to more than 18 hours (65 000 seconds). Keep in mind that the X-axis scaling is only approximate.

The **Set X** and **Set Y** features can be used to set the scaling, colors, and line type (e.g., linear or logarithmic) and the number of grid lines that overlay the graph.

Viewing Voltage and Current Waveforms {ELITE_{pro} only}

Use the software command **Logger > Display Present Readings > Waveform Capture** to see the actual current, voltage and power waveform. A typical display is shown next:

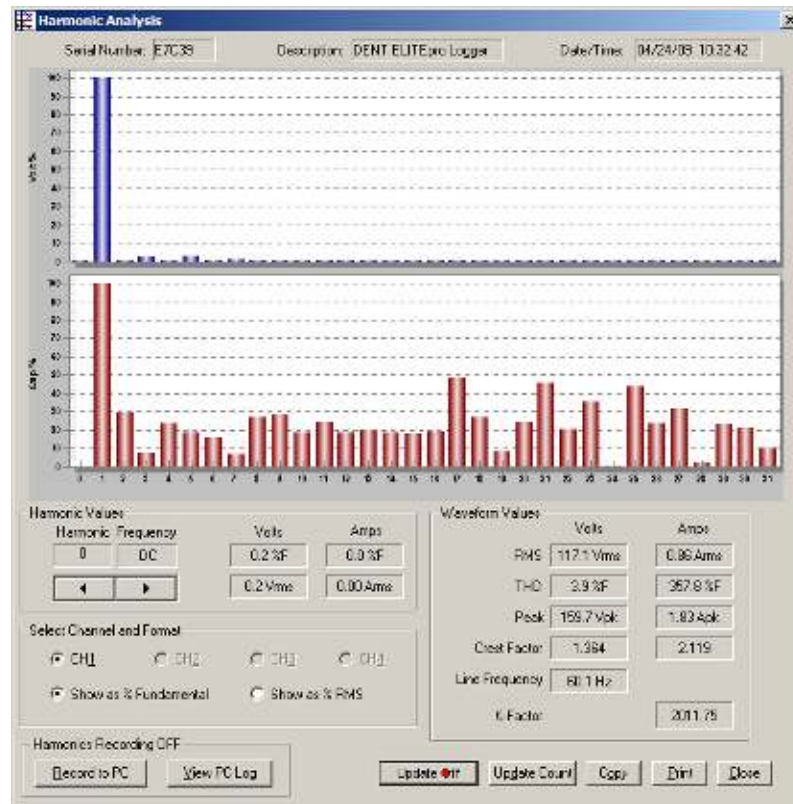


The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. The image presented is a single snapshot in time. Use the **Update** button for additional views. Copy will capture the image onto the clipboard for pasting into other programs.



Note: The waveform image displayed shows a distorted (current) waveform from a household lamp. See also the graph on the next page.

Viewing Harmonics {ELITEpro only}

Use the software command **Logger > Display Present Readings > Harmonics** to see the actual current, voltage and power waveform. A typical display is shown next:



The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. This screen includes a good deal of information. The voltage and current harmonics are presented graphically in the upper part of the window. The ordinate (y-axis) is scaled in percent of the fundamental. The abscissa (x-axis) is the harmonic. Both even and odd harmonics are shown.

The actual value of the voltage and current for each harmonic may be found in the Harmonic Values box. By clicking on the   buttons, higher or lower order harmonics may be selected. The Waveform Values box provides summary statistics for the overall current and voltage waveforms. This includes the RMS value, Total Harmonic Distortion (THD), Peak values, Crest Factor and K-Factor.

Note: The individual harmonic values and THD can be shown as a percentage of the fundamental (IEEE Standard 1035-1989) or as a percentage of the total RMS value (CSA and IEC standard).

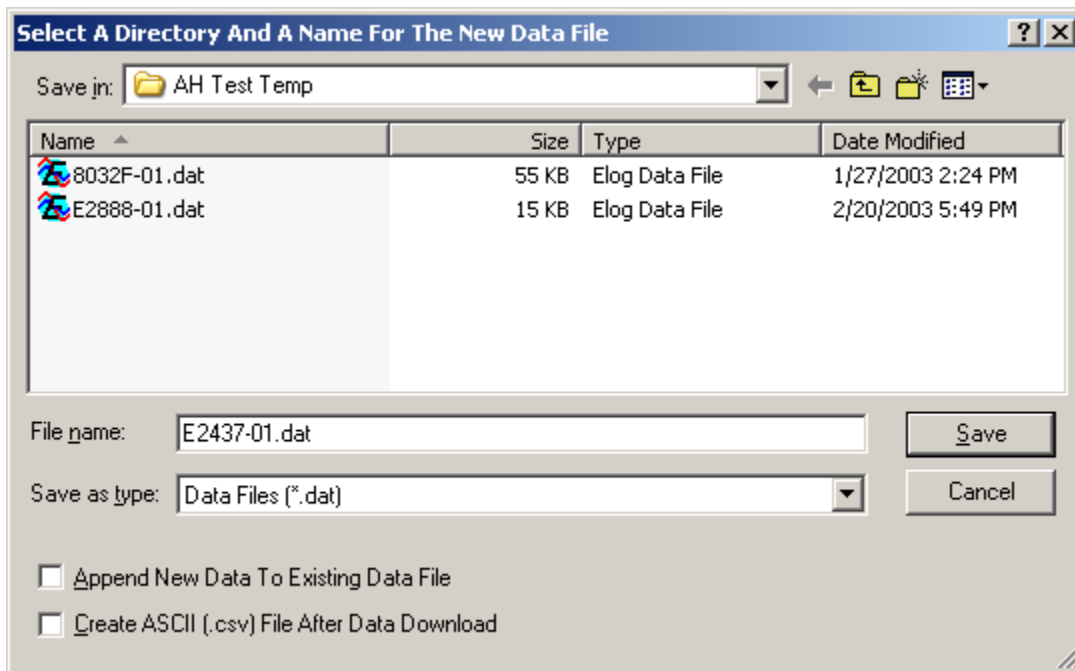
The image presented is a single waveform snapshot. Use the **Update** button for additional views. **Copy** will capture the image on the clipboard for pasting into other programs.

TECH TIP: The default number of harmonics shown is 31 plus the DC component. To view additional harmonics (up to the 63rd) place the cursor on the horizontal axis of either (or both) the voltage or current bar graph then double click. In the Horizontal Axis dialog box, change the "**To**" field to the number of the highest harmonic desired then click **OK**.

Step 5: Retrieving Data From The Logger

After connecting the logger and a PC, the data in the logger can be retrieved by using the **Logger > Retrieve Data** command.

This command retrieves data from the logger and saves it as a binary file with a .dat extension on the computer hard drive. Before retrieving the data, you will be prompted for a data file name as shown below. The default will be the Logger serial number plus 2 digits that correspond to the number of times data has been retrieved from the Logger and stored in the target folder on the PC. The data will be saved to the folder as specified in **Tools > PC Setup > Data Files Saved To:** or as specified when the data is retrieved. The default data folder is C:\DENT\ELOG\Setups



Note the two additional check boxes at the lower left of the screen. The **Append New Data To Existing Data File** box, when checked, then anytime a logger is read and the data retrieved, it will be appended to a previously existing data file from that logger. You will need to select which data file to append to. Data will only be appended to a data file if the setup table of the logger has not been changed from when the earlier data file was downloaded. The “Append” feature is very useful for long term metering projects where automatic, periodic data downloads are made.

Create ASCII (.csv) File After Data Download, if checked, will automatically create a second file in addition to the .dat file that is in a comma separated value (.csv) format. A .csv file can then be opened in a variety of third party programs such as Microsoft Excel.

To view a data file, use **Data > Open Data File** and then choose the file desired.

TECH TIP: When retrieving data from a Logger that is connected to external DC power, the sampling rate is reduced from one read every three seconds to one read every 15 seconds during the data retrieval. For Loggers that are operating on the internal battery the sampling rate remains at once per minute.

Step 6: Viewing the Data: Analyzing, Graphing And Exporting

Once the data stored in the Logger has been retrieved to a PC, there are three options available:

1. The data may be opened and viewed (but not edited) using **Data > Open Data File** and then choose the file desired (or also, **File > Open > select Data File > OK**).
2. You may create graphs using **Data > Create New Graph...** and perform various analysis functions Using **Data > Analyze a Selected Data Range** or create a quick summary of the data using **Data > Data File Summary**. The data file can also be clipped using the **Extract a Range of Data**
3. The data can be **Exported** as a comma separated value file (.csv) for viewing or further analysis in other applications such as spreadsheets.

VIEWING A DATA FILE

Stored data files can be viewed (but not edited; editing must be done in another application) by selecting **Data > Open Data File**. To view a data file it must first be downloaded from the Logger by using the **Logger > Retrieve Data...** command. After selecting a data file, a screen similar to the one below will appear:

C:\ELOG TEST\Data\Substation Data.dat									
	Record Date	Record End Time	Chan 1 Avg. Amp	Chan 1 Avg. KVAR	Chan 2 Avg. Amp	Chan 2 Avg. KVAR	Chan 3 Avg. Amp	Chan 3 Avg. KVAR	
1	04/17/01	08:30:00	157.41	-56.758	203.60	1323.972	146.05	-999.384	753
2	04/17/01	08:45:00	155.07	-44.545	208.01	1359.083	145.13	-989.754	752
3	04/17/01	09:00:00	155.93	-50.511	207.56	1354.113	145.33	-993.263	752
4	04/17/01	09:15:00	158.68	-32.752	205.94	1342.615	147.46	-1004.621	752
5	04/17/01	09:30:00	154.21	-44.839	203.12	1328.998	145.57	-995.622	753
6	04/17/01	09:45:00	153.76	-54.259	196.58	1276.536	140.28	-966.407	753

The data is always shown in the same way. The left-most column is the record number. It begins with 1 and continues sequentially through all of the data records in the file. The second column is the date of the record and the third column is the time of the record.

TECH TIP: To change the format for the date and time stamps use **Start > Settings > Control Panel > Regional and Language Options (Win XP)**. For Windows Vista, use **Start > Control Panel > Clock, Language, Region**.

Note: To view all the data when it does not fit on one screen, use the up/down, left/right scroll bars to move through the data.

The fourth and remaining columns are the data recorded for each parameter that had been logged. If minimum or maximum values were recorded, then the time (to the second) that the minimum or maximum occurred will also be recorded.

GRAPHING AND ANALYZING THE DATA

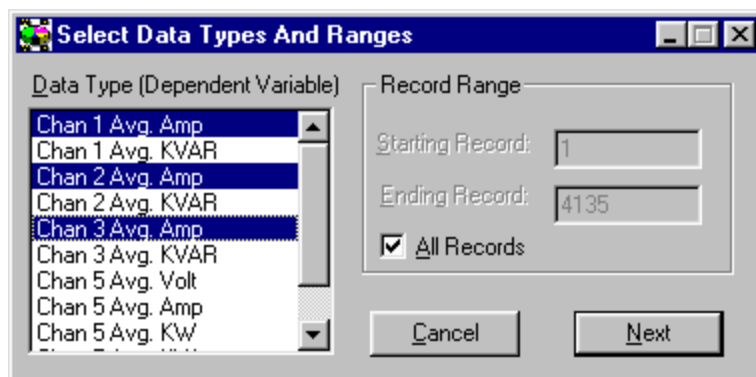
Use Data > Create New Graph... to make a graph from a saved (on the PC) data file.



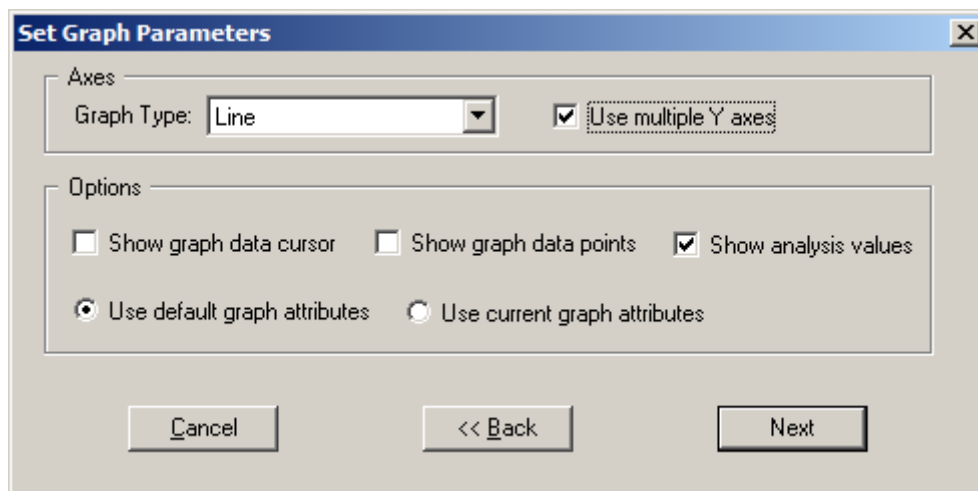
If a data file is not already open, clicking on this menu item will first bring up a folder from which to select a data file to be used as a source to create a graph. If a data file is already open, selecting this menu item will again open the file folder but will default to the file that is already open.

After selecting a data file, a screen similar to the example below will appear:

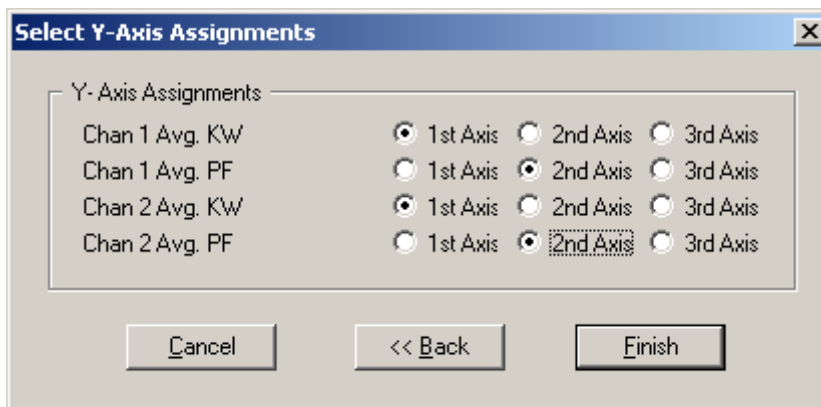
Use the mouse to select which parameters you wish to graph. Use standard Microsoft Windows functions to select parameters such as: Tag multiple parameters simultaneously by clicking on the first one and then hold down the Control (Ctrl) key and click on any other desired parameters; to select a continuous group of parameters, click on the first one and then hold down the Shift key and click on the last parameter in the group. This will select all parameters within the group including the first and last ones.



After selecting the parameters to graph, click **N**ext to define the type of graph to make. Click on the down arrow to reveal the graph type options. Click the data cursor check box to have the data cursor appear when the graph is created (you can also toggle the data cursor on and off with the right mouse button). Use the radio buttons to choose between using the default graph parameters (colors, fonts, etc.) and those used in the last graph created. You can also choose to show summary statistics (minimum, maximum, average) on the graph by checking the Show analysis values box.



If you have selected more than one parameter to plot the Use multiple Y axes box will appear. If checked, you will get a third window that allows you to assign which parameters are assigned to which Y axes.



Select Y-Axis Assignments

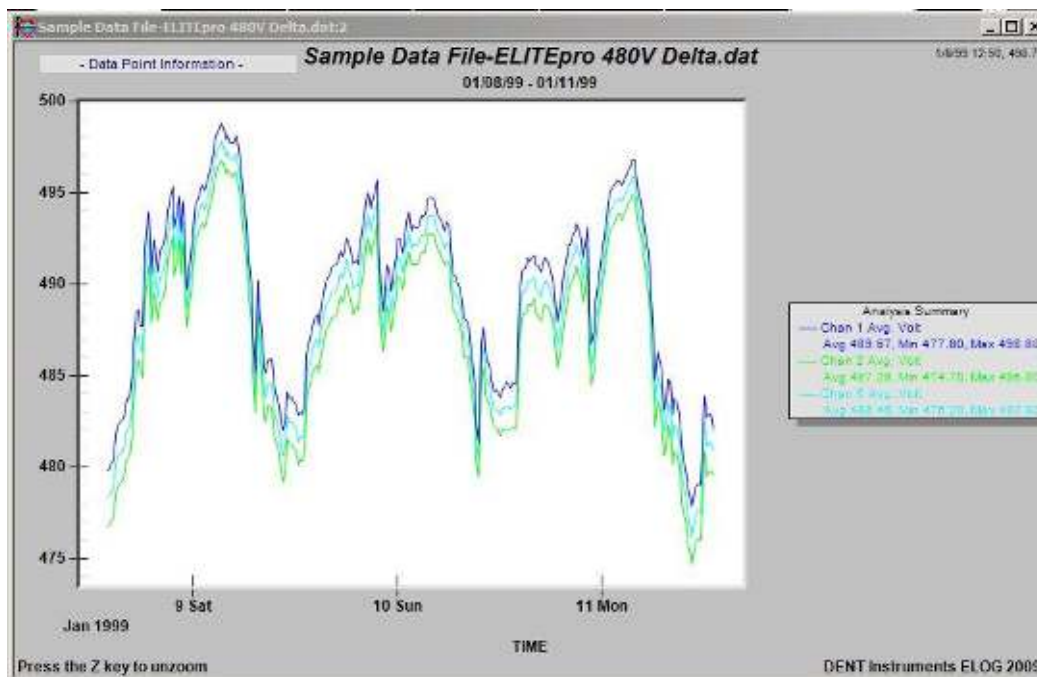
Y-Axis Assignments

Chan 1 Avg. KW	<input checked="" type="radio"/> 1st Axis	<input type="radio"/> 2nd Axis	<input type="radio"/> 3rd Axis
Chan 1 Avg. PF	<input type="radio"/> 1st Axis	<input checked="" type="radio"/> 2nd Axis	<input type="radio"/> 3rd Axis
Chan 2 Avg. KW	<input checked="" type="radio"/> 1st Axis	<input type="radio"/> 2nd Axis	<input type="radio"/> 3rd Axis
Chan 2 Avg. PF	<input type="radio"/> 1st Axis	<input checked="" type="radio"/> 2nd Axis	<input type="radio"/> 3rd Axis

Cancel << Back Finish

Click **Finish** and the graph you have defined will appear similar to the example shown below. Though difficult to see, the parameter names to the right of the graph have a number (1, 2, or 3) in parentheses that indicates which Y – axis they are referenced to. Notice the vertical dashed red line data cursor.

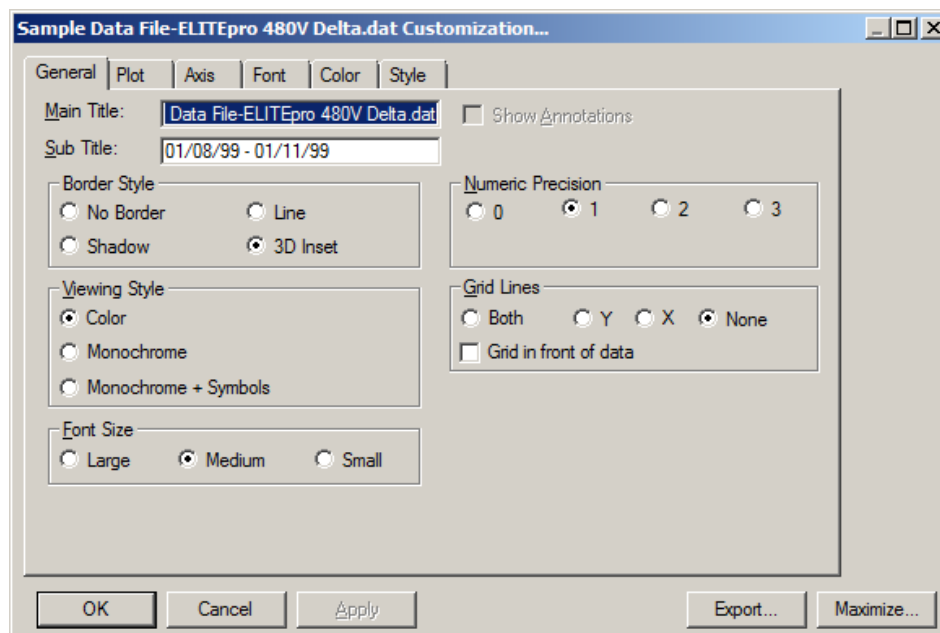
The graph values that are intersected by the Data Cursor are shown in the upper left hand corner of the screen. **Data Point 29: Chan 1 Avg. Volt, 01/08/1999 21:00:00, 494.00**



TECH TIP: Quickly create a graph from an open data file by clicking on the  **Create Graph** hot button.


EDITING A GRAPH

Once created, the graph may be edited in a number of ways. In general, any editable feature may be changed by double-clicking in the graphing area. A dialog box appears, similar to the one below. This box allows you to make changes to the look of your graph, including graph type, color, fonts and so on. It also gives you the opportunity to export your graph in several graphical formats, such as .jpg or .png. Graphs may be exported to a file, printer, or to the clip board.



Graphs as well as other file types (Data, Setup Tables, Logger Lists) may be printed using the **File > Print...** command (or Ctrl + P).

TECH TIP: You may also access the graphing customization options by right-clicking in the graphing area and selecting the option you wish to change.

TECH TIP: Zoom To zoom in on any portion of the graph, drag the pointer to make a rectangle that covers the area to be zoomed. Let go of the mouse and the graph will redraw an enlarged portion of the graph. The graph may be zoomed as many times as desired. Press the **Z** key or **View > UnZoom**, Ctrl+U, or the  hot button to un-zoom.

ELOG incorporates a number of data analysis features. Use the menu command **Data > Analyze A Selected Data Range** to access all the features. To use this command, first select a range of data in the file. Do this by placing the mouse over the first record to be included in the analysis and, with the left mouse button held down, drag the pointer to the end of the range of data desired. To select an entire column, place the mouse pointer over the column header (title) and left click.

There are two things to be aware of: A selection must include at least two records in the same column and only one column may be selected at a time.

Once the data records of interest have been selected (highlighted) use the **Data > Analyze a Selected Data Range** command to choose the desired analysis function.

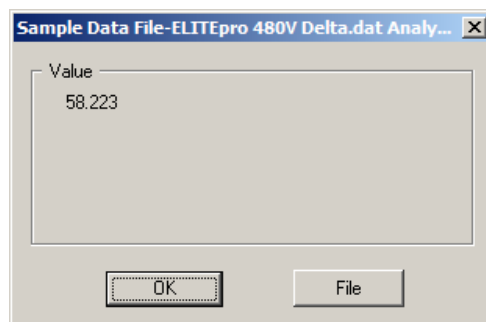
A faster way is to use the mouse to select a column or range of data to analyze and then right-click the mouse while the pointer is over the highlighted section.

	Record Date	Record End Time	Chan 1 Avg. Volt	Chan 1 Avg. Amp	Chan 1 Avg. KW	Chan 2 Avg. Am
1	06/14/99	10:15:00	227.9	198.75	11.196	221.58
2	06/14/99	10:30:00	228.1	191.74	11.310	224.82
3	06/14/99	10:45:00	230.4	216.91		
4	06/14/99	11:00:00	225.7	217.90		
5	06/14/99	11:15:00	226.4	218.89		
6	06/14/99	11:30:00	231.3	218.62		
7	06/14/99	11:45:00	221.6	226.65		
8	06/14/99	12:00:00	230.1	223.47		
9	06/14/99	12:15:00	229.4	228.90		
10	06/14/99	12:30:00	228.5	241.45		
11	06/14/99	12:45:00	231.9	238.75	11.645	1248.94

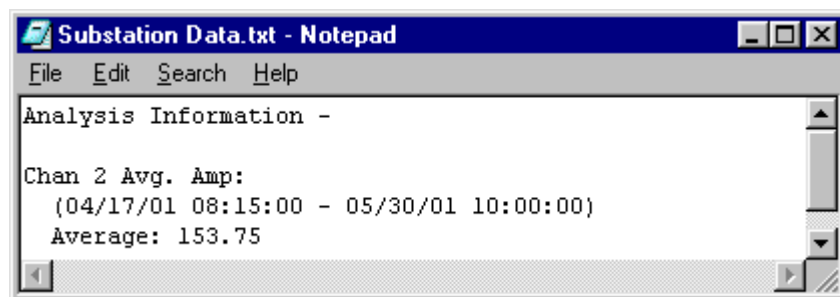
Analysis Functions

- Average
- Load Factor
- Maximum
- Minimum
- Total
- Graph
- Daily Profile Graph
- Daily Profile Data Points
- Extract a Range of Data

Selecting Average, Load Factor, Maximum, Minimum or Total brings up a display such as:

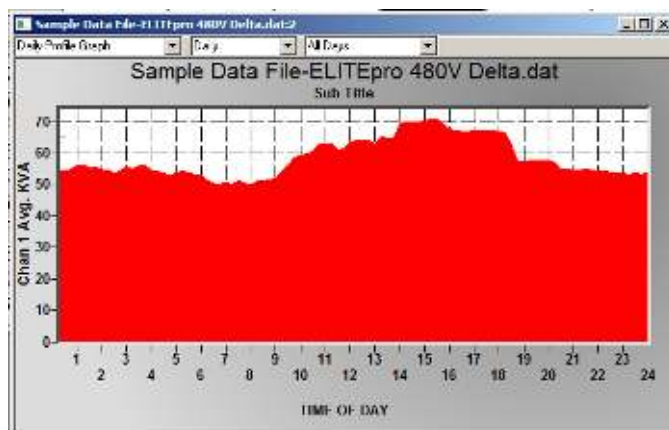


Selecting **OK** closes the pop-up window and returns you to the data file. Selecting **File** opens the Microsoft Notepad and creates a text file such as the example below.



From this point the Notepad file may be edited, saved or printed. In addition, if further analysis is done on this data and the “File” selection is made, the new analysis is also added to the current Notepad document.

Load Factor is the ratio of the peak (maximum) value to the average value. A horizontal line would have a load factor of 1.0.



Starting	Ending	Chan 5 Avg. KW
12:00:00 AM	12:14:59 AM	1309.144
12:15:00 AM	12:29:59 AM	1294.156
12:30:00 AM	12:44:59 AM	1286.723
12:45:00 AM	12:59:59 AM	1272.086
1:00:00 AM	1:14:59 AM	1262.168
1:15:00 AM	1:29:59 AM	1266.999
1:30:00 AM	1:44:59 AM	1264.248
1:45:00 AM	1:59:59 AM	1261.210
2:00:00 AM	2:14:59 AM	1253.972
2:15:00 AM	2:29:59 AM	1261.502
2:30:00 AM	2:44:59 AM	1263.407
2:45:00 AM	2:59:59 AM	1262.420
3:00:00 AM	3:14:59 AM	1277.095

Graph creates a line graph of the selected data range.

Daily Profile Graph and **Daily Profile Data Points** are two powerful functions that create a 24 hour or 7 day profile graph (sometimes called Load Profile) of the data. A daily profile graph always has as the X-axis the time of day from 0-24 hours or 0-7 days. The Y-axis is the average value at each hour of the day. Think of it as taking all the days of data laid one on top of the other to create an average day. The X-axis resolution of the DP graph and data points is the same as the integration interval of the original data.

An example Daily Profile Graph and Data Points are shown here.

Within the Daily Profile graph there are a number of other functions available including changing to an average Weekly Profile and several choices in the day types used in the graph: All Days, Week Days Only, Weekend Days Only.

Both the Daily Profile graph and data points may be saved using the **File > Save As** command. The graph becomes a Windows meta file (.wmf) and the data points are saved as a comma separated value (.csv) ASCII file.

Data File Summary is a feature that provides a quick summary of the data and the data file. The Data File Summary opens Notepad and creates a new file that provides a quick snapshot of the data file, the measured parameters, the setup table and the logger itself. This is where the Peak kW Demand and kWh, kVARh, and kVAh totalizer values are found. This document may be edited or saved with Notepad or copy and pasted into a word processor such as Microsoft Word.

Data Summary

Data File Name: E8B10-01.dat

First Data Record End Time: 06/15/09 16:02:00

Last Data Record End Time: 06/16/09 11:01:00

Monitoring Period Duration: 0.79 days

Peak Demand: 133.145kW on Monday 06/15/09 at 23:13:00

Total Usage (Channel 5): 2430kWh, 2435kVAh, 2kVARh

	Average	Maximum (Date Time)	Minimum (Date Time)	Total
Chan 1 Avg. Volt	588.7	604.7 (06/15/09 22:05:00)	0.0 (06/16/09 11:01:00)	
Chan 1 Avg. Amp	108.38	187.39 (06/16/09 11:01:00)	101.52 (06/16/09 07:30:00)	
Chan 1 KW Hours	1.056	1.102 (06/15/09 23:24:00)	0.000 (06/16/09 11:01:00)	1203.836
Chan 1 Avg. KW	63.361	66.134 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 1 Avg. KVA	63.372	66.147 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 1 Avg. PF	1.00	1.00 (06/16/09 11:01:00)	1.00 (06/16/09 11:01:00)	
Chan 1 Avg. KVAR	-0.140	0.000 (06/16/09 11:01:00)	-0.357 (06/16/09 10:46:00)	
Chan 2 Avg. Volt	2.2	2.3 (06/16/09 10:50:00)	0.0 (06/16/09 11:01:00)	
Chan 2 Avg. Amp	110.08	187.39 (06/16/09 11:01:00)	103.09 (06/16/09 07:30:00)	
Chan 2 KW Hours	0.000	0.000 (06/16/09 11:01:00)	0.000 (06/16/09 11:01:00)	0.000
Chan 2 Avg. KW	0.010	0.015 (06/15/09 23:37:00)	0.000 (06/16/09 11:01:00)	
Chan 2 Avg. KVA	0.242	0.253 (06/16/09 00:08:00)	0.000 (06/16/09 11:01:00)	
Chan 2 Avg. PF	0.05	1.00 (06/16/09 11:01:00)	0.01 (06/16/09 10:42:00)	
Chan 2 Avg. KVAR	0.230	0.242 (06/16/09 00:29:00)	0.000 (06/16/09 11:01:00)	
Chan 3 Avg. Volt	588.9	604.8 (06/15/09 22:05:00)	0.0 (06/16/09 11:01:00)	
Chan 3 Avg. Amp	110.35	187.39 (06/16/09 11:01:00)	103.38 (06/16/09 07:30:00)	
Chan 3 KW Hours	1.076	1.124 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	1226.804
Chan 3 Avg. KW	64.569	67.457 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 3 Avg. KVA	64.570	67.457 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 3 Avg. PF	1.00	1.00 (06/16/09 11:01:00)	1.00 (06/16/09 11:01:00)	
Chan 3 Avg. KVAR	0.008	0.022 (06/15/09 18:03:00)	-0.101 (06/16/09 10:32:00)	
Chan 5 Avg. Volt	393.3	403.9 (06/15/09 22:05:00)	0.0 (06/16/09 11:01:00)	
Chan 5 Avg. Amp	328.81	562.18 (06/16/09 11:01:00)	307.99 (06/16/09 07:30:00)	
Chan 5 KW Hours	2.132	2.227 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	2430.884
Chan 5 Avg. KW	127.940	133.601 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 5 Avg. KVA	128.184	133.855 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 5 Avg. PF	1.00	1.00 (06/16/09 11:01:00)	1.00 (06/16/09 11:01:00)	
Chan 5 Avg. KVAR	0.098	0.152 (06/16/09 00:34:00)	-0.235 (06/16/09 10:44:00)	

Setup Summary

Setup Table Description: Main Computer room

Channel 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 100.000

Channel 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 100.000

Channel 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 100.000

Channel 5 - Power Sum: 1,2,3

Memory Type: Ring

Line Frequency: 60 Hz

Integration Period: 1 Minute

Channel 5 Peak kW Demand Window: Moving, Width = 15 minutes

Logger Summary

Logger Description Line: DENT ELITEpro Logger

Logger Serial Number: E8B10

Logger type: ELITEpro

Firmware Version: IL400.064

Extract a Range of Data is used to trim undesired data off of the ends of the data file. Sometimes data collection occurs before the logger is connected to the load and produces "0" for the first few data records. This can also occur at the end of the data file. By using the Extract command, the ends of the data can be removed.

This feature can also be used to select a set of data out of the middle of a larger data set. For example, perhaps there is a data file that spans the months of April through June but it is desired to have only May data. The Extract command can be used to obtain only the May data.

EXPORTING A DATA FILE FOR USE IN ANOTHER PROGRAM

Data files may also be exported in an ASCII format for further analysis in other programs. The menu command **Data > Export Data File...** converts the raw, binary .dat file to a .csv format (comma separated value) which can be brought into a spreadsheet or database program.

To view the data from a spreadsheet program such as Excel follow these steps:

1. Use **Data > Export Data File...** Then select the desired data file to export
2. Click on Open; a new file with the same name but .csv instead of .dat will be created

or

1. Retrieve the data from the Logger or open an existing file
2. Use **File > Save As** and under Save as type select (.csv) Comma Separated Value and then Save

then

3. Start the spreadsheet program
4. From the spreadsheet, use **File > Open** and find the .csv data file from the folder you specified, for example, C:\DENT\ELOG\Data*name of file.csv*
5. Follow the instructions for importing the file.

COMMUNICATION VIA LOCAL AREA NETWORK (ETHERNET)

When equipped with the on-board Ethernet card, the ELITEpro and DATApro Loggers can be accessed remotely over a network by any PC on the network running ELOG. This includes accessing the loggers over the internet from anywhere in the world. Networked loggers can also have their data read automatically by using AutoPoll described below and near the end of section 2.


To use the network connection the logger must first be configured for such use. This must be done through a direct (serial) connection before putting the logger on the network. You will need to obtain an unused Static IP Address, Local Port Number, and Subnet Mask Number from your network administrator. A familiar analogy is to think of these items as the “country code, area code, and telephone number” of the logger on the network. The network administrator acts much like the local telephone company who assigns the telephone number to a new home.

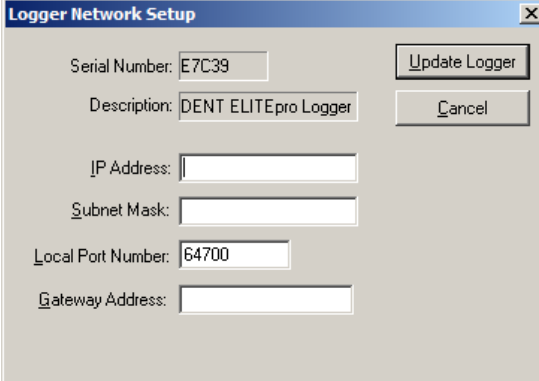
Using the direct serial connection, connect to the logger and click **Logger > Communication > Logger Network Setup...** menu command to bring up the following screen:

Input the appropriate IP Address, Subnet Mask and Local Port Number obtained from the network administrator. The Gateway Address is usually not needed but is used with large networks that have routers.

After entering the addresses click on **OK** to send them to the logger. Disconnect from the logger by


Note: The logger must have external power from the wall transformer to operate the Ethernet card.

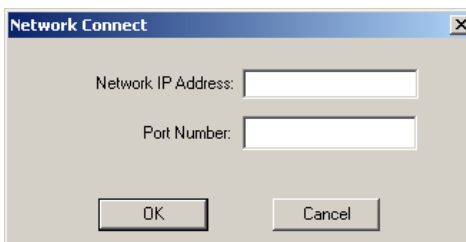
clicking the  button. Unplug the serial cable from the logger and using a standard Ethernet cable, plug the logger into any open Ethernet jack that has the same Subnet Mask address as in the logger.



The 'Logger Network Setup' dialog box contains the following fields and buttons:

- Serial Number: E7C39
- Description: DENT ELITEpro Logger
- IP Address: [Empty field]
- Subnet Mask: [Empty field]
- Local Port Number: 64700
- Gateway Address: [Empty field]
- Buttons: Update Logger, Cancel

Next, click on the Network Connection button  in ELOG. A screen similar to the one at right will appear. Enter the IP Address and Port Number for the logger and then click OK. ELOG should connect to the logger.

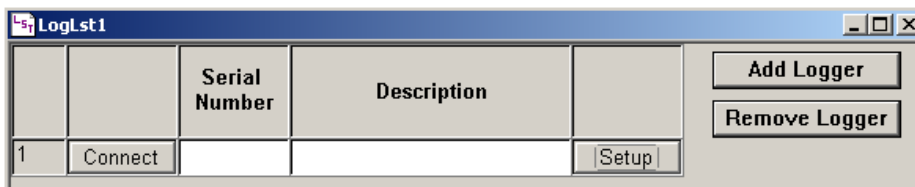


The 'Network Connect' dialog box contains the following fields and buttons:

- Network IP Address: [Empty field]
- Port Number: [Empty field]
- Buttons: OK, Cancel

Using a Logger List: If there are multiple loggers on the network it is often easier to use a Logger List to keep track of them and their addresses. A Logger List is like an “address book” of your loggers. To create a logger list use **File > New > Logger List File > OK**. A screen similar to the one below will appear. Click the Setup button to enter logger connection type (direct, network, modem) and the logger’s address.

Use Add Logger to create new, blank entries in the Logger List and then complete the addresses as with the first one. When finished, use the **File > Save** (or Save As...) command to save the Logger List to the hard drive on your computer.



The 'LogList1' window displays a table with columns for Serial Number and Description. It includes buttons for Add Logger, Remove Logger, and a Setup button in the bottom right corner.

	Serial Number	Description
1	Connect	[Empty field]

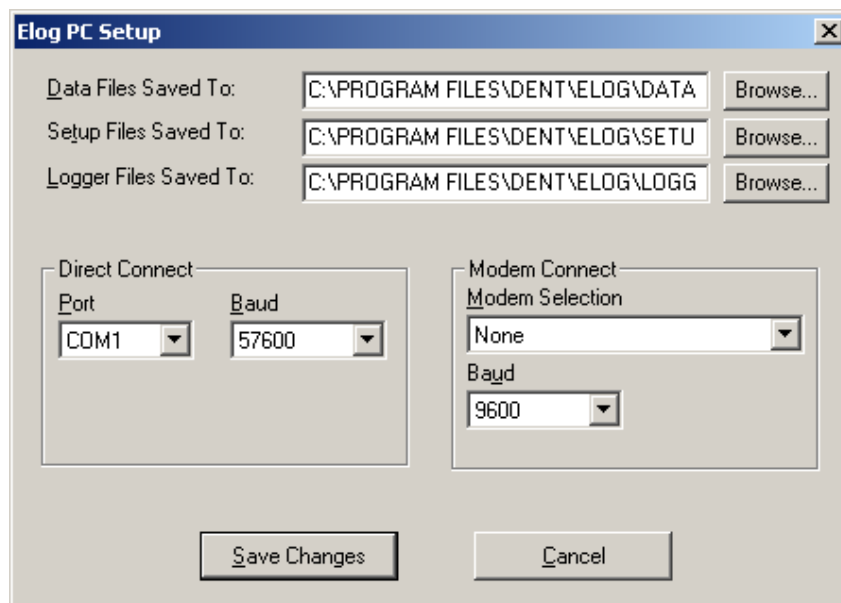
To use a Logger List to connect to a logger, use the File > Open: Logger List File command and select the Logger List containing the logger you wish to contact. Using the Serial Number and/or Description line to identify the desired logger, click Connect. Additional information about Logger Lists can be found in Section 2 under AutoPoll.

COMMUNICATION VIA TELEPHONE MODEM


When equipped with a modem, the ELITEpro and DATApr Loggers can be accessed remotely over land telephone lines. All of the functions that are available during a direct serial connection to a PC are also available over modem connections. This section describes telephone communication using an internal modem. For a discussion of using external modems, see *USING ELITEPROS AND DATAPROS WITH EXTERNAL MODEMS* in the Application Notes section on Page 101.

Loggers with modems can also have their data read automatically by using *AutoPoll* (PC initiates the call) or *AutoHost* (logger initiates the call) described below and starting on Page 62.

Before beginning a telephone connection, the PC and PC modem should be properly configured. Use the **Tools > PC Setup...** menu command to enter the PC setup screen as shown below:



In the Modem Connect window, select the PC modem that you want ELOG to use to call (or answer) the loggers. If there are multiple modems in the PC, choose the one desired. If there is only one modem, you may select that modem or None and ELOG will find the modem when making a call.

TECH TIP: Quickly set up the PC by clicking on the  PC Setup button on the screen.

Next select the desired communication speed (baud rate). If using a logger with an internal modem, set the PC modem baud rate to match that of the logger modem. Currently the default choice is 14400 baud but the logger modems can be set to 1200, 2400, 4800 or 9600.

Note: The PC modem must match the logger modem baud rate for a connection to occur. Set the logger modem baud rate from a direct serial connection by selecting **Logger > Logger Baud Rate...**

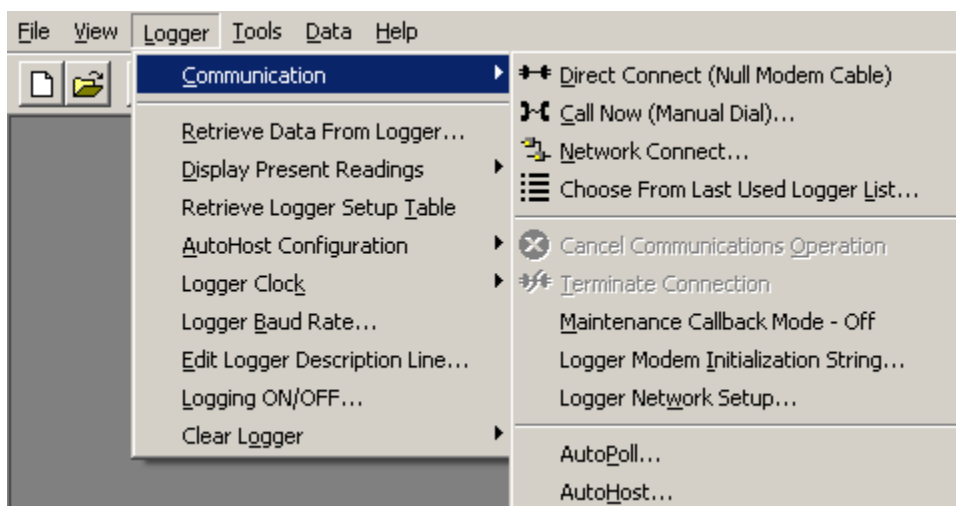
Changing The PC Modem Initialization String: ELOG uses Windows' TAPI protocols that allow the user select which modem and baud rate to use. To change the computer modem Initialization string, use the **Windows Start > Control Panel > Modems > General tab > Properties button > Connection tab > Advanced button > Extra Settings** line. Consult your modem manual for the specific commands.

Changing the Logger Modem Initialization String: The logger modem can also be configured. It is done through the **Logger > Communication > Logger Modem Initialization String...** menu in ELOG. The initialization string is stored in the logger and is sent to the modem every day at midnight and at midday as determined by the logger clock. The resending of the initialization string helps prevent modem lock-ups by continually resetting the modem.

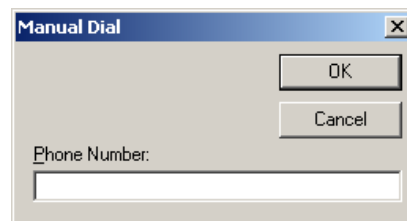
CALLING THE LOGGER FROM THE PC

Use the **Logger > Communication** menu to access the telephone connection options.

From the **Logger > Communication** menu, use either **Call Now (Manual Dial)...** or **Choose From Last Used Logger List...**

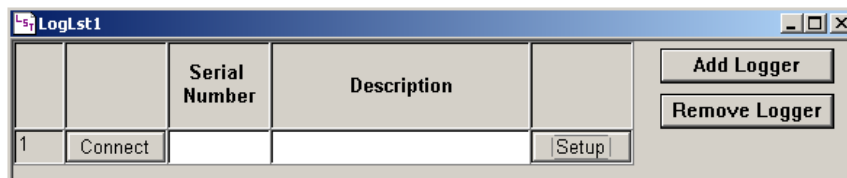


Call Now (Manual Dial)... brings up the following window in which the telephone number to be called is to be entered. Enter the telephone number and press **OK**. The PC will then be directed to call the logger and initiate a communication session.



Using a Logger List: If there are multiple modem-equipped loggers to be called, it is often easier to use a Logger List to keep track of them and their telephone numbers. A Logger List is like an “address book”

of your loggers. To create a logger list use **File > New > Logger List File > OK**. A screen similar to the one shown will appear. Click the Setup button to enter logger connection type (direct, network, modem) and the logger’s phone number.



Use Add Logger to create new, blank entries in the Logger List and then complete the telephone numbers as with the first one. When finished, use the **File > Save** (or Save As...) command to save the Logger List to the hard disk on your computer.

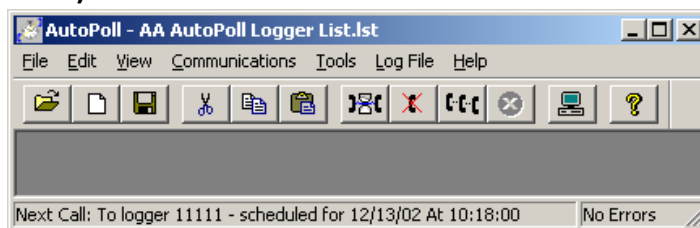
To use a Logger List to connect to a logger, use the **File > Open: Logger List File** command and select the Logger List containing the logger you wish to contact. Using the Serial Number and/or Description line to identify the desired logger, click Connect.

AUTOMATIC DATA COLLECTION

The logger and computer can also be set up to automatically and routinely download data. There are two options: The first is where the logger calls the PC (AutoHost) and the second is where the PC calls the logger (AutoPoll).

1. PC INITIATED CALLS TO THE LOGGER (AUTOPOLL)

ELOG may be used for unattended and automatic data retrieval from a number of remote or networked loggers. AutoPoll (short for *Automatic Polling*) is a stand-alone program that may be launched from ELOG by using the **Logger > Communication > AutoPoll...** menu command. AutoPoll works in conjunction with a *Logger List*, which is a compilation of one or more local, networked, or remote loggers, how they are contacted (serial port, IP address or modem telephone number), call schedules and other tasks. A complete description of Logger Lists is found below.



Additional information, including detailed explanations of Logger Lists, can be found in Section 2: ELOG Menu Commands; AutoPoll: Unattended Calling from the PC to the Logger.

After launching AutoPoll, you are prompted to first select a Logger List containing the loggers that you wish to call. *Only one Logger List may be active at a time*. After selecting the desired Logger List, a screen similar to the one below becomes the active window.

At this point, the AutoPoll program is running and may be minimized if desired. The AutoPoll **F**ile command can be used to open and change the active Logger List. Note that at the bottom of the window is a status bar showing the next call that AutoPoll will make.

Note: AutoPoll can also be used for multiple, automatic data downloads while on a direct serial connection or over an Ethernet LAN or even over the Internet. See the section Menu Commands, AutoPoll: Unattended Calling From The PC To The Logger for more information.

2. LOGGER INITIATED CALLS TO A PC (AUTOHOST)

ELITEpro and **DATApro** loggers can also be configured to initiate telephone data retrieval sessions. The AutoHost configuration is stored in the logger and contains a call-out schedule, task list and telephone number. At the time(s) specified in the AutoHost schedule stored in the logger, the logger will call a host computer at the telephone number in its memory. If the computer has the application AutoHost running (AutoHost is launched from the menu **Logger > Communication > AutoHost**), then the computer will answer the call and perform the data retrieval tasks programmed into the logger.

Whereas AutoPoll described earlier can be used with loggers on a direct connection, network connection or telephone connection, AutoHost can only be used on a telephone connection. AutoHost is most useful for situations where a remote logger must share a telephone line with a customer.

Additional information can be found in the section titled: *AutoHost: Unattended, Logger Initiated Calls To The PC* on page 70.

To use AutoHost, connect a logger to the serial port of a PC (or to a USB port via a USB Adapter) using the **Logger > Communication > Direct Connect** command. Then use **AutoHost Configuration > Send** (or **Retrieve**) to call up a configuration table to edit. Using **Retrieve** will call up the AutoHost configuration already in the logger. Using **Store** will call up a blank configuration if **Retrieve** has not already been used. If **Retrieve** has been used, then the AutoHost configuration shown will be the one previously brought from the logger.

An example configuration table is shown below. The call interval has been set to Weekly and the logger makes calls to a host computer at the number 1-800-388-0770. According to this example schedule, the logger will call *every* Monday at 03:00, Wednesday at 05:30 and every Friday at 02:00. Upon connection with the AutoHost program, the host computer is instructed to update the logger clock to the PC clock and download ALL data in the logger.

Note: You must be connected to a logger to use the AutoHost Configuration command.

AutoHost Call Schedule Configuration

Call Interval: ☐ No Calls ☐ Single ☒ Daily ☐ Weekly ☐ Monthly

Phone Number: 1-800-388-0770

Single Call Time: hh:mm 00:00

Daily Call Time: hh:mm 15:00

Logger Tasks: ☒ Set Logger Clock ☒ Download Data ☐ Download All Data ☒ Append New Data

Weekly Call Time(s):

Sundays	Mondays	Tuesdays	Wednesdays	Thursdays	Fridays	Saturdays
No Call	No Call	No Call	No Call	No Call	No Call	No Call

Monthly Call Time(s):

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

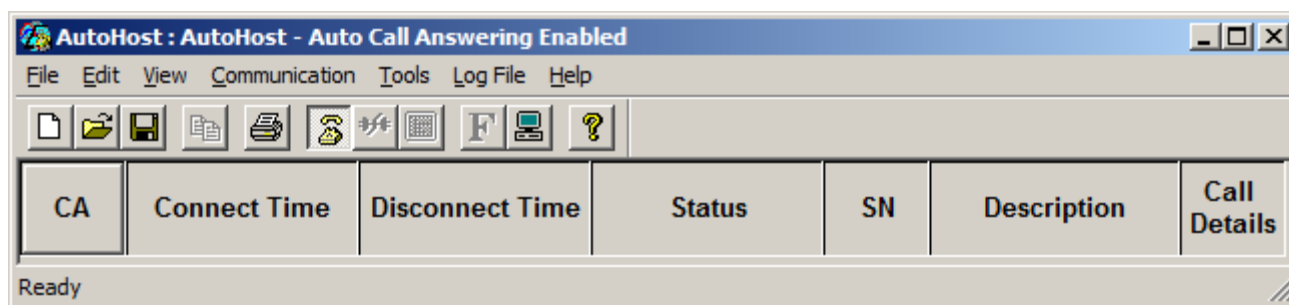
Send To Logger Cancel

With an AutoHost configuration on the screen, change the configuration table as desired. Use the **Store** key to send the changed table back to the logger. The configuration table must have set, as a minimum, the telephone number of the host computer to call, a call time, and a task (set clock and/or download data).

There are two data download options. The first, **Download All Data**, sends all the data stored in the logger to the PC. The second option, **Append New Data**, sends only the data that the logger has collected *since the last time the logger was read* by the host computer. In this instance, the new data (since last download) is appended to the existing data file that has already been retrieved from the logger. If the logger cannot find an existing data file to append to, it will default to a complete data download.

The default Call Interval is No Calls. The logger can be set to make only one call to the host (**Single**) or every day (**Daily**). To call on a monthly basis choose **Monthly** in the Call Interval box. At that point, the **Monthly Call Time(s)** window becomes active and a call time for a day(s) of the month is selected by using the mouse to click on the day(s) that a call is to be made. A window similar to the one below appears:

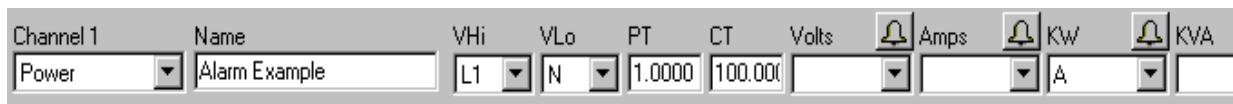
Lastly, use **Logger > Communication > AutoHost...** to launch the AutoHost program. The AutoHost program must be running for the computer to answer calls from the loggers.




ALARMS

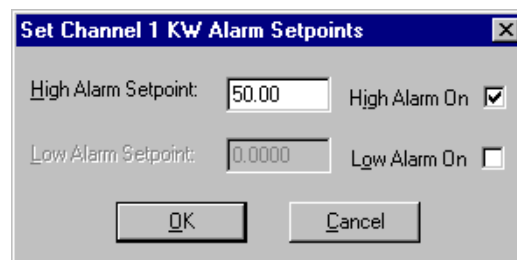
The **ELITEpro** and **DATApro** have the capability to accept high and low alarm set points for any of the measurement parameters (V, A, kW, kVAR, kVA, and Power Factor, temperature, milliamps and so on). When a channel exceeds either its high or low level set point it will call a programmed telephone number and download the data to the AutoHost program.

To set an alarm, use the second page of the Setup Table as shown.



Click on the bell symbol  or the parameter that you wish to have the alarm set, for example, KW.

A dialog box similar to the one to the right will appear. By checking either or both the High and Low Alarm On boxes you can enter the set points for which you want an alarm call to occur. The units of the trigger point are always the same as the parameter being tested. For example, in an **ELITEpro**, the set point units of a kW channel are kilowatts, the units of a



current channel are amps, and so on. For a **DATApro**, the set point units are the raw units with the slope and offset (or scale) factors applied. This allows setting alarm points based on engineering units.

Click on **OK**. Note that the recording flag field (where the A,N,X,H flags appear) turns red indicating that an alarm has been set. Use the **Store** command to send the modified setup table into the logger.

When an alarm condition occurs (for example, instantaneous kW exceeds a high level set point) two things will happen. First, when viewing the channel values in real-time using **Logger > Display Present Reading > Show As Text**, the parameter in alarm will turn red.

Second, if the logger is equipped with an internal modem, the logger will call the telephone number in its memory and download all the data in its memory while setting a visual and audible alarm in the host computer three minutes after the alarm occurs. (Check with DENT Instruments for applicability of external modems.)

Note: To answer a call from the logger, the PC must have AutoHost™ running.

AutoHost is a stand-alone Windows program that is loaded onto your computer when ELOG is installed. See also the previous section *Logger Initiated Calls (AutoHost)* for a more detailed explanation.

After making a successful connection to the host PC and completing a download of the data (including the alarm state), AutoHost will reset the logger callout schedule back to what it was prior to the alarm condition occurring. If the measured parameter has not returned to a value within the bounds of the high and low set points, the logger will stay in an alarm state but will not call the host PC again except as dictated by the callout schedule programmed into its memory.

When the channel reading that was in the alarm state returns to a value that is within the alarm set point boundaries, the logger alarm is reset. The next time an alarm condition occurs, the logger will again call the host PC and download its data and the process is repeated.

If it does not make a successful connection and data download when the logger calls the host PC, it will retry three more times, two minutes apart. If all four attempts fail, the logger will try again 24 hours later and each day thereafter until a successful connection occurs.

All of the parameters for which an alarm may be set (for example, high voltage, low power factor and so on) are independent. A call will be generated any time any alarm set point is exceeded.

An alarm condition in the logger may also be cleared manually by using ELOG in a direct connection or over the telephone via modem.

Line Power Supply {ELITEpro™ only, Optional}

Operation

Some **ELITEpro** meters are equipped with an optional Line Power Supply (LPS) that draws power from the monitored voltage mains to operate the meter. The LPS is an available option on new meters or as an upgrade to existing meters. (Consult DENT Instruments for more information.) No additional connections need to be made besides those used to connect the meter for normal metering. The one exception is for single phase loads as described on the next page.

The Line Power Supply works by drawing a little power from the high voltage leads and putting it through a custom designed, extremely wide band power supply to make the low-voltage dc power needed to operate the meter. An **ELITEpro** with an LPS can still operate on its internal battery if no AC power is available (such as when using the **ELITEpro** to only measure current.) In the event of a loss of power, the **ELITEpro** will switch to battery operation automatically. (This is unless the integration interval is set to 3, 15, or 30 seconds. In that case, logging will stop until AC power is restored or an external wall transformer [supplied] is connected.)

The LPS draws its power from the L1 and L2 phase voltage leads. Both of these leads must be connected for the **ELITEpro** to be powered. A minimum of 50 volts, AC or DC, is required across L1 & L2 to power the meter. The maximum is 600 VAC.

When connected to line power the **ELITEpro** can also supply power to external sensors from the jack on the side. Up to 2W at 5VDC can be supplied. Note that to supply 2W the minimum voltage required between the L1 & L2 phases rises to 70 VAC or 90 VDC.



RISK OF ELECTRIC SHOCK. LIFE THREATENING VOLTAGES MAY BE PRESENT. QUALIFIED PERSONNEL ONLY. CONNECTING AND DISCONNECTING THE LOGGER SHOULD BE DONE ONLY WITH PROPER INSULATION ON THE USER INCLUDING PROPERLY RATED HIGH VOLTAGE GLOVES.

Line Power Supply Ratings

- Temperature Range: -7 °C to +60 °C
- Absolute Maximum Voltage: 600VAC or VDC Line to Line, 350 VAC Line to Neutral
- Minimum Voltage To Operate Logger: 50VAC or VDC
- Minimum Voltage To Operate Logger and Supply 2 W External: 70VAC or 90VDC
- Maximum External Sensor Power: Up to 2W at 5VDC
- Power Requirement With No External Load @ 280VAC L1 to L2: .83W (1.7VA)
- Power Requirement With No External Load @ 600VAC L1 to L2: 2.1W (5.1VA)
- Power Requirement With 2W External Load @ 280VAC L1 to L2: 6.3W (10VA)
- Power Requirement With 2W External Load @ 600VAC L1 to L2: 8.2W (17VA)

Connection

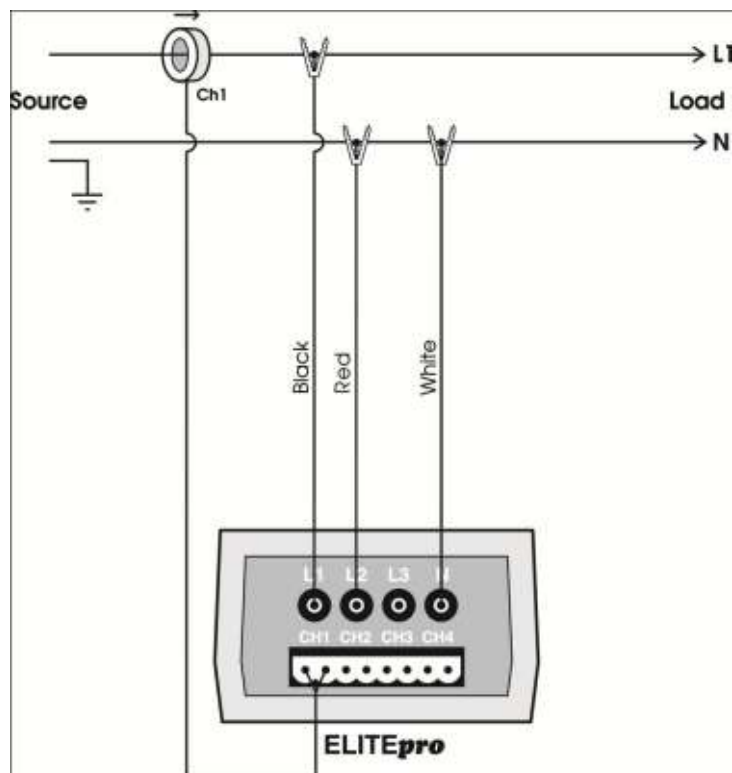
The Line Power Supply is connected across the L1 and L2 Phases inside the meter. To supply power to the **ELITEpro** both L1 and L2 phases must be connected. During normal metering, of three phase loads, both 3 wire Delta services and 4 wire Wye services the L1 and L2 phases will be connected.

If used with a single phase load where the metering circuit voltage reference is (for example) L1 to Neutral, the L2 wire of the **ELITEpro** must also be connected to Neutral. See Figure 1.



Since the internal power supply is connected across the L1 and L2 leads, connecting either voltage lead to a high voltage means the other lead is also at the same voltage potential. If either L1 or L2 is connected to a voltage source DO NOT TOUCH the other lead without proper protection or a serious shock could occur resulting in injury or death.

Figure 1. Connecting the **ELITEpro** with internal power supply to a single phase load.



Note that the internal power supply is connected to the L1 and L2 phases. For the **ELITEpro** to be powered by the line, both the L1 & L2 leads must be connected as shown above. However, the logger Setup Table would not change as shown below.

Example Single Phase Setup Table. Note voltage reference is still L1 to Neutral. The L2 lead is used only to power the meter and is not part of the measurement circuit for single phase loads.

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps
Power	Single Phase 2 Wire	L1	N	1.0000	100.00		



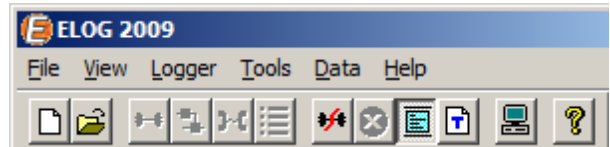
Depending on when in the voltage cycle the second of the L1 and L2 leads is connected, a small spark may be noted. This is normal operation and will not damage the meter.

SECTION 2

ELOG 2009 MENU COMMANDS

This section is a line-by-line description of each menu item in the ELOG software. The order of presentation is from left to right and top to bottom for each menu item.

When the ELOG software is first run, the MAIN MENU will appear which consists of one line of standard Windows menus and a lower line of "hot buttons" that can access many of the most commonly used software functions with just one click of the mouse.



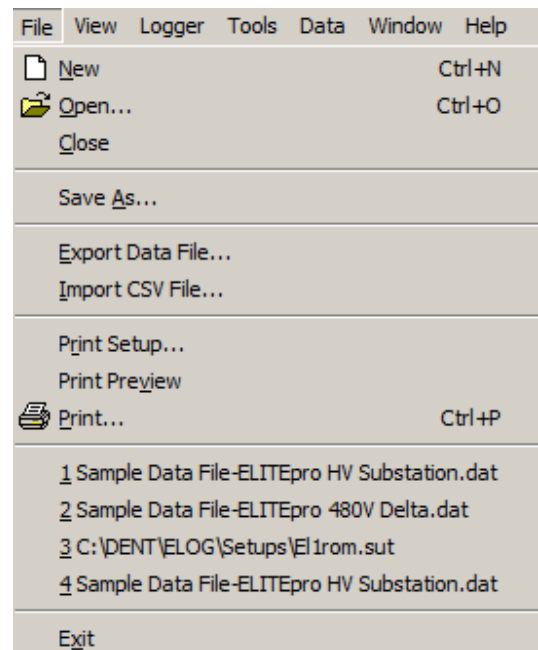
MAIN MENU


Note: Because Microsoft Windows uses Automatic Menu Switching (i.e., context sensitive), only the commands that are active will appear. When you click on File you will possibly see a different list of commands than those shown here.

File

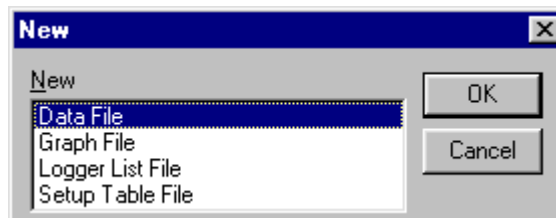
Typical Windows commands are found in this menu.

Note: Many of the menu commands can be accessed through shortcut keyboard commands (e.g., Ctrl + N for open a new file) or the speed buttons located on the line below the main menu.



 **New** Ctrl+N Opens a New File. There are four kinds of files that are applicable to the data loggers including *Data Files* (data retrieved from a logger), *Graph Files* (graphs made from logger data), *Logger Lists* (groups of loggers used with the AutoPoll, automatic data collection application) and *Setup Table Files* (saved logger configuration settings).

If **Data File** is chosen, the software will ask you to connect to a logger from which the new data file is to be extracted. If already connected to a logger, you will be asked for a file name to give to the data about to be retrieved from the Logger.





If **Graph File** is chosen, a folder window will appear where you may choose from already existing data files which one you wish to use to create a graph.


If **Logger List File** is chosen, you will be shown the folder where the Logger Lists reside and be allowed to select one for review or editing. (Logger Lists are used for unattended data retrieval by the computer; see also the section on AutoPoll.)

If **Setup Table File** is chosen and you are not already connected to a Logger, you will be asked for what kind of Logger (**ELITEpro** or **DATApr**) you want to create a new Setup Table. If you are already connected to a Logger, it will assume that the Setup Table you are about to create is for the Logger type to which you are connected.

TECH TIP: Setup Tables are used by the logger to define which parameters are to be recorded by the logger, how often, and so on.

 **Open...** Ctrl+O The **Open** function is very similar to the **New** command except it assumes that a Data File, Graph, Setup Table or Logger List is already stored somewhere on the hard drive and will prompt you to select which type of file you wish to open. It operates the same whether or not you are connected to a Logger.

 **Close** This command will close only the currently active file. If multiple files of any type are open, the active file is the one with the illuminated top border.

 **Save** Ctrl+S and **Save As...** These functions allow you to save an open file of any type using the current name and location (**Save**) or with a new name and/or to a new location on the hard drive (**Save As**).

Note: Graphs may also be saved (using **Save As**) as a Windows Meta File with a .wmf extension. Because data files may not be edited the **Save** & **Save As** commands do not apply and will not appear in the **File** menu. To change a data file name use Windows Explorer.

Export Data File... Allows you to export a data file to a .csv file for use in another program.

Import CSV File... Allows you to import a .csv file into ELOG.

Page Setup Allows you to define the usual printing parameters such as margins, grid lines, and headers.

Print Setup... Is used to select the printer to be used, paper tray source, and paper orientation.

Print Preview

Allows you to view the document as it will appear on the paper.



Print...

Ctrl+P

Is used to initiate printing and select the pages to be printed. Print Setup may also be accessed from this menu.

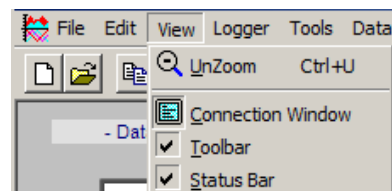
Exit


Exits and closes the **ELOG** program.

View


The View functions relate to what is shown on the computer screen.

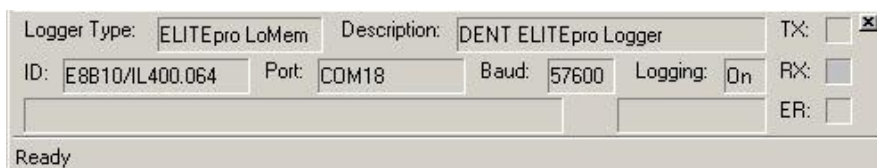
UnZoom is only used with graphs to back out of a view where the Zoom function had been used (See also **Data > Create New Graph...**).



TECH TIP: Quickly UnZoom by clicking on the  button or typing Ctrl + U.

The **Connection Window** appears at the bottom of the screen during a connection to a logger and provides information about the logger, communication port, baud rates, etc.

The **Toolbar** (hot buttons under the main menu) and the **Status Bar** (information line at the bottom of the screen) may be turned on or off by selecting () or deselecting by clicking on them with the mouse.

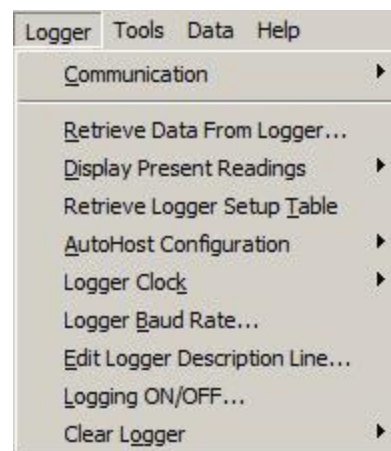


Logger

Use this function to configure the ELITEpro Logger, view channel data in real time, and download Logger data and set a variety of logger communication parameters.

Communication

Use this command to establish a connection between the computer (PC) and the Logger.



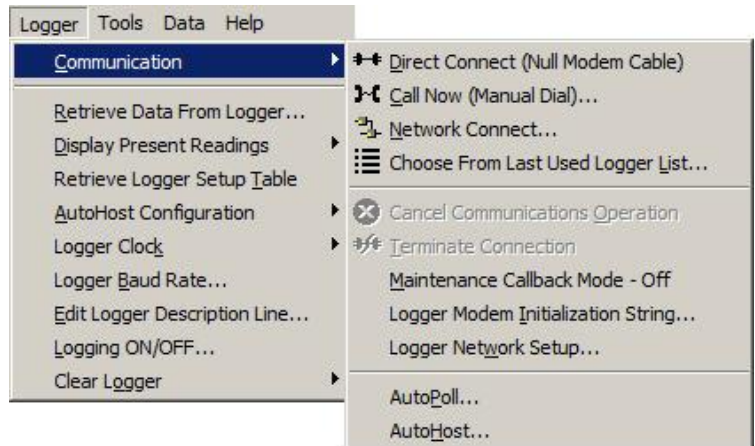
Direct Connect (Null Modem Cable): This command is used to connect the Logger to a PC using a 9 pin null modem serial cable between the RS-232 serial ports on the computer and the logger. A connect message will appear on the screen.

Note: Only a Null Modem serial cable between the logger and the PC will work for this connection.


TECH TIP: Quickly connect by clicking on the  **Direct Connect** hot button on the screen.

Call Now (Manual Dial): This function allows direct dialing from a PC to a logger when both the logger and PC are equipped with modems. After selecting this function, enter the telephone number of the logger to be called and press **OK**. The PC will then be directed to call the logger and initiate a communication session.

Network Connect: Enter the IP Address and Port Number and click OK to connect to a logger on the Ethernet network. This function also works with loggers connected to the Internet. See also the section *SETTING UP AND USING THE ELITEpro AND DATApro LOGGERS; Communication Via Local Area Network (Ethernet)* on Page 26.




Choose From Last Used Logger List: If you have a number of remote loggers on a network or with modems, you may wish to add them to one or more Logger Lists where characteristics such as their serial number, telephone number, IP Address and so on are kept. To use, select Choose From Last Used Logger List... and just click on the Connect button next to the desired logger. To choose a logger from a different Logger List use **File > Open > Logger List File** and select the desired list.

TECH TIP: You can also use the tool bar hot button  to get the last used Logger List.

Cancel Communications Operation: During any communication operation between the PC and the logger (connecting, retrieving data, viewing real time values), this command may be used to cancel the current communication command.

Terminate Connection: Disconnects the computer from the logger (use for both direct and telephone modem connections).

TECH TIP: Quickly disconnect by clicking on the  **Disconnect** button on the screen.

Maintenance Callback Mode: When using the AutoHost feature of ELOG (described in detail at the end of this section) it is quite common to have the loggers call the PC in the middle of the night to avoid conflict with the telephone line during daylight or business hours. Sometimes it is desirable to have the logger call during a more convenient time to perform diagnostics or view the data collection in real-time.

Toggle the Maintenance Callback Mode on and off with the mouse. Placing ELOG in the Callback Mode disables all other communication options. In addition, while in this mode, ELOG will answer any incoming calls made to the computer.

Logger Modem Initialization String: Allows user to set the initialization string in the remote modem (the one inside the Logger). The Logger automatically sends the initialization string to the modem every day at midday and midnight. This feature resets the modem in the event of a modem lock-up.

Use this option to configure the remote (logger) modem. Consult the modem manual for proper settings.

Logger Network Setup: This function is used to set the addressing in a logger connected on a local area network. To use it you must be connected to the logger via a direct serial connection. See also Communication Via Local Area Network (Ethernet) in the Section 1 on Page 26..

AutoPoll: AutoPoll, short for **Automatic Polling**, is a separate program that comes bundled with ELOG and is loaded onto the PC when ELOG is installed. AutoPoll may be used for unattended and automatic data retrieval from a number of remote loggers where the PC calls the loggers either over a telephone line or network. It can also be used for automatic, unattended calls to the logger through a direct serial connection from the PC to the logger. AutoHost (described next) may also be used for unattended and automatic data retrieval from a number of remote loggers where the loggers call the PC though only via telephone.

AutoPoll works in conjunction with a *Logger List*, which is a compilation of the remote loggers to be interrogated, their modem telephone numbers, call schedule, and other tasks to be performed. A complete description of Logger Lists is found with the description of AutoPoll.

AutoPoll has limited user interaction and should be thought of primarily as an automatic dialer. After launching AutoPoll, you are prompted to first select a Logger List containing the loggers that you wish to call. Only one Logger List may be active at a time.

A complete description of AutoPoll can be found at the end of this section in: *AutoPoll: Unattended Calls From The PC To The Logger* on Page 62.

AutoHost: AutoHost, short for **A**utomatic **P**C **H**osting, is a separate program that comes bundled with ELOG and is loaded onto the PC when ELOG is installed. **ELITEpro** and **DATApro** loggers with modems can be configured to automatically *initiate* telephone data retrieval sessions. AutoHost is the application that answers the call from the logger and collects the data.

TECH TIP: AutoPoll is the application that directs the PC to call the logger.

The AutoHost configuration function in ELOG allows storing in the logger a call-out schedule, task list and telephone number for the logger to call. The logger will call a host computer at the telephone number in its memory at the time(s) specified in the configuration table stored in the logger. If the computer has the application AutoHost running, then the computer will answer the call and perform the data retrieval tasks programmed into the logger.

A complete description of AutoHost can be found at the end of this section in:
AutoHost: Unattended, Logger Initiated Calls To The PC.

Retrieve Data...

Retrieves data from the logger and saves it as a .dat file to the hard disk. Before retrieving the data, you will be prompted for a file name to use. The default will be the Logger serial number plus 2 digits that correspond to the number of times that data has been retrieved from the Logger.

When a logger's memory is downloaded, the data may also be added or "appended" to an already existing file from the same logger. Check the Append New Data To Existing Data File box and select which file you wish to add the data to.

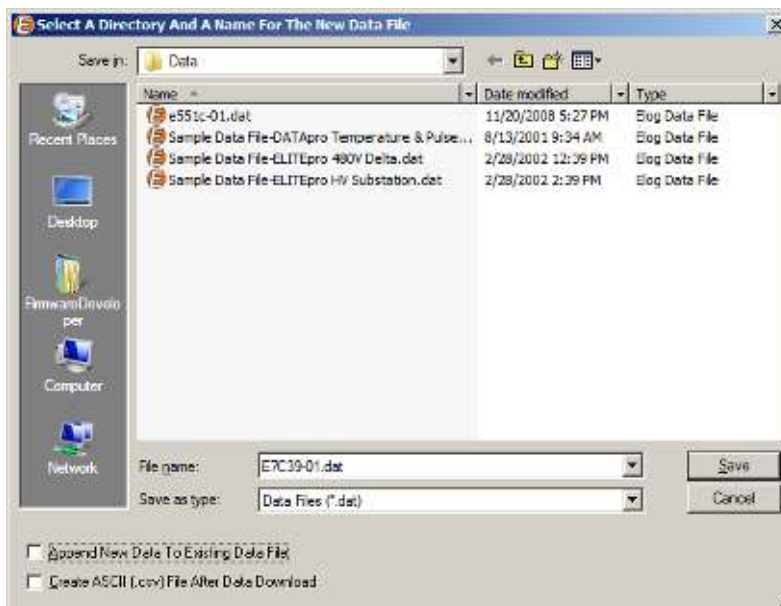
Also, when the data is downloaded a second file can be created at the same time that is a comma separated value format (.csv). A .csv file is also called a "flat," or ASCII, file and can be opened in other applications such as spreadsheets and databases.

The data will be saved to the folder as specified in **Tools > PC Setup > Data Files Saved To:** The default data folder is C:\DENT\ELOG

To view a data file, use **Data > Open Data File >** and then choose the file desired.

Even if not downloaded as a .csv file, the original binary .dat data files may be exported in a comma delimited ASCII file with a .csv extension. To export a data file, use the command **Data > Export Data File...**

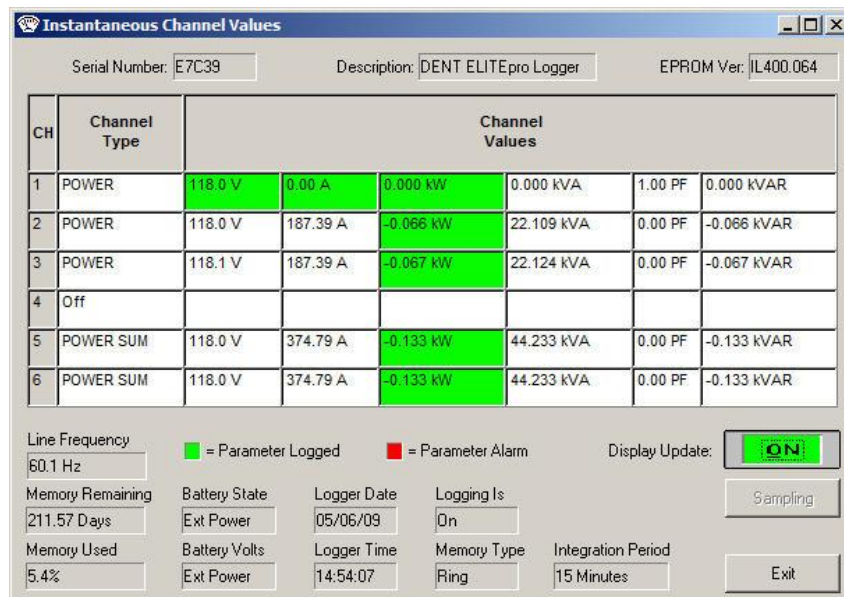
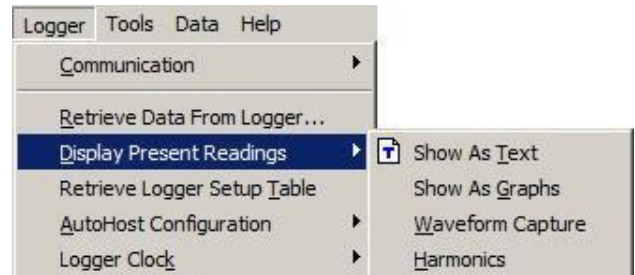
TECH TIP: When retrieving data from a Logger that is connected to an outlet via an AC adapter, the sampling rate is reduced from one read every three seconds to one read every 15 seconds. For Loggers that are operating on the internal battery, the sampling rate remains at once per minute.



Display Present Readings

Shows instantaneous readings for channels in use in either a textual or graphical format.

Show As Text: When this option is selected, a screen similar to the one next is shown. All of the channels that are turned on (even if not set to recording) are displayed simultaneously. If a parameter is being recorded by the logger, it will be shaded as shown below. For a Power Channel (as Channel 1, next), that means you will be able to see all six power parameters (V, A, kW, kVA, PF, and kVAR) even if only one of the parameters is being recorded. This feature is very useful for verifying correct installation of the Logger.

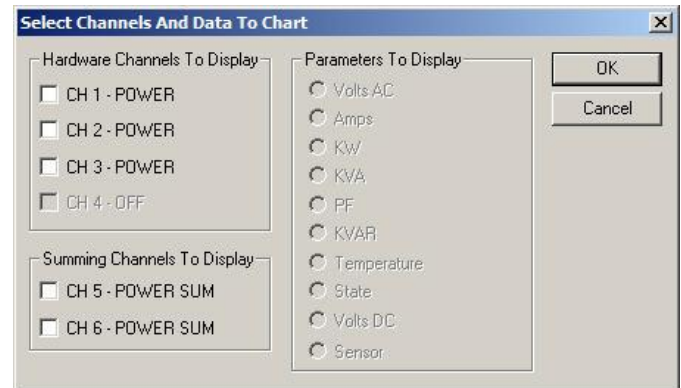


This screen provides information about:

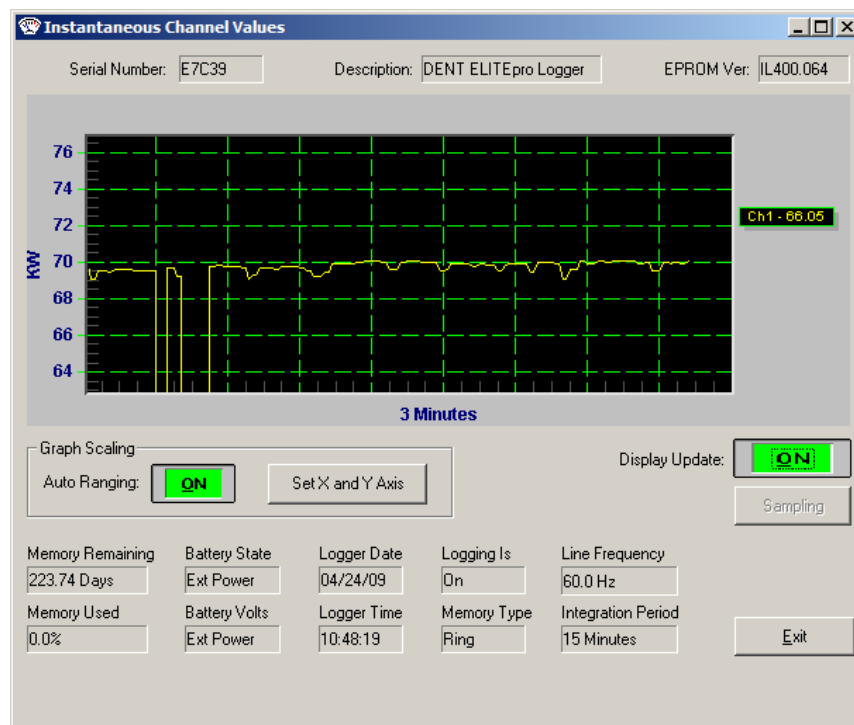
- The real-time data (which can be paused for cross-channel comparisons)
- The Line Frequency as measured from Channel 1 on L1
- How many days the memory has remaining before filling
- The logger battery condition (and if equipped, internal modem battery)
- The logger clock's current date and time
- Whether or not the data logging is turned on
- How much memory has been used
- Type of memory: Linear (Stop When Full) or Ring (Continuous)
- The integration period
- If a measurement is an alarm condition

TECH TIP: If no current transformer is connected to a channel that is turned "on," non-zero readings will be displayed. You can use this feature to verify a current transformer connection. If the CT is connected but shows a "0" for a value, then the CT is probably connected but the monitored load is turned off. On the other hand, if a constant (high) current is displayed, a CT wire may have come off of the logger.

Show As Graphs: This feature is similar to the text version described above but shows the data in a graphical format. After selecting this option, a screen such as the one at right appears. Among the hardware channels to display will be all of the channels that are currently turned on in the logger. Selecting Power makes the **Parameters To Display** active and you may choose one variable to graph. You can only choose one variable at a time unlike the text option where you will see all parameters displayed simultaneously. This is because of differences in scaling and also to reduce clutter on the graph. For example, you could display kW from 4 channels simultaneously but not a kW and a KVAR even if from the same channel.



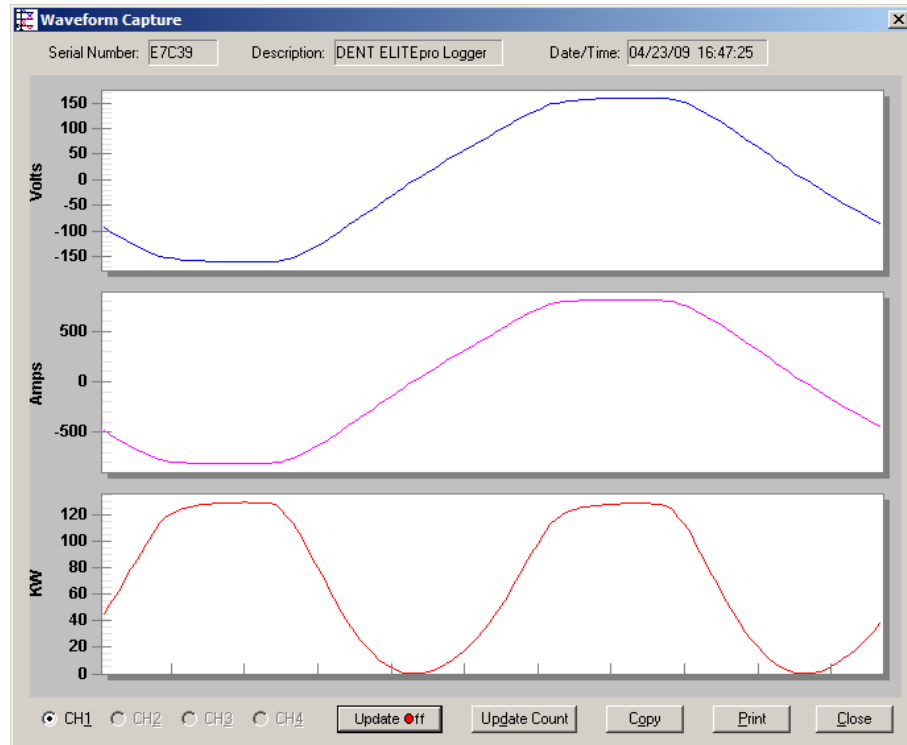
After selecting **OK**, a graph similar to the following appears:



This graphical presentation is very similar to paper strip chart recorders. The graph begins on the left edge and moves to the right. Upon reaching the right edge, the whole graph scrolls to the left with each new reading so that the most current data values are always shown and the older points slide off the left edge. By using the **Set X** feature, the amount of data shown can be varied from 1 second to more than 18 hours (65,000 seconds). Note that the X-axis scaling is only approximate.

The **Set X** and **Set Y** features can be used to set the scaling, colors, and line type (e.g., linear or logarithmic) and the number of grid lines that overlay the graph.

Waveform Capture: {ELITE_{pro} only} Use the software command **Logger > Display Present Readings > Waveform Capture** to see the actual current, voltage and power waveform. A typical (highly distorted waveform) display is shown below:





The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. The image presented is a single snapshot in time. Use the **Update** button for additional views. Copy will capture the image on the clipboard for pasting into other programs.

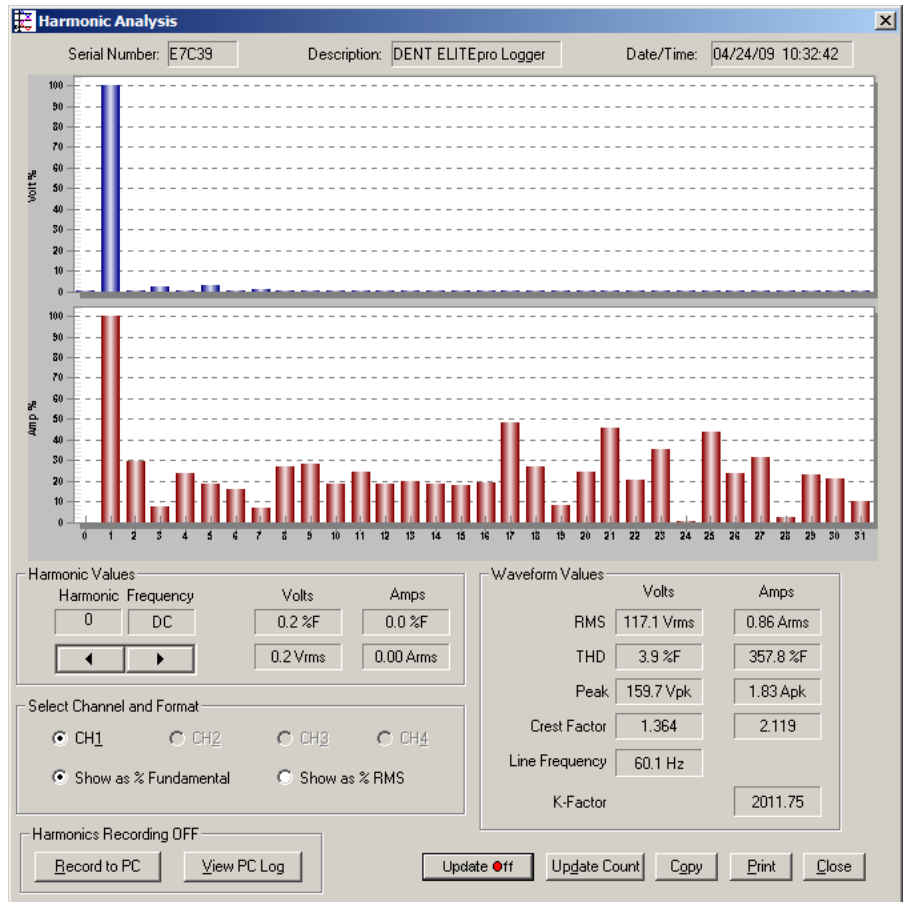
Note: The image displayed above shows a distorted (current) waveform from a household lamp. See also the graph below.

Harmonics: {ELITEpro only} The harmonic content of the previous waveform is shown below:

The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. This screen includes a good deal of information. The voltage and current harmonics are presented graphically in the upper part of the window. The ordinate (y-axis) is scaled in percent of the fundamental. The abscissa (x-axis) is the harmonic. Both even and odd harmonics are shown together with the zero order, DC component.

The actual value of the voltage and current for each harmonic may be found in the Harmonic Values box. By clicking on the   buttons, details about higher or lower order harmonics may be determined. The Waveform Values box provides summary statistics for the overall current and voltage waveforms. This includes the RMS value, Total Harmonic Distortion (THD), Peak values, and Crest Factor.

The image presented is a single waveform snapshot. Use the **Update** button for additional views. Copy will capture the image on the clipboard for pasting into other programs.



TECH TIP: The default number of harmonics shown is 31 plus the DC component. To view additional harmonics (up to the 63rd) place the cursor on the horizontal axis of either (or both) the voltage or current bar graph then double click. In the Horizontal Axis dialog box, change the "To:" field to the number of the highest harmonic desired then click **OK**

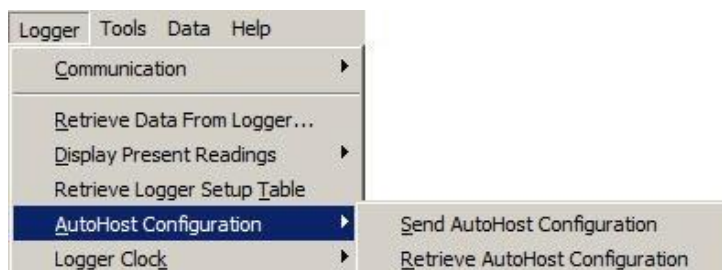
TECH TIP: The individual harmonic values and THD can be shown as a percentage of the fundamental (IEEE Standard 1035-1989) or as a percentage of the total RMS value (CSA and IEC standard).

Retrieve Logger Setup Table

This function retrieves the Setup Table in the Logger so it can be viewed, edited, resent to the logger or saved to the hard disk. See also page 1-2, **Setting up the Logger**, in the previous section for more information on Setup Tables.

AutoHost Configuration

ELITEpro and DATApro loggers can be configured to initiate telephone data retrieval sessions. AutoHost Configuration allows a call-out time schedule, task list and telephone number to call to be loaded into the loggers. At the time(s) sent, the logger will call a host computer at the number in its memory. If the computer has the application



AutoHost running (AutoHost is found in the Logger; Communication menu) then, when the logger calls, the computer will answer the call and perform the data retrieval tasks programmed.

To use AutoHost, connect a logger to the serial port of a PC and use the ELOG command **Logger > Communication > Direct Connect**. Then use **AutoHost Configuration > Send AutoHost Configuration** (or **Retrieve AutoHost Configuration**) to call up a configuration table to edit. Using **Retrieve** will call up the AutoHost configuration already in the logger. Using **Send** will call up a blank configuration if **Retrieve** has not already been used. If **Retrieve** has been used in the current ELOG session, then the AutoHost configuration shown will be the one brought from the logger. The configuration table must have set as a minimum, the telephone number of the host computer to call, a call time, and a task (set clock and/or download data).

Store AutoHost Configuration: This function is used to send an AutoHost Configuration file (callout schedule and task list) to the logger. If no AutoHost Configuration has been retrieved from the logger, the **Store AutoHost Configuration** command will produce a blank configuration table. The blank table may then be edited and stored in the logger.

The software does not save AutoHost Configurations. Instead, a configuration table may be retrieved from a logger, edited and then resent to the logger. The configuration settings remain active in the computer until ELOG is closed. The active configuration settings may be downloaded to any number of loggers to accelerate setting up the loggers for automatic calling to the host computer.

Retrieve AutoHost Configuration: This function will retrieve the callout schedule and task list from the logger for viewing, editing and re-sending to the logger.

Logger Clock

See also the section *AUTOHOST: UNATTENDED, LOGGER INITIATED CALLS TO THE PC*

This function is used to set the Logger's internal clock time and date. You may change the clock manually or synchronize it to the computer's clock.

Manually Set Logger Time: Allows user to set the logger date using the MM/DD/YY format. Also allows user to manually set the internal clock. *Use a 24-hour clock format.*

Synchronize Time To Match PC: With this option the computer clock is read and automatically updates the Logger.

Note: The **Synchronize...** function does not ask if you are sure if you want to set the logger clock to match the PC before doing so.

Logger Baud Rate...

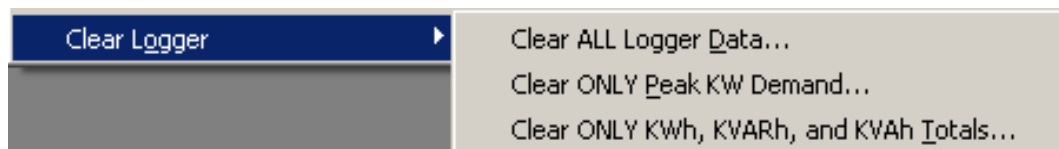
The choices are baud rates of 1200, 2400, 4800, 9600, 14400, 19200, 28800 and 57600. When using modems for remote communication, the maximum communication speed is 14400 baud. Use this option carefully when making a modem connection as the Logger, computer, and both modems must **ALL** be set to the same value.

Edit Logger Description Line...

This option allows you to change the user-defined, one line description in the Logger. The Description Line can be used to help identify the specific logger after the Logger has been retrieved from the field.

Logging ON/OFF...

This option starts and stops data collection.



There are three options. Note that Clear ALL Logger Data clears all the time series data in the logger memory as well as the Peak kW Demand register and the kWh, kVARh, and kVAh totalizer registers.

CAUTION: Do not select this menu item unless you are absolutely positive that you want to delete the information from your logger. Once deleted, the data may not be retrieved.

Tools > PC Setup...



PC Setup allows the user to configure the host computer. It sets the default file storage folders and configures the direct connect baud rate and port and the PC modem, and modem baud rate.

Data Files Saved To: Sets the default folder the data files will be saved in. When retrieving data files using the **Logger > Retrieve Data...** function, the data files will be sent to the folder specified here.

Setup Files Saved To: Sets the default folder the Setup Tables will be saved in. When opening a Setup Table file ELOG will look in this folder first.

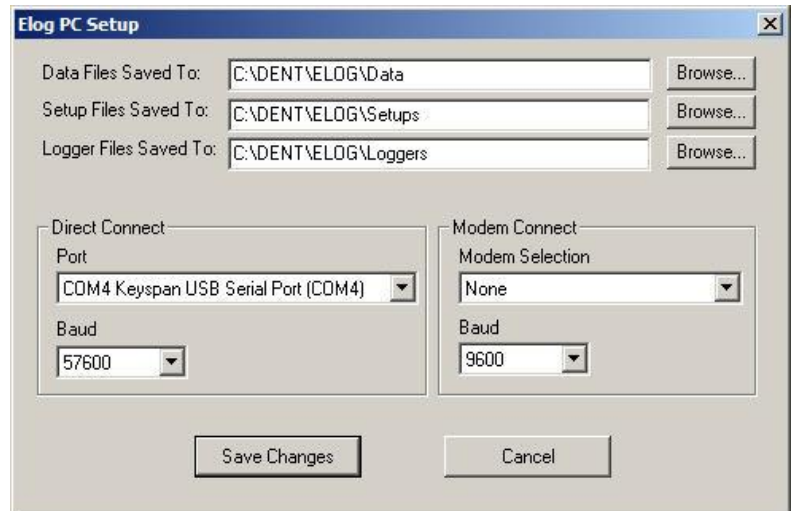
Logger Files Saved To: Sets the default folder the Logger files will be saved in. When using the automatic data collection program AutoPoll, ELOG will look in this folder first for the Logger Lists to call.


Append Downloaded Data To Existing

Data File: When this box is checked, anytime a logger is read the data retrieved will be appended to any previously existing data file from that logger. If ELOG does not find an existing data file in the default folder defined above (or the name of the file has been changed), then ELOG will download a complete data file. This feature is very useful for long term metering projects where periodic data downloads are made.

Direct Connect: Configures the computer for directly connecting (via the RS-232 port) to the Logger. The Computer communication ports (1, 2, 3, or 4) and Baud Rate (1200, 2400, 4800, 9600, 14400, 19200, 28800 or 57600) can be set from this menu.

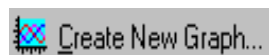
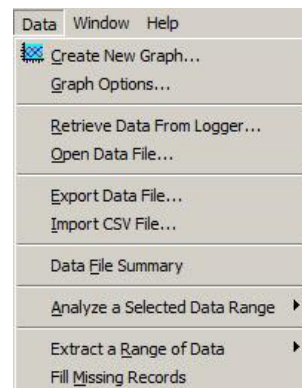
Modem Connect: Configures the computer for remote communication. Select only the modem to use and the Baud Rate (1200, 2400, 4800, 9600 or 14400). Changing the computer (local) modem Initialization String is done from Windows in **Control Panel > Hardware and Sound > Device Manager > Right-Click Modem Name > Properties > Advanced Tab**.



TECH TIP: Quickly set up the PC by clicking on the  **PC Setup** button on the screen.

Data

Once the data stored in the Logger has been retrieved to a PC and the file opened there are a large number of analysis, graphing, and exporting options are available.

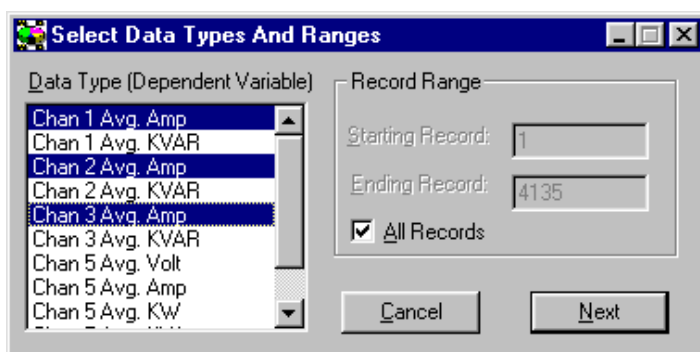


If a data file is not already open, clicking on this menu item will first bring up a folder from which to select a

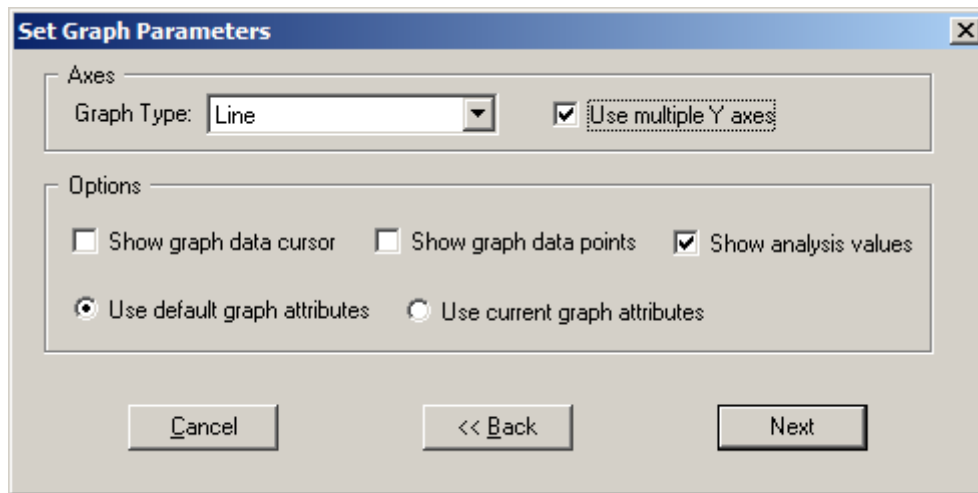
data file to be used to create a graph. If a data file is open, selecting this menu item will again open the file folder but will default to the file that is already open.

After selecting a data file, a screen similar to this example will appear:

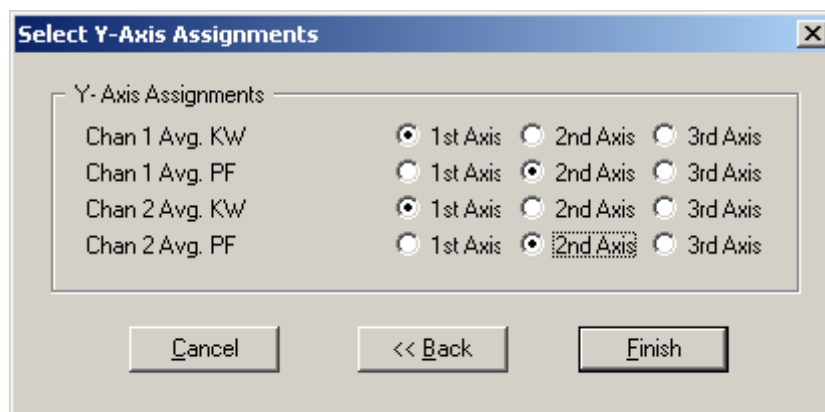
Use the mouse to select which parameters contained in the data file you wish to graph. Use standard Microsoft Windows functions to select parameters such as: Tag multiple parameters simultaneously by clicking on the first one and then hold down the Control (Ctrl) key and click on any other desired parameters; to select a continuous group of parameters, click on the first one and then hold down the Shift key and click on the last parameter in the group. This will select all parameters within the group including the first and last ones.



After selecting the parameters to graph, click **Next** to define the type of graph to make. Click on the down arrow to reveal the graph type options. Click the data cursor check box to have the data cursor appear when the graph is created (you can also toggle the data cursor on and off with the right mouse button). Use the radio buttons to choose between using the default graph parameters (colors, fonts, etc.) and those used in the last graph created. You can also choose to show summary statistics (minimum, maximum, average) on the graph by checking the Show analysis values box.



If you have selected more than one parameter to plot the Use multiple Y axes box will appear. If checked, you will get a third window that allows you to assign which parameters are assigned to which Y axes.




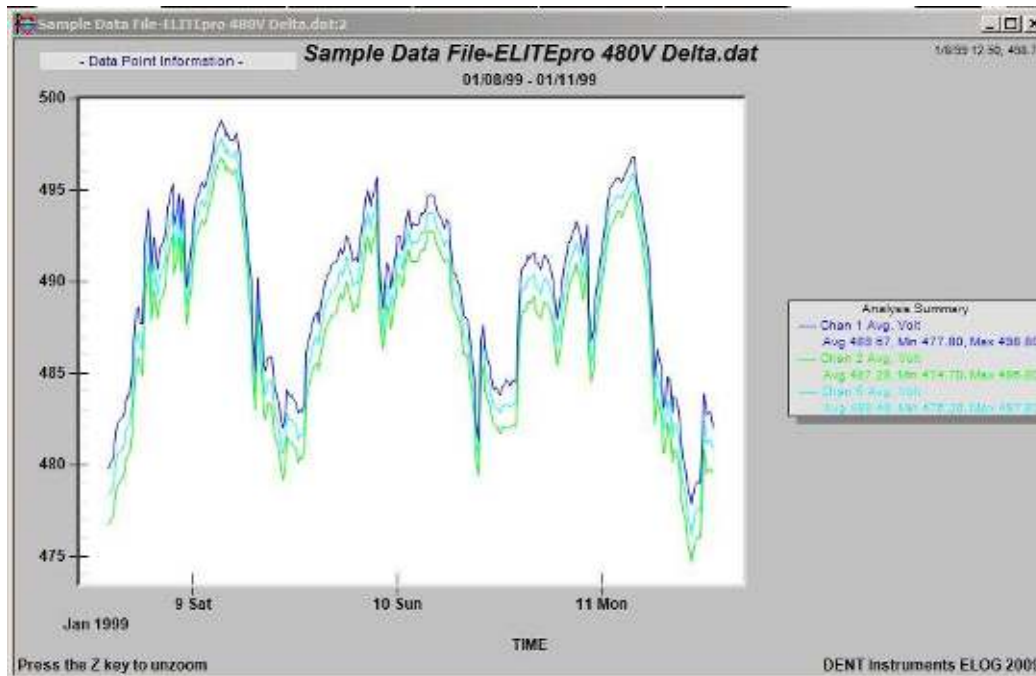
Click **Finish** and the graph you have defined will appear similar to the example shown on the next page. Though difficult to see, the parameter names to the right of the graph have a number (1, 2, or 3) in parentheses that indicates which Y – axis they are referenced to. Notice the vertical dashed red line data cursor in the graph.

The graph values that are intersected by the Data Cursor are shown in the upper left hand corner of the screen.

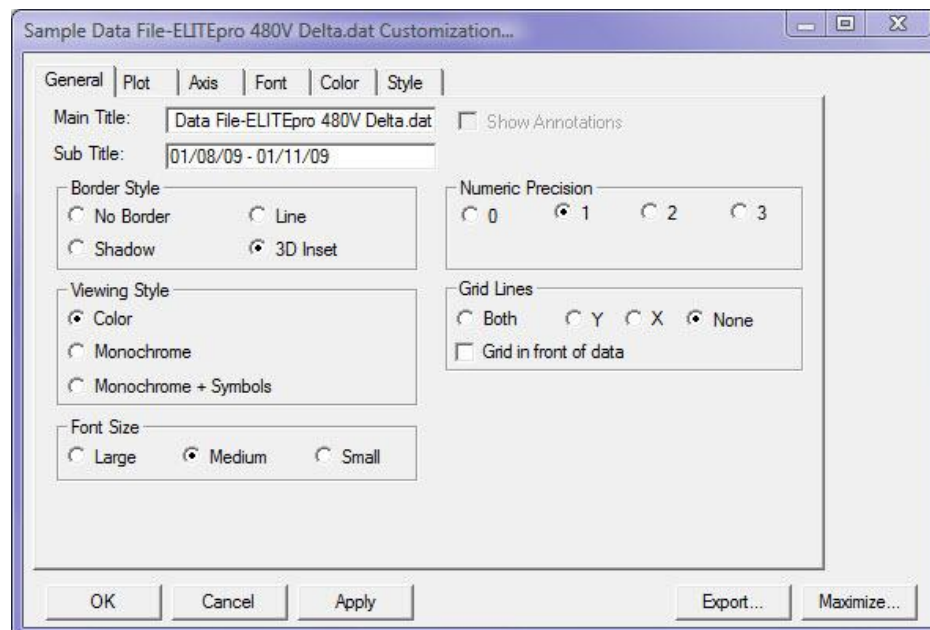
Values for 01/10/99 20:15:00: 51.415, -0.95, 40.830, 0.74

Once created, the graph may be edited in a number of ways. In general, any editable feature may be changed by double-clicking on the feature and making changes in the dialog box that appears. A few examples follow.

TECH TIP: Quickly open a data file and create a graph by clicking on the  **Create Graph** hot button.




Double-clicking anywhere in the graph area produces a dialog box that gives you various options to customize your graph by changing the graph type, colors, fonts and other options.



TECH TIP: Data Value

To determine the actual value of any data point in a graph, place the mouse pointer over the point in question. The X (time) and Y (value) of the point will be shown in the upper left corner of the screen.

TECH TIP: Zoom To zoom in on a portion of the graph, position the mouse pointer near the area to be zoomed. Hold the Control (Ctrl) key and left mouse button down, then drag the pointer to make a rectangle that covers the area to be zoomed. Let go of the mouse and Control key and the graph will redraw a zoomed portion of the graph.

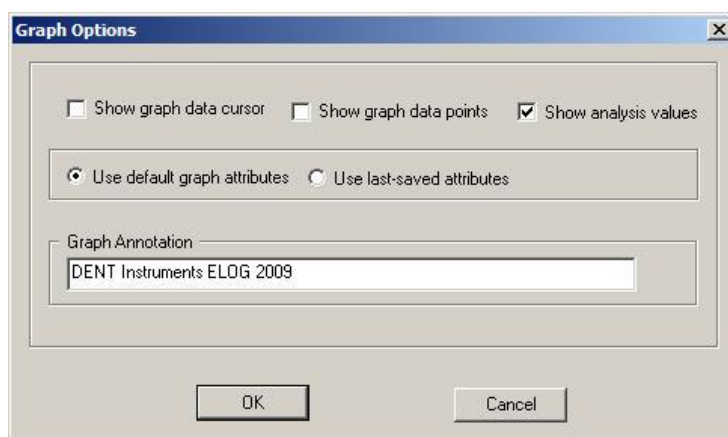
The graph may be zoomed as many times as desired. Use the **View > UnZoom**, Ctrl+U, or the  key to unzoom in reverse order of the zoom.

Graphs as well as other file types (Data, Setup Tables, Logger Lists) may be printed using the **File > Print...** command (or Ctrl + P).

Graph Options...

The Graph Options function allows you to set several defaults used when a new graph is created. The Graph Options window is shown below.

Graph Data Cursor: The data cursor is a vertical line that appears on a graph and is used to show the exact time and value of a data point in the graph. Use the Show graph data cursor check box to turn on the data cursor. It can also be turned on and off at any time while viewing a graph by clicking the right mouse button. The time and value of the graph where the data cursor intersects it is shown in the bottom left corner of the screen.



If there is more than one variable plotted, all values are shown on the screen. The values are not labeled but are shown in the same order that the variables appear in on the graph.

The data cursor may be moved by using the left-right arrow keys or by using the mouse to left click on the cursor and drag it to the desired location. (Note: You will not see the cursor move when using the mouse until releasing the left mouse button.)

Analysis Values: For each parameter plotted on a graph the average, maximum and minimum value is also shown to the right of the graph where the graph labels are also shown. If desired, by unchecking the Show analysis values box, the values will not be shown (or printed) on the graph.

Graph Attributes: The graph attributes include font sizes, background colors, graph colors and numerous others. Every time a graph is made and there is a change to any of the attributes the changes are remembered by ELOG. At the creation of the next graph you have the option of using the default graph attributes or the changes that were last made. Once a graph is made you cannot change the graph attributes using this window. You must change them from the graph itself.

Graph Annotation: If you make a lot of graphs and want to have the same annotation on the graph you may use this feature to add a description to the graph. Common uses are the name of the consulting company performing the metering and analysis or the name of the client.

Download Data File

This function is identical to the **Retrieve Data...** command in the **Logger** menu. It is used to download the data from the logger to the PC prior to viewing, graphing or exporting.

Open Data File

Data files stored on the PC can be viewed (but not edited) by selecting this menu item. To view a data file it must first be downloaded from the Logger by using the **Logger > Retrieve Data...** command or **Data > Download Data File** described above. After selecting a data file to open, a screen similar to the one below will appear.

	Record Date	Record End Time	Chan 1 Avg. Volt	Chan 1 Avg. Amp	Chan 1 Avg. KW	Chan 1 Avg. KVA	Chan 1 Avg. PF	Chan 1 Avg. Hz
1	12/10/98	16:35:00	120.2	88.84	9.695	10.675	0.91	4.394
2	12/10/98	16:40:00	121.1	81.17	8.512	9.830	0.87	4.877
3	12/10/98	16:45:00	121.1	87.45	9.276	10.590	0.88	5.068
4	12/10/98	16:50:00	121.1	85.23	9.068	10.317	0.88	4.878
5	12/10/98	16:55:00	121.1	83.02	8.681	10.049	0.86	5.030
6	12/10/98	17:00:00	121.1	80.58	8.542	10.841	0.89	4.915

The data is always shown in the same way. The left-most column is the record number and begins with 1 and continues through all of the data records in the file. The second column is the date of the record and the third column is the time of the record.

The fourth and remaining columns will be the data recorded by the logger for each parameter. If minimum or maximum values were recorded then the time, to the second, that the maximum or minimum occurred will also be recorded.

TECH TIP: To change the date format of the data time stamps in columns 1 and 2, use **Start, Settings, Control Panel, Regional Settings**.

Note: To view all the data when it does not fit on one screen, use the up/down, right/left scroll bars to move through the data.

TECH TIP: To edit a data set, first export the data (as described next) and then re-open it in another application, such as Excel.

Export Data File...

Exports the raw, binary .dat file to a .csv format (Comma Separated Value) file, which can be brought into a spreadsheet or database program.

To view the data from a spreadsheet program such as Excel or Lotus 1-2-3, follow these steps:

1. Retrieve the data from the Logger
2. Export the data to .csv file
3. Start the spreadsheet program (such as Excel)
4. Use the **File > Open** command in the spreadsheet and select "All Files" in the Files of type: box
5. Open the .csv data file from the folder you specified, for example,
C:\Program Files\DENT\ELOG\Data*name of file.csv*

Data File Summary

The Data File Summary is a very useful feature to see, at a glance, a lot of information about the data file, the logger used to collect the data, and the setup table used in the logger. This is where the Peak kW Demand and kWh, kVARh, and kVAh totalizer values are found. An example Summary is shown on the next page.

The file is divided into three parts: The first is the Data Summary and gives the start and end times of the data, file name in the PC, and summary statistics for each channel and parameter that was recorded by the logger. The second part is the Setup Summary and it shows the essential features of the setup table that was active in the logger during the data collection period. The third part is the Logger Summary and provides information about the logger used to collect the data. The Data File Summary is opened in Microsoft Notepad and can be edited, saved, printed or moved into another report.

Data Summary

Data File Name: E8B10-01.dat

First Data Record End Time: 06/15/09 16:02:00

Last Data Record End Time: 06/16/09 11:01:00

Monitoring Period Duration: 0.79 days

Peak Demand: 133.145kW on Monday 06/15/09 at 23:13:00

Total Usage (Channel 5): 2430kWh, 2435kVAh, 2kVARh

	Average	Maximum (Date Time)	Minimum (Date Time)	Total
Chan 1 Avg. Volt	588.7	604.7 (06/15/09 22:05:00)	0.0 (06/16/09 11:01:00)	
Chan 1 Avg. Amp	108.38	187.39 (06/16/09 11:01:00)	101.52 (06/16/09 07:30:00)	
Chan 1 KW Hours	1.056	1.102 (06/15/09 23:24:00)	0.000 (06/16/09 11:01:00)	1203.836
Chan 1 Avg. KW	63.361	66.134 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 1 Avg. KVA	63.372	66.147 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 1 Avg. PF	1.00	1.00 (06/16/09 11:01:00)	1.00 (06/16/09 11:01:00)	
Chan 1 Avg. KVAR	-0.140	0.000 (06/16/09 11:01:00)	-0.357 (06/16/09 10:46:00)	
Chan 2 Avg. Volt	2.2	2.3 (06/16/09 10:50:00)	0.0 (06/16/09 11:01:00)	
Chan 2 Avg. Amp	110.08	187.39 (06/16/09 11:01:00)	103.09 (06/16/09 07:30:00)	
Chan 2 KW Hours	0.000	0.000 (06/16/09 11:01:00)	0.000 (06/16/09 11:01:00)	0.000
Chan 2 Avg. KW	0.010	0.015 (06/15/09 23:37:00)	0.000 (06/16/09 11:01:00)	
Chan 2 Avg. KVA	0.242	0.253 (06/16/09 00:08:00)	0.000 (06/16/09 11:01:00)	
Chan 2 Avg. PF	0.05	1.00 (06/16/09 11:01:00)	0.01 (06/16/09 10:42:00)	
Chan 2 Avg. KVAR	0.230	0.242 (06/16/09 00:29:00)	0.000 (06/16/09 11:01:00)	
Chan 3 Avg. Volt	588.9	604.8 (06/15/09 22:05:00)	0.0 (06/16/09 11:01:00)	
Chan 3 Avg. Amp	110.35	187.39 (06/16/09 11:01:00)	103.38 (06/16/09 07:30:00)	
Chan 3 KW Hours	1.076	1.124 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	1226.804
Chan 3 Avg. KW	64.569	67.457 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 3 Avg. KVA	64.570	67.457 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 3 Avg. PF	1.00	1.00 (06/16/09 11:01:00)	1.00 (06/16/09 11:01:00)	
Chan 3 Avg. KVAR	0.008	0.022 (06/15/09 18:03:00)	-0.101 (06/16/09 10:32:00)	
Chan 5 Avg. Volt	393.3	403.9 (06/15/09 22:05:00)	0.0 (06/16/09 11:01:00)	
Chan 5 Avg. Amp	328.81	562.18 (06/16/09 11:01:00)	307.99 (06/16/09 07:30:00)	
Chan 5 KW Hours	2.132	2.227 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	2430.884
Chan 5 Avg. KW	127.940	133.601 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 5 Avg. KVA	128.184	133.855 (06/15/09 22:05:00)	0.000 (06/16/09 11:01:00)	
Chan 5 Avg. PF	1.00	1.00 (06/16/09 11:01:00)	1.00 (06/16/09 11:01:00)	
Chan 5 Avg. KVAR	0.098	0.152 (06/16/09 00:34:00)	-0.235 (06/16/09 10:44:00)	

Setup Summary

Setup Table Description: Main Computer room

Channel 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 100.000

Channel 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 100.000

Channel 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 100.000

Channel 5 - Power Sum: 1,2,3

Memory Type: Ring

Line Frequency: 60 Hz

Integration Period: 1 Minute

Channel 5 Peak kW Demand Window: Moving, Width = 15 minutes

Logger Summary

Logger Description Line: DENT ELITEpro Logger

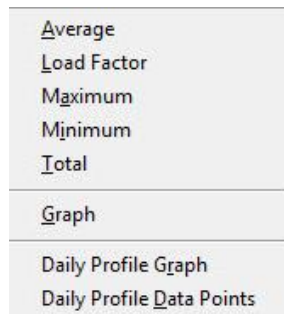
Logger Serial Number: E8B10

Logger type: ELITEpro

Firmware Version: IL400.064

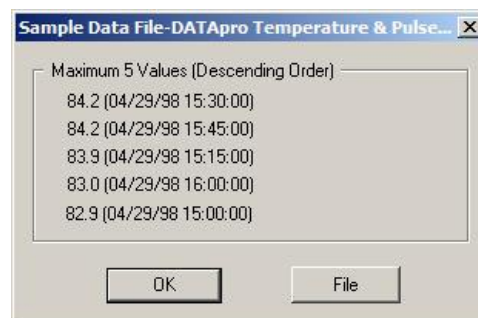
Analyze a Selected Range of Data

ELOG also has a number of analysis features. With a data file open, click on the Analyze a Selected Data Range menu to show the various options available. You may also right-click the mouse over the selected range of data to access the various options. The analyses features ***only work on a selected range for one variable at a time***. A variable may be selected in several ways all using standard MS Windows methods. To select an entire column of data, place the mouse pointer over the column header (e.g., Chan 1 Avg. Amp) and click the left button. The entire column should be selected. To select a portion of a column, place the mouse pointer over the first record to be included then push the left button down and hold it while dragging the mouse down the screen. When located over the last record to be included, release the mouse button.



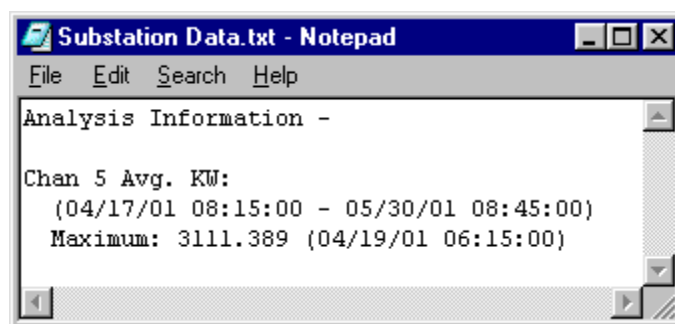
Once a data range has been selected, use the mouse to select the analysis desired. A window such as shown will appear:

In this case, Maximum value was chosen after selecting the kilowatt draw measured by an ELITEpro. Note that when maximum and minimum are selected, the date and time of the maximum (or minimum) is also shown along with the value. In all cases, clicking on "OK" closes the window.



If "File" is selected, ELOG opens MS Notepad and a window similar to the one at right appears.

Together with the maximum value and time of occurrence is shown the date range for the piece of the data that selected for analysis. As with the Data File Summary, the data contained in the Notepad file may be edited, saved, printed or moved into another program for reporting generation.



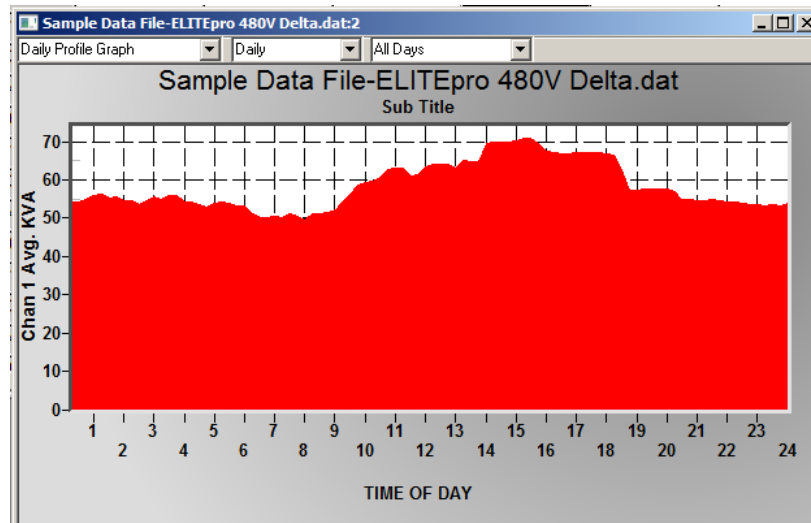
Each time an analysis function is used and "File" is selected, Notepad is opened and the result of the analysis function ***is added to the existing Notepad file***.

For the first five analysis functions, **Average** is the arithmetic average of all the values in the selected column within the date range of data selected. **Load Factor** is the ratio of the peak (maximum) value divided by the average value. **Maximum** and **Minimum** are the largest and smallest values together with the day and time of the occurrence. **Total** is the algebraic sum of all the values (useful for summing kWh within a specified period of time).

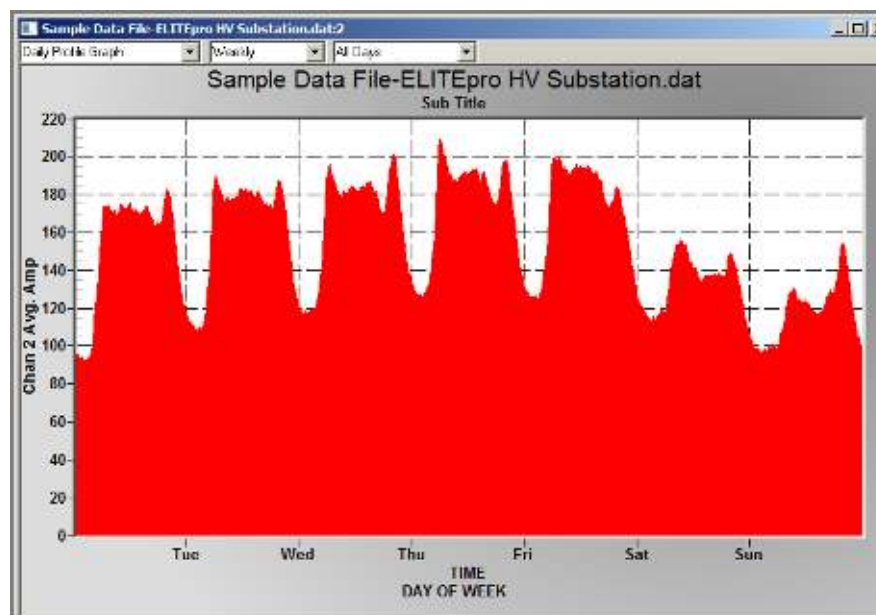
For any selected variable and range, **Graph** can also be used to create a quick line graph.

TECH TIP: All analysis features in the Analyze a Selected Data Range and Extract (described next) can be quickly accessed using the right mouse button. First use the mouse to select a range of data for analysis by dragging holding the left mouse button down over the first record in the range and then dragging the mouse until the last record and releasing the button. Then place the mouse pointer over the selected range and use the right button.

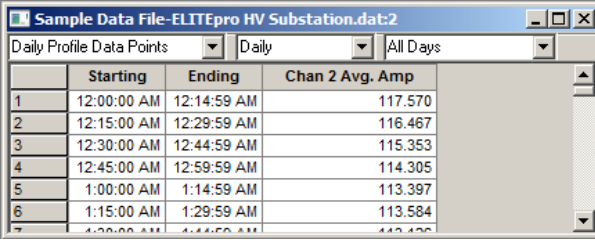
Daily Profile Graph and **Daily Profile Data Points:** (also called Load Profiles) can be used to create 24 hour or 7 day load shapes of the any desired parameter. As before, select a range of data (or the whole column) for a parameter for which you wish to create a Daily Profile. Then use the mouse to select the menu item **Data > Analyze the Selected Data range > Daily Profile Graph**. An example Daily Profile is shown below.



Note that there are a number of controls accessible from the graph. By clicking on the down arrows at the top of the window, the Daily Profile Graph may be changed to display the Daily Profile Data Points that make up the graph (first arrow). The middle down arrow allows changing from a Daily Shape to a Weekly Profile as in the example below. Lastly, the third down arrow allows you to select between using all day types (weekdays and weekend days) to make the profile, to using only week days or just weekend days. Especially true for kW load shapes, it is very typical for weekday profiles to be very different from weekend day profiles as can be seen in the weekly profile below where all seven days of the week are shown separately.



To the right is an example of the data points used in creating the daily profile graph. Note that the interval between the data points is always the same as the integration interval used when the data was collected. In other words, if the data was collected at 15 minute intervals then there will be 96, 15 minute points in the daily profile. Also, a weekly profile would then have $7 \times 96 = 672$ points in the graph.



	Starting	Ending	Chan 2 Avg. Amp
1	12:00:00 AM	12:14:59 AM	117.570
2	12:15:00 AM	12:29:59 AM	116.467
3	12:30:00 AM	12:44:59 AM	115.353
4	12:45:00 AM	12:59:59 AM	114.305
5	1:00:00 AM	1:14:59 AM	113.397
6	1:15:00 AM	1:29:59 AM	113.584

Daily Profile Graphs and the corresponding data points can also be saved or printed using the **File > Save As** command. The data points are saved as comma separated variable files (.csv) and the graphs are saved as Windows Metafiles (.wmf).

Extract A Range of Data

Sometimes it is useful to use only part of a data file. For example, the beginning and end of a data file may include records that do not correspond to the actual monitoring period. Perhaps data collection was started before the logger was connected or the logger was removed and continued to collect data before logging was stopped or the data retrieved from the logger. In these instances, it is desirable to remove the beginning and end of the data file so the non-monitoring records are not included in the subsequent analysis. ELOG offers two ways to extract only the desired range of data from the “middle” of a data file: either by a date range or by record number. Both of these methods are described on the next page.

Extract By Date: Allows you to enter a beginning and ending date and time for the data you wish to keep. Data before the beginning date and time and also data with a time stamp after the ending date and time are trimmed off. When using this command, the following dialog box is opened. Note that the top of the box shows the beginning and end times of the first and last records in the data.

The dialog box titled "Save a Range of Data" has a close button (X) in the top right corner. It is divided into two main sections. The top section, "Existing Date/Time Limits", shows "File Starts: 6/14/99 10:15:00" and "File Ends: 7/20/99 21:45:00". The bottom section, "Save Date/Time Limits", has a "Format: mm/dd/yyyy" label and a "hh:mm:ss" label. It contains "New Start:" and "New End:" fields. The "New Start:" field shows "6 / 14 / 99" and the "New End:" field shows "7 / 20 / 99". To the right of these fields are "at" labels and time selection fields showing "10 : 15 : 00" and "21 : 45 : 00". Each time field has up/down arrows and a "Midnight" button. At the bottom are "OK" and "Cancel" buttons.

In the bottom half of the window, place the mouse pointer over the date or time to be change and click the left button. Then type in the new date or time or use the up/down arrows to change the values to those desired.

TECH TIP: Use the Midnight buttons to quickly set the times to 00:00:00 and thus make the date range occur on the day boundary.

Extract By Record Number: This function is similar to Extract By Date but allows you to clip a section out of a data file based on the desired record numbers. Sometimes it is easier to look at the data file (using **Data > Open Data File**) and then scan the data to find the records in the data where the desired data begins and ends. The record number is always shown in the leftmost column. Using the window shown, change the start and end numbers in the New Record Range to those desired.

Using either method to extract a range of data will open a new window on the screen of the extracted data file. From there it may be analyzed as any other data file or saved using **File > Save As**. In addition, if the extracted file or ELOG is closed a warning message will be displayed asking if you want to save the extracted data.

The dialog box titled "Save a Range of Data" has a close button (X) in the top right corner. It contains a text box with the instruction "Select the range of records you want to extract and save". Below this is a section with "File Record Range: 1 to 3503" and "New Record Range: 1 to 3503". The "New Record Range" fields have up/down arrows. At the bottom are "OK" and "Cancel" buttons.

TECH TIP: A shortcut method to an extraction is to use the mouse to select the range of data desired then place the mouse pointer over the highlighted range and push the right mouse button. Then select Extract. Note that all columns in the data are extracted even if only one column is selected.

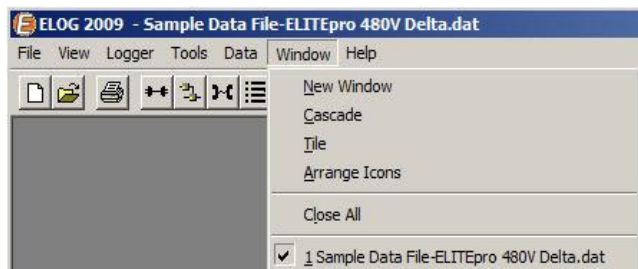
Fill Missing Records {ELITEpro}: The final Data Menu choice is Fill Missing Records. This function fills in zeros when there is a time gap in the data due to the logger losing power during a recording session. This is especially useful if you want to see a power loss when graphing the data. To use this option, you must have a data file open. Then select **Data > Fill Missing Records**. Once ELOG has filled the records with zeros, a window appears to tell you how many records and gaps were filled.

The Fill Missing Records option was designed for ELITEpro instruments with Firmware Version 64 or greater. To check the firmware version of your logger, open ELOG and connect the logger to the PC using **Logger > Communication > Direct Connect** or the Connection speed button. The firmware version will be displayed in the Connection Box.

Window

New Window

Opens another copy of the data file to view or from which to make graphs.



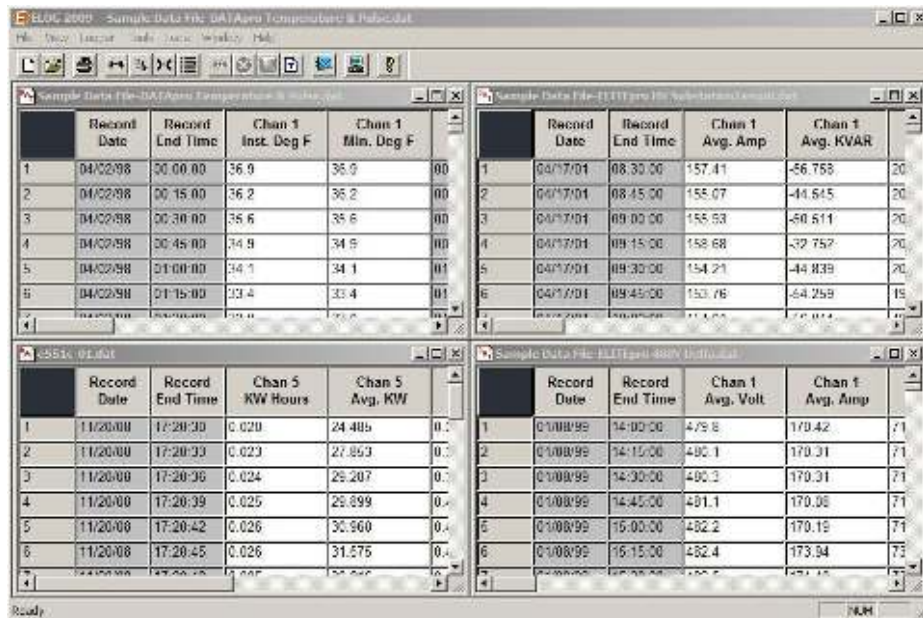
Cascade

If multiple windows (data files or graphs) are open simultaneously, using the Cascade command will organize the open files one on top of the other as shown below.

Record	Record Date	Record End Time	Chan 5 KW Hours	Chan 5 Avg. KW	Chan 5 Avg. PF	Chan 5 KVAR Hours
1	11/20/08	17:20:30	0.020	24.485	0.29	0.020
2	11/20/08	17:20:33	0.023	27.853	0.34	0.023
3	11/20/08	17:20:36	0.024	29.287	0.38	0.024
4	11/20/08	17:20:39	0.025	29.899	0.41	0.025
5	11/20/08	17:20:42	0.026	30.960	0.44	0.026
6	11/20/08	17:20:45	0.026	31.575	0.45	0.026
7	11/20/08	17:20:48	0.025	30.216	0.44	0.025
8	11/20/08	17:20:51	0.026	31.016	0.45	0.026
9	11/20/08	17:20:54	0.026	31.016	0.47	0.026
10	11/20/08	17:20:57	0.026	31.668	0.47	0.026
11	11/20/08	17:21:00	0.027	32.300	0.48	0.027
12	11/20/08	17:21:03	0.026	30.700	0.43	0.026
13	11/20/08	17:21:06	0.026	31.426	0.46	0.026
14	11/20/08	17:21:09	0.027	31.984	0.48	0.027
15	11/20/08	17:21:12	0.027	32.040	0.48	0.027

Tile

If multiple windows (data files or graphs) are open simultaneously, using the **Tile** command will organize the open files side by side for simultaneous viewing as shown below.



Arrange Icons


If multiple graphs or data files have been opened and then minimized, the **Arrange Icons** command will order them neatly along the bottom of the screen.

Close All

Closes all open windows (data files or graphs).

Hot Buttons

ELOG has a number of Hot Buttons that can be used to quickly accomplish some of the more commonly used functions such as making a direct connection from a PC to a logger. Instead of using the menu commands

Logger > Communication > Direct Connection (Null Modem Cable) simply click on the  button. The button tool bar can be toggled on and off by checking or unchecking the **View > Toolbar** box.

A description of each hot button follows:



New: Create a new Setup Table, Logger List, Data File (download), or Graph



Open: Open an existing Setup Table, Logger List, Data File, or Graph



Print: Print the active window



Direction Connection: Use for connecting the logger to the PC when using a serial cable



Network Connection: Use for connecting a PC to a logger that is on a local area network



Manual Dial: Use for direct dialing a remote logger



Choose from last used Logger List: Use to connect to a logger on a Logger List



Disconnect: Quickly disconnect from either direct connection or a telephone connection



Toggle Connection Window: Use to turn on and off the connection status window at the bottom of the screen



Setup PC: Quickly access PC setup configurations



Create Graph: Create a graph from an open data file




UnZoom Graph: Use to back out of an expanded graph



Cancel COMM OP: Cancel the current communication operation



About: Opens the ELOG Manual

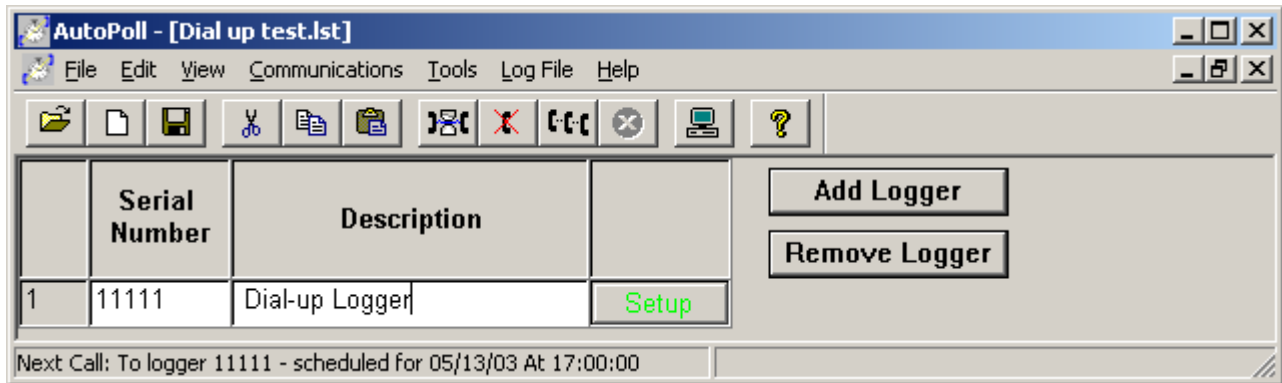
Note: The number and type of hot buttons in the toolbar depend on the windows that are open. For example, the  (UnZoom Graph) button will only appear when a graph is open.


AUTOPOLL: UNATTENDED CALLING FROM THE PC TO THE LOGGER

When ELOG is installed onto the PC, two other programs are also installed: AutoPoll and AutoHost. AutoPoll may be used for unattended and automatic data retrieval from a number of remote loggers where the PC calls the loggers. AutoHost (described in the next section) may also be used for unattended and automatic data retrieval from a number of remote loggers where the loggers call the PC.

AutoPoll (short for **Automatic Polling**) is a stand-alone Windows application program that may be launched from ELOG by using the **Logger > Communication > AutoPoll...** menu command. AutoPoll works in conjunction with a *Logger List*, which is a compilation of the remote loggers to be interrogated, their modem telephone numbers, call schedule, and other tasks to be performed. A complete description of Logger Lists is found on Page 66.

AutoPoll has limited user interaction and should be thought of primarily as an automatic dialer. After launching AutoPoll, you are prompted to first select a Logger List containing the loggers that you wish to call. Only one Logger List may be active at a time. After selecting the desired Logger List, a screen similar to the one below becomes the active window.



At this point, the AutoPoll program is running and may be minimized by clicking on the  button. AutoPoll will run in the background and you may continue to use the PC for any other tasks during the day. AutoPoll does seize the modem and modem port. While AutoPoll is running, you will not be able to use the modem for other programs such as e-mail or the internet.

File

Typical Windows commands are found in this menu item.

New (Ctrl+N) Opens a New Logger List: groups of loggers used with the AutoPoll. Logger List files have an .lst extension.

Open... (Ctrl+O) The **Open** function is very similar to the **New** command except it assumes that a Logger List is already stored somewhere on the computer disk.

File	Edit	View	Communicat
New			Ctrl+N
Open...			Ctrl+O
Save			Ctrl+S
Save As...			
Print...			Ctrl+P
Print Preview			
Print Setup...			
1 Test logger.lst			
Exit			

Save (Ctrl+S) and **Save As...** These functions allow you to save an open Logger List using the current name and location (**Save**) or with a new name and/or to a new location on the PC hard drive (**Save As**).

Print (Ctrl+P) Used to initiate printing and to select the pages to be printed. Print Setup may also be accessed from this menu.

Print Preview Allows you to view the document to be printed as it will appear on the paper.

Print Setup... Is used to select the printer to be used, paper tray source, and paper orientation.

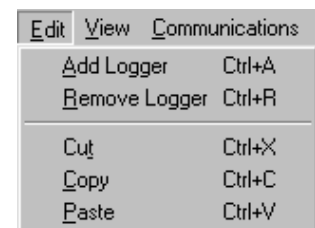
Exit Exits and closes the AutoPoll program.

Edit

Add Logger (Ctrl+A) Adds a new logger to a logger list

Remove Logger (Ctrl+R) Removes an existing logger from a logger list

Cut (Ctrl+X), Copy (Ctrl+C), Paste (Ctrl+V) Standard Windows commands.



View

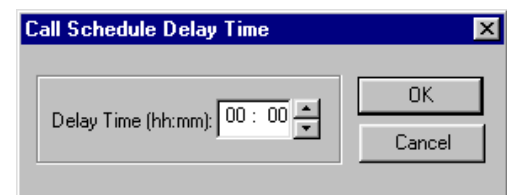
View is used to toggle the **Toolbar** and **Status Bar** on or off as desired. The Toolbar contains the hot buttons and the Status Bar is the line at the bottom of the screen that reports the callout status.


The Current Call List is the active Logger List that is being used by AutoPoll to schedule calls to loggers. The logger list may be closed and hidden but is still active in AutoPoll until a new logger list is opened, replacing the current list.



Communications

Delay Today's Calls: Is used to *temporarily* change the time calls are to be made. If the window is minimized, AutoPoll operates in the background and the computer may be used for other purposes at the same time AutoPoll is running. Sometimes it may be desired to use the computer modem for another purpose (e.g., retrieving e-mail). To lock out AutoPoll so that it does not interfere with other uses of the modem, use **Delay Today's Calls...** to delay all scheduled calls for the day for up to 24 hours.



To use, click on the  buttons to select the length of the delay and then click **OK**. When the delay period has passed, any loggers that had been scheduled during the delay period will then be immediately called.

Cancel Today's Calls: This feature deletes all calls scheduled for the day and they are *NOT* called later.

Repeat Today's Calls: This function allows all loggers on the day's call list to be recalled. This feature would be useful if, for example, the telephone cord was not connected to the modem when the calls were attempted and, consequently, no data retrieval took place. Repeat Today's Calls makes it easy to call all of the loggers again.

Terminate Current Call: This menu item will cancel a call in process.

TECH TIP: You may also cancel any operation, including data retrieval by clicking on the Cancel Communication Operation (Cancel COMM Op) hot button.



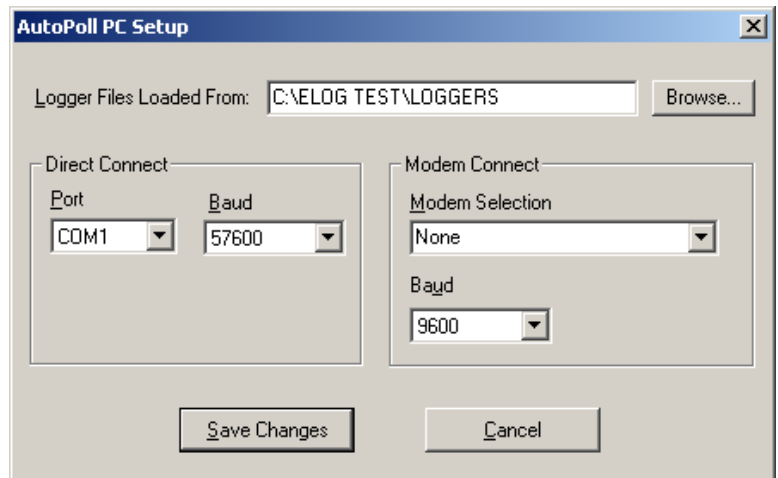
Tools > PC Setup

PC Setup is used to set parameters related to the computer including port settings, baud rates and more.

Clicking on **PC Setup** brings up the following screen:

The default folder from which Logger Lists may be selected is set here.

The **COM** (communication) **Port** that the PC will look to for both direct serial and modem communication, the communication speed (**Baud**) are also set here.



AutoPoll PC Setup

Logger Files Loaded From: C:\ELOG TEST\LOGGERS Browse...

Direct Connect

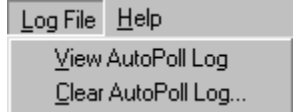
Port: COM1 Baud: 57600

Modem Connect

Modem Selection: None Baud: 9600

Save Changes Cancel

Log File



View AutoPoll Log: When the AutoPoll program calls loggers, it creates a text file that contains a summary of all of the calls made called the AutoPoll Log. An excerpt of Log is shown below:

```
- DENT Instruments -

AutoPoll Event Log File

Connecting to logger ELITE on 04/10/02 at 10:54:31
Direct connection to logger ELITE completed
Setting clock from 10:54:36 04/10/02 to 10:54:38 04/10/02 for logger ELITE
Task complete for call to logger ELITE
Downloading data for logger ELITE
Download of data from logger ELITE completed. Appended to file ELITE-01.dat
All session calls completed - 1 Calls Attempted - 0 Calls Failed

-----

Connecting to logger ELITE on 04/10/02 at 11:08:01
Direct connection to logger ELITE completed
Setting clock from 11:08:07 04/10/02 to 11:08:08 04/10/02 for logger ELITE
Task complete for call to logger ELITE
Downloading data for logger ELITE
Download of data from logger ELITE completed. Appended to file ELITE-01.dat
All session calls completed - 2 Calls Attempted - 0 Calls Failed

-----
```

At the end of each call, a dashed line is added to the bottom of the file to separate calling sessions.

The file created shows the status of each call (and attempted call) made to the logger(s) in the Logger List and includes changes made to the logger clock if the *Set Logger Clock* flag has been checked in the Logger List. At the end of the session, a summary of the calls attempted and failed will be shown. If the software took three attempts to contact a logger and was successful on the third try, the summary would still show 1 Call Attempted - 0 Calls Failed.

The file created is labeled autopoll.log and is automatically saved to whatever folder contains the ELOG application program (typically C:\Program files\DENT\ELOG). The folder where the file is saved may not be changed except by moving the ELOG application too.

As subsequent polling sessions are completed, the autopoll.log file is automatically updated and the new contact reports are appended to the existing .log file. The maximum size of the autopoll.log file is 1 Megabyte. If this limit is exceeded, AutoPoll automatically changes the existing .log file into a .bak and starts a new .log file. If there is already an existing autopoll.bak file, the existing file is deleted and replaced by the new autopoll.bak file.

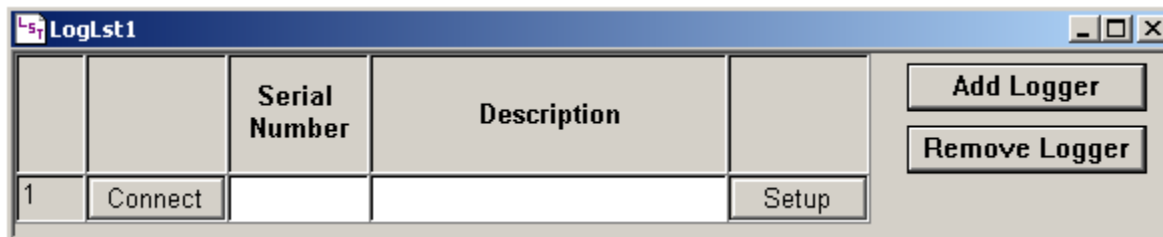
Autopoll.log is a text format document (.txt) and may be opened by a word processor or any application that reads ASCII files from which it may then be viewed or printed.

Clear AutoPoll Log: Can be used to clear the current call log. **Caution:** Once cleared the call log information cannot be retrieved.

Logger Lists

Logger Lists are used to maintain information about groups of loggers (the lists) related to telephone communication, including the telephone number of the logger modem and a schedule of calls to be made to the logger by the host computer. This information can be used for manual connecting and by the AutoPoll program. A Logger List may have as few as one logger in it or as many as a disk space on the computer allows.

Logger Lists are accessed through the **File > Open (or New) > Logger List File** command. Selecting **Open** will bring up a folder from which to select an existing Logger List to edit or use. Selecting **New** will bring up a blank Logger List as shown below:



The screenshot shows a window titled "LogLst1" with a table and two buttons. The table has four columns: an index column, a "Connect" column, a "Serial Number" column, and a "Description" column. The first row contains the number "1" in the index column, "Connect" in the "Connect" column, and "Setup" in the "Description" column. To the right of the table are two buttons: "Add Logger" and "Remove Logger".

	Connect	Serial Number	Description
1	Connect		Setup

Where:

Serial Number is the 5 digit logger serial number. If the serial number entered here does not match the serial number of the logger called at the phone number listed, the data will be retrieved but an error will be noted in the Call Log.

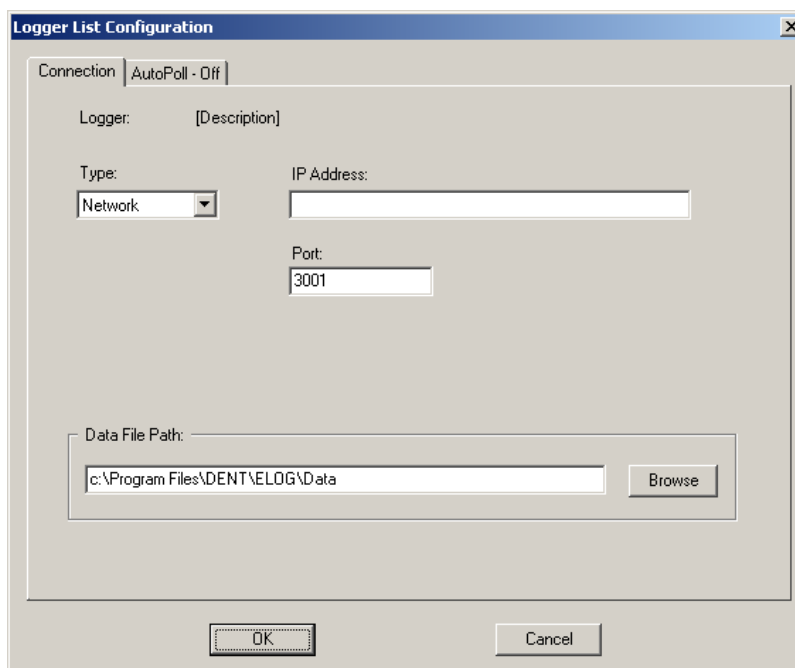
Description (optional) is a 20 character description of the load monitored

Setup is where additional information about connecting to the logger is kept.

Add Logger is used to add a new, blank line at the bottom of the Logger List to create new entries for additional loggers.

Remove Logger is used to remove a logger from the list. To remove a logger, place the mouse cursor over the number in the left-most column of the logger to be removed. Left click the mouse to highlight the logger and then click Remove Logger.

Clicking on Setup for a logger brings up the following screen:



The dialog box is titled "Logger List Configuration". It has a tab labeled "AutoPoll - Off". Inside, there is a section for "Logger:" with a "[Description]" label. Below this, there is a "Type:" dropdown menu currently set to "Network". To the right of the dropdown is an "IP Address:" text field. Below the IP address field is a "Port:" text field with the value "3001". At the bottom of the dialog, there is a "Data File Path:" text field containing "c:\Program Files\DENT\ELOG\Data" and a "Browse" button. At the very bottom are "OK" and "Cancel" buttons.

Connection Tab

The default connection type is Network. If the logger is to be used on a network enter the IP Address and Port Number assigned to the logger.

If the logger is not connected to a network, click the **Type:** down arrow to change the connection method to Direct (Serial) or Telephone (Modem). For Direct connection set the logger baud rate (default is 57600) and PC COM port (default is COM 1) to be used. For Telephone connection, select the baud rate (default is 14400 baud) and enter the telephone number of the logger modem.

Data File Path: (optional) is the location of the folder where data files retrieved from the logger will be saved. This field is advisory only. The actual data file "save-to" path used by AutoPoll is set in **Tools > PC Setup**.

An example completed Logger List for five loggers may look as below:

AA AutoPoll Logger List.lst					Add Logger	
		Serial Number	Description		Remove Logger	
1	Connect	U4T_1	DATApro Direct	Setup		
2	Connect	00106	DENT Network Logger	Setup		
3	Connect	E2437	Admin. Building	Setup		
4	Connect	E2817	Main Floor	Setup		
5	Connect	11111	DENT Dial-up	Setup		

AutoPoll Tab

When a Logger List is to be used by the AutoPoll program for automatic, unattended data retrieval, the serial number should be entered and the connection method selected on the Connection tab of the Setup section. The Data File Path should also be completed.

A Call Schedule must also be defined for each logger in the list which is done by clicking on the AutoPoll tab which brings up the following default call scheduler:

The screenshot shows the 'Logger List Configuration' dialog box with the 'AutoPoll - Off' tab selected. The dialog is divided into several sections:

- AutoPoll On:** A checkbox that is currently unchecked.
- Logger Tasks:** A group box containing:
 - Set Logger Clock:** An unchecked checkbox.
 - Download Data:** A checked checkbox.
 - Download All Data:** An unselected radio button.
 - Append New Data:** A selected radio button.
 - Create .csv File:** An unchecked checkbox.
- Call Interval:** A group box containing:
 - Immediate Call:** An unselected radio button.
 - Single Call:** A selected radio button.
 - Multiple Calls:** An unselected radio button.
 - Daily:** An unselected radio button.
 - Weekly:** An unselected radio button.
- Single Call Date/Time:** A group box with two time pickers:
 - mm/dd:** Set to 01 / 01.
 - hh:mm:** Set to 00 : 00.
- Multiple Call Setup:** A group box with two time pickers:
 - First Call Time:** Set to hh:mm 00 : 00.
 - Then Call Every:** Set to hh:mm 00 : 00.
- Daily Call Setup:** A group box with one time picker:
 - Time to Call:** Set to hh:mm 00 : 00.
- Weekly Times To Call:** A group box with seven rows, one for each day of the week (Sunday through Saturday). Each row has a checkbox and a time picker (hh:mm). All checkboxes are unchecked, and all time pickers are set to 00 : 00.

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

The default call schedule is a Single Call on January 1st at 00:00 (Midnight). When the PC calls the logger, only the “new” data in the logger stored since the last data download will be retrieved.

Logger Tasks

Set Logger Clock—If the *Set Logger Clock* box is checked then, after the PC calls the logger and the data download is complete, the PC will set the logger clock to the PC time.

Download Data—Data retrieval may be one of two options: Download All Data or Append New Data. Append New Data is used for on-going metering projects and only data collected and stored in the logger since the last download is retrieved. The new data is appended to the existing data file.

Note: When appending a data file, AutoPoll looks in the data folder specified in the **Tools > PC Setup** for that logger. If the data file has been moved or this is the first time the logger has been read and Append New Data is checked, then AutoPoll will download the entire memory of the logger.

Create .csv File—If it is desired to have the downloaded data also be created in a .csv (Comma Separated Value) format for use in other applications such as Excel, check this box. Creating a .csv does not affect original .dat file downloaded from the logger.

Call Interval

Five choices are available for automatic polling and data retrieval however *only one Call Interval may be selected at a time*. The choices are:



Immediate Call—Calls the logger as soon as the AutoPoll program is initiated. Use this to test the system after completing a logger installation to verify correct operation.

Single Call—Use this option to make a one-time call and data retrieval from a logger. Use the Single Call Date/Time box to set the month and day (mm/dd), and hour and minute (hh:mm) the call is to be made.

Multiple Calls—Use this option to make multiple calls to a logger in the same day. The First Call Time is when AutoPoll first calls the logger. AutoPoll then calls the logger at the interval set in: Then Call Every. The time of the first call happens on the first day that the call out time is encountered *after* the Logger List has been saved.

Daily Call—Use this option to call the logger every day at the same time. Use the Daily Time To Call box to set the hour and minute (hh:mm) that the call is to be made.

Weekly Call—Use this option to configure the host computer to call the logger on one or more days every week. Use the Weekly Times To Call box to select the days and the hour (hh) and minute (mm) the calls are to be made. Only one call per day is permitted but they can be at different times on different days.

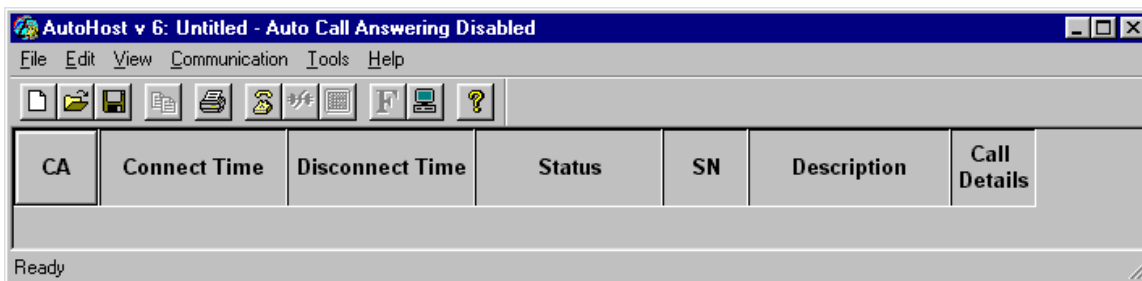
Note: To set any of the times (days or months) use the mouse to select the field to be changed and then click on the   arrows to change to the desired value.

AutoHost: UNATTENDED, LOGGER INITIATED CALLS TO THE PC

ELITEpro and DATApro loggers equipped with modems can be configured to automatically *initiate* telephone data retrieval sessions (AutoHost, short for *Automatic PC Host*), as well as answer calls from the PC (AutoPoll). The AutoHost configuration function in ELOG allows storing in the logger a call-out schedule, task list and telephone number for the logger to call. At the time(s) specified in the configuration table stored in the logger, the logger will call a host computer at the telephone number stored in the logger. If the computer has the application AutoHost running (the AutoHost application is launched from the **Logger > Communication > AutoHost** menu), then the computer will answer the call and perform the data retrieval tasks programmed into the logger.

AutoHost is most useful when a dedicated telephone line for the logger is not available and a customer's telephone line must be shared. In such cases it is common for the logger to call out to a toll-free number that connects to the computer where AutoHost is running.

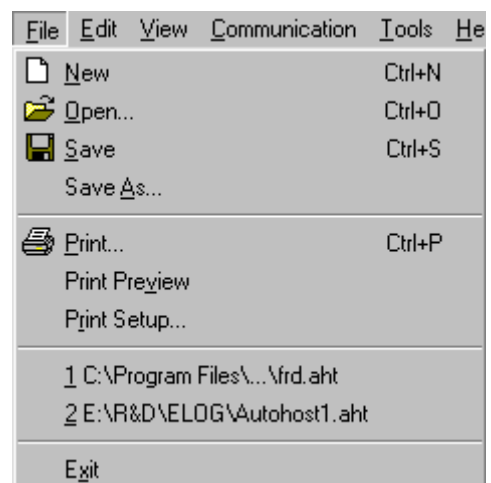
Launching AutoHost brings up the following screen:



The menu commands in AutoHost are described next.

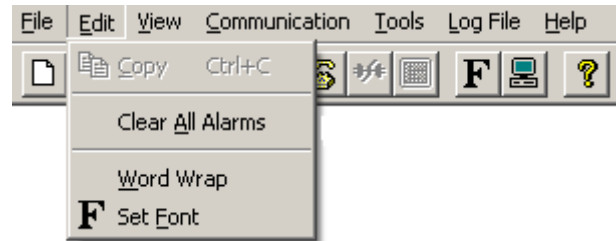
File

File is used for standard Windows operations for opening, saving and printing files. In this case, File refers to an AutoHost file which is the report generated when a logger calls the host PC. AutoHost files have a ".aht" extension.



Edit

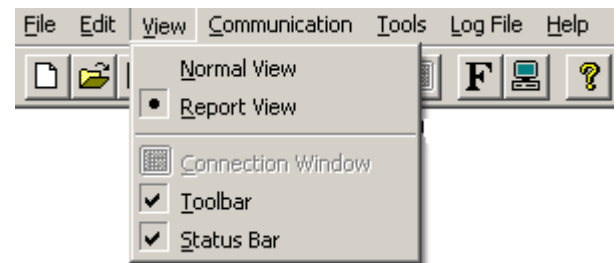
Edit is used with an AutoHost report file. Use **Clear All Alarms** to turn off any alarm conditions that may have been reported by a logger that had an alarm set point exceeded. **Word Wrap** and **Set Font** are available only when in **Report View** format as described in **View** below.



View

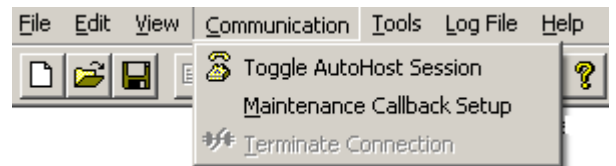
Normal View and **Report View** toggle the presentation of the connection report file (.aht). Normal View provides a style of report with one-line summaries of the each logger's call to the PC. Report View is a running text presentation of the complete connection report.

Toolbar and **Status Bar** toggle on and off viewing the hot buttons (Toolbar) and the connection window at the bottom of the screen (Status Bar).



Communication

Toggle AutoHost Session: Sometimes it is desirable to disable AutoHost temporarily, such as to use the PC modem for other purposes. To disable AutoHost, click on this menu item.



Maintenance Callback Setup: Sometimes it is desirable to have the logger call the host computer at a time other than that set in its callout schedule. For example, loggers may be set to call in the middle of the night to save money on long distance telephone charges. Perhaps it is desirable to have a specific logger call the next day at 12:00 (noon, as in the screen above) to view the channel values in real-time. In the Maintenance Callback area enter the serial number of the logger you wish to have call you, then check the Request Callback box, and enter a time and telephone number for the logger to call. When the logger calls in for its next scheduled data download, AutoHost will send the callback command, time to make the call and telephone number to call to the logger. The next time that the callback time occurs (later the same day or the next day), the logger will call the designated number. If the designated time of day to callback has passed, the logger will callback at the requested time on the next day.

If ELOG is open (*not AutoHost*) when the logger calls back *and* the Maintenance Callback Mode is set to ON (in the **Logger > Communication** menu), then ELOG will answer the call and connect just like a normal modem connection. At that point, the user will be able to interact with the logger and use all of the ELOG commands including viewing data in real-time, changing Setup Tables or callout schedules.

At the end of the ELOG session, use the ELOG menu command: **Logger > AutoHost Configuration > Retrieve AutoHost Configuration** to call up the AutoHost Call Schedule Configuration in the logger. Check the box: **Resume original callback schedule** to return the logger to its normal callout schedule. If the logger fails to connect with ELOG or if the Resume original callback schedule box in the AutoHost Configuration has not been checked, the normal callout schedule will be suspended and the logger will continue to call back every day at the Maintenance Callback time.

Note: The callback can be scheduled for any time of day and the call will only occur when that time next occurs.

Terminate Connection: This function is used to end a call from a logger while it is in process.

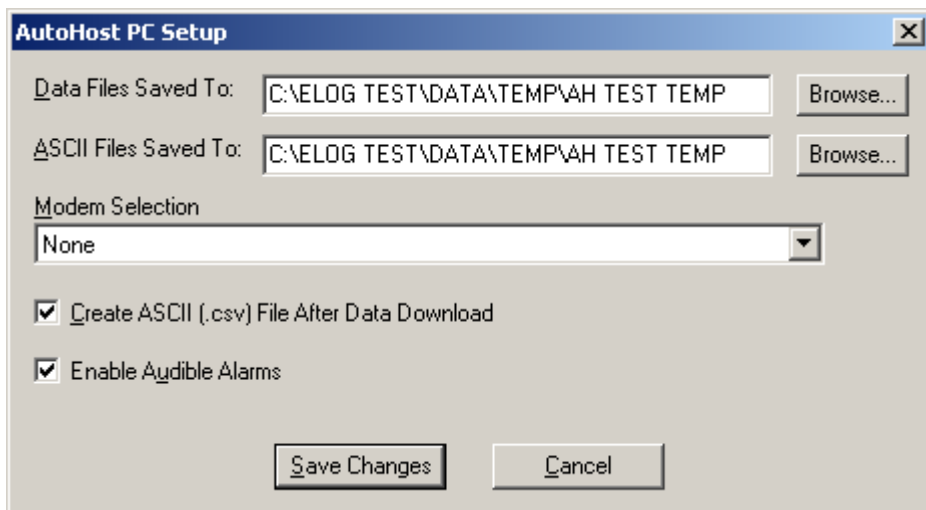
Tools

PC Setup is used to set various default parameters related to the connection. Selecting this menu item brings up the following dialog box:



Data Files Saved To: Allows the user to set the default data folder to which data files will be sent when downloaded from the logger

ASCII Files Saved To: Data files may also be retrieved in a flat file (.csv-comma separated value format) as described below. The ASCII files may be saved to a folder different than where the binary files are saved.



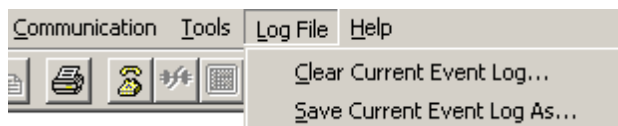
Modem Selection: Windows allows the user to select from multiple modems for communication. The default is **None** and, with that selection, AutoHost will use the first modem it finds to answer the logger's call.

Create ASCII (.csv) File After Data Download: Sometimes it is desirable to have the logger data files be in an ASCII format for use by other programs (e.g., Excel). By checking this box, a comma separated value (.csv) ASCII file is created and saved *in addition* to the usual .dat binary file.

Enable Audible Alarms: If the alarm capability of the logger is used it will normally trigger an audible alarm in the PC when the data is downloaded. The audio alarm is in addition to the flashing red text that also appears on the computer screen. To disable the audio part of the alarm only, check this box.

Log File

When AutoHost answers incoming calls from the remote loggers it keeps a record of the calls and their success or failures together with details about the calls. This call log file is stored on the PC with a .aht file extension. When a .aht call log is open, it may be cleared (deleted) or saved for future use.



Using AutoHost

First, connect a logger to the serial port of a PC using ELOG and the **Logger > Communication > Direct Connect** command. Then use **AutoHost Configuration > Send AutoHost Configuration (or Retrieve AutoHost Configuration)** to call up a configuration table to edit. Using **Retrieve** will call up the AutoHost configuration already in the logger. Using **Send** will call up a blank configuration if **Retrieve** has not already been used. If **Retrieve** has been used in the current ELOG session, then the AutoHost configuration shown will be the one brought from the logger.

A blank configuration is shown below:

AutoHost Call Schedule Configuration

Call Interval: ☒ No Calls, ☐ Single, ☐ Daily, ☐ Weekly, ☐ Monthly

Phone Number:

Single Call Time: hh:mm : :

Daily Call Time: hh:mm : :

Logger Tasks: ☐ Set Logger Clock, ☐ Download Data, ☒ Download All Data, ☐ Append New Data

Weekly Call Time(s):
Sundays: No Call, Mondays: No Call, Tuesdays: No Call, Wednesdays: No Call, Thursdays: No Call, Fridays: No Call, Saturdays: No Call

Monthly Call Time(s):

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

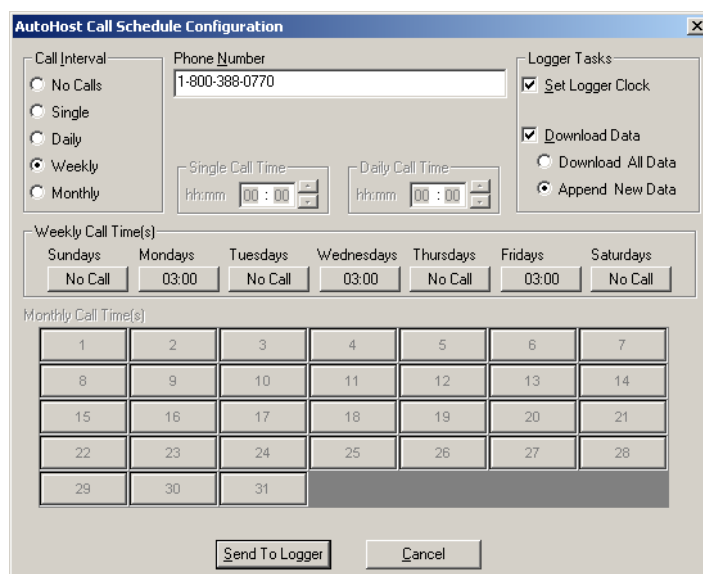
Send To Logger Cancel

With an AutoHost configuration on the screen, you may change the configuration table as desired. Use the **Send To Logger** button to send the changed table back to the logger. The configuration table must include, at a minimum, the telephone number of the host computer to call, a call time, and a task (set clock and/or download data).

There are two data download options. The first, **Download All Data**, sends all the stored data in the logger to the PC. The second option, **Append New Data**, sends only the data that the logger has collected since the last time the logger was read by the host computer. In this instance, the new data (since last download) is appended to the existing data file that has already been retrieved from the logger. If the logger cannot find an existing data file to append to, it will default to a complete data download.

Note: Since AutoHost configuration tables are not stored on the PC, you must be connected to a logger to use the AutoHost Configuration command.

An example callout schedule is shown below. The call interval has been set to Weekly and the logger makes a toll-free call to a host computer at the number 1-800-388-0770. According to the example schedule, the logger will call every Monday, Wednesday and Friday at 03:00. Upon connection with the AutoHost program, the host computer is instructed to update the logger clock to the PC clock and download all new data in the logger. New data means data collected and stored in the logger since the last time the logger memory was read.



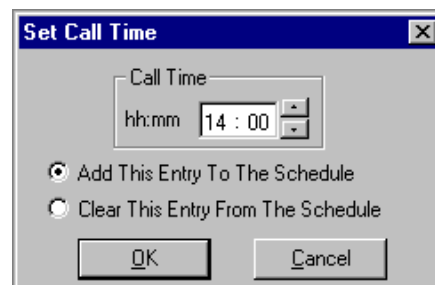
The dialog box is titled "AutoHost Call Schedule Configuration". It contains the following sections:

- Call Interval:** Radio buttons for No Calls, Single, Daily, Weekly (selected), and Monthly.
- Phone Number:** A text field containing "1-800-388-0770".
- Single Call Time:** A time selection box showing "00 : 00".
- Daily Call Time:** A time selection box showing "00 : 00".
- Logger Tasks:** Checkboxes for "Set Logger Clock" (checked), "Download Data" (checked), "Download All Data" (unchecked), and "Append New Data" (unchecked).
- Weekly Call Time(s):** A grid of buttons for each day of the week. The buttons for Mondays, Wednesdays, and Fridays are labeled "03:00", while the others are labeled "No Call".
- Monthly Call Time(s):** A calendar grid showing days 1 through 31.
- Buttons:** "Send To Logger" and "Cancel" at the bottom.

The default Call Interval is No Calls. The logger can also be set to make only one call to the host (Single Call Interval) or every day (Daily Call Interval). The calling on a monthly basis is set by choosing Monthly in the Call Interval box. At that point, the Monthly Call Time(s) window becomes active and a call time for a day(s) of the month is selected by using the mouse to click on the day(s) that a call is to be made. A window similar to the one below appears:

After clicking **OK**, the day of month button changes to **12 (14:00)** where the first number is the day of the month (12th) and the second number in the parentheses is the time of day that the logger will call the host computer (14:00).

Note: Regardless of the Call Interval specified, there can be only one call-out time per day.



The dialog box is titled "Set Call Time". It contains the following elements:

- Call Time:** A time selection box showing "14 : 00".
- Buttons:** "Add This Entry To The Schedule" (selected), "Clear This Entry From The Schedule" (unchecked), "OK", and "Cancel".

After creating the AutoHost Configuration file, it must be sent to the logger. Do this by clicking on the **Send To Logger** button. Lastly, use **Logger > Communication > AutoHost...** to launch the AutoHost program. The AutoHost program must be running for the computer to answer calls from the loggers.

TECH TIP: AutoHost Configurations are not saved by the software. Instead, a configuration table may be retrieved from a logger, edited and then resent to the logger. The configuration settings remain active in the computer until ELOG is closed. The active configuration settings may be downloaded to any number of loggers to accelerate setting up the loggers for automatic calling of the host computer.

ELITEpro™: CONNECTING SENSORS AND CONFIGURING CHANNELS

Power Measurement

The **ELITEpro** can monitor AC power loads ranging from single phase-two wire to 3 phase-4 wire systems and up to 600 VAC at either 50 or 60 Hz.

1. Use the proper Current Transformers (CTs) for the load being monitored. For a complete discussion on this, see the section *Current Transformer (CT) Selection* below.
2. **Caution: Do not use unshunted CTs, only use shunted CTs with 333mV AC output. A serious shock hazard and damage to a Logger can result from unshunted CTs.**
3. Always point the arrow on the CT *towards* the load or as otherwise indicated on the CT. All diagrams in this section will show the CT phasing arrow pointing towards the load.
4. *Always connect the white neutral wire to the neutral bus bar if available or to the L2 or L3 phase if metering a 3 Phase, 3 Wire system with no neutral.*

READ ALL WARNING SYMBOLS DESCRIBED IN THE SAFETY SECTION AT THE BEGINNING OF THIS MANUAL.



Warning: Use of this device in a manner for which it is not intended may impair its means of protection. **Do not exceed 600 VAC into voltage inputs!**



When connecting the **ELITEpro** to an AC load, follow these steps in sequence to prevent a shock hazard:

1. Connect the CTs to the appropriate channels on the **ELITEpro**.
2. Connect the CTs to the phases being monitored.
3. If equipped with the external wall charger power supply, connect it next.
4. Connect the voltage leads in this sequence: If equipped with a **GROUND (green) wire connect it first, then NEUTRAL (white or as marked)**. Then connect the other remaining three phase wires in any order.

Logger Wiring Label Conventions:

When connecting the voltage wires to the AC line, the following wire colors should be used for the different phases:

U.S./Canada

A Phase (black)
B Phase (red)
C Phase (blue)
Neutral (white)
Ground (green)*

International

L1 Phase (black wire with "L1" label)
L2 Phase (black wire with "L2" label)
L3 Phase (black wire with "L3" label)
Neutral (black wire with "N" label)
Ground or Earth (green wire)*

*The Ground (green) wire is not found on **ELITEpros** manufactured after 12/98.

Note: The U.S. & Canada color conventions are used in the diagrams that follow.

Current Transformer (CT) Selection:

Proper CT selection is critical for accurate results. Use CTs with the smallest diameter to fit around the wire(s), and whose rated amperage is not less than 100% of the largest load expected.

In general (but not always, check with the factory), solid core CTs have better accuracy than split core CTs. Also, best CT accuracy will result when the load operates *as close to the full rating* of the CT as possible. Do not use CTs that greatly exceed the maximum load of the item being monitored.

The following is a list of some of the most common CTs available:

Current Transformers Available from DENT Instruments				
Small Split Core	Medium Split Core	Large Split Core	Clamp-On	Rogowski
5A/15A (high accuracy)	100A	600A	150A	300/3000A
50A	200A	1000A	500A	RoCoil mV™
100A	400A		1000A	Various sizes available. Contact DENT Instruments for further details.
	600A			

All of the above CTs are available from DENT Instruments. These are shunted CTs (333mV output) which make them safe to handle even when connected to an energized wire. Also, they are case-insulated for 600V phase-to-phase service. Do not use on services with higher voltages.

TECH TIP: You can extend the leads of any of our CTs up to 100 feet without loss of accuracy provided that the new wire is identical to the original lead wire.



Caution: Do not use unshunted CTs. Only use shunted CTs (333mV AC output). A serious shock hazard and damage can occur if unshunted CTs are used.

CT Selection Examples

The following are example scenarios for selecting the proper CT:

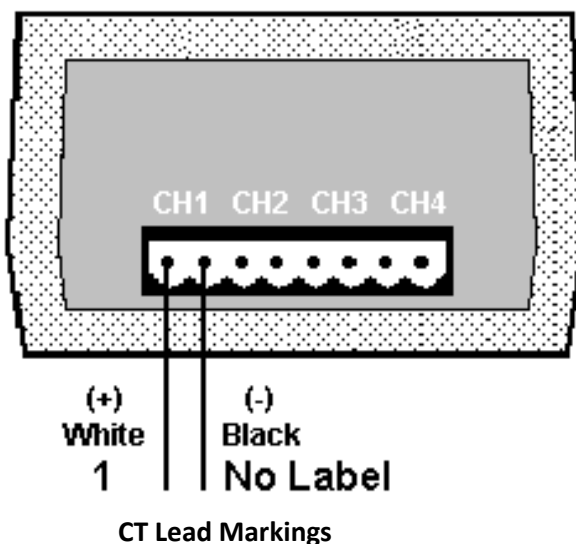
1. A single phase motor with a 20 amp breaker (rated as 10 amps running load) with #12 wire. In this scenario, use a 15 or 50 amp split core or 150 clamp-on.
2. Four lighting circuits, #12 wires with 20 amp breakers. When all lights are on, the amperage measures 45 amps. In this scenario, use a 50 amp CT.
3. A single heating circuit, with a 2/0 conductor and a 60 amp breaker. In this scenario, use a 100 amp CT.

TECH TIP: If a utility already has a meter with a 5A secondary CT(s) connected to a load being monitored, you may connect a 5A split core CT around the output (secondary) of the utility's CT. To calculate the CT value to be used in the Logger setup table, multiply the utility CT ratio by the ELITEpros CT size (e.g. if the utility CT is 4000:5 and the ELITE Logger CT is 50A use $(4000/5) \times 50 = 40,000$ for the value of the CT in the logger Setup Table.

Connecting CTs and Configuring Channels: Examples

The next section will show how to connect the CTs and the voltage taps to different service types, and how to configure the logger channel(s) for monitoring.

ELITEpros made after 12/98 use CTs with stripped and tinned, bare terminated wires. The CT leads need to be connected to the green Phoenix termination block as shown in the diagram below:



Note: Correct polarity is required to insure proper phasing of the CT.

For each channel, the left connector pin is the positive or high-side wire and the right pin is the negative or low-side. When using DENT Instrument supplied current transformers, connect them as follows:

- Split-core CTs (removable leg)—The white CT wire is (+) and the black wire is (-)
- Clamp-on CTs (clothes pin type)—The banded wire with a number one (1) is the (+) wire and the unbanded wire is (-)

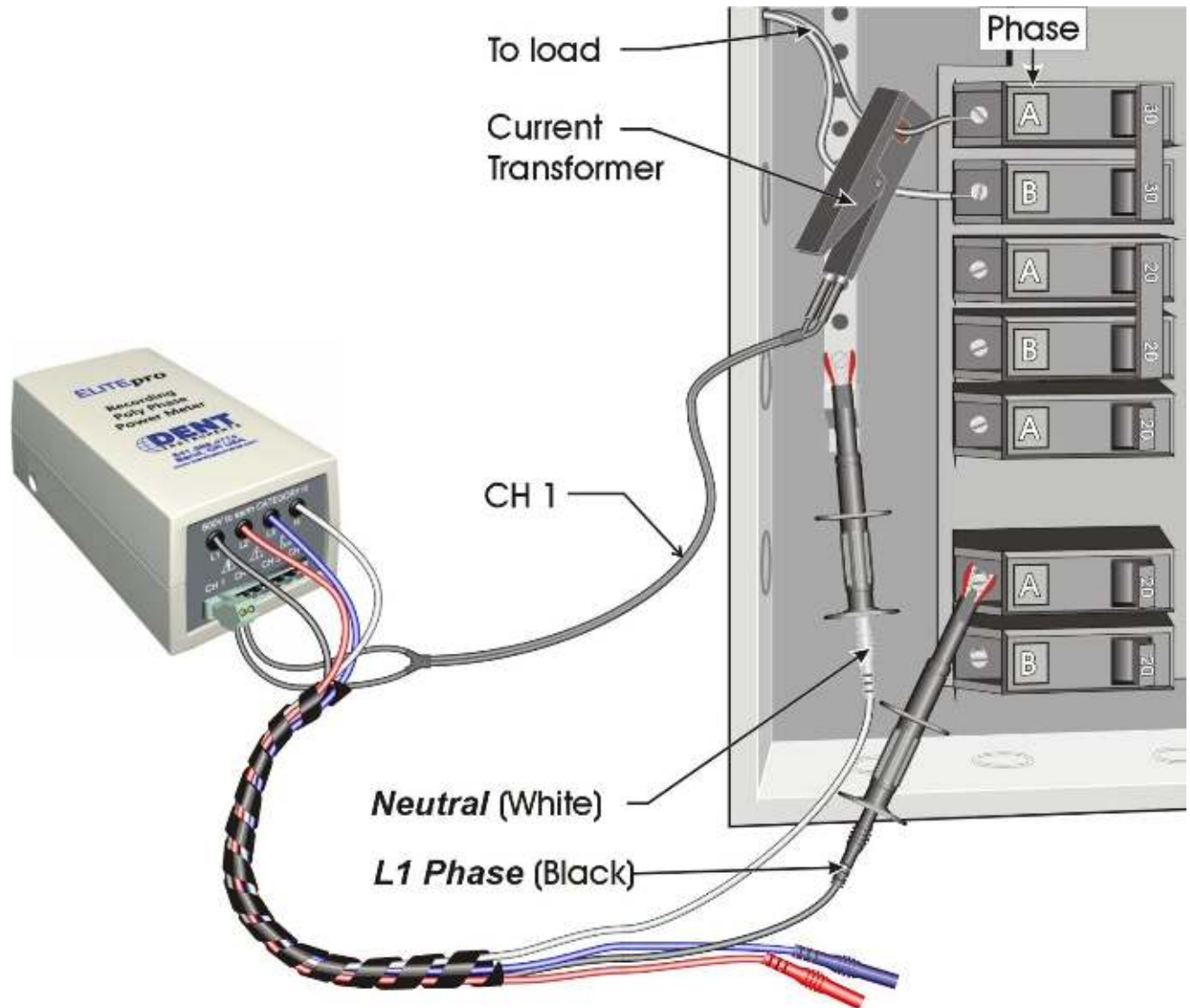
After connecting the CTs to the green (Phoenix) connector block, apply the CTs to the phases being monitored. Be careful to observe proper CT orientation. If an arrow is shown on the CT label it should be pointed towards the load. Otherwise, use the instructions printed on the CT (For example, "This Side Toward Load").

If the **ELITEpro** is equipped with an external wall transformer, connect it next.

Lastly, connect the voltage leads to the different phases. Connect the Neutral wire first, then the remaining voltage sense (phase) wires.

ELITE^{pro}™ Logger: Single Phase, 2 Wire Power Measurements

The **ELITE^{pro}** can monitor up to four Single Phase, 2 wire AC loads.



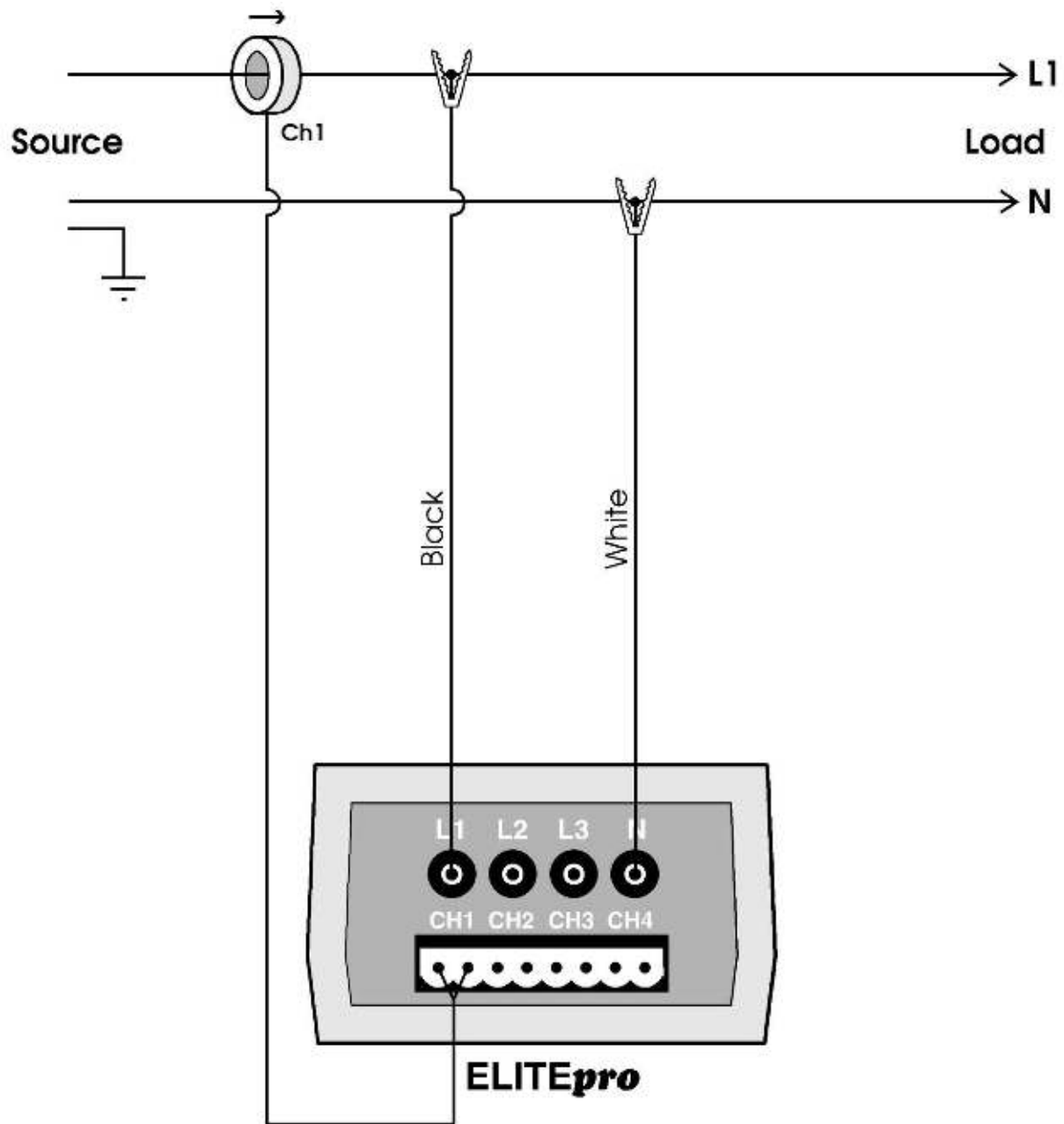
Configure Channel 1 in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps
Power	Single Phase 2 Wire	L1	N	1.0000	100.00*		

*This value should correspond to the actual rating of the selected CT.

ELITE^{pro}™ Logger:

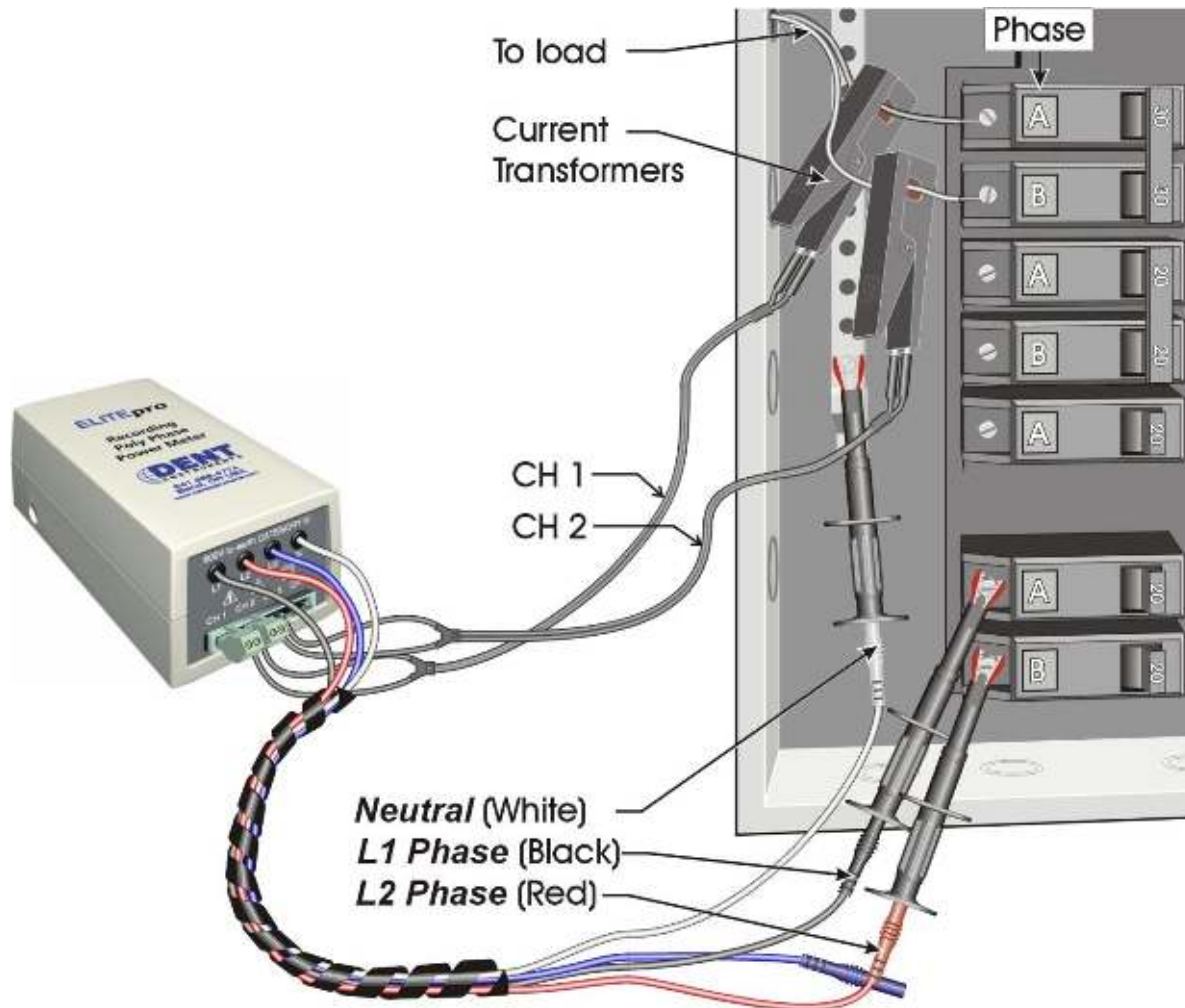
Wiring Diagram for Single Phase, 2 Wire



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITE^{pro}™ Logger: Single Phase, 3 Wire Power Measurements

The ELITE^{pro} can monitor up to two Single Phase-3 Wire AC Loads.



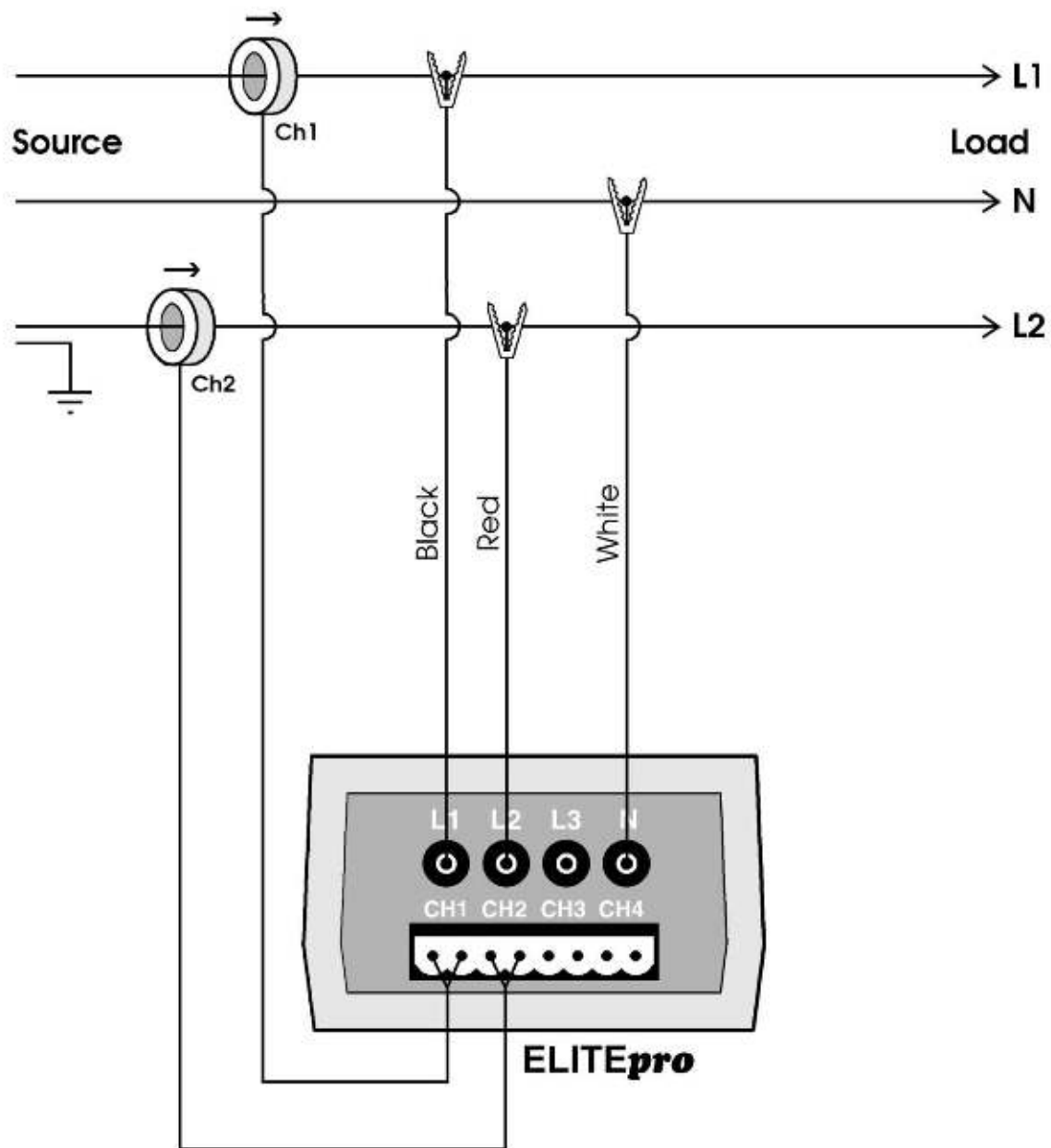
Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts		Amps	
Power	Single Phase 3 Wire	L1	N	1.0000	100.0*				
Channel 2	Name	VHi	VLo	PT	CT	Volts		Amps	
Power	Single Phase 3 Wire	L2	N	1.0000	100.0*				
Channel 3	<div>Off</div>								
Channel 4	<div>Off</div>								
Channel 5	Name	Combine Channels			Volts		Amps		
Power Sum	Optional	1,2							

*These values should correspond to the actual rating of the selected CTs.

ELITE^{pro}™ Logger:

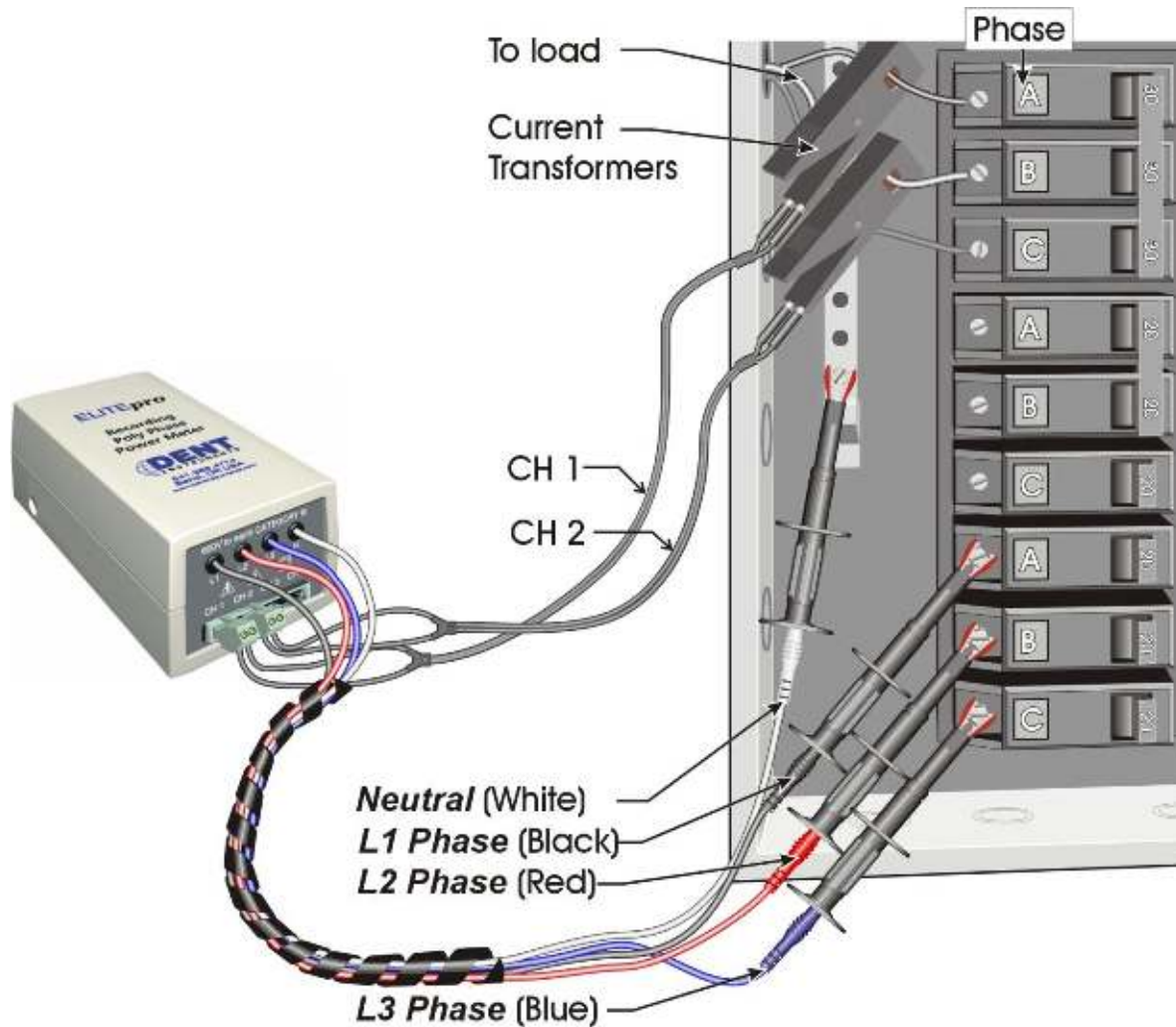
Wiring Diagram: Single Phase, 3 Wire



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITEpro™ Logger: 3 Phase, 3 Wire (DELTA) Power Measurements

The ELITEpro can monitor up to two 3-Phase, 3 Wire DELTA loads.



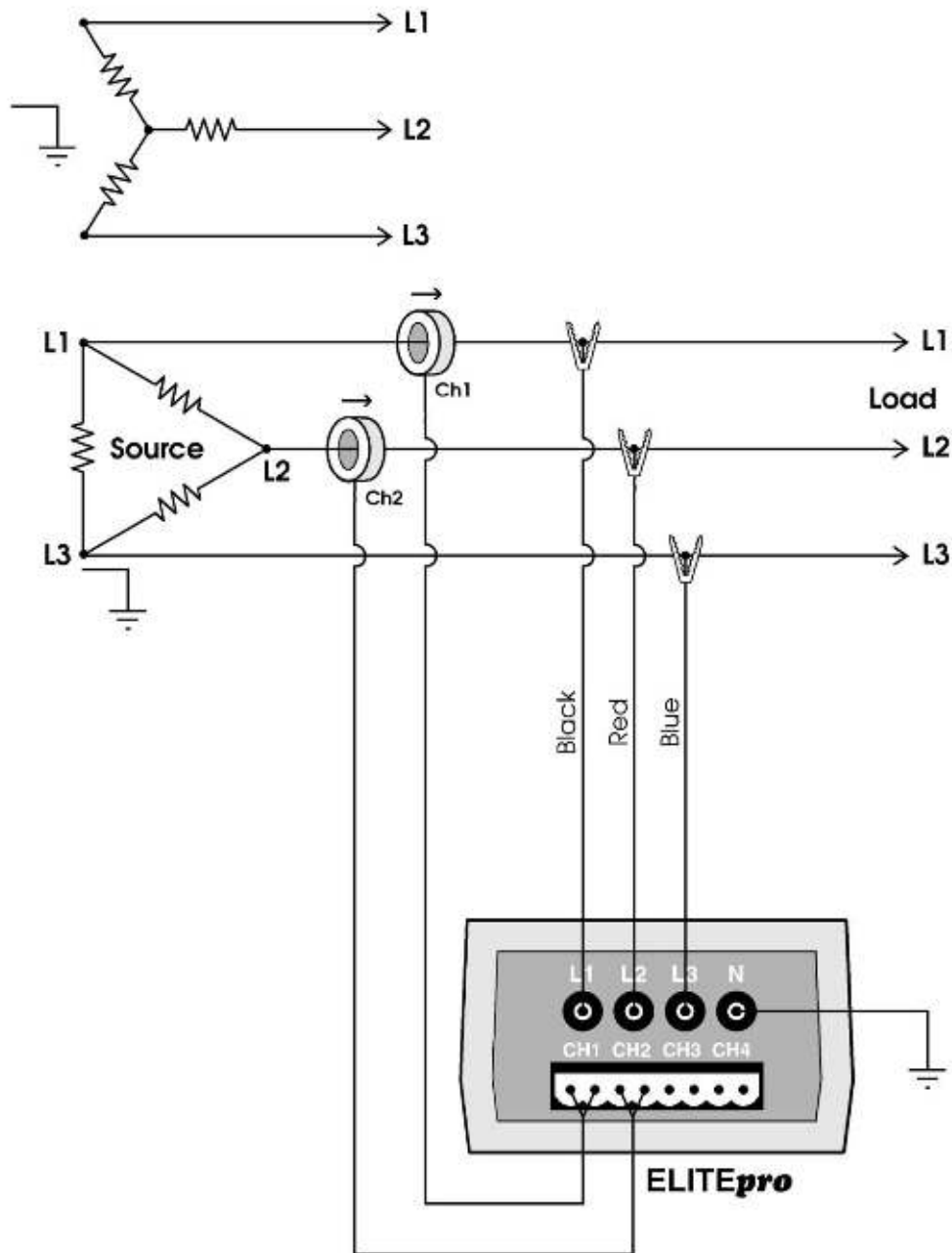
Configure the channels in the Setup Table as follows:

Channel	Name	VHi	VLo	PT	CT	Volts	Amps	K
Channel 1	Power	3 Phase 3 Wire	L1	L3	1.0000	100.0*		
Channel 2	Power	3 Phase 3 Wire	L2	L3	1.0000	100.0*		
Channel 3	Off							
Channel 4	Off							
Channel 5	Power Sum	Optional	Combine Channels	1,2				

*These values should correspond to the actual ratings of the selected CTs.

ELITE^{pro}™ Logger:

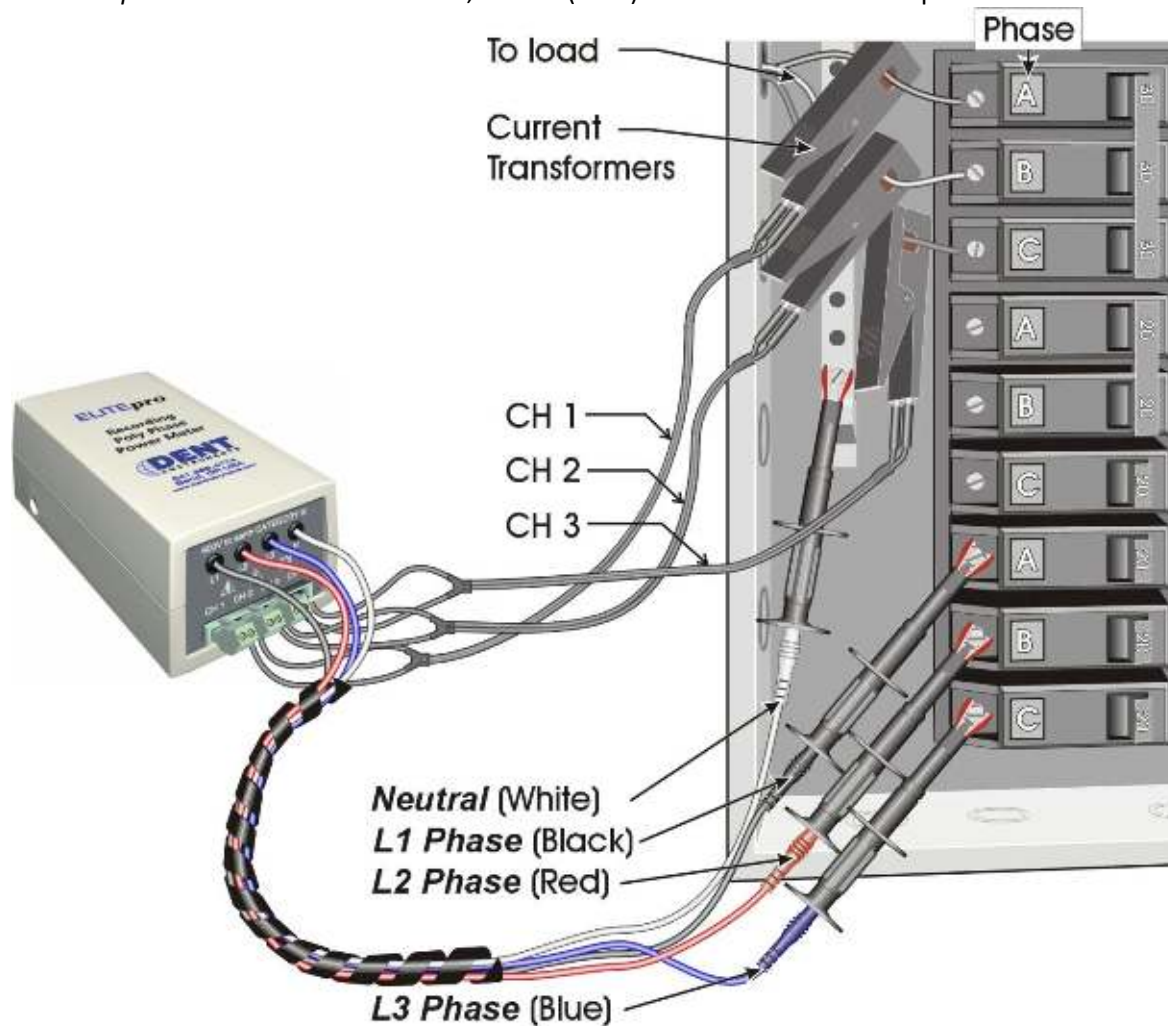
Wiring Diagram: Three Phase, 3 Wire



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

3 Phase, 4 Wire WYE Power Measurements

The **ELITE***pro* can monitor one 3-Phase, 4 Wire (WYE) load. Three CTs are required.



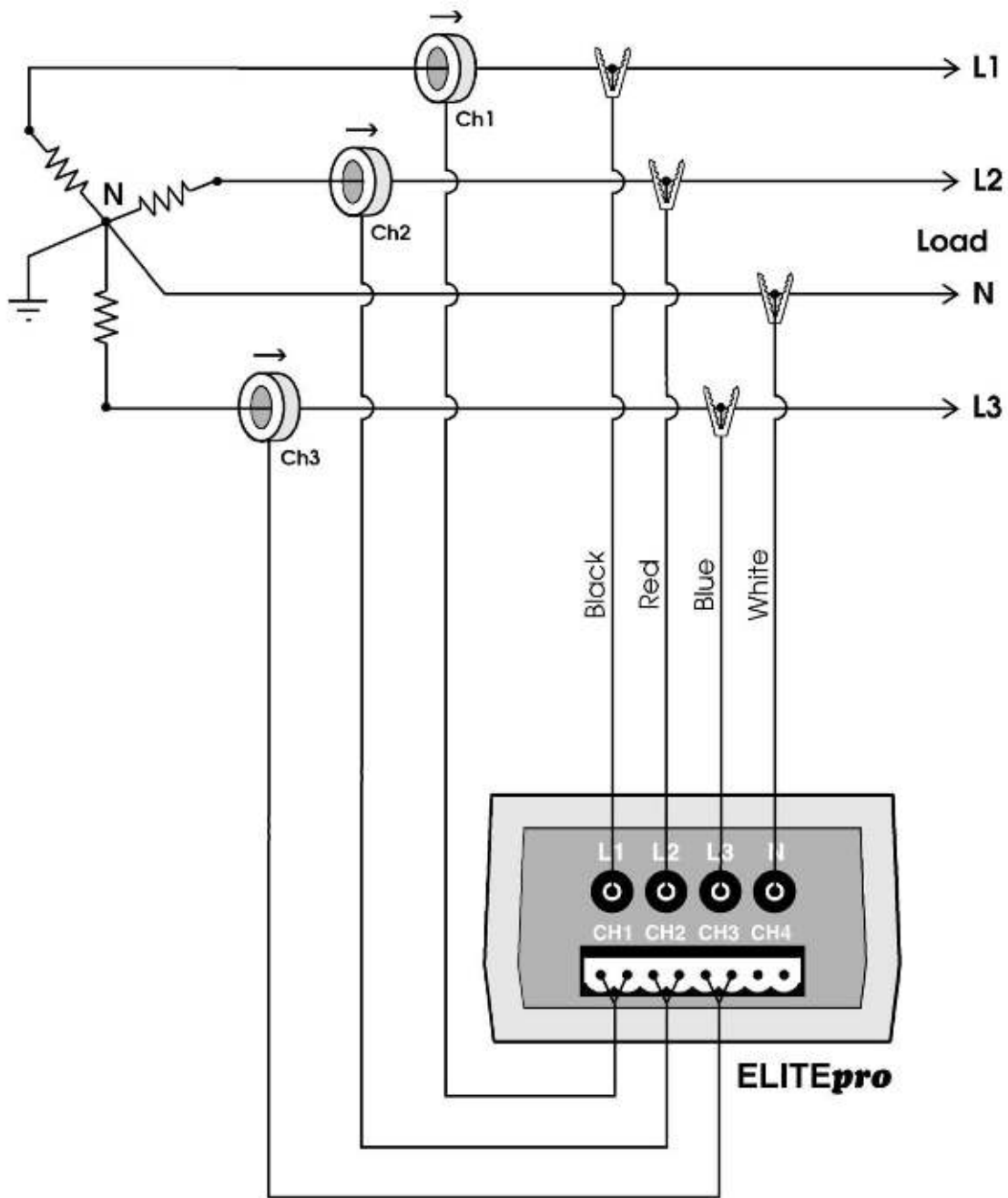
Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps
Power	3 Phase 4 Wire L1-N	L1	N	1.0000	100.0*		
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps
Power	3 Phase 4 Wire L2-N	L2	N	1.0000	100.0*		
Channel 3	Name	VHi	VLo	PT	CT	Volts	Amps
Power	3 Phase 4 Wire L3-N	L3	N	1.0000	100.0*		
Channel 4	Off						
Channel 5	Name	Combine Channels			Volts	Amps	
Power Sum	(Optional) Total	1,2,3					

*These values should correspond to the actual rating of the selected CTs.

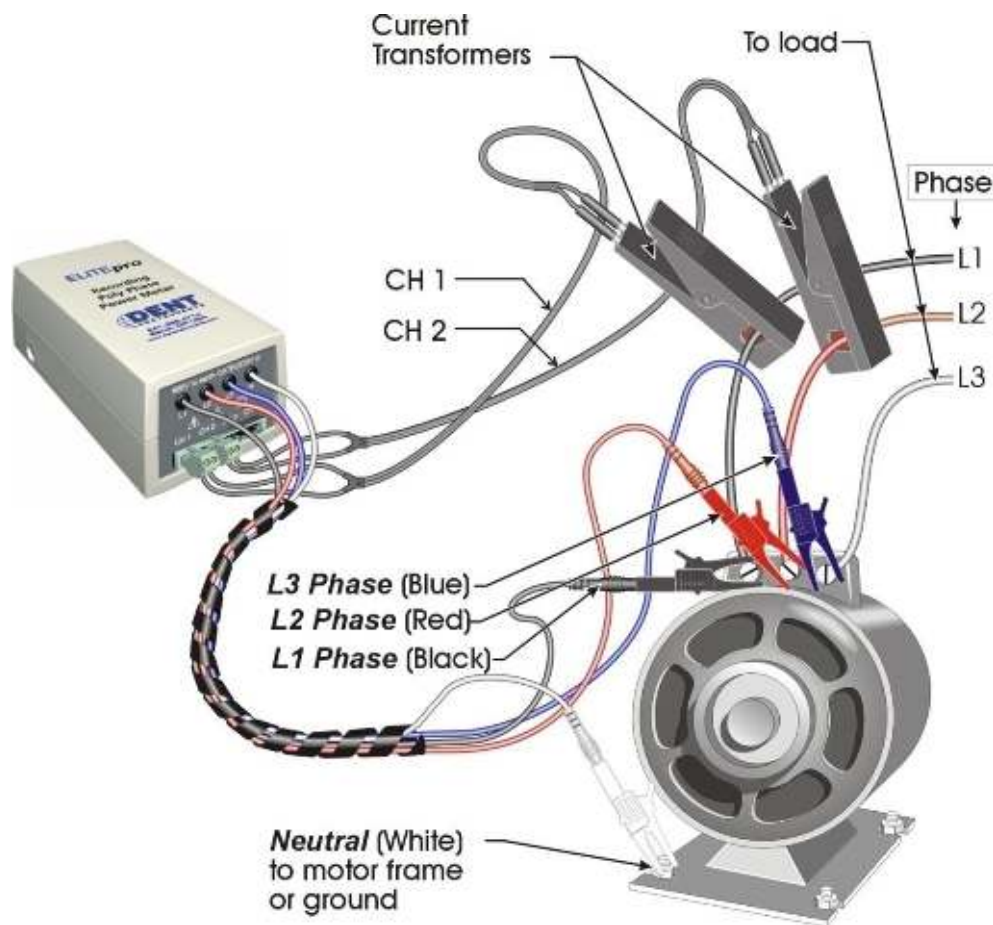
ELITE^{pro}™ Logger:

Wiring Diagram: Three Phase, 4 Wire WYE



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITEpro™ Logger: Monitoring a Three Phase (Delta) Motor*



Configure the channels in the Setup Table as follows:

Channel	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Channel 1	Power	Motor L1-L3	L1	L3	1.0000	100.0*		H
Channel 2	Power	Motor L2-L3	L2	L3	1.0000	100.0*		H
Channel 3	Off							
Channel 4	Off							
Channel 5	Power Sum	Motor Total		Combine Channels	1.2			H

*These values should correspond to the actual ratings of the selected CTs.

POWER SUM EQUATIONS USED BY THE ELITE^{pro}™ LOGGER

Channels 5 and 6 (in the software and in the **ELITE^{pro}**) are called *Power Summation Channels*. They can be configured to sum the data from 2 or more power channels. The Power Sum Channels are often used to calculate total device power parameters or total building power parameters for 3 phase services but they may also be used to sum together multiple single phase loads as well.

The power summation channels can also be used to **optimize** the memory of the **ELITE^{pro}**. Instead of collecting data from two (or more) separate channels, the power summation channel(s) can be configured to collect and sum the data from multiple channels.

Channel 5 *automatically* appears in the Setup Table on the computer screen when 2 or more power channels are turned “on.” When 3 or 4 power channels are turned “on,” channel 6 also *automatically* appears in the Setup Table.

TECH TIP: If only 1 power channel is turned on in a Setup Table, then channels 5 and 6 will **not** appear. If 2 power channels are turned on, then only channel 5 will appear. If 3 or 4 power channels are turned on, then channels 5 and 6 will appear.

THREE PHASE POWER SUM EQUATIONS

3-Wire Delta Systems: 2 Watt-Element Method

Channel 5 Values:

$$\text{SYSTEM VOLTS} = \frac{(\text{CH1 VOLTS} + \text{CH2 VOLTS})}{2}$$

$$\text{SYSTEM AMPS} = \text{CH1 AMPS} + \text{CH2 AMPS}$$

$$\text{SYSTEM VARS} = \text{CH1 VARS} + \text{CH2 VARS}$$

$$\text{SYSTEM WATTS} = \text{CH1 WATTS} + \text{CH2 WATTS}$$

$$\text{SYSTEM VOLT-AMPS} = \sqrt{(\text{CH 1 VARS} + \text{CH2 VARS})^2 + (\text{CH1 WATTS} + \text{CH2 WATTS})^2}$$

$$\text{SYSTEM POWER FACTOR} = \frac{\text{SYSTEM W}}{\text{SYSTEM VA}} \quad \text{“Displacement Power Factor”}$$

See also the Application Note: Using The 3 Watt-Element (3 CT) Method On A 3-Wire DELTA Service.

Positive (+), “lagging” Power Factor is typical for an inductive load

Negative (-), “leading” Power Factor is typical for a capacitive load

TECH TIP: Because only two channels are needed to monitor a three phase—three wire load, then two such loads can be monitored simultaneously by the **ELITE^{pro}** as long as the voltage references are the same.

4-Wire WYE Systems: 3 Watt-Element Method

Channel 5 Values:

$$\text{SYSTEM VOLTS} = \frac{(\text{CH 1 VOLTS} + \text{CH 2 VOLTS} + \text{CH 3 VOLTS})}{3}$$

$$\text{SYSTEM AMPS} = \text{CH1 AMPS} + \text{CH2 AMPS} + \text{CH3 AMPS}$$

$$\text{SYSTEM VARS} = \text{CH1 VARS} + \text{CH2 VARS} + \text{CH3 VARS}$$

$$\text{SYSTEM WATTS} = \text{CH1 WATTS} + \text{CH2 WATTS} + \text{CH3 WATTS}$$

$$\text{SYSTEM VOLT-AMPS} = \text{CH1 VA} + \text{CH2 VA} + \text{CH3 VA}$$

$$\text{SYSTEM POWER FACTOR} = \frac{\text{SYSTEM } W}{\text{SYSTEM VA}} \text{ "Apparent Power Factor"}$$

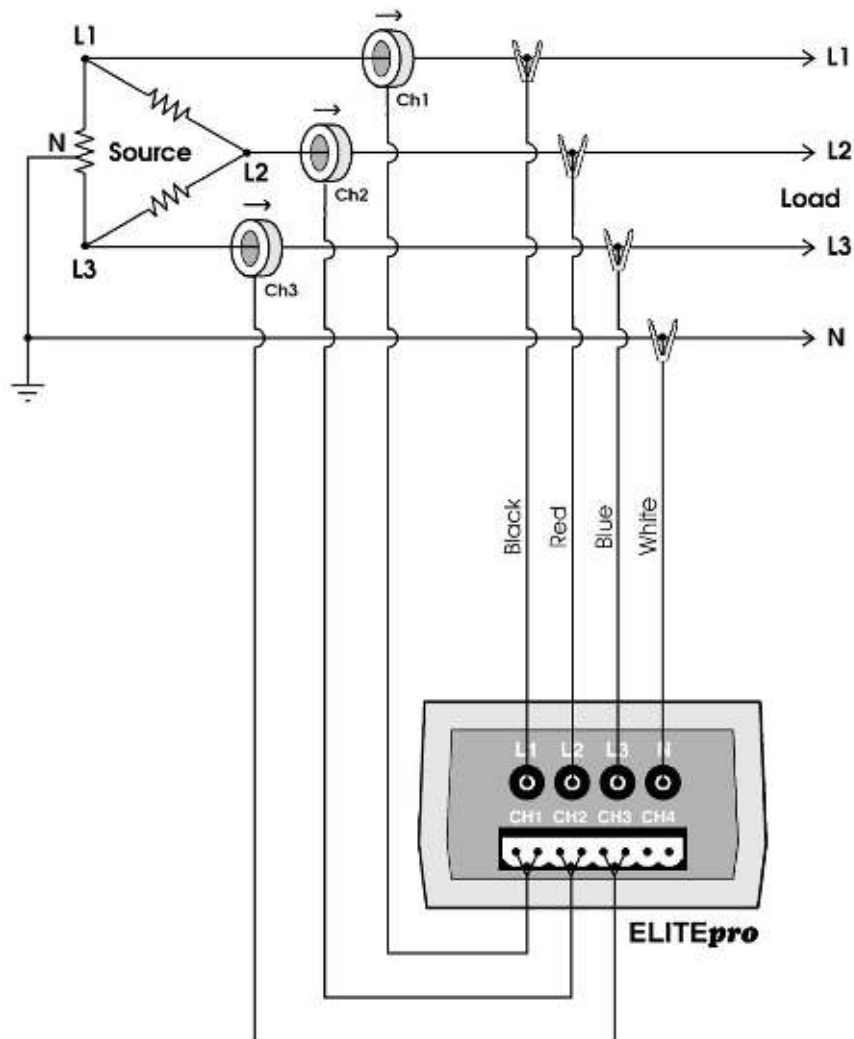
Sign of Power Factor (+ or-) = sign (SYSTEM VARs X SYSTEM WATTS)

Positive (+), "lagging" Power Factor is typical for an inductive load

Negative (-), "leading" Power Factor is typical for a capacitive load

Unusual Metering Systems

Three Phase Delta with a “Wild” (Red) Leg

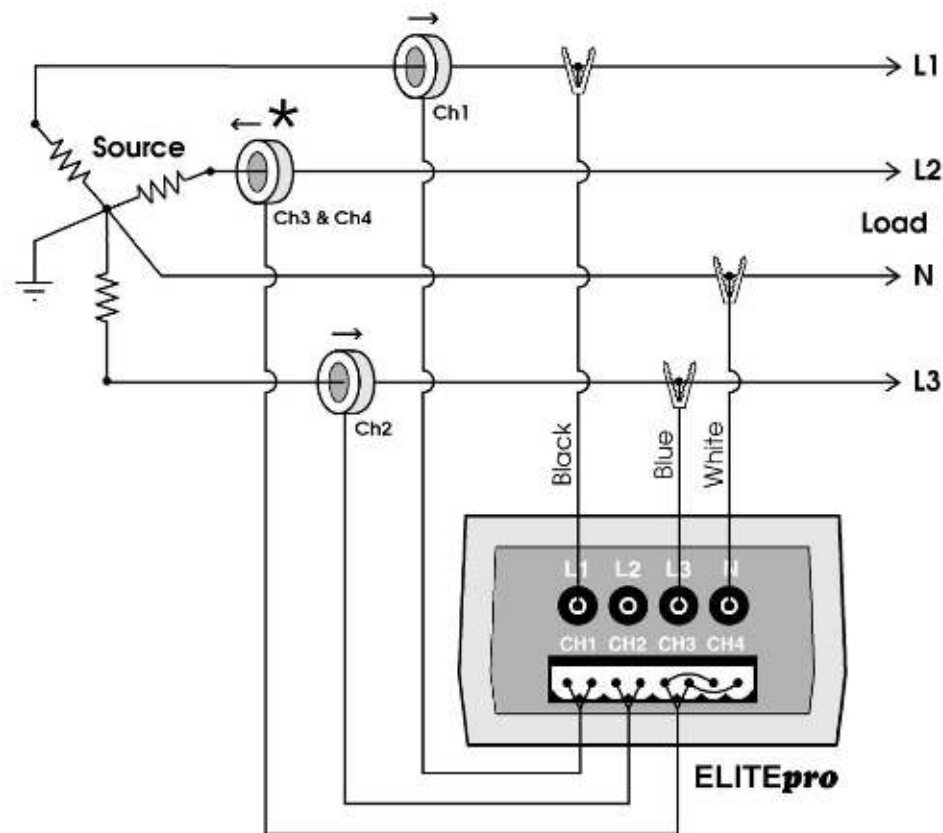


Configure the channels in the Setup Table as follows:

Channel	Name	VHi	VLo	PT	CT	Volts	Amps	K
Channel 1	3 Phase 4 Wire L1-N	L1	N	1.0000	100.0*			
Channel 2	3 Phase 4 Wire L2-N	L2	N	1.0000	100.0*			
Channel 3	3 Phase 4 Wire L3-N	L3	N	1.0000	100.0*			
Channel 4	Off							
Channel 5	(Optional) Total	Combine Channels		1,2,3				

*These values should correspond to the actual rating of the selected CTs.

2 ½ Element Meters



Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L1 CT	L1	N	1**	5***			
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L3 (Not L2!) CT	L3	N	1**	5***			
Channel 3	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L2 CT Reversed*	L3	N	1**	5***			
Channel 4	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L2 CT Reversed*	L1	N	1**	5***			
Channel 5	Name	Combine Channels				Volts	Amps	KW
Power Sum	2 1/2 Element Total	1,2,3,4						A

*The CT on channel three of the ELITEpro is placed on the L2 phase and is backwards. Note that the Ch3 CT is jumpered in parallel into Ch4 of the logger.

**Since the 2 ½ Element method is often used on high voltage metering, a PT ratio other than one is typical and should be set to whatever the actual PT ratio is.

***Set the CT value that is true for the CT connected to the ELITEpro. Again, because the 2 ½ element method is most often used in high voltage applications, there will be high voltage CTs present. Use the high-accuracy 5A CT from DENT Instruments on the existing high voltage CT secondary. The CT value used in the Setup Table should be primary rating of the high voltage CT (assuming the secondary output is 5A.)

DATAproTM : CONNECTING SENSORS AND CONFIGURING CHANNELS

CURRENT MEASUREMENT (Model 4C)

The **DATApro 4C** Logger can monitor up to 4 AC currents simultaneously at 50 or 60 Hz.

Use the proper Current Transformers (CTs) for the load being monitored. For a complete discussion on this, see the section *Current Transformer (CT) Selection* below.



Caution: *Do not use unshunted CTs, only use shunted CTs (333mV AC output). A serious shock hazard and damage can occur if an installed, unshunted CT is handled.*

READ ALL WARNING SYMBOLS DESCRIBED IN THE SAFETY SECTION.



Warning: Use of this device in a manner for which it is not intended may impair its means of protection



When connecting the **DATApro** to an AC load, follow these steps in sequence to prevent a shock hazard:

1. Connect the CTs to the appropriate channels on the **DATApro**.
2. Connect the CTs to the wires being monitored.
3. If equipped with the external wall charger power supply, connect it next.

Current Transformer (CT) Selection:

Proper CT selection is critical for accurate results. Use CTs with the smallest diameter to fit around the wire(s), and whose rated amperage is not less than 100% of the largest load expected.

In general (but not always, check with the factory), solid core CTs have better accuracy than split core CTs. Also, best CT accuracy will result when the load operates *as close to the full rating* of the CT as possible. Do not use CTs that greatly exceed the maximum load of the item being monitored.

The following is a list of some of the CTs available from DENT Instruments. For more information, please contact DENT Instruments or visit our website.

Current Transformers Available from DENT Instruments				
Small Split Core	Medium Split Core	Large Split Core	Clamp-On	Rogowski
5A/15A (high accuracy)	100A	600A	150A	300/3000A
50A	200A	1000A	500A	RoCoil mV™
100A	400A		1000A	Various sizes available. Contact DENT Instruments for further details.
	600A			

All of the above CTs are available from DENT Instruments. These are shunted CTs (333mV output) which make them safe to handle even when connected to an energized wire. They are case-insulated for 600V phase-to-phase service. Do not use on services with higher voltages.

TECH TIP: You can extend the leads of any of our CTs up to 100 feet without loss of accuracy provided that the new wire is identical to the original lead wire.



Caution: Do not use unshunted CTs, only use shunted CTs (333mV AC output). A serious shock hazard and damage can occur if an installed, unshunted CT is handled.

CT Selection Examples

The following are example scenarios for selecting the proper CT:

1. A single phase motor with a 20 amp breaker (rated as 10 amps running load) with #12 wire. In this scenario, use a 15 or 50 amp split core or 150 clamp-on.
2. Four lighting circuits, #12 wires with 20 amp breakers. When all lights are on, the amperage measures 45 amps. In this scenario, use a 50 amp CT.
3. A single heating circuit, with a 2/0 conductor and a 60 amp breaker. In this scenario, use a 100 amp CT.

TECH TIP: If a utility already has a meter with a 5A secondary CT(s) connected to a load being monitored, you may connect a 5A split core CT around the output (secondary) of the utility's CT. To calculate the CT value to be used in the Logger setup table, multiply the utility CT ratio by the **DATApro's** CT size (e.g. if the utility CT is 4000:5 and the **DATApro** CT is 50A use $(4000/5) \times 50 = 40,000$ for the value of the CT in the logger Setup Table.

Connecting CTs and Configuring Channels on the DATApro™ : Examples

The diagrams below will show how to connect the CTs to different service types and how to configure the logger channel(s) for monitoring.

CT Lead Markings

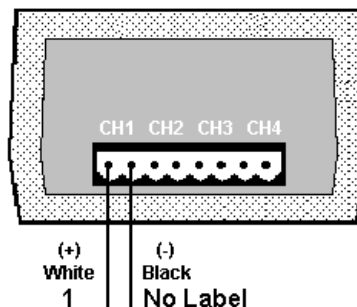
For each channel, the left connector pin is the positive or high-side wire and the right pin is the negative or low-side. When using DENT Instruments supplied current transformers, connect them as follows:

Split-core CTs (removable leg)—The white CT wire is (+) and the black wire is (-)

Clamp-on CTs (clothes pin type)—The red wire is (+), the black wire is (-).

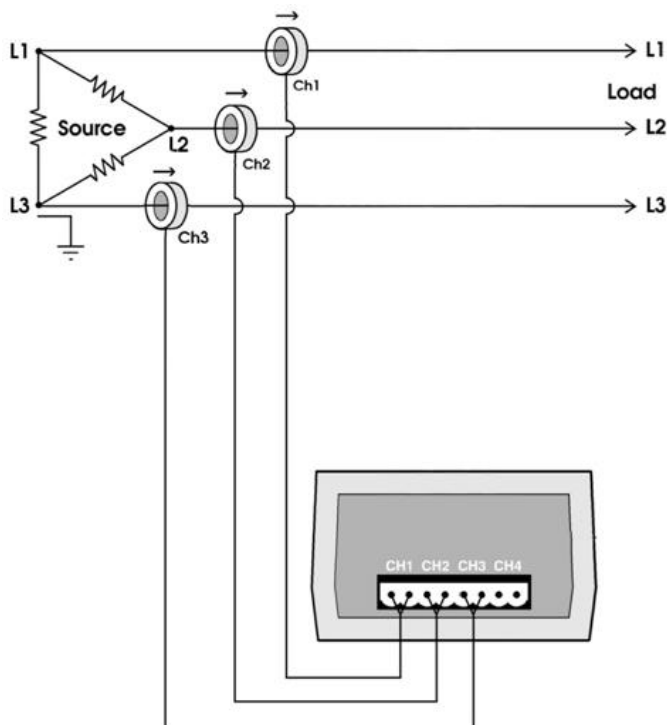
After connecting the CTs to the green connector block, put the CTs on the phases being monitored.

Next, connect the external wall transformer (supplied).

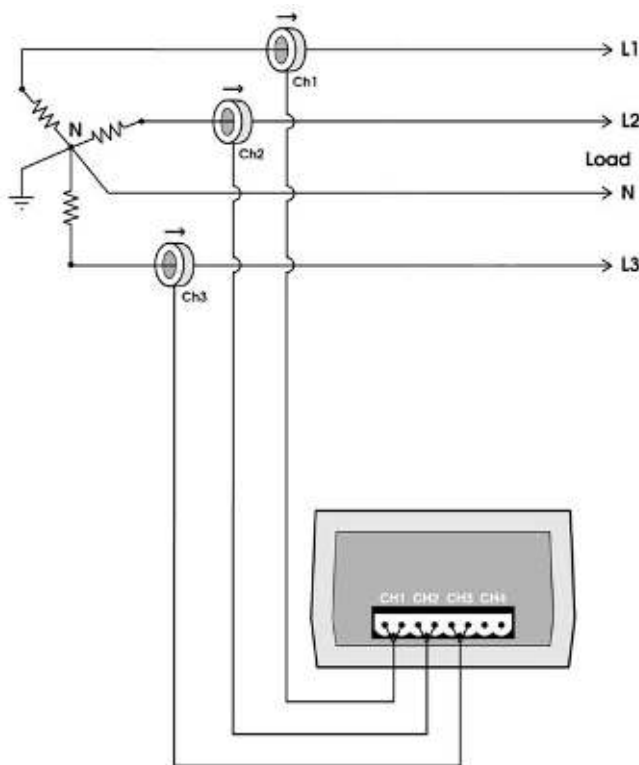


TECH TIP: Correct polarity or phasing of the CT is not required with the DATApro.

DATApro Delta Setup



DATApro Wye Setup



TEMPERATURE MEASUREMENT (MODELS 1T/3P, 2T/2P and 4T)

All channels of the **4T**, channel 1 of the 1T/3P and channels 1 & 2 of the **2T/2P DATApro** are dedicated to temperature measurement. The **DATApro** uses 10K Ohm NTC precision thermistors as the sensors. These sensors can be obtained from DENT Instruments in a variety of configurations with high interchangeable accuracies.

To monitor temperature, connect the sensor to an appropriate channel of the logger. The sensors are not polarized and may be connected to the channel inputs (the first two positions in the connector) in either orientation.

Extension wire may be added to the sensors to allow locating them remote from the logger. When extending the leads, always use a good splicing method (soldering is best). Outdoor splices should be done with a weatherproof cover to prevent moisture or corrosion from degrading the connection.

In the ELOG software, configure the channel in the Setup Table as follows. Note that the desired temperature units may be selected from the **Units** menu.

The screenshot shows the 'Setup Table' in the ELOG software. It has columns for Channel, Name, Slope, Offset, Units, Record, and a bell icon. Channel 1 is set to 'Temperature' with Name 'Temperature 1', Slope '1.0000', Offset '0.0000', and Units 'Fahrenheit'. Channel 2 is set to 'Off (Temp)'. A dropdown menu for the Units column is open, showing options: Fahrenheit (selected), Celsius, Rankine, and Kelvin.

Channel	Name	Slope	Offset	Units	Record	
Channel 1	Temperature 1	1.0000	0.0000	Fahrenheit	A	
Channel 2	Off (Temp)					

Using the Slope and Offset fields

Some sensors have good repeatability but need to be calibrated using a linear model, $y = ax + b$ where “y” is the calibrated sensor output, “x” is the raw sensor output, “a” is slope and “b” is the offset. “b” will have units of degrees and “a” will have units of degrees per ohm. Other **DATApro** models with analog inputs (milliamps, dc volts) can use the slope and offset to both calibrate a sensor and convert the raw signal to engineering units.

Temperature Sensor Placement Considerations

Indoor Sensors: 4 to 5 feet (1.5 M) above the floor level on an interior wall away from direct sun heating/cooling vents and drafts. Use low traffic areas to avoid accidental contact.

Outdoor Sensors: North side of building, under eaves or overhangs, preferably in a radiation shield. Avoid locations above a roof. For long term monitoring applications (several months or more), remember that locations that are shaded at the time of sensor installation may not remain so as the sun's location in the sky changes.

When placing temperature sensors, either indoor or outdoor, one basic principle applies: *Place the sensor where the desired air temperature is the only item being monitored*, not in drafts, sunlight, by heaters, etc. For indoor monitoring, place the sensor away from drafts caused by heating or cooling systems, or appliances. Do not place in areas that are artificially heated by direct sunlight, lighting, or open doors. For outdoor monitoring, place the sensor where it won't be affected by sunlight, snow, ice, or other weather that may cause a false reading. Do not place near outside lights or exhaust vents or other areas that may artificially heat or cool the sensor.

CONTACT/PULSE INITIATING SENSORS (MODELS 1T/3P, 2T/2P and 4P)

The 1T/3P, 2T/2P and 4P **DATApro** Loggers are equipped to monitor digital signals from switches, relays, and pulse initiating sensors as are commonly found on electric meters, gas and water meters. The most common measurements for these types of sensors are frequency, run-time, duty cycle, and pulse counting. With the interval recording capability of the **DATApros**, it is easy to gather inexpensive profile data from virtually any pulse initiating meter or sensor.

Connecting Digital and Pulse Sensors: Because digital and pulse sensors are not polarized, it does not matter in what order the two wires from the sensor are connected to the logger inputs. The sensor leads should be trimmed to expose approximately 6 mm (1/4") of lead and then inserted into the green Phoenix screw connectors. Tighten the screws until the wire is held firmly but not so tight that the wires are crimped.

Using Pulse Initiating Sensors: The most common uses for pulse initiating sensors are to monitor water, gas, steam, sewer, and electric meters. A meter can be used to obtain energy (kWh) and demand (kW) information.

By selecting "**Count**" from the **Record** field on the second page of the Setup Table the number of pulses occurring during the integration period are counted. Multiply the count by the **Scale** factor converts the raw number of pulses into engineering units such as cumulative energy (kWh meters) or cumulative volume (gas and water meters).

By selecting "**Rate**" in the Record field the pulse frequency in Hertz is measured. For an electric meter this corresponds to the draw of the load (kW) or the rate of flow for gas and water meters (CFS or L/S) when multiplied by the scale factor. The stored value is the average over the integration period.

When configuring pulse channel, the scale factor should be set. The scale factor is the value of each output pulse in the units specified. For example, if you are monitoring a kWh meter with a disk constant 7.2 Watt-hours/revolution and the meter provides one pulse per revolution, the scale factor would then be 7.2 (watt-hours per pulse) and the units recorded by the **DATApro** would be watt-hours. Use .0072 as a scale factor to obtain kilowatt-hours.

Gas Flow Meter Example

Suppose you were monitoring a gas flow meter with the **DATApro** Logger. From the output specifications for the meter you determine that 1 pulse = 0.1 cubic foot.

Configure the channel in page two of the Setup Table as follows:

Channel 3	Name	Sensor	Scale	Units	Record	
Contact/Pulse ▼	Gas Furnace	Pulse Output Meter	0.1	CF	C ▼	

Using a Contact Sensor (Relay) on Loads to Characterize Run-Time

Switches and relays are often used as proxies to obtain device run-time, duty cycle, and cycling (count) information.

Run-Time: This is how long the item being monitored is "on" during the integration period. It can be measured in seconds, minutes, or hours.

Duty Cycle: The duty cycle equals the run-time during the integration period divided by the period length and is equivalent to the fraction of the integration period the switch is closed.

Count: This is the number of switch closures or pulses counted during the integration period.

Note: When configuring the channel for a contact sensor, the scale factor and **Units** are not applicable. See the following example for how to configure a contact channel.

Motor Run-Time Example

Suppose you needed run-time information from a motor. To do this, attach a relay (with a rating appropriate to the motor's operating voltage) to the motor's power wires or other suitable place. Connect the **DATApro** Logger to the "dry" contacts of the relay (NOT the energized side of the relay).

Configure the channel to monitor Run-Time (N), Duty Cycle (D), and Count (C) as shown below.

Channel 3	Name	Sensor	Scale	Units	Record	
Contact/Pulse ▼	Motor Operation	Relay	1		N,D,C	▼

MILLIAMP OUTPUT SENSORS (Model 4MA)

The **4MA DATApro** is capable of measuring output from a large number of milliamp output sensors that are commonly used in the controls and sensing industry. This would include sensors of 4-20, 0-20 and 0-24 mA outputs.

Channel 1	Name	Sensor	Slope	Offset	Units	Record	Channel 1 Notes
4 - 20mA	4-20 mA sensor	Any 4-20 mA	1.0000	0.0000	Any Unit	A	
Channel 2	Name	Sensor	Slope	Offset	Units	Record	Channel 2 Notes
0 - 25mA	milliammeter	Any 0-25 mA	1.0000	0.0000	Any Unit	A	

The channels in a **4MA DATApro** can be set to either 0-25 mA or 4-20mA. The difference is that with the 4-20 mA selection, the 4 mA offset is automatically removed from the stored data.

The Slope and Offset fields are used to convert the raw output of the sensor (mA) into engineering units.

Example 1: If a 4-20 mA output pressure transducer has a range of 0-100 psi. At 0 psi the sensor output is 4 mA. At 100 psi the sensor output is 20 mA. In this case, the Offset is 0 and the Slope is

$$\frac{(100 - 0)}{(20 - 4)} = 6.25 \text{psi/mA}$$

A 0-25 mA channel type could also have been selected. In that case, the slope is still $(100-0)/(20-4) = 6.25$ psi/mA but the Offset becomes

$$(6.25 \text{psi/mA} \times 4 \text{mA}) = -25 \text{psi}$$

Again, the 4-20 mA channel type automatically takes care of the inherent 4 mA offset for 4-20 mA sensors.

Example 2: There is a pressure gage that measures from -100 to 700 psi with a corresponding output of 4-20 mA. In this case, to convert the raw sensor output to engineering units (psi) the Offset would be -100 (psi) and the Slope would be

$$\frac{(700 - (-100))}{(20 - 4)} = 50 \text{psi/mA}$$

DC VOLTAGE OUTPUT SENSORS (Model 4DC)

The 4DC DATApro is capable of measuring output from a large number of low voltage dc output sensors with an output range of 0-10 Vdc that are commonly used in the controls and sensing industry. This would include sensors with a 0-1, 0-2.5 and 0-5 Vdc output as well.

Channel 1	Name	Sensor	Slope	Offset	Units	Record	Channel 1 Notes
0 - 10Vdc	DC Voltage	0-1 to 0-10 Vdc	1.0000	0.0000	Any Unit	A	

The channels in a 4DC DATApro can accurately measure any positive direct current (DC) voltage up to 10 volts.

Like the temperature and milliamp channels, the Slope and Offset fields are used to convert the raw output of the sensor (Vdc) into engineering units.

Example 1: A 0-10 Vdc output pressure transducer has a range of 0-100 psi. At 0 psi the sensor output is 0 volts. At 100 psi the sensor output is 10 volts. In this case, the Offset is 0 and the Slope is

$$\frac{(100 - 0)}{(10 - 0)} = 10 \text{ psi/volt}$$

Example 2: A 0-5 Vdc output pressure transducer has a range of 0-100 psi. At 0 psi the sensor output is 0 volts. At 100 psi the sensor output is 5 volts. In this case, the Offset is 0 and the Slope is

$$\frac{(100 - 0)}{(5 - 0)} = 20 \text{ psi/volt}$$

Example 3: A 0-10 Vdc output pressure transducer has a range of -100 to +700 psi. At -100 psi the sensor output is 0 volts. At 700 psi the sensor output is 10 volts. In this case, the Offset is -100 and the Slope is

$$\frac{(700 - (-100))}{(10 - 0)} = 80 \text{ psi/volt}$$

Example 4: A 0-10 Vdc output watt transducer has an output of 8 volts when measuring 150kW and 3 volts when measuring 50kW. The sensor has a linear output and it is desired that its output be measured and recorded using a DATApro. What should the Slope and Offset in the Setup Table be?

For more complex problems like this it is often helpful to draw a graph with the engineering units (kW) on the y-axis and the raw sensor output (volts DC) on the x-axis. Use the two data points to sketch a line graph to get a feel for what the slope and offset should be. Here the Slope is

$$\frac{(y_2 - y_1)}{(x_2 - x_1)} \text{ or } \frac{(150 - 50)}{(8 - 3)} = 20 \text{ kW/volt DC}$$

Calculate the Offset using either data point and the Slope and formula for a line: $y = \text{Slope}(x) + \text{Offset}$.

$$\text{Offset} = y - \text{Slope}(x) = 150 - (20 \times 8) = -10 \text{ kW}$$

APPLICATION NOTES

1. USING ELITEPROS AND DATAPROS WITH USB TO SERIAL ADAPTERS

A growing number of laptop computers and other devices no longer have serial ports on them. Instead, the serial ports have been replaced by USB (Universal Serial Bus) ports. USB ports may be connected to ELITEpros and DATAprós by using a suitable USB to Serial adapter. Contact DENT Instruments to purchase a compatible adapter.

To use, connect the adapter between the logger and the PC and connect to the logger as you normally would. We have noticed that sometimes the adapters drop or repeat characters between the logger and PC causing a communication failure. This can be minimized by using a lower baud rate. In general, use the highest baud rate that gives a reliable connection. For a direct serial connection that is almost always the maximum rate of 57600 baud. With the USB adapter it may need to go to 28800 or even 9600 baud to get reliable communication. A description of changing the baud rate is found in Section 2, **Tools > PC Setup**.

2. USING THE 3 WATT-ELEMENT (3 CT) METHOD ON A 3-WIRE DELTA SERVICE

Using the two watt-element method on 3-phase 3-wire Delta services is a perfectly valid measurement technique. The 2-element method also uses less logger memory and hardware channels and allows measuring two Delta (3-wire) loads simultaneously. However, there are two times when it may be desirable to use the 3 watt-element method.

They are:

1. The 3-element method is more intuitive. By placing a CT on each phase wire, it is easier to understand what is happening in each phase without referring to phasor diagrams
2. Different power factor calculation. As noted in the description of the Power Sum Equations above, the System VA and, consequently, System Power Factor are calculated differently between the 2 and 3 element methods.

In 2-element measurements, Systems VA is calculated from Watts and VARs using the power triangle. In 3 element measurements, System VA is calculated as the sum of the VAs from the individual phases. Both methods are completely valid.

The major difference is how harmonics are treated. When harmonics exist, they are usually only (or mostly) present in the current and not in the voltage. Because watts and VARs are calculated as the instantaneous product of volts and amps and because an existing third or fifth harmonic current does not have a corresponding voltage harmonic, then the harmonics' products are zero. Therefore, the instantaneous product of volts and amps used to obtain watts and VARs *does not include* any harmonic component. Thus the 2-element method does not include any harmonic content in the calculation of System VA, or System Power Factor. The Power Factor calculated in this way is also known as the "Displacement Power Factor." In 3 element systems, because System VA is calculated as the sum of the phase VAs, which in turn are the product of the RMS volts multiplied by the RMS amps, then harmonics *are* included (in the RMS amps). The System Power Factor then also includes harmonics and is sometimes called the "Apparent Power Factor."

If there are no harmonics present, the displacement power factor and harmonic power factor are identical. If harmonics are present, the harmonic power factor (3 element) will always be smaller than the displacement

power factor (2 element). Similarly, the 3-element VA will always be larger than the 2-element VA. When comparing the **ELITEpro** three phase measurements with other meters, make sure that the same method of calculating VA and Power Factor is used.

Connecting the ELITEpro to a 3-phase 3-wire Delta load using the 3 element method: It is very similar to the 3-phase 4-wire WYE connection. Use a CT on each phase and connect the three **ELITEpro** voltage wires to each phase. The neutral wire should then be connected to earth ground. The second page of the logger Setup table should look just like that of the 4-wire WYE setup.

3. MONITORING VOLTAGES GREATER THAN 600 V

Using the PT (Voltage Multiplier)

When monitoring loads greater than 600V (maximum rating of the **ELITEpro**), a Voltage or Potential Transformer (PT) is required.

Use an instrument grade transformer with low phase shift and high accuracy since errors in the transformer will translate directly into errors in the recorded data. The PT value put into the Setup Table in the logger should be the transformer ratio. This feature is useful when monitoring high voltage loads such as found at a substation or on transmission lines.

CAUTION: *If a PT is not used on loads greater than 600V, the **ELITEpro** Logger may overheat (or worse) causing irreparable damage and extreme danger to the user.*

Determining the PT Value to be Used in the Setup Table

The PT is the transformer ratio. For example, a potential transformer is used to monitor a 4160 VAC load. The transformer steps the voltage down from 4160 to 120 VAC. The PT equals the transformer ratio or $4160/120 = 34.667$. Thus, 34.667 would be used for the PT value in the channel Setup Table.

4. USING ELITEPROS AND DATAPROS WITH EXTERNAL MODEMS

Whenever possible, DENT Instruments recommends using Internal modems with the **ELITEpro** and **DATApro** Loggers. Given the large number of differences in modems the small amount of money that may be saved in using third party external modems can easily be lost in labor spent to make all of the components work together.

Because of the wide variety of modem protocols, using an external modem for remote communication requires that all four devices involved: the PC, the PC modem (local modem), Logger, and Logger modem (remote modem) must be configured correctly. They must all be set to the SAME baud rate and locked there. You may need the external logger modem manual for part of this.

From the **Logger > Communication** menu, you may call the logger one of two ways. If you know the logger modem's telephone number you may use the **Call Now (Manual Dial)...** function. Secondly, if you have added the logger to a Logger List you may use **Call Now (Choose from Logger List)...** With the Logger List open, select the desired logger with the mouse and then select **Ok** to call the logger.

Setup The PC and PC Modem: Use **Tools > PC Setup...** to set the Modem Connect Baud rate to 14400. Then from your Windows Desktop use Start > Control Panel > Hardware and Sound > Device Manager > Modems> select your modem > right-click for Properties > Advanced tab > Change Default Preferences button and set Flow Control to Off or None.

Setup The Remote Logger: The Logger cannot connect faster than 14400 baud in a modem connection (but in a direct connect it can go to 57600). If your modem will support 14400 and the phone lines are good enough, set the Logger to 14400 baud using **Logger > Communication > Direct Connect (Null Modem Cable)** and after connection, **Logger Baud Rate...**

Setup The Remote (Logger) Modem: Connect the Logger modem to the PC with a null modem cable and, using a terminal program (such as HyperTerminal), set the remote modem's baud rate to 14400 using the appropriate commands for that modem as stated in the modem manual. This "locks" the remote modem's baud rate by storing it into the modem's nonvolatile memory so that it cannot change.

TECH TIP: 25 to 9 pin adapters often make good logger-to-modem connectors.

Now connect the modem to the logger with a short connector or cable.

If locking screws are provided on the connector, use them to make sure that the connection does not come apart after you have left the site. Plug the telephone wire into the Logger modem and power cord into the modem.

TECH TIP: Once you have a successful installation, NEVER use the Logger Baud Rate... function during a modem connection because if you do, you will have lost your ability to talk to the logger until someone goes out and does a direct connect to the Logger to change the baud rate back. The reason is that the modems are talking at (for example) 14400 baud and let's say you change the Logger baud rate to 2400, which you can do. Then as soon as the Logger accepts the change command you can no longer talk to it because the modem is still talking at 14400.

TECH TIP: When doing a field project, and after completing the installation, have someone call the Logger from your office while you are standing there watching it and make sure they can talk to the logger.

TECH TIP: Before going into the field, make sure you can do a telephone connection with the logger at your office using 2 phone lines. In some cases, certain modem combinations (PC and Logger) just will not work.

TECH TIP: If you want to use a shared telephone line where the building occupant also has access to the line for part of the day, a good way to do that is to use the logger modem manual to determine how to set the number of rings before answering. The usual command is S0=10. By setting the ring count to 10-15 rings before the modem answers, the building occupant will have time to answer before the modem does. After normal business hours when the occupants are not on site, the modem will pick up after the set number of rings. Do not use a shared line that is used 24 hours a day or that "rolls over" to an answering service after business hours.

ANSWERS TO THE MOST COMMONLY ASKED QUESTIONS

Through conversations with **ELITEpro™** and **DATApro™** Logger users, we have come up with a compilation of the *Most Commonly Asked Questions*. However, do not hesitate to call us you have any further questions not covered in this section.

My logger says it's an ULTRALite but my manual says DATApro™ . What's the difference?

None. The **ULTRA/ite** was renamed in January 2002 to better describe its functions and indicate that it is part of the PRO-SERIES family of products.

How does my PRO-Series Logger talk to the computer?

Communication between the PC and the Logger occurs when the RS-232 cable (or RS-232 cable and USB adapter) is connected to the logger and the computer. Using the Logger software, the logger and computer are ready to communicate. Or, if you are remotely accessing the logger via a modem, call the logger using the software and you are ready to communicate.

Why aren't my PC and Logger communicating?

There are three items to check when this occurs. First, check to see if the cable is securely attached to both the RS-232 port on the logger and the serial port on the PC. (Or, if using a USB to Serial Adapter, check the connections between the logger, RS-232 cable, USB adapter and PC.) Second, check to see that the cable is the DENT INSTRUMENTS supplied null modem cable or (a standard RS-232 cable will not work) null modem adapter is in place on the USB converter. Third, make sure the correct COM Port in the computer software is selected (use **Tools > PC Setup...**). If none of these suggestions work, call DENT Instruments' Tech Support (541.388.4774) for further assistance.

How much flexibility do I have when configuring the channels?

You can configure the channels any way you want. You can choose any combination of power, VARs, power factor, volts, amps and VA {**ELITEpro**} or other sensors that the logger allows {**DATApro**}. You may also record average, minimum, maximum or instantaneous values. You may select any one of these parameters or all four. The only limitation is the number of channels in the logger and the logger memory. See Page 5 for further information.

How do I configure a channel?

Configuring a channel is very easy. You will need to create a Setup Table, which can be done from the software. A Setup Table defines how each channel is configured so the Logger will know which items to monitor during the study. Using the computer software you can create any number of Setup Tables by saving them to your hard drive. See Page 5 for further information.

How many records can my PRO-Series Logger store? How long can my monitoring session last?

The **ELITEpro**[™] and **DATApro**[™] Loggers can store about 25,000 individual records (about 100,000 for the high memory option). The length of the monitoring session depends on the number of channels that are active, the number of recording flags that are set, and the integration interval. ELOG will calculate the length of the recording session for any Setup Table you define and can be found on Page 1 of the SUT.

When I view the real-time channel values, why are there non-zero voltage values for channels I have turned on even though I haven't connected a current transformer?

The reason is because the logger is picking up noise or showing default values for Amps. These values are erroneous and should be disregarded. Note however, anything shown in the real-time display will be recorded.

When I am monitoring a load that requires more than one channel (such as a 3 Phase - 3 Wire Delta load), which channel shows my totals? {ELITEpro}

When using more than one channel for one load, the results from each channel have to be added together to obtain the total power consumption. This is done using the computed channels 5 and 6.

How important is it to connect the Neutral and (if so equipped) Ground wires when monitoring power loads? {ELITEpro}

Always connect the Neutral and Ground wires before other voltage leads! This is both for safety and for proper operation of the logger.

What kind of current transformers are available?

Three types: split-core, clamp-on and flexible (Rogowski). See the table on Page 92 or visit our website for more information.

How many 3 phase, 3 Wire Delta loads can I monitor with the ELITEpro[™] Logger? How many 3 Phase, 4 Wire WYE loads?

The amount of channels you will need depends on how many CTs the load you are monitoring requires (one CT per channel). A general rule when figuring out how many CTs you will need is to subtract one from the amount of wires in your load. For a 3 phase, 3 Wire delta load, you will need 2 CTs (3 Wires - 1). For this case, two 3 phase, 3 Wire delta loads can be monitored concurrently. For a 3 phase, 4 Wire WYE load, you will need 3 CTs (4 Wires - 1). One 3 Phase, 4 Wire WYE load can be monitored by the ELITEpro Logger (you will have one channel remaining).

However, if the load monitored is balanced, i.e., the phase voltages are equal and the phase currents are equal, then it is possible to monitor multiple 3 Φ loads. Use one CT on one phase and one voltage reference from that phase to the reference phase. For a three-phase delta load, the voltage reference should be phase to phase. Use 1.73 for the PT value in the setup table.

For a three-phase four wire load, use one CT and reference the voltage from that phase to neutral. Use 3 for the PT value.

Can I use the ELITEpro™ to monitor 400 Hz (military) loads?

Yes. Set the logger to 50 Hz on the first page of the Setup Table. At 400Hz, the logger will sample at 16 times per cycle. This method works very well as long as there is little harmonic current beyond the 7th harmonic (2800 Hz).

Will the ELITEpro™ Logger meter 600V loads?

The logger is capable of continuously metering 600 volts. Metering voltages above 600 volts can cause excessive heat to build up, damage to the Logger and extreme danger to the user. When measuring higher voltages use a properly rated instrument grade step-down transformer to reduce the voltage to the Logger to under 600 volts.

When I compare the ELITEpro™ measurements on three phase loads with another meter, I notice that the watts and VARs agree but VA and Power Factor do not. Why?

The usual reason is that the two meters are not calculating VA and Power Factor in the same way. Some meters include harmonics in the calculation and some do not. The ELITEpro™ can do both depending on whether the 2 watt-element method is being used (does not include harmonics) or the 3 watt-element method (does include harmonics). See also the section *USING THE 3 WATT-ELEMENT METHOD ON A 3-WIRE DELTA SERVICE* on Page 99.

What is "Integration (or Recording) Interval"?

These are the periods that the logger will post data for. You can use 3, 15, or 30 sec., 1, 2, 5, 10, 15, or 30 min., or 1, 12, or 24 hour interval periods with the ELITEpro™. All recorded values will have a time stamp using one of the above periods.

Can I have a monitored event trigger the start of monitoring?

No, however you can delay start until a specific date and time.

How do I connect my ELITEpro™ or my DATApron™ to my USB port?

You may purchase a USB to Serial Port adapter available from DENT Instruments.

How exactly does an ELITEpro gather data to record a sample?

There are two answers to this question: (1) for situations where your ELITEpro™ is running on battery power only and (2) in situations where your ELITEpro™ is using external (wall) or line-power.

(1) All DENT Loggers using battery power **only** will take a sample every one minute and then go to sleep. So, for example, if you are set for a five minute integration period, the logger will wake every 60 seconds and take a sample. After five minutes, the logger will average five samples. It then records the requested data.

(2) If the logger is using external power or line-power, it will take a sample every three seconds. For example, if you are set for a five minute integration period, the logger will take a sample every three seconds and then average the 100 samples taken. It then records the requested data.

What is "Waveform Sampling"?

This is the process of digitizing an analog waveform. The logger has a sampling frequency of 7.68kHz (128 points per waveform). The ELITEpro uses two 12 bit A/D to sample both current and voltage waveforms simultaneously. The data points from the waveform sampling are used for all calculations.

What exactly happens when an ELITEpro records a sample?

When the ELITEpro takes a sample, the logger takes a single 360° sine wave, measures 128 points across it, Root Mean Squares all of the values, and records the requested data. In the case of a 3 phase measurement, the logger tries to take a concurrent sine wave from each phase, and then calculates the data.

Why will the ELITEpro™ not allow me to set my integration interval at 30 seconds?

Most likely it is because you are powering the instrument from the internal batteries. When running from the internal batteries the rate at which it will sample is once per minute. This preserves the batteries. When sampling on external power (9V transformer) the instrument senses the power and switches into a fast sampling mode (once every 3 seconds).

How fast can I sample with the DENT ELITEpro™ logger?

Every three seconds is the fastest sampling rate at which the ELITEpro can record data. In order to record at less than one minute intervals, the ELITEpro must be either plugged into a wall outlet, or, if the unit has the 'Line-Power' option, drawing out power through the voltage leads. One minute is the fastest sampling rate for an ELITEpro using battery power only.

I'd like to use my own CT's. What voltage output will be compatible with the DENT Instruments?

The CT inputs of the ELITEpro can handle a maximum of 450mV or AC or DC current. All CT's must be shunted to output 0-333mVAC at rated current.

How long does the battery last and is it replaceable?

Battery life for a PRO-SERIES instruments is generally 3 years. The standard instrument uses one lithium C cell and the modem instrument uses two lithium C cells. The batteries are in holders and are easily replaceable. Contact the factory for availability. Instructions can be found on Page 108 of this manual. Note: Use the wall transformer whenever possible as this provides external power to the instrument and extends battery life.

How will I know if I have sufficient memory to complete my study?

The best way to calculate the memory is in the first page of a setup table. Create the set up table in ELOG and view the calculated memory from the first page of the set up table. You can alter the table easily and see how it affects total memory. Detailed instructions can be found on Page 110.

What is the difference between the ELITEpro™ and the DATApro™?

The ELITEpro is a poly-phase power meter designed to measure electrical loads and power consumption up to 600V. The DATApro is a four channel logging device designed to measure data provided from outside sensors that can produce any of the following inputs; 4-20mA, 0-10VDC, electrical currents, temperature signals, or pulse signals.

Can the DATApro™ record harmonics and waveforms?

Only our ELITEpro™ can monitor harmonics and waveforms and allow you to view it in real time and the harmonic data can be stored directly on the hard drive of a connected PC (by clicking on the Record to PC button in the Harmonic Analysis window). However, this data cannot be stored directly in the logger.

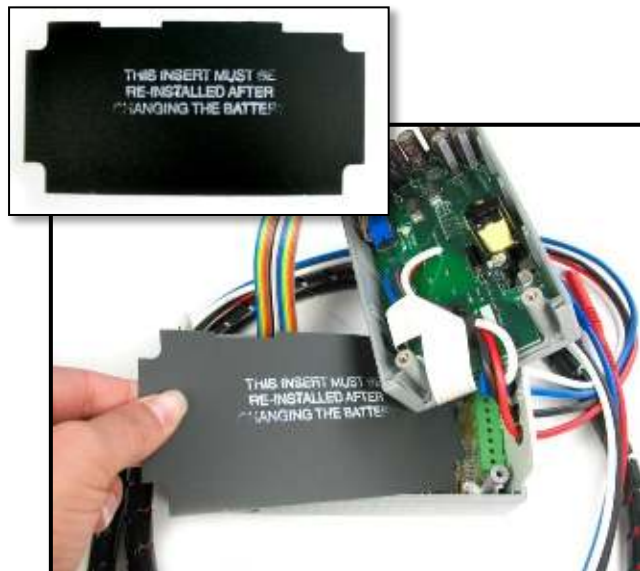
Can I upgrade my memory at a later date?

Yes, in the form of a factory upgrade. We also offer upgrades to line-power and internal modems. All memory upgrades include new Firmware, new batteries, an electrical systems check, calibration, burn-in, and a copy of our latest software.

APPENDIX

ADDENDUM 1:

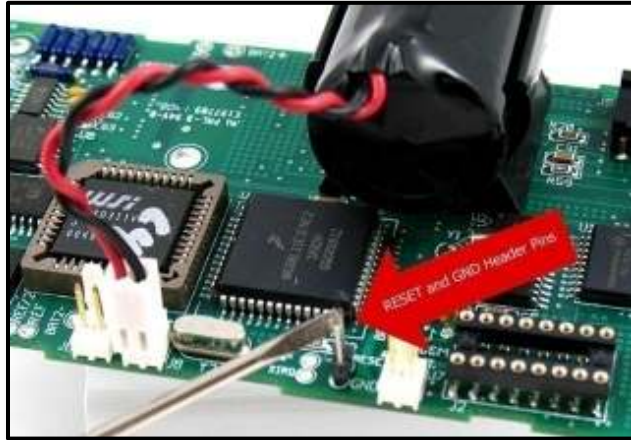
BATTERY REPLACEMENT PROCEDURE FOR PRO-SERIES



1. **Remove voltage leads from any source!**
2. Remove the four case screws from the bottom panel.
3. Slide the top panel off the end panels and lay to the side.
4. **Do not remove original battery if the unit has valuable data stored!** Locate the battery and cut the retaining tape. If you are replacing a low voltage battery: Connect the new battery to the redundant battery post (MAIN BATT) then quickly remove the old battery from its battery post
5. If you are replacing a "dead" battery: Remove the old battery from the holder and insert the new one, but do not connect to the terminal.
6. Short the MAIN BATT pins together to remove charge
7. Connect the new battery to the MAIN BATT post
8. Short RESET and GND pins for one second
9. **NOTE:** If replacing batteries for an instrument with a modem, connect modem battery first then connect the main battery.
10. Tape the new battery into the battery holder (Apply Dielectric Insert on Line Powered Units. The included Dielectric Insert shield is only required for Line Powered ELITEpro units.)
11. Close the case and re-install the four case screws.
12. Connect with ELOG software and set unit's time.
13. Check the battery voltage in Present Readings/Show as Text screen. Battery should read between 3.5-3.7VDC.
14. Set the logger's clock using ELOG software.

ADDENDUM 2: PRO-SERIES RESET PROCEDURE

ELITEpro RESET and GND Pins



1. **Remove voltage leads from any source!**
2. Remove the four case screws from the bottom panel
3. Slide the top panel off the end panels and lay to the side
4. Short RESET and GND pins for one second
5. Both LEDs should flash briefly, and then go dark. If LEDs continue to flash repeatedly, please contact DENT Instruments as your logger may require further repair.
6. Close the case and re-install the four case screws
7. Connect with ELOG software

DATAprom RESET and GND Pins



ADDENDUM 3:

CHECK MEMORY CAPACITY AND REMAINING MEMORY OF A PRO-SERIES LOGGER

By following these steps, you will be able to determine whether your **ELITEpro™** or **DATApro™** instrument has Standard or High Memory and how much memory is left.

The easiest way to see how much memory your logger has is to send a Set-Up Table (or SUT) to your unit. On the first page of the SUT, there are two fields which show the “Calculated Days Until Memory Exhausted”. Make a note of the number in this field.

Send the table to your logger, then from the ELOG toolbar choose: **Logger > Display Present Readings > Show as Text.**

When the box appears, there will be a “Memory Remaining” box in the bottom-left corner which will contain a number of days. This number will very closely match one of the values you saw on the SUT.

If the value in the “Memory Remaining” box matches the lower number of days from the SUT, it means you have 128k (Standard) memory, if it matches the higher, it means you have 512k (High).

ADDENDUM 4:

ELITEPRO METERS WITH OPTIONAL LINE POWER SUPPLY

Operation

Some **ELITEpro** meters are equipped with an optional Line Power Supply (LPS) that draws power from the monitored voltage mains to operate the meter. The LPS is available with new meters or as an upgrade to existing meters. (Consult DENT Instruments for more information.) No additional connections need to be made besides those used to connect the meter for normal metering. The one exception is for single phase loads as described below.

The Line Power Supply works by drawing a little power from the high voltage leads and putting it through a custom designed, extremely wide band power supply to make the low-voltage dc power needed to operate the meter. An **ELITEpro** with an LPS can still operate on its internal battery if no AC power is available (such as when using the **ELITEpro** to only measure current.) In the event of a loss of power, the **ELITEpro** will switch to battery operation automatically. (Unless the integration interval is set to 3, 15, or 30 seconds. In that case, logging will stop until AC power is restored or an external wall transformer [supplied] is connected.)

The LPS draws its power from the L1 and L2 phase voltage leads. Both of these leads must be connected for the **ELITEpro** to be powered. A minimum of 50 volts, AC or DC, is required across L1 & L2 to power the meter. The maximum is 600 VAC.

When connected to line power the **ELITEpro** can also supply power to external sensors from the jack on the side. Up to 2W at 5VDC can be supplied. Note that to supply 2W the minimum voltage required between the L1 & L2 phases rises to 70 VAC or 90 VDC.



RISK OF ELECTRIC SHOCK. LIFE THREATENING VOLTAGES MAY BE PRESENT. QUALIFIED PERSONNEL ONLY. CONNECTING AND DISCONNECTING THE LOGGER SHOULD BE DONE ONLY WITH PROPER INSULATION ON THE USER INCLUDING PROPERLY RATED HIGH VOLTAGE GLOVES.


Line Power Supply Ratings

- Temperature Range: -7 °C to +60 °C
- Absolute Maximum Voltage: 600VAC or VDC Line to Line, 350 VAC Line to Neutral
- Minimum Voltage To Operate Logger: 50VAC or VDC
- Minimum Voltage To Operate Logger and Supply 2 W External: 70VAC or 90VDC
- Maximum External Sensor Power: Up to 2W at 5VDC
- Power Requirement With No External Load @ 280VAC L1 to L2: .83W (1.7VA)
- Power Requirement With No External Load @ 600VAC L1 to L2: 2.1W (5.1VA)
- Power Requirement With 2W External Load @ 280VAC L1 to L2: 6.3W (10VA)
- Power Requirement With 2W External Load @ 600VAC L1 to L2: 8.2W (17VA)

Connection

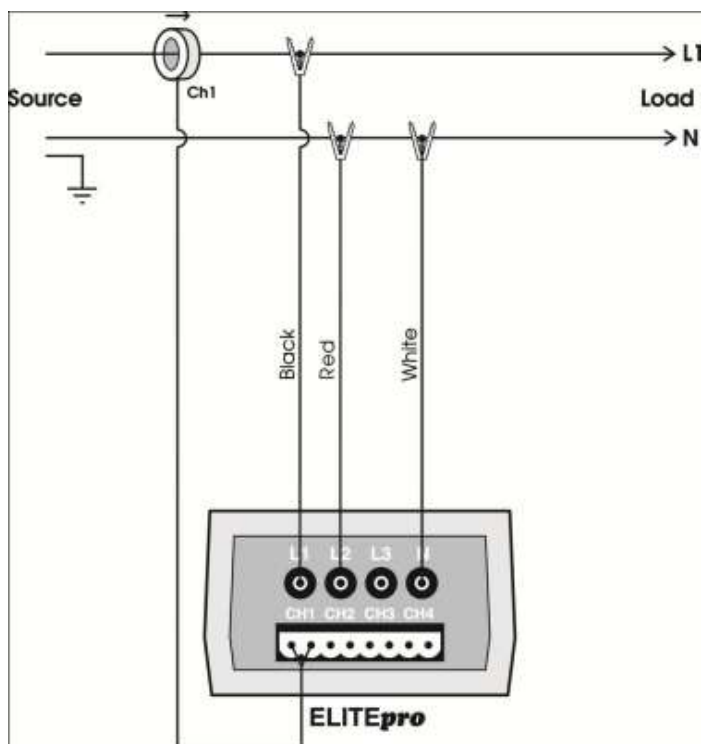
The Line Power Supply is connected across the L1 and L2 Phases inside the meter. To supply power to the **ELITEpro** both L1 and L2 phases must be connected. During normal metering, of three phase loads, both 3 wire Delta services and 4 wire Wye services the L1 and L2 phases will be connected.


If used with a single phase load where the metering circuit voltage reference is (for example) L1 to Neutral, the L2 wire of the **ELITEpro** must also be connected to Neutral. See Figure 1.



Since the internal power supply is connected across the L1 and L2 leads, connecting either voltage lead to a high voltage means the other lead is also at the same voltage potential. If either L1 or L2 is connected to a voltage source **DO NOT TOUCH** the other lead without proper protection or a serious shock could occur resulting in injury or death.

Figure 1. Connecting the **ELITEpro** with internal power supply to a single phase load.





Depending on when in the voltage cycle the second of the L1 and L2 leads is connected, a small spark may be noted. This is normal operation and will not damage the meter.

Note that the internal power supply is connected to the L1 and L2 phases. For the **ELITEpro** to be powered by the line, both the L1 & L2 leads must be connected as shown above. However, the logger Setup Table would not change as shown below.

Example Single Phase Setup Table: Note voltage reference is still L1 to Neutral. The L2 lead is used only to power the meter and is not part of the measurement circuit for single phase loads.

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps
Power	Single Phase 2 Wire	L1	N	1.0000	100.00°		

ADDENDUM 5:

SIMPLIFIED INTERFACE FOR PRO-SERIES INSTRUMENTS

PRO-SERIES loggers have a simplified user interface that allows third party software to perform such functions as retrieve data, read and set clock, and other tasks in a “simple” manner. The interface is designed to be used primarily with routine data collection programs such as MV-90 or handheld devices. The simplified interface can also be used by handheld data readers micro-computers (palm tops) and Windows CE devices.

The simplified interface is not capable of setting up the logger for a monitoring session. ELOG is required for logger set up.

Any terminal program, such as Procomm or Hyperterminal, can be used for one-time or routine data collection by issuing the ASCII commands described below. Additional simple commands are being added to the loggers for specialized applications. If you have any questions about the commands or their functions please contact DENT Instruments.

Format of the command descriptions that follow:

1. The actual command is shown in **bold**.
2. Some commands have an optional argument which is shown in brackets [], e.g., [mm/dd/yy hh:mm]. When using the optional arguments do not include the brackets in the command.
3. The first line following the command is a brief description of the function of the command.
4. The next text provides greater description of how the command or how it is used.
5. Lastly, there is an example of the command and what is returned from the logger when the command is used. The “command” line is what the computer sends to the logger and “returns” refers to what the logger sends to the computer.

A couple of nuances to be aware of: READ THESE!

1. The command syntax must be **exact**. For example, a missing or extra space voids the command.
2. For direct RS-232 connections to the logger, there is a 15 second timeout. After 15 seconds, the logger goes to “sleep.” If a command is sent while the logger is asleep, the first character will be used to “wake the logger up” resulting in the command being missed. While communicating with modems, the timeout is 90 seconds.
3. To ensure that the logger is “awake,” send an Enter before each command. If awake upon receiving an Enter, the logger will return a line feed, carriage return and prompt (>). If the logger is asleep upon receiving an Enter, the logger will wake up and give a carriage return and prompt only.
4. Some commands result in the logger giving a line feed and carriage return followed by what the command asks for. Some commands only give a carriage return (without a line feed) followed by what the command asks for. In the description of the commands the words “line feed” appear after commands where a line feed is returned by the logger and “no line feed” where there is none.
5. Important Communication Protocols: Set the remote host to communicate at 57600 baud (or whatever baud rate the logger is set to), **8 data bits, Parity = None, 1 stop bit, Flow control = None.**

An Example Routine Data Collection Set of Commands

In its simplest form, data retrieval consists of sending a SELECT command to tell the logger what date range of data is desired followed by an EXPORT command that begins the data transmission.

Typical Data Collection Session Commands—Computer calls the logger

First Call to Logger

PC Commands	Function
<enter>	Wakes the logger, Returns a prompt (>)
ID	Returns the logger serial number
HEADINGS	Returns the time stamp and data column headings
SELECT /*	Tells the logger to choose all data in the logger for downloading
EXPORT	Tells the logger to begin downloading the data

Second and Subsequent Calls to the Logger

PC Commands	Function
<enter>	Wakes the logger, Returns a prompt (>)
SELECT /* mm/dd/yy hh:mm	Tells the logger to choose all data from mm/dd/yy hh:mm to the last data record for downloading. Where mm/dd/yy hh:mm should be the record following the last record from the previous download.
EXPORT	Tells the logger to begin downloading the data

An additional, optional command would be **C! [date time]** to update the logger clock to the PC's clock.

It may also be desired to use the **\$?** command prior to HEADINGS to turn off the character echo from the logger. That will prevent the command names from being added into the downloaded data file.

If the logger originates the call, the last command issued to the logger should be S! (see below).

1. DESCRIPTION OF COMMANDS FOR DATA RETRIEVAL

ID

Returns logger serial number.

The serial number may or may not be retrieved with each data download session. It is often used to identify an existing data file to which new data will be appended or to label a new data file.

Example:	command	>ID<enter>	(no line feed)
	returns	8032F	
		>	

HEADINGS

Returns the text column headings for the data and time-stamp fields.

The column headings consist of two rows. The first line returned is the top row and the second line is the bottom row. The headings are in quotes and comma delimited. The first three column headings will always be:

Record	Record	Record	(followed next by the data column names)
Number		Date	End Time

The column headings are usually retrieved once from the logger at the first data download. Subsequent data retrievals are usually appended to an existing file and the column headings need not be re-retrieved.

Example:	command	>HEADINGS<enter>	(no line feed)
	returns	"Record","Record","Record","Chan 1","Chan 2","Chan 2"	
		"Number","Date","End Time","Avg. Temp","(C)Units","(R)Units"	
		(carriage return and line feed)	
		>	

SELECT /*

Sets the logger to output ALL data in the logger starting from the first record through the last. Data output occurs when the logger receives an EXPORT command. (See below.) There must be a space between SELECT and the /*

Example:	command	>SELECT /*<enter>	(line feed)
	returns	>	

SELECT /* mm/dd/yy hh:mm

Sets the logger to output all data in the logger starting with the date and time listed in mm/dd/yy hh:mm (inclusive) to the end of the data in the logger. Must be used with an **EXPORT** command. There must be a space between SELECT and the /* and the date and time argument.

The argument mm/dd/yy hh:mm = month/day/year hour:minute of the first record to be exported. All data from the time specified (inclusive) through the last record in the logger (most recent) will be downloaded when the logger receives the EXPORT command.

The SELECT /* [mm/dd/yy hh:mm] is most often used for on-going data collection projects where only *new* data is desired and it is to be automatically appended to the existing data file. There are other SELECT commands available and they are described below.

Example:	command	>SELECT /* 09/14/98 14:00<enter>	(line feed)
returns	>		

EXPORT

Exports data according to the last SELECT command received by the logger.

Example:	command	>EXPORT<enter>	(no line feed)
	returns	1,10/01/98,16:39:00,+0073.2,0,000.00	
		2,10/01/98,16:40:00,+0073.2,0,000.00	
		3,10/01/98,16:41:00,+0073.9,0,000.00	
		:	
		:	
		9,10/01/98,16:47:00,+0073.5,0,000.00	
		10,10/01/98,16:48:00,+0073.4,0,000.00	
		(line feed and carriage return)	
		(second line feed, without a prompt)	

The data continues to be sent until the SELECT command is satisfied
There is no prompt after the end of the data

Note: Since the logger keeps track of the last data record sent, it is not always necessary to use a SELECT command with EXPORT. An EXPORT command issued to the logger without a SELECT command preceding it will cause the logger to download its data beginning with the first record in the logger following the last downloaded record. The danger in not sending SELECT with each data download occurs when 2 or more computers are used to download data from the same logger(s). The logger has no record of who last requested data, only what data it sent. Multiple computers accessing the same logger may have gaps in their data if each computer does not send a SELECT command prior to retrieving data.

C?

Returns logger's clock time in a hh:mm:ss mm/dd/yy format. The clock uses a 24 hour format.

Example:	command	>C?<enter>	(line feed)
	returns	15:42:52 09/18/98	

>

C! hh:mm:ss mm/dd/yy

Sets logger's real-time clock.

This command is used to keep the logger's clock in synchronization with a host computer that is doing the data retrieval and to compensate for any drift in the logger clock. Logger clocks do not compensate for daylight savings time.

Example:	command	>C! 18:44:00 09/18/98<enter>	(line feed)
	returns	(second line feed and carriage return)	

>

Additional Commands

SELECT /1 mm/dd/yy hh:mm

Sets the logger to EXPORT only one data record at the date and time specified.

Format and function is similar to the SELECT /* command described above.

SELECT /H mm/dd/yy hh:mm - Sets the logger to EXPORT all data from the time specified in the argument (inclusive of the argument time) until the end of the hour (exclusive of the beginning of the next hour).

The number of records that are retrieved with this command depends on the integration interval set in the logger and the time given in the argument. For example, if the logger is set to record 5 minute interval data and the argument time in the minutes section (mm) of the SELECT command is xx:40 then 4 records will be returned (xx:40, xx:45, xx:50, xx:55).

Format and function is similar to the SELECT /* command described above.

SELECT /D mm/dd/yy hh:mm - Sets the logger to EXPORT all data from the time specified in the argument (inclusive of the argument time) until the end of the day (exclusive of midnight).

The number of records actually retrieved depends on the time specified in the argument and the integration interval set in the logger as described in SELECT /H, above.

Format and function is similar to the SELECT /* command described above.

VERSION

Returns EPROM (logger software) version number

DENT loggers are continually being improved, enhanced and given new capabilities. The EPROM version number is most often used by the factory for trouble-shooting and to answer questions about features and capabilities in the logger.

Example:	command	>VERSION<enter>	(no line feed)
returns	EUC1B.085		
>			

2. COMMANDS FOR SETTING UP THE LOGGER TO CALL THE COMPUTER

The PRO-SERIES loggers have the capability to originate a data download session. This feature is particularly useful when sharing a telephone line at the site. The commands described above apply equally to sessions where the logger originates the call.

The logger can be configured to periodically call a telephone number and send its data to the PC that answers the call using the simple commands that follow. It is usually easier to set the logger call-out schedule using the DENT's **ELOG** software but it can also be done with the **SCHEDULE** commands below.

The PC must have a modem and terminal program that is capable of answering the incoming call. After connection the terminal program would send the appropriate commands as described above to retrieve data and set the logger clock as desired.

All sessions where the logger originates the call must end with an S! command (see below).

PHONE

Returns the telephone number the logger will call to download data.

Example:	command	>PHONE<enter>	(no line feed)
	returns	15413884774	
		>	

PHONE [number]

Sets the telephone number for logger to call.

PHONE [number] supports commas used to cause delays needed for PBX telephone systems. A comma adds 1-2 seconds delay each before dialing the next number.

Example:	command	>PHONE 9,18003880770<enter>	(no line feed)
	returns	9,18003880770	
		>	

SCHEDULE /C

Clears (erases) the current call-out schedule in the logger.

Before sending a new call-out schedule a SCHEDULE /C command should be sent to clear any previous schedule that may be in the logger.

Example:	command	>SCHEDULE /C<enter>	(line feed)
	returns	(line feed and carriage return)	
		>	

SCHEDULE /1 hh:mm dd

Logger calls out one time only at the time & date specified.

For all SCHEDULE commands (including those described below) the argument value "dd" corresponds to the day of the month it is desired to have the logger call out. Note: if, for example, dd is set to 7 and the day on which it is set is the 8th of the month then the logger will not call out until the 7th of the next month. Also, if dd is set to 31 and the month in which it is set has only 30 or fewer days then the logger will not make a call until the 31st of the next month that has 31 days in it. Note also that the argument hh:mm dd is mandatory for this command. Also, there must be a space between SCHEDULE and the /x and the date and time argument.

Example:	command	>SCHEDULE /1 01:00 22<enter>	(line feed)
	returns	(second line feed and carriage return)	
		>	

SCHEDULE /D hh:mm dd

Logger calls out once every day at the time specified in hh:mm and starting on day of the month "dd"

Example is the same as for SCHEDULE /1

SCHEDULE /W hh:mm dd

Logger calls out once every week at time specified starting at day of month “dd”

The logger will call every week on the same day of the week (Monday, Tuesday...) that corresponds with dd. Note: If the day of the week corresponding to “dd” next occurs in the month following the month when the SCHEDULE command is sent to the logger, then the weekday that the logger will call corresponds to the day of the week that is “dd” in the following month.

Up to seven (7) SCHEDULE /W commands may be sent to the logger; one (and only one) for each day of the week.

Example is the same as for SCHEDULE /1

SCHEDULE /M hh:mm dd

Logger calls out once every month on the “dd” day of the month and at the time specified.

Up to thirty-one (31) SCHEDULE /M commands may be sent to the logger; one (and only one) for each day of the month.

Example is the same as for SCHEDULE /1

SCHEDULE /V

View Schedule. Returns the loggers call-out schedule.

Example:	command	>SCHEDULE /V<enter>	(line feed)
	returns	/W 01:33 18	
		(second line feed and carriage return)	
		>	

S!

Tells the logger that the scheduled session has been satisfactorily completed.

Upon receiving an S! command, the logger will hang-up. It will call back at the next, normally scheduled time. If the logger does not get an S! at the end of a telephone/modem session, it will assume there was a problem with the session and call back about 2 minutes following the disconnect and retry the data download.

The S! command should be used at the end of every session where the logger initiates the call.

Example:	command	>S!<enter>	(line feed)
	returns	(second line feed and carriage return)	
		>	

Additional Commands

SCHEDULE /S hh:mm dd

Maintenance mode: Upon receiving this command the normal call-out schedule in the logger is suspended and the logger calls every day at hh:mm starting on day “dd.” This call-out time continues until a SCHEDULE /R is sent to the logger or until another, new “SCHEDULE” is sent.

Example:	command	> SCHEDULE /S 12:00 11<enter>	(line feed)
	returns	(line feed and carriage return)	
		>	

This command is most often used for having the logger call the host PC at a specific time without erasing the normal schedule. Often times the loggers are set to call the host in the middle of the night. SCHEDULE /S can be used to have the logger make a call in middle of the day (for example) when the PC is attended to verify proper operation of the logger.

SCHEDULE /R

Resumes the original call-out schedule that was suspended by a SCHEDULE /S command.

Example:	command	> SCHEDULE /R<enter>	(line feed)
	returns	(line feed and carriage return)	
		>	

Simplified Interface Command Summary All Firmware Versions

Command

<enter> key - Tells the logger to execute the command that precedes the <enter>. Also used to “wake” the logger before sending commands

\$? – Turns off logger character echo.

\$\$ – Turns on logger character echo.

ID - Returns logger serial number

VERSION - Returns EPROM version number

HEADINGS - Exports headings of Columns

SELECT /1 mm/dd/yy hh:mm – Sets Logger to output a single record of data at time listed

SELECT /H mm/dd/yy hh:mm - Sets Logger to output data from time listed to end of hour

SELECT /D mm/dd/yy hh:mm - Sets Logger to output data from time listed to end of day

SELECT /* mm/dd/yy hh:mm - Sets Logger to output data from time listed through remaining

SELECT /* - Sets Logger to output all data in the logger

[mm/dd/yy hh:mm] = month/day/year hour:minute of data to start export

EXPORT – Begins data down load per SELECT command. If no SELECT is sent prior to receiving an EXPORT command the logger sends all data collected since the last Export.

C?- Returns logger's time [hh:mm:ss mm/dd/yy]

C! hh:mm:ss mm/dd/yy- Sets Logger's clock

PHONE – Returns logger telephone number logger calls for data downloads

PHONE number - Sets phone number for logger to call

SCHEDULE /1 hh:mm dd - Sets logger to call out one time only at time on day dd

SCHEDULE /D hh:mm dd - Sets logger to call out every day at hh:mm starting on day dd

SCHEDULE /W hh:mm dd - Sets logger to call out every week at time hh:mm on day of week dd

SCHEDULE /M hh:mm dd -Sets logger to call out every month at hh:mm on day of month dd

(Can only have one "SCHEDULE /1", one "SCHEDULE /D", can have up to seven "SCHEDULE /W", and thirty-one "SCHEDULE /M")

SCHEDULE /S hh:mm dd –Maintenance mode, normal schedule is in suspense until a "SCHEDULE /R" is received or until another "SCHEDULE" is sent. It calls every day at hh:mm starting at dd.

SCHEDULE /R- Resumes normal schedule

SCHEDULE /V- View Call-out Schedule

SCHEDULE /C- Clear Call-out Schedule

S!- Tells logger that Scheduled session is satisfactory completed, call again at next scheduled time. If logger doesn't get an "S!", it will recall in about 2 minutes after the disconnect to complete the scheduled maintenance. Always end a logger-originated session with an S!<enter> .

Additional Simplified Interface Commands

Requires ELITEpro Firmware Version xxxx.056 or Higher

READ CHx – Returns the real-time values for Channel "X." X can be any channel 1-6 but the channel must be enabled in the logger Setup Table

READ PEAK – Returns the kW Peak Demand value with the date and time stamp marking the beginning of the demand period

CLEAR PEAK – Clears the kW Peak Demand register

READ TOTALS – Returns the values in the kWh, kVARh, and kVAh totalizer registers. A value is present only if one or more recording flags have been turned on in the Setup Table. (For example, to get a kWh Total, at least one of the Average kW, Maximum kW, Minimum kW, or kWh boxes in the Setup Table for that channel must be checked.)

CLEAR TOTALS – Resets all of the kWh, kVARh, and kVAh totalizer registers. Does not affect any time series data stored in the logger or the Peak kW Demand register.

STOP LOGGING – Turns logging off (does not clear the memory).

START LOGGING – Resumes logging immediately following a STOP LOGGING command. Assumes a valid Setup Table exists in the logger. (Does not clear memory on logging start.)

START LOGGING hh:mm mm/dd/yy – Starts data logging at the future time specified. If the logger is already logging, logging is stopped when the command is sent. The schedule is only set if the specified time is in the future.

Note: *If there is data already in the logger then START LOGGING with a date/time clears the memory when logging resumes.*

CLEAR MEMORY – Turns logging off and clears the logger interval data in memory (Does not clear the kWh, kVARh, kVAh totalizer registers or peak kW demand register).

READ CLOCK – Returns logger's time [hh:mm:ss mm/dd/yy] (Same as C?)

SET CLOCK hh:mm:ss mm/dd/yy- Sets Logger's clock. Note: To change the clock time but not date only the hh:mm:ss need be entered. To change the date, the time must also be entered. (Same as C!)

Note: *When using the Simplified Interface to retrieve data that has 3, 15, or 30 second integration intervals, the time stamps for the data will only show hours:minutes:00. The seconds will not be shown.*

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