

TOU **SMART**logger™
&
SMARTware™ 11
Software
Operator's Guide



October 5, 2012

Congratulations!

You have just purchased one of the most powerful, easy to use and lowest cost data loggers available. **TOU SMARTloggers** are characterized by:

1. Ease of installation, no wires to connect

- Installs in seconds. Really!

2. No Electricians needed

- Save some serious money!

3. Easy to use software for analysis and graphing

- Lots of useful features!

4. High reliability

- You can count on the instruments to provide years of reliable data!

5. Long battery life (5+ years)

- Won't let your project be derailed by a dead battery!

6. Fourth Generation TOU SMARTlogger features include:

- *Now with 32,000+ transition memory (4X bigger than before)*

As well as:

- Total On-Time Display
- Percent-On Display
- USB communications for faster data retrieval
- Smaller size! 1/3 the size of the old ones
- Replaceable Battery

We are certain that you will find the new 4th Generation **TOU SMARTloggers** to be one of your most-used energy survey tools.

What's New With The 3rd & 4th Generation SMARTloggers™ ?

A lot! The TOU 3G SMARTloggers have been redesigned. Now they are:

With More Memory: 32,576 on/off transitions can now be stored.

Smaller: About 1/3 the size of the old loggers.

Lighter: Only 1.4 oz (40 grams)

Faster: USB communication for faster downloads

Upgradeable: New features can be added through firmware updates

More Informative: 5 digit LCD shows On-Time, Percent On

Easier: User replaceable battery

New Version: CONTACTlogger for switches and relays

SMARTware™ 11

SMARTware now installs more easily, with fewer problems, on more PC operating systems, and on more manufacturers of PCs than ever before.

The 4th Generation SMARTware 11 is very different from earlier versions. New features include the following items and many other “under the covers” changes to just make the software friendlier, more robust, and easier to use.

New Features for SMARTware 11

1. **Completely New Graphics:**
 - Better graphing options
 - Better printing
 - Faster graph drawing
2. **Now Analyze 32,576 Transitions Simultaneously**

And from SMARTware 2009

1. **Reprogrammable TOU Firmware:** Now changes, updates, and improvements can be uploaded into the loggers
2. **Import CSV File:** Makes changes to a data file in Excel® then import it back to SMARTware for more analysis.
3. **Edit the Data:** Now the data can be edited for errors in the clock or for removing records that are unneeded.
4. **More information** is shown in Status Screen including number of transitions recorded.
5. **Summary Report:** The Summary Report is now organized in a more logical, user-friendly fashion. Also, the *Percent On* is now calculated by dividing the *Total On-Time* by the *Total Elapsed Time* (it was previously derived from the *Reset Time and Date*). The *Total Elapsed Time* is again listed. The Summary Report is now more useful than ever.

Quick Start: Get up and running in 5 minutes!

Install the SMARTware 11 Software on your Computer (see also Section III.A)

1. Place the software CD into your CD or DVD drive. The software will start automatically. If the program does not autorun, open Windows Explorer and browse to the CD/DVD drive (usually D:). Double-click the SMARTwareInstaller.exe and follow the instructions.
2. Next connect the USB communication cable to any USB port on the computer.
3. Windows will display a message that your hardware is connected.
4. SMARTware and your USB com cable are now ready to use with a SMARTlogger.

Setup the TOU Logger for a Monitoring Session

1. Double click on the SMARTware icon on the Windows® Desktop to start the application.
2. Connect the logger to a computer USB port with the USB *Communication* cable.
Note: SMARTware 11 works with Windows 7 both 32 bit and 64 bit, Windows Vista® and XP but not earlier Windows operating systems.
3. With SMARTware open, click on **Logger**, and then **Logger Clock** to set the Logger's real-time clock to the correct, local time.
4. (Optional) Use **Logger; Edit Logger Description Line...** to include an additional description in the logger.

Begin Monitoring

1. Disconnect the logger from the communication cable.
2. Choose an appropriate location to place your *TOU SMARTlogger*. (Refer to Page 7.)
3. If using a **LIGHTING, MAG, or CTlogger**, you may wish to set the logger's sensitivity level. (Refer to Page 8.)
4. Verify that the ON symbol  is displayed when the device being monitored is on, and that the symbol disappears when the monitored device is off.
5. Clear the logger's memory with the RESET switch. Push and hold the button for several seconds until the display shows "rESEt."
6. Record the logger's location and serial number on a separate piece of paper for easy retrieval later.
7. **Tip:** Sometimes taking a photo of the installation can make finding the logger at retrieval much easier.

Retrieve and Analyze Data from a *SMARTlogger*™

1. Connect the logger to the computer using the USB Communication cable.
2. Start *SMARTware* and use the **Logger; Retrieve Data...** command to retrieve the data from the logger and save it to the computer hard drive.
3. Use any of the options in the **Data** menu to study the data or use **File; Save As** to save the data file in a .csv (comma separated value) format for opening in a spreadsheet such as Excel®.

The TOU *SMARTlogger* Layout

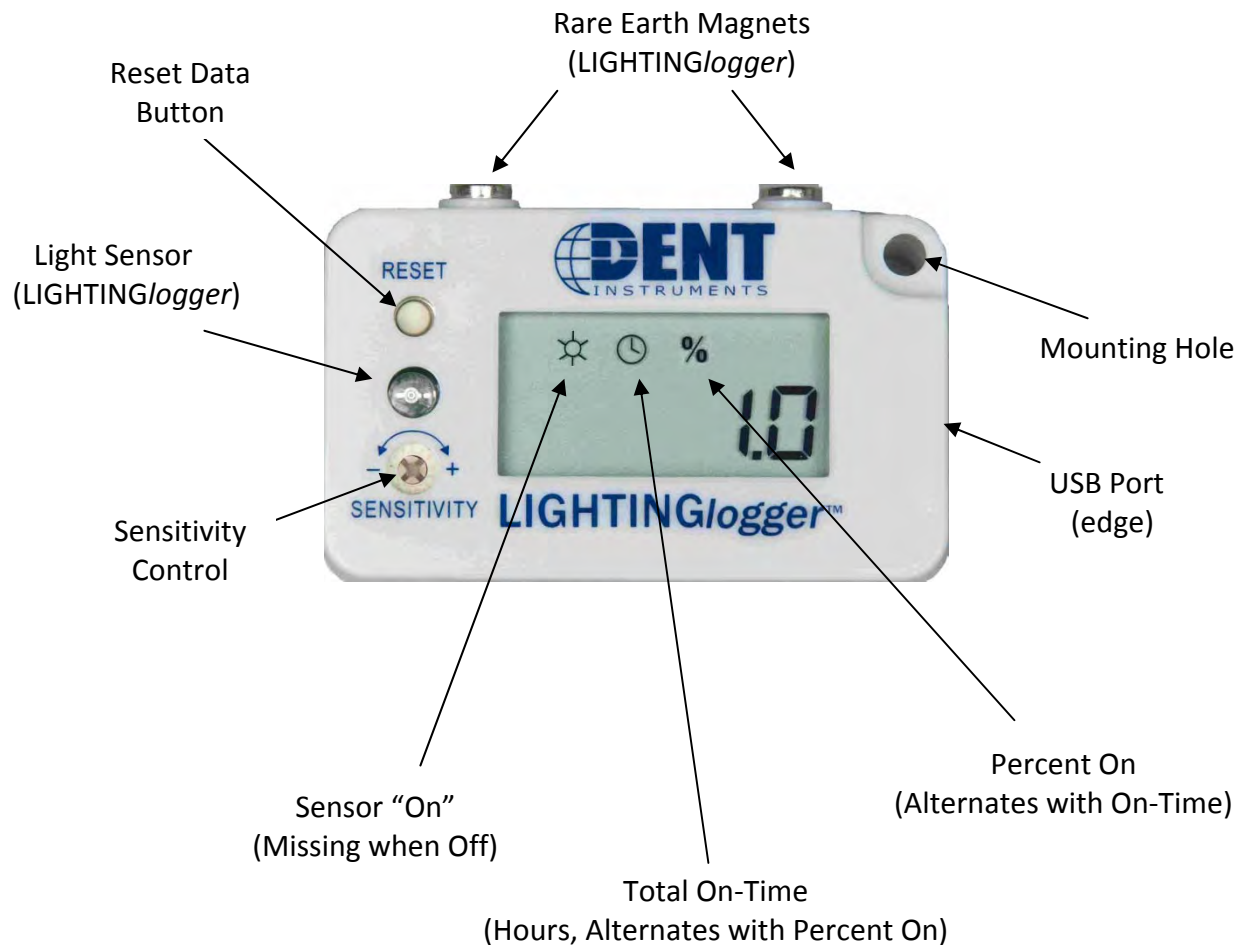


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I. INTRODUCTION TO THE SMARTlogger™ MODELS AND SOFTWARE



TOU SMARTloggers are single channel, on-off status data loggers. They are designed to provide **Total On-Time** and **Time-Of-Use (TOU)** information about energy consuming devices with a constant power draw as well as the operating schedule for any device. The TOUs record the time (to the second) that a device turns on, and then again when it turns off. The data saved to the logger's memory is a series of on-off transitions and time stamps such as shown below. The Total On-Time and Percent On are also shown on the logger's 5 digit LCD screen.

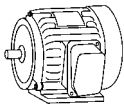
	Date	Time	Transition
1	2/8/2006	4:13:02 PM	Was OFF
2	2/9/2006	2:57:57 PM	Turned ON
3	2/10/2006	5:43:36 AM	Turned OFF
4	2/10/2006	6:55:52 AM	Turned ON
5	2/10/2006	7:10:20 PM	Turned OFF
6	2/11/2006	11:24:46 AM	Turned ON
7	2/11/2006	10:13:38 PM	Turned OFF

Data stored in the logger can be downloaded to your computer, where the SMARTware 11 Software will analyze and graph the data, or let you export the data and perform additional analysis using the software of your choice, such as Excel®.

There are four logger models:



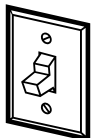
The **LIGHTINGlogger™, Model TOU-L**, for monitoring lights.



The **MAGlogger™, Model TOU-M**, for monitoring electric motors, electric water heaters, appliances, computers, or any device generating a magnetic field.



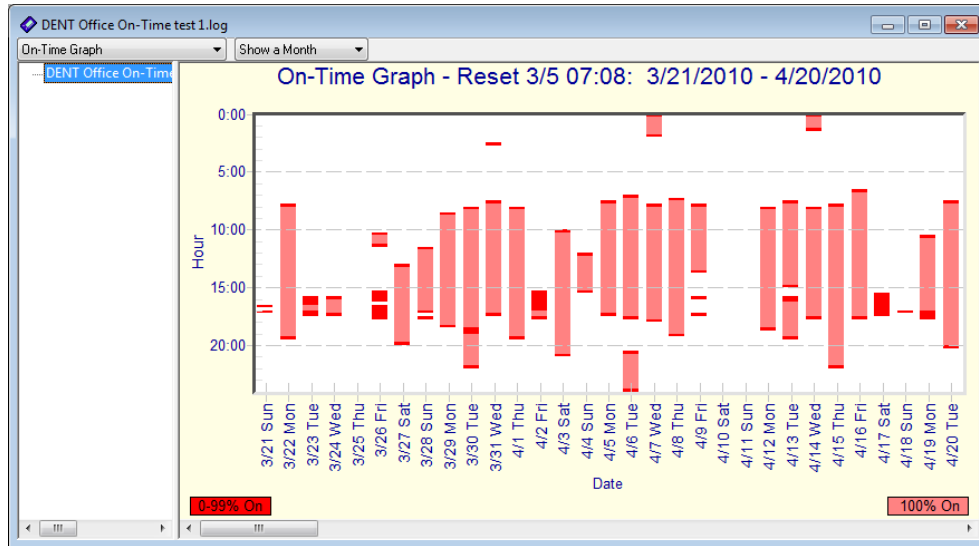
The **CTlogger™, Model TOU-CT**, for monitoring electric load status using a clamp-on current probe.



The **CONTACTlogger™, Model TOU-C**, for monitoring relay closures, switches, and digital on/off signals.

The information you can obtain includes:

- Total On-Time and Percentage of the time the device was on since Reset from the display, and from the stored data
- Statistics, such as operating schedule, cycling frequency and number, average on-time, and more
- Graphs, including on-off transitions, line, and block graphs, like the one on the following page



Example of an On-Time Graph

Export formats:

- Data can be exported as a .csv file (comma separated value) that can be easily read by spreadsheet programs, such as Excel®, for further analysis.
- Graphs can be copied to the Windows® clipboard and pasted into other programs such as word processors for creating reports.

II. SPECIFICATIONS & SYSTEM REQUIREMENTS

II.A. SMARTlogger Specifications

Dimensions:	6.3 x 3.8 x 1.9 cm (2.5" x 1.5" x .75")
Weight:	2 oz. (40 gm) TOU-L, TOU-M, and TOU-C; 1.4 oz. (160 gm) TOU-CT
Mounting:	
	LIGHTINGlogger Rare Earth Magnets with 4 lb (18N) breakaway force from steel or use mounting hole with a screw
	MAGlogger Hook & Loop Strip or mounting hole
	CTlogger Hook & Loop Strip or mounting hole
	CONTACTlogger Hook & Loop Strip or mounting hole
Display:	5 digit LCD showing Logger sensing, Total On-Time and Percent-On since Reset
Time Stamps:	Time stamped data records in month, day, year, hour, minute, second.
Minimum Event On/Off Capture:	0.5 Hz (2 seconds)
Typical Sensitivity:	
	LIGHTINGlogger At maximum sensitivity: 30 foot-candles At minimum sensitivity: 5000 foot-candles
	MAGlogger At maximum sensitivity: 15 milliGauss At minimum sensitivity: 3000 milliGauss
	CTlogger At minimum sensitivity: 0.25 amps At maximum sensitivity: 16 amps
	CONTACTlogger Dry contact, un-energized switch or open collector transistor
Power:	User-replaceable battery provides 5+ years of operation.
Clock Accuracy:	True Calendar, Real-Time Clock Quartz Crystal controlled to 20 ppm typical (better than 1 minute per month), 30 ppm max.
Time Stamp Resolution:	1 second
Operating Environment:	0 °C to 60 °C (32 °F to 140 °F), non-condensing humidity
Memory Capacity:	32,576 transitions
Communication:	USB with SMARTlogger Communication Cable
Data Analysis:	SMARTware 11 software provides statistics, min, max, and average, graphics, and the ability to export data into Excel® (.csv) format.
Warranty:	3 Years

II.B. Minimum System Requirements

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

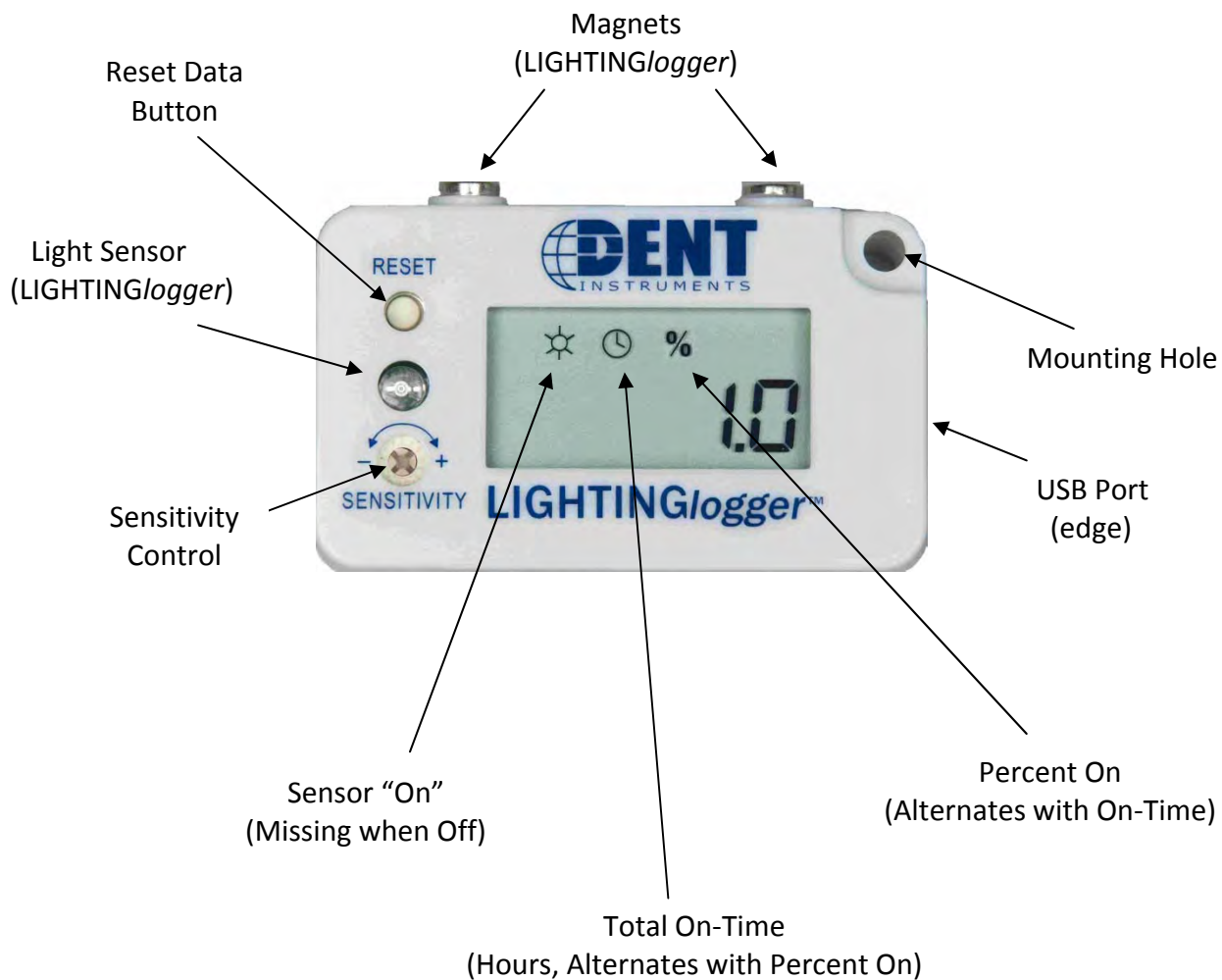
Hard Drive: 50MB minimum available

Graphics: SVGA or higher resolution (800X600)

Communications Port: One USB Port

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

The TOU **SMART**logger Layout



III. USING THE TOU Series SMARTloggers™

You can install the TOU SMARTlogger in seconds, without an electrician, by following these simple steps (explained in more detail in section III.B):

1. Using the SMARTware software, set the logger's internal clock to the correct time, and give the logger an identifying name.

2. Record the installation date or time on the back of the logger.

3. Choose an appropriate location to place your logger and attach it securely.



4. Set the logger's sensitivity level. Verify that the logger symbol  is displayed when the monitored device is on, and that the symbol is blank when the monitored device is off.

5. Clear the logger's memory by pushing and holding the RESET switch with a screwdriver or paper clip and hold until the LCD shows rESet. (Approximately 2 seconds)

6. Record the logger's location and serial number on a separate piece of paper (or on the *Notes* page at the back of this manual) for easy retrieval.

7. When the monitoring period is done, retrieve the logger. Record the removal date on the back of the logger. Connect the logger to a computer to retrieve the data.

These steps are described in more detail beginning in Section III.B on page 6.

III.A. Introduction to SMARTware™ 11

To use the SMARTware 11 software it must first be installed on your computer.

If you are a New User of SMARTware and SMARTloggers (or upgrading from older SMARTware):

1. Place the software CD into your CD or DVD drive. The software will start automatically. If the program does not autorun, open Windows Explorer and browse to the CD/DVD drive (usually D:). Double-click the SMARTwareInstaller.exe and follow the instructions.
2. Next connect the USB communication cable to any USB port on the computer.
3. Windows will display a message that your hardware is connected.
4. SMARTware and your USB com cable are now ready to use with a SMARTlogger.

If you are upgrading from SMARTware 2006 and you do NOT want to keep using the old USB communication cable (because you have a new cable) the new software will be loaded into a different folder on your computer than where the old version is located.

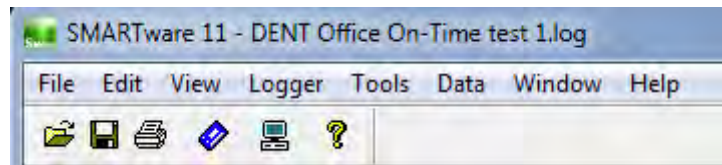
In this case, first uninstall the old version of SMARTware then install the SMARTware 11 as in steps 1 through 5 above. Note that new data files will be stored in C:\DENT\SMARTware\Data. Unless they are moved, old data files will still be found in C:\ProgramFiles\DENT\SMARTware\Data. Note also that old versions of the USB communication cable will no longer work after the old version of SMARTware 2006 has been removed.

If you are upgrading from SMARTware 2006 and you want to keep using the old USB communication cable the new software will be loaded into a different folder on your computer than where the old version is located. Do not uninstall SMARTware 2006 *because* the driver for the old USB communication cable is still needed for the old cable.

Install the software as in steps 1 through 4 above. Note that new data files will be stored in C:\DENT\SMARTware\Data. Unless they are moved, old data files will still be found in C:\ProgramFiles\DENT\SMARTware\Data

When the SMARTware 11 software is open, 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



Communicating with the Logger: Since the TOU SMARTloggers have no user interface on the logger, all communication must happen through a computer (PC) connected via a SMARTlogger USB Communication Cable. Note that the cable only connects to the logger one way with the tab down. Also, make sure to disconnect the USB Communication Cable from the logger after you've downloaded the data to prevent draining the battery.

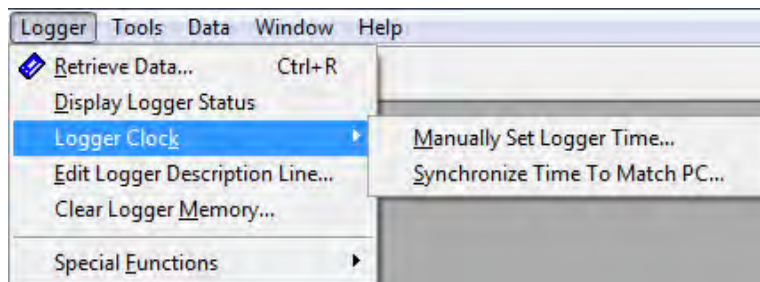
TECH TIP: Quickly set the PC default values by clicking on the  **PC Setup** button on the screen.

TECH TIP: If you have difficulty getting the PC to connect to the SMARTlogger, try plugging the communication Cable into a different USB port. If you are using a USB hub, try plugging the Communication Cable directly into a USB port on the PC.

III.B. Detailed Explanation of Using the SMARTLogger

1. Set the Clock

Connect the SMARTlogger to the computer with the USB communication cable. Use the SMARTware 11 command: **Logger; Logger Clock** and then manually set the time or use the PC clock to automatically set the logger clock to your time zone.



Use **Logger; Edit Logger Description Line...** to give an identifying name to the logger (optional). This name will appear on all reports and graphs you create with the SMARTware. Disconnect the logger from the USB cable.

2. Record Installation Time

Turn the logger over and record the installation time on the label space provided on the back, as shown at right.



3. Place the Logger

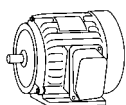


LIGHTINGlogger™: The unlabeled hole in the middle of the left edge of the LIGHTINGlogger contains the light sensor. Install the LIGHTINGlogger so that the light sensor is aimed toward the light source to be monitored *and* away from any stray light sources, such as lamps or windows, which could cause false monitoring. Watch for security lights that are on continuously.

When monitoring fluorescent lighting, place the LIGHTINGlogger inside the fixture and attach using the magnets on top. When monitoring incandescent lighting, high temperatures must be considered. The maximum temperature rating of all SMARTloggers is 140°F (60°C). In terms of distance, that is approximately 8 inches (20 cm) horizontally from a 100 watt bulb in free-moving air. If it is not possible to mount the logger at an appropriate distance using the magnet supplied, then hang it with wire, or attach it with adhesive tape, or Velcro®.

TECH TIP: Use a Ziploc® or similar plastic bag to protect the logger from moisture.

For high temperature or hard-to-reach locations, DENT Instruments offers a long-reach, flexible, fiber optic sensor, so that you can place the logger conveniently away from the light fixture. These fiber optic sensors are available in custom lengths from one foot up to twenty feet long. Contact DENT for availability.



MAGlogger™: The MAGlogger is designed to attach to the motor case using the enclosed Velcro® fasteners. The surface of the motor case must be clean before the Velcro® will adhere to the motor. Duct tape or other fasteners may also be used.

TECH TIP: Use a Ziploc® bag to protect the logger from moisture and contaminants when in a harsh, wet, or outdoor locations.

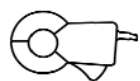
Because of differences in motors, some brief experimentation may be required to locate the logger in an optimum sensing position. The MAGlogger's sensitivity can depend on the orientation of the logger on the motor being monitored as well as its position.

The magnetic field sensor is located inside the logger, on the left side, behind the display. First place the logger on the running motor right side up. If required, rotate it until the MAGlogger's ON symbol  is

shown. If you cannot find a location on the motor that activates the logger, try rotating the logger onto its sides, ends, and back at different locations on the motor, until the ON symbol is displayed.

The MAGlogger can also be used to monitor individual conductors (wires) carrying one amp or more of current. This ability makes the MAGlogger a versatile monitoring tool. For example, a water heater can be monitored by attaching the logger to the power wiring with tape, or by laying it on top of the heater near where the wiring enters at the top of the tank, or over the thermostat cover. Separating the wires may be unnecessary for larger loads.

Use the MAGlogger on water heaters, furnaces, boilers, appliances, and of course, motors.



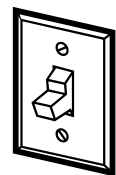
CTlogger™: Simply clip the CT (current transformer) over any conductor carrying 0.25 amp AC or more.

Secure the logger itself with Velcro® or duct tape. Use a Ziploc® bag to protect the logger from moisture, if necessary. Take care to protect the CT from moisture as well.

The logger is activated when there is more than 0.25 amp of current flowing through the wire to the device being monitored. The logger is sensing the load when the ON symbol  shows in the display.

TECH TIP: When monitoring devices that have power cords, use a short extension cord where the individual wires have been separated to clamp the CT around just one. Exercise extreme care that none of the insulation around any of the wires is cut or otherwise exposes a bare wire.

Note: You cannot place the current transformer around both wires of different phases (on appliances with two-conductor power cords, for example). To monitor equipment with two conductor power cords, separate the wires so that the current transformer is placed around only one wire. Either the “hot” lead or the neutral wire will work.



CONTACTlogger™: The CONTACTlogger is designed to monitor switches and relays. It comes with a 3 foot (90 cm) pair of wires that are connected to the switch or relay. The CONTACTlogger can only be used on un-energized, “dry contact” devices.

Secure the logger itself with Velcro® or duct tape. Use a Ziploc® bag to protect the logger from moisture, if necessary.

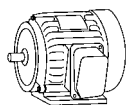
4. Set the Logger Sensitivity



LIGHTINGlogger: You can adjust the LIGHTINGlogger for various ambient light conditions by turning the screw labeled "SENSITIVITY." The LIGHTINGlogger is sensing the lights when the ON

symbol  is shown in the LCD. Adjust the sensitivity using a small screwdriver so that, in the highest ambient light conditions and with the light to be monitored off, the logger is off (ON symbol is missing). The logger should then show the ON symbol when the monitored light is turned on.

Using a screwdriver to turn the sensitivity screw clockwise towards the "+" will make the LIGHTINGlogger more sensitive to light. **DO NOT OVERTURN! THE SCREW WILL ONLY TURN THROUGH ABOUT 270°.** Greater sensitivity allows it to be used in areas of low ambient light and will allow a dimmer light source to activate the LIGHTINGlogger. Making the LIGHTINGlogger less sensitive to light allows it to be used in areas of high ambient light without activating until the monitored light is turned on.



MAGlogger and **CTlogger**: Normally, set the sensitivity to maximum (all the way clockwise). Otherwise, if a constant background load is not to be monitored (e.g. the defrost cycle in a refrigerator), set the sensitivity so that the unwanted load will not activate the logger. Use a screwdriver to turn the sensitivity screw clockwise for greater sensitivity or counter-clockwise for less sensitivity. Some experimentation may be needed to find the right setting.

The **CONTACTlogger** does not have a sensitivity adjustment.

5. Reset the Memory

If the data in the logger memory are not part of the current monitoring session, insert a small screwdriver or paperclip into the hole labeled "RESET" and push and hold down the recessed button for approximately 2 seconds until the word "rESEt" appears in the display. This will tell the logger to start a new monitoring

TECH TIP: Pushing the "RESET" button will not erase any data from the logger's memory. Rather, old data remains stored in the memory and will be overwritten as new data is collected during a new monitoring session. If you need to view data from a previous session, see the section "Special Functions" on Page 16 to learn how to retrieve it.

session. **Be sure to do this after you have set the sensitivity.**

6. Record Serial Number and Location



It is important to note the location of the logger on a separate piece of paper, since it is easy to forget where you put it. Using a digital camera to take a picture of the logger location can also be very helpful at the time of retrieval to help you find your logger again.

7. Retrieve Data from the SMARTlogger

At the end of a monitoring session, remove the logger from its monitoring location. Record the removal date on the back of the logger. Recording the beginning and end times of the monitoring is useful when additional transitions are recorded by the logger before or after the monitoring and it is desirable to "clip" the ends off of the data. See also page 29 for a description of how to extract a range of data from the file.



TECH TIP: After removing a TOU-L LIGHTINGlogger set the sensitivity to minimum to avoid adding unwanted transitions to the data during transport.

Connect the Logger to your computer with the SMARTlogger USB Communication Cable. The communication cable is required for proper communication between the computer and logger. Do not use any other USB cable.

All models of the 4G SMARTlogger family communicate with the same type of communication cable and SMARTware software.

8. Data Analysis

SMARTware 11 offers a number of “one-touch” analyses including: Summary statistics, Load Profiles, Multiple logger file combination, Analysis by Time-Of-Use rate periods (Rate Schedule Analysis), Run-Time graphs and numerous other features. These are described in detail in Section IV beginning on page 11.

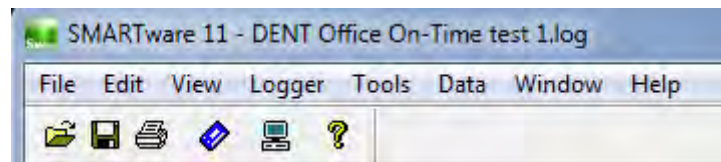
In addition to the built-in analysis capability, SMARTware 11 allows you to export the data in a .csv format (ASCII) which can be opened in Excel® and other spreadsheet programs for even more analysis.

IV. SMARTware 11 MENU COMMANDS

This section is a feature-by-feature description of every function in the SMARTware software. The order of presentation is from left to right and top to bottom for each command in the Windows Menu.

When the SMARTware software is first launched, the MAIN MENU will appear which consists of one line of standard Windows® menus and a lower line of "hot buttons" (Page 34) that can access many of the most commonly used software functions with just one click of the mouse.

MAIN MENU



Note: Because Windows® uses context sensitive Automatic Menu Switching, only the commands that are active will appear. When you click on File you will probably see a different list of commands than those shown below.

Note: For "power users" many of the menu commands can be accessed through shortcut keyboard commands (e.g., Ctrl + O to open an existing file) or from the hot buttons located on the line below the main menu.

File

Typical Windows® commands are found in this menu.

Open...

The Open function opens an existing Data File already stored somewhere on the computer hard disk. It operates the same whether or not you are connected to a Logger.

TECH TIP: The default folder from which files are opened or saved to may be changed through the Tools; PC Setup menu. See also page 17.

Close

Closes only the currently active file. If multiple files are open, the active file is the one with the illuminated top border.

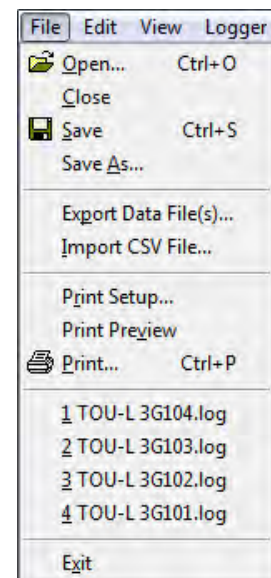
Save

Saves a data file that has been **Ex**tracted from another file.

Save As...

Saves a Data File that has been retrieved from a logger to a new name or location. It also allows saving Transition Data Points, Time Series Data Points or Load Profile Data Points to a .csv (Comma Separated Value) that can be easily imported into spreadsheets such as Excel®.

Note: Graphs cannot be saved. However, they can be printed using the File; Print command.



TECH TIP: *Graphs (and any other image on the computer screen) can be copied and pasted to other applications using Print Screen key (PrtScn) to copy the image to the clipboard. Then use Ctrl + V to paste the image into a different application. To edit the image first, paste it into your image editing software, such as Microsoft Paint® (in Start; Programs; Accessories).*

Export Data File(s)...

Export allows a quick and simple way to convert one, or several files simultaneously, from a .log binary file into a .csv (comma separated value) file that can be read by a number of third party applications such as Microsoft Excel®.

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

1. After retrieving the data from the Logger and saving the file on the PC, use Data; Export Data File(s)...to select the file to export.
2. Click Open to begin the export of the data to .csv file.
3. To view the .csv file, start the spreadsheet program (Excel® or other spreadsheet program).
4. Use the File; Open command in the spreadsheet and select "All Files" in the box Files of type:
5. Open the .csv data file from the folder you specified, for example,
C:\DENT\SMARTware\Data\name of file.csv

Note: *The new, exported file will be placed in the data folder specified in the Tools; PC Setup... menu.*

Export may be used to convert multiple files simultaneously to a .csv format. Use the standard windows commands Ctrl + mouse click to select non-adjacent files or Shift + mouse click to select all files between the first and last selected.

Import CSV File...

Allows a previously exported data file that had been modified in Excel® (for example) to be imported back into a .log format and analyzed in SMARTware.

Print Setup...

Allows the user to select the printer to be used, paper tray source, and paper orientation.

Print Preview

Displays on the computer screen the document to be printed as it will appear on the paper.

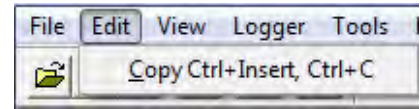
Print

Allows the user to select the pages to be printed and initiate printing.

Exit

Exits and closes the SMARTware 11 program.

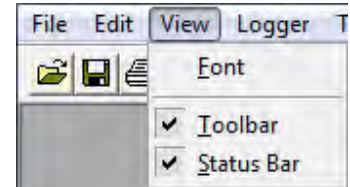
Edit



The **C**opy function is a standard Windows® clipboard function. Text can be highlighted with the mouse and copied to the clipboard with this command for pasting into other applications such as word processors. (Edit; Copy or Ctrl + C). Graphs cannot be copied with this menu command but can be copied using the Ctrl + C or a right click of the mouse and “Copy the Graph to the Clipboard” command.

View

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



Font

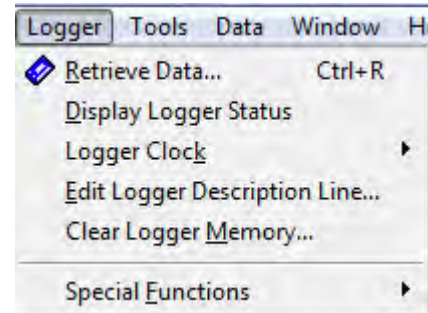
Font can be used to change the font of the text in the Summary report and in the Transition, Time Series and Load Profile Data Points view. It does not affect any of the graphical views. The change made to the default fonts can be printed but they do not persist in a copy command.

Toolbar and Status Bar

The toolbar line (Hot Buttons under the main menu, see Page 34 for a description of the Hot Buttons) and the status bar at the bottom of the screen may be turned on or off by selecting (✓) or deselecting by clicking on the selection box with the mouse. The status bar provides additional explanation of the function of a menu command when the mouse cursor is held over the command in question.

Logger

Use the **Logger** menu to retrieve data, set the logger clock and interact with the logger.



Retrieve Data...

Retrieves data from the logger and saves as a .log file to the hard disk. First connect the logger to the computer with the SMART/logger USB Interface cable and then click on the **Retrieve Data...** command. Before retrieving the data, the software will check the connection to the logger and prompt you for a data file name. 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 and stored in that folder.

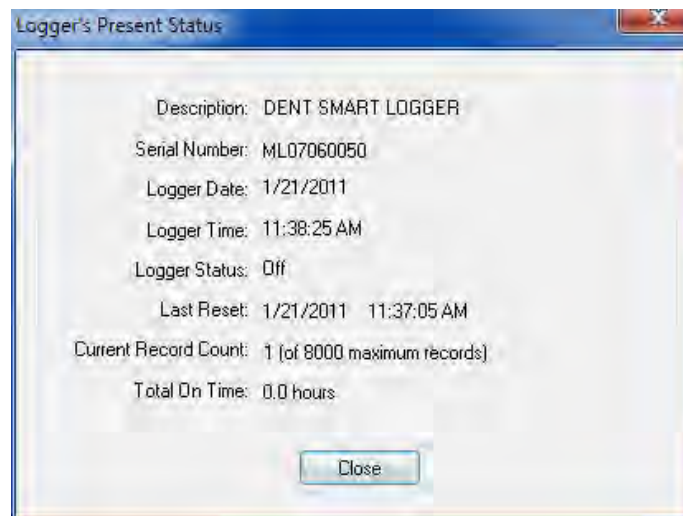
The data will be saved to the default folder unless you choose to send it into another folder. The default data folder can be set in **Tools; PC Setup; Data Files Saved To:** (See also page 17). The default data folder is C:\DENT\SMARTWARE\DATA. The **Retrieve Data** command will not affect the data stored in the logger; the data is not erased when read.

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

The binary .log data files may also be exported in a comma separated value (.csv) ASCII file that can be used in other applications such as a spreadsheet or database. Use **File; Save As...** to save in the .csv format.

Display Logger Status

Reads and displays current state of the logger's sensor (on or off), current date and time of logger's internal clock, last reset time, cumulative on-time, and other information. Using this function returns a screen similar to the one below:



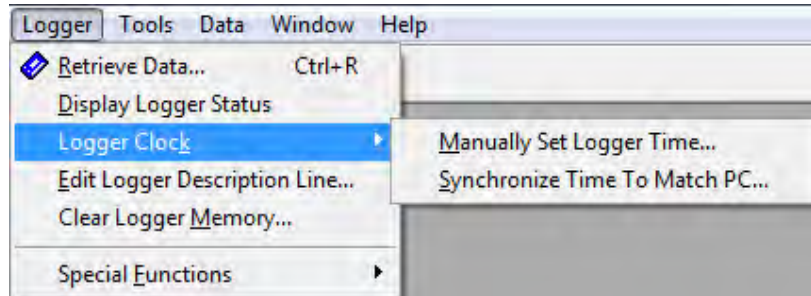
Logger Clock

This function allows you to change the logger's internal clock. You may set the time manually or synchronize the logger's clock to the PC.

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 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.



WARNING: Changing the logger's date or time in the middle of a monitoring session can have undesirable effects. If the date or time is advanced, a gap in the data would result. If the date and/or time is set back, overlapping data will result.

In both cases, statistical summaries and graphs would provide invalid results. We recommend that you export the entire data set to a spreadsheet if a global time change is required. Otherwise use the function **Data; Extract a Range of Data** to extract and analyze only part of the data.

Edit Logger Description Line...

A user-defined description is stored in the logger to help identify the specific logger.

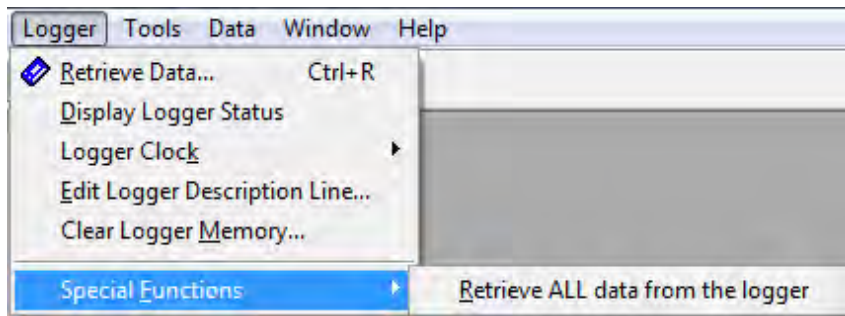
If you wish to change this description after retrieving data from the logger open the desired file and use **Data; Edit File's Description Line**.

Clear Logger Memory...

Performs the same function as manually pressing the RESET button on the logger. This will tell the logger to start a new monitoring session. *Be sure to do this after you have set the sensitivity.*

TECH TIP: Pushing the "RESET" button will not erase any data from the logger's memory. Rather, old data remains stored in the memory and will be overwritten as new data is collected during a new monitoring session. If you need to view data from a previous session, see the section "Special Functions" on Page 14 to learn how to retrieve it.

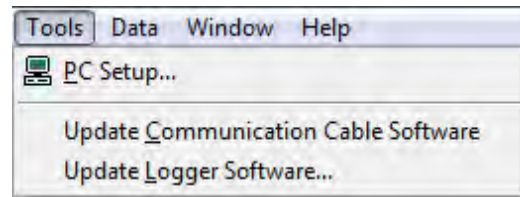
Special Function; Retrieve ALL Data from the Logger



Retrieves ALL data from the logger's memory. Use this after an accidental reset of the logger.

All 32,576 data points (8,000 in older 3G loggers) in the logger's memory will be retrieved; only a portion of which are the actual or "real" data. Use **Data; Extract a Range of Data** to clip out only the records which represent good data.

Tools



PC Setup...

PC Setup allows the user to configure the host computer to work with the TOU Loggers. It sets the default analysis views, folders where data files are stored and, when used with older, legacy SMARTloggers, selects the direct connect (RS-232) port to be used for communication.



Default Logger Connection Type Sets the default for which type of logger is to be connected to the PC. Note that SMARTware will automatically detect which logger type is connected to the PC. If an older, serial logger is used, the Com Port it is connected to must be specified. Also, if a serial logger is used, it must have the appropriate serial communication cable.

Default Data View Sets the default for how the data will first be displayed when a data file is opened.

Default Display Sets various data analysis default values.

Time Series Default for the time “bin” size when viewing the data in a time series format or the load profile data points.

On-Time Graph Shows the On-Time graph in a weekly or a monthly format.

Load Profile Shows the Load Profile graph as a Daily (24 hour) or weekly load profile.

Load Profile Data Sets which day types will be used in the Load Profile.

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.

Note: All of these default values can be overridden during the viewing of the graphs or data.

The 4G (Fourth Generation) SMART/loggers offer a feature found in no other loggers of similar price. In addition to updates and new features being added to SMARTware, new features can be added to the “firmware” in the logger itself. Contact DENT Instruments for more information.

TECH TIP: Setup the PC quickly by clicking on the  **PC Setup** button on the Hot Button line.

Update Communication Cable Firmware...

Use this to add new features to the USB Communication Cable.

Note: SMARTware 11 will automatically detect if a newer version of Communication Cable firmware is available in the SMARTware directory and will prompt the user to update the Communications

Update Logger Firmware...

Use this function to add new features to the SMART/logger. This function works with 3rd and 4th Generation SMART/loggers.

Note: SMARTware 11 will automatically detect if a newer version of TOU logger firmware is available in the SMARTware directory and will prompt the user to update the logger.

Note: Updating the logger firmware will overwrite all records in the logger and replace them with records dated 12/31/1969.

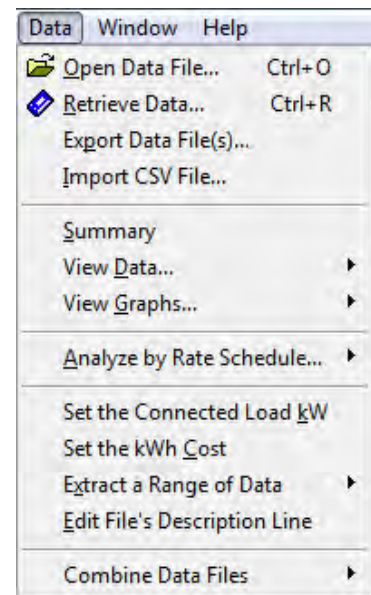
Data

Open Data File...

Has the same function as **File; Open...** It is used to select and open a data file for viewing, graphing or analysis.

Note: After opening a data file, Summary, View Data... View Graphs... as well as additional controls can be accessed from the drop-down menus at the top of the open data window(s).

TECH TIP: Quickly open a file for analysis by clicking on the  **File Open** button on the Hot Button line. Or use the Ctrl + O keys together.



Retrieve Data...

Retrieves data from the logger and saves as a .log file to the hard disk.

Export Data File(s)...

Export allows a quick and simple way to convert one, or several files simultaneously, from a .log binary file into a .csv (comma separated value) file that can be read by a number of third party applications such as Microsoft Excel®.

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

1. After retrieving the data from the Logger and saving the file on the PC use Data; Export Data File(s)...to select the file to export.
2. Click Open to begin the export the data to .csv file.
3. To view the .csv file, start the spreadsheet program (Excel® or other spreadsheet program).
4. Use the File; Open command in the spreadsheet and select "All Files" in the box Files of type:
5. Open the .csv data file from the folder you specified, for example,
6. C:\DENT\SMARTware\Data\name of file.csv

Note: The new file will be placed in the data folder specified in the Tools; PC Setup... menu.

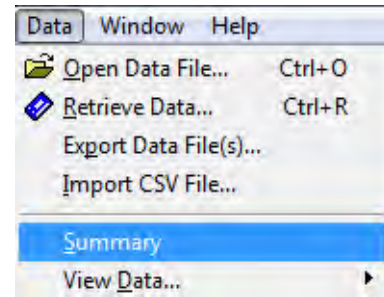
Export may be used to convert multiple files simultaneously to a .csv format. Use the standard windows commands Ctrl + mouse click to select non-adjacent files or Shift + mouse click to select all files between the first and last selected.

Import CSV File...

Import is used to convert a .csv file back to a .log that can then be read by SMARTware. This is a very useful feature when a .log file needs to be edited. For example, assume the logger clock was not set to the correct time before the metering project began. The .log data could be exported, opened in Excel® and all of the date & time stamps edited to the correct time. The .csv file could then be imported back into SMARTware for further analysis.

Summary

Provides a statistical summary (Total Elapsed Time, Total and Average On-Times and Off-Times, Total kWh Cost, etc.) of data stored in file. The SMARTware 11 version of the Summary Report is more useful than ever and has been re-organized to be more logical and user-friendly. See the Example below:



Example Summary Report

Data File Name:	Irrigation_Pump.log	
Logger Serial Number:	ML10100004	
Description:	Irrigation Pump	
Logger Reset:	11/28/09	2:39:10 PM
Elapsed Time Since Reset:	2129.48	
On-Time since Reset:	975.9	hrs (3,415,6 kWh, \$273.25)
Percent On Since Reset:	45.83%	
Connected Load:	3.5	kW
Energy Cost:	\$0.08	per kWh
Data Starts:	2/1/10	2:39:10 PM
Data Ends:	2/25/10	7:20:13 PM
Data Elapsed Time:	584.15	hrs
Estimated Annual Hours On:	3160	hrs (11,060 kWh, \$884.80)
Number of Turn Ons:	591	
Percent On:	36.08	%
Data On-Time:	210.74	hrs (737.6 kWh, \$59.01)
Average On-Time:	0.36	hrs (1.2 kWh, \$0.10)
Longest On-Time:	2.02	hrs (7.1 kWh, \$0.57)
Shortest On-Time:	0.05	hrs (0.2 kWh, \$0.02)
Number of Turn Offs:	591	
Percent Off:	63.92	%
Data Off-Time:	373.41	hrs
Average Off-Time:	0.32	hrs
Longest Off-Time:	0.82	hrs
Shortest Off-Time:	0.12	hrs

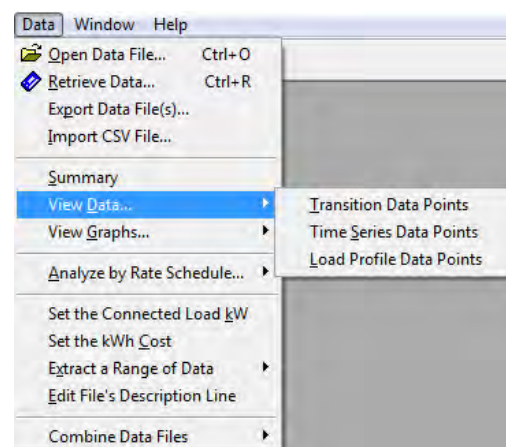
TECH TIP: If a connected load kW value has been set (see **Set the Connected Load kW** on page 28) then a kWh number will appear with every on-time value in the Summary.

View Data...

View Data is used to choose the format of how the data is displayed.

Note: For Time Series Data and Load Profile Data the data views will use the default values set in **Tools; PC Setup**.

TECH TIP: Once a data file has been opened, the view can also be changed by clicking on the data presentation box at the top left of the data window.



Transition Data Points This view is of the raw data as it is stored in the logger. A brief excerpt is shown below:

	Date	Time	Transition
1	11/28/07	2:39:10 PM	Was ON
2	11/28/07	4:28:35 PM	Turned OFF
3	11/28/07	8:02:09 PM	Turned ON
4	11/28/07	11:30:54 PM	Turned OFF
5	11/29/07	7:35:41 AM	Turned ON
6	11/29/07	7:35:43 AM	Turned OFF
:	:	:	:

Time Series Data Points This view is similar to Transition Data Points and shows data after it has been converted to Time Series format. "Bin" sizes may be set from 1 minute to 24 hours. The time series data may also be exported in a .csv format for further analysis in spreadsheet(s) or other programs. An example of a Time Series Data set (converted from the Transition Data above) is shown below:

The Percent On column is the percentage of time in the interval that the monitored load was on. Note that the interval size is set to 15 minutes in this example.

Date	Starting	Ending	Percent On
11/28/07	2:45:00 PM	2:59:59 PM	100.0%
11/28/07	3:00:00 PM	3:14:59 PM	100.0%
11/28/07	3:15:00 PM	3:29:59 PM	100.0%
11/28/07	3:30:00 PM	3:44:59 PM	100.0%

Load Profile Data Points Creates a 24 hour or one week load profile from the data. Note that the load profile interval is set to 1 hour in this example.

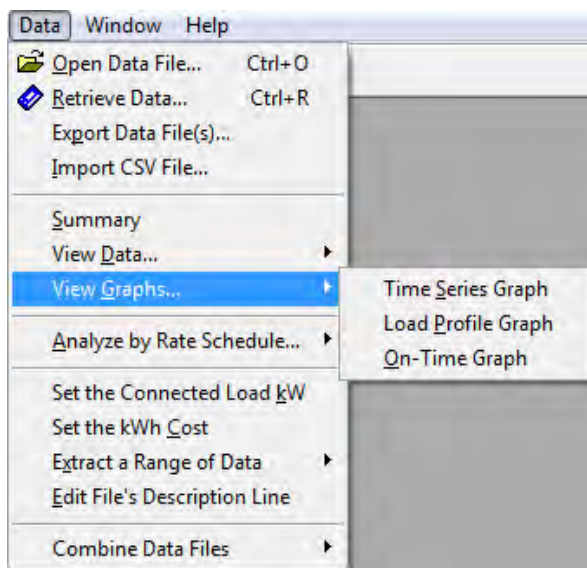
A load profile takes all of the data collected by the logger and creates an average day (or week). It does this by overlaying each day on top of one another and calculating an average day. In the example below, for all of the days that the logger was monitoring and for the hour from 09:00 until 10:00, the load was on the 51.4% of the time.

The load profile function is very powerful and allows you to change a number of parameters including which days are used in the calculation (weekdays only, weekend days only or all days).

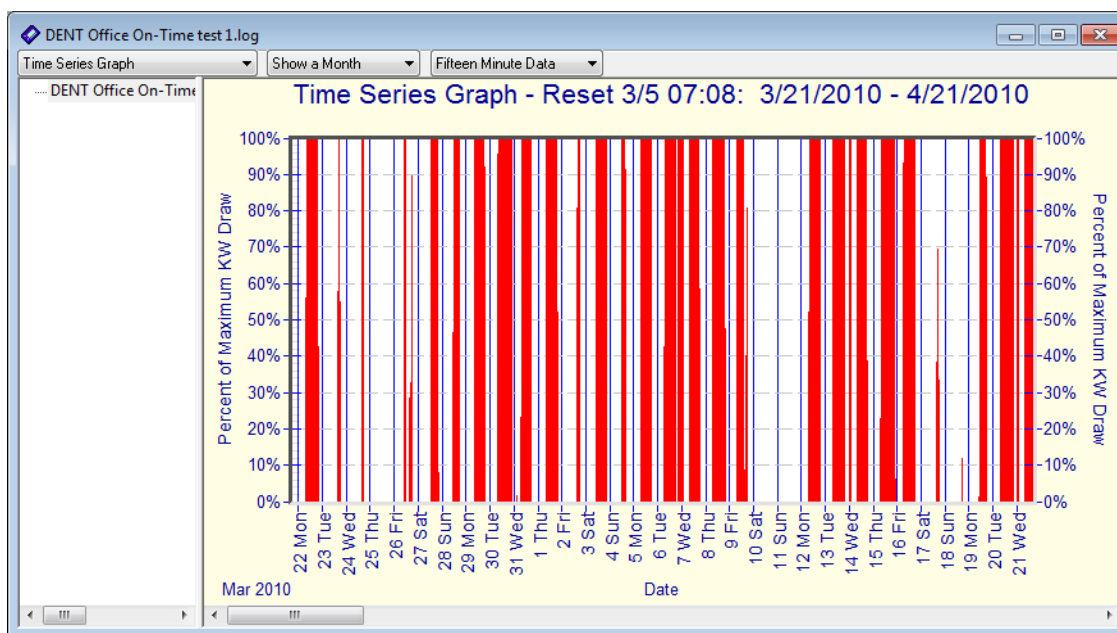
Starting	Ending	Percent On
7:00:00 AM	7:59:59 AM	19.0%
8:00:00 AM	8:59:59 AM	51.8%
9:00:00 AM	9:59:59 AM	51.4%
10:00:00 AM	10:59:59 AM	41.7%
11:00:00 AM	11:59:59 AM	36.0%

View Graphs...

View Graphs... is used to show the logged data in various graphical formats. The graphs types are explained in detail below.

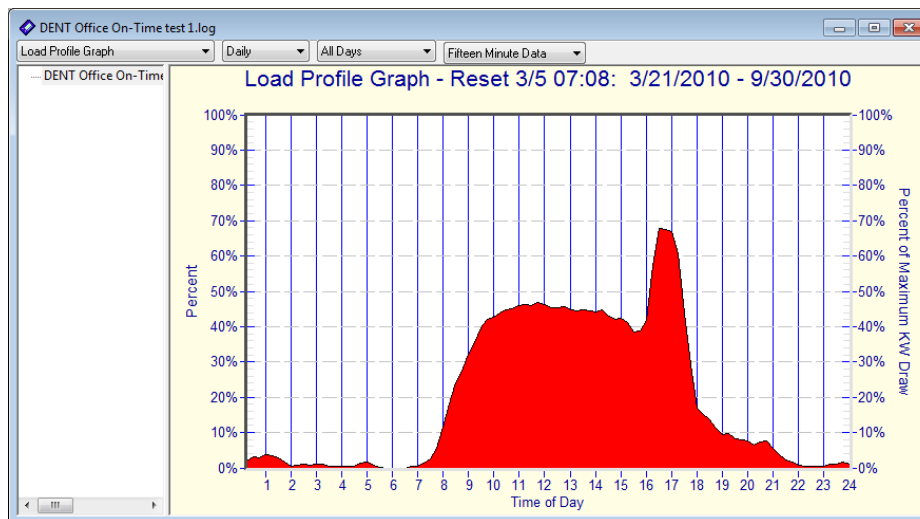


Time Series Graph is shown in the example below. To create this graph, the software first converts the transition data into a time series format. An example graph is shown below. The drop down boxes along the top of the graph allow for changing the view from a week of data at a time to viewing one month of data. The data interval may also be selected from 1 minute to 24 hours.

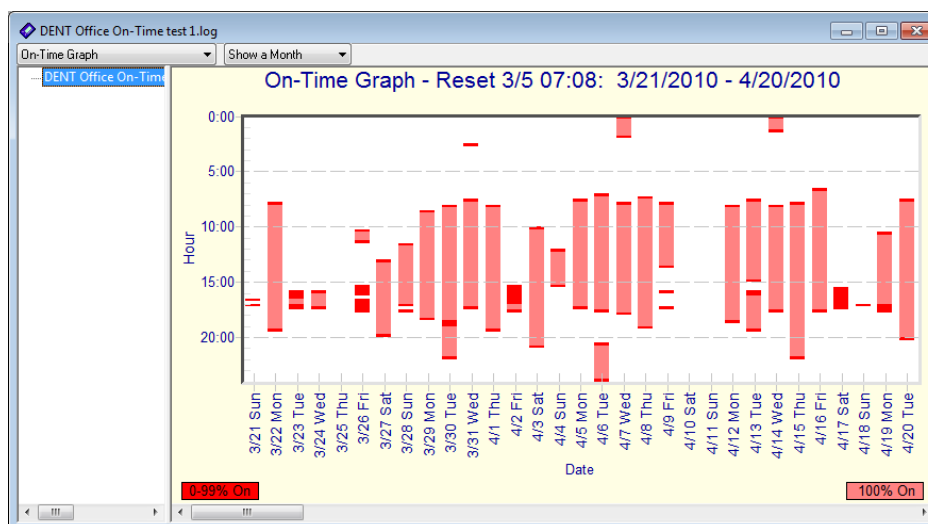


Load Profile Graph plots the load profile data points. The interval size (1 minute to 24 hours) may be changed on the graph as can the type of days included in the graph. An example is shown below.

Note: Any of the graph parameters can be changed “on the fly” by clicking on any of the menu boxes at the top of the graph.



On-Time Graph is a simple way to view the data collected by the logger:



This graph depicts the on-time as recorded by the logger. The days are shown across the bottom of the graph and the time of day along the vertical axis. The white space is where the monitored load was off and the colored area is where the load was on. This presentation shows the logged data in a way that makes interpreting on and off times very simple. The On-time graph is usually the first graph to look at after downloading data from a logger. It is also very simple to understand and is useful as a presentation tool for clients when performing energy audits.

Editing A Graph Along the top row of the graph are several drop down boxes that allow defining some of the graph parameters such as the data interval or amount of data shown. Different graphs have different editing capability. Only the functions that are available for a given graph will be available.

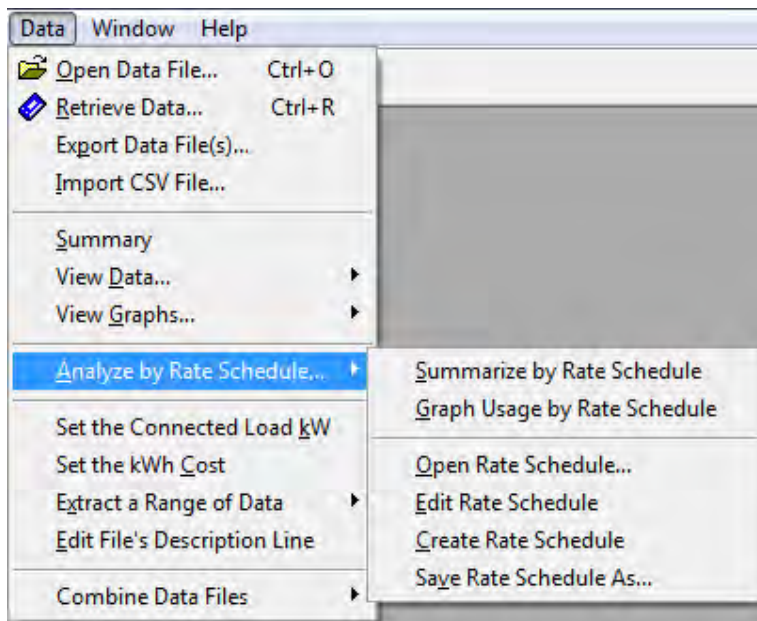
A number of changes can be made to all graphs such as changing the graph title and graph color. To edit the graph, place the mouse cursor anywhere in the graph and then right-click. For all graphs, using the right mouse click gives a menu shown to the right.

Edit the Graph Title
Copy the Graph to the Clipboard (Ctrl+C)
Print the Graph (Ctrl+P)
Set the graph color for 99% On
Set the graph color for 100% On

Double (left) clicking the mouse on the title also allows editing. The color can be changed by right-clicking anywhere in the graph.

Analyze by Rate Schedule...

This function is used to analyze energy usage or operating patterns by disaggregating all of the run-time hours into user specified time blocks. These time blocks can be arbitrarily defined and are often used in conjunction with a utility's time-of-use rate schedule to compute actual operating costs. An example Rate Schedule might include on-peak, mid-peak, and off-peak times. Any number of different Rate periods may be defined. Run-times, energy consumption and summary statistics and other useful data are calculated by SMARTware for each defined period.



Summarize by Rate Schedule To view the summary statistics for each defined rate period, select this option. Each major period is summarized on a separate screen. The different summaries for each rate period can be accessed using the drop down menu at the top of the screen.

Before using this feature, a Rate Schedule needs to be defined as described below. The default summary is All Rate Schedule Periods.

TECH TIP: Input the connected load of the monitored device using the **Set the Connected Load kW** function in the Data menu before viewing your rate schedule. Total values for kWh energy consumption will then be displayed for each period. Similarly, use the **Set the kWh Cost** function define the cost of energy for each rate period to calculate the cost of operating the device for that period.

Graph Usage by Rate Schedule Select this option to view a graph of the on-times for each rate period. This graph is similar to the time series graph described earlier but here each period is shown in a different color as defined when the rate schedule was created. The colors and the rate schedule definition may be changed by right clicking on the graph.

Open Rate Schedule Select this option to open an existing Rate Schedule File (.drs) from your hard drive.

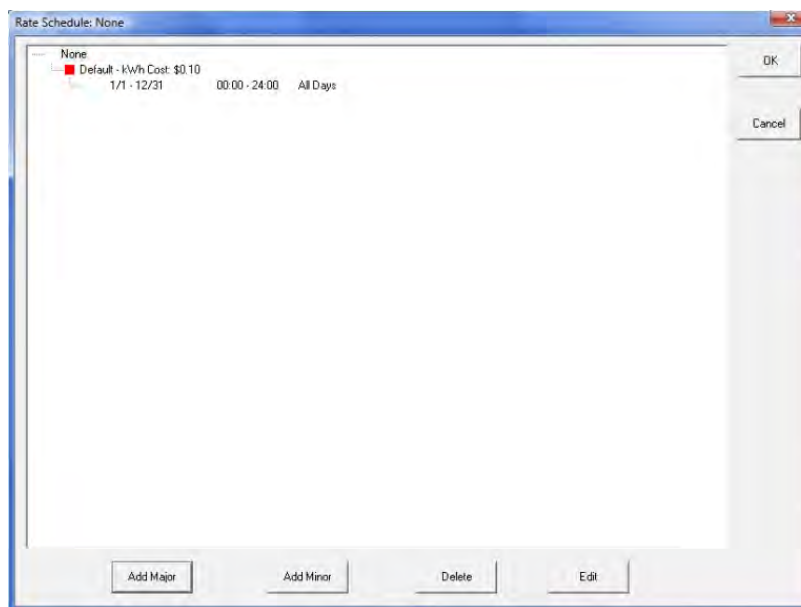
Edit Rate Schedule Allows you to modify an existing rate schedule.

Create Rate Schedule Allows you to set up a rate schedule. See below.

Save Rate Schedule As... Allows you to save your current rate schedule. If you save it under a new name or in a new location, you will not overwrite the existing file.

Before setting up a rate schedule, define the major and minor periods to be used. For example, if you want a schedule that includes the rate periods On-Peak, Mid-Peak, and Off-Peak, you need three “major” periods and enough “minor” periods to fill a 24 hour day and to span the time period of data being analyzed. The software will allow you to designate any number of major and minor time period combinations.

The first time a rate schedule is created, a default screen will appear as shown below. This can be considered a single period rate schedule and encompasses all hours of the day and all days of the year.

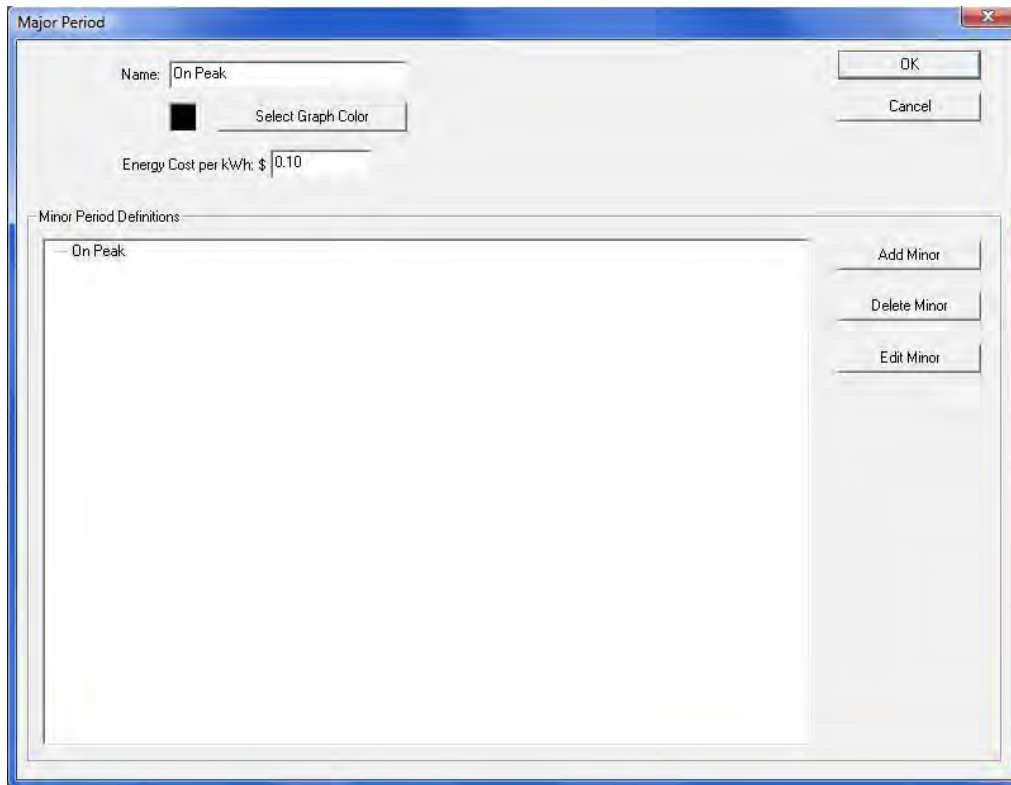


Minor Rate Period: Minor rate periods are used to define the major rate periods. To create minor periods use the **Add Minor** button. Use the **Edit (Minor)** button to define the three parameters which may be set for each minor rate period: Day Type, Days, and Hours of Day. Double clicking on a rate period also brings up the edit box.

Day Type: Choose from All Days, Week Days Only, or Weekend Days Only.

Days: Set the dates that you want to include in the rate schedule. Use this to define seasonal rate periods.

Hours of Day: Choose the hours for this minor period. Remember, the software uses a 24 hour clock (for example, 1:00 pm is 13:00).



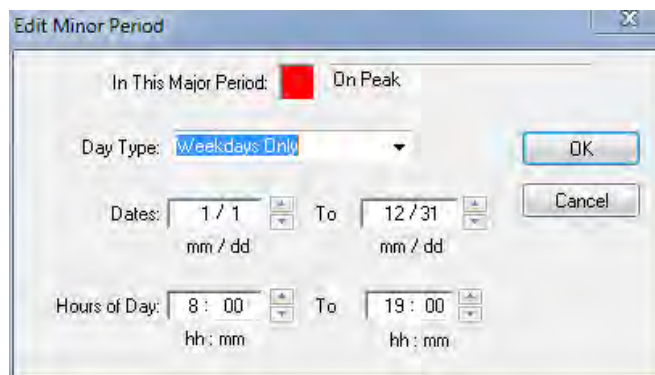
Graph Color: After you name a major period, you can choose a unique color to appear on the graph.

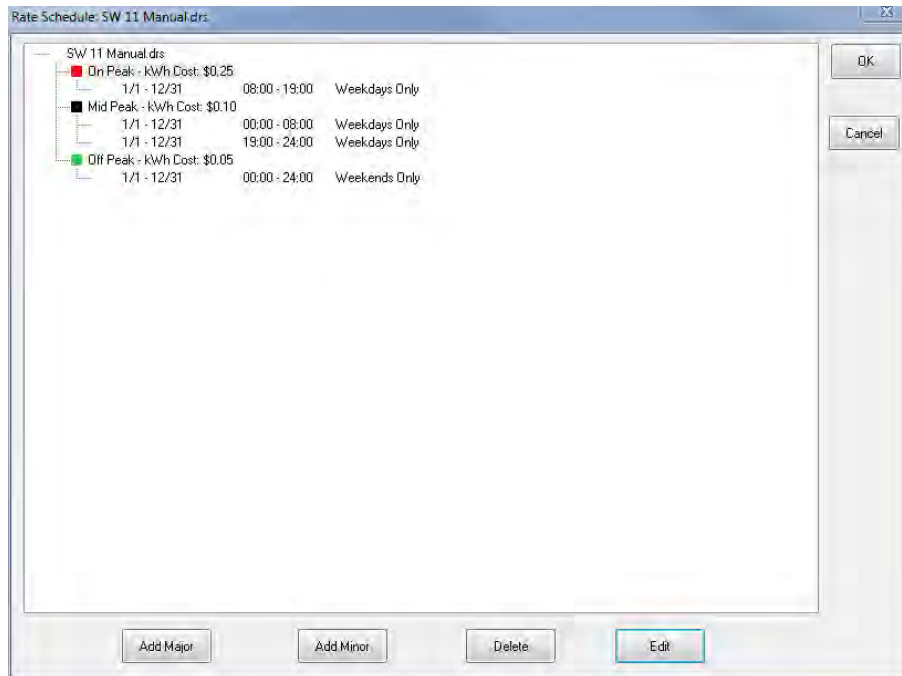
To demonstrate a multiple period Rate Schedule, a three period schedule is defined below. To create the Rate Schedule, click on the **Add Major** button to add a new, major rate period.

Next, use the **Add Minor** button to define the Major Period. A minor period includes the days and times of the day that defines the rate period. Use **Day Type** to select Weekdays, Weekend days or All Days (both). Set the **Dates** and **Hours of Day** as appropriate. In this example, the On Peak time is defined as all weekdays in the year from 8 am until 7 pm.

Similarly, the Mid Peak period was defined as the weekday times that were not On Peak. Off Peak days were defined as weekends. The resulting Rate Schedule is shown next.

Note: Two minor rate periods were needed in the Mid Peak schedule to define the hours of day before and after the On Peak time.





To edit any of the periods, double click on an existing period to bring up an edit box.

Repeat the process above of adding and defining minor rate periods until all relevant time periods for the major period have been specified. Your rate schedule will be complete when all hours of the day and all days of the chosen monitoring period are included in the minor rate periods.

Once you have completed your rate schedule, press **OK**. At this point, SMARTware will check for errors in the rate schedule. If there are any gaps or overlaps in your schedule, the software will alert you to *what* periods are in conflict and *where* they are in conflict. You can elect to ignore the conflicts or correct them. If there are no errors or you choose to ignore them, then you can view the rate schedules in graphical or summary form.

TECH TIP: Holidays may require a unique rate schedule. Create a major period called *Holiday* and then create a minor period for each day to be included. For example, if January 1 is a holiday, create a minor period like this:

Day Type:	All Days
Days:	01/01-01/01
Hours of Day:	0:00 - 24:00

Repeat this step for each holiday that is included in the monitoring period. **Remember:** You must “remove” holidays from any other major periods that included them. If they are not removed, an “overlap error” will be reported.

Note: Only one Rate Schedule may be used at a time. To analyze the data with another Rate Schedule a new schedule must be created. Multiple Rate Schedules may be created and saved with a .drs extension.

Set the Connected Load kW

Set the Connected Load kW is a unique feature that allows scaling of the on-time measured by the TOU Logger by the draw of the connected load.

For example, assume that the logger is monitoring the on-time of an electric motor of 50 kW. With the data file open, select the **Set the Connected Load kW** menu item and enter 50. Now, whenever an on-time is shown in any of the analysis or graphical views, next to the on-time will be a new number which is the kWh consumed.

The kWh shown is the on-time hours multiplied by the connected load kW.

Set the kWh Cost

Set the kWh Cost is an option that allows you to set the price of each kW hour in dollars and cents.

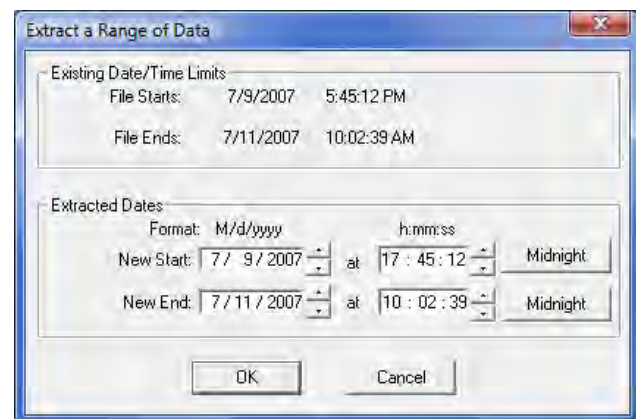
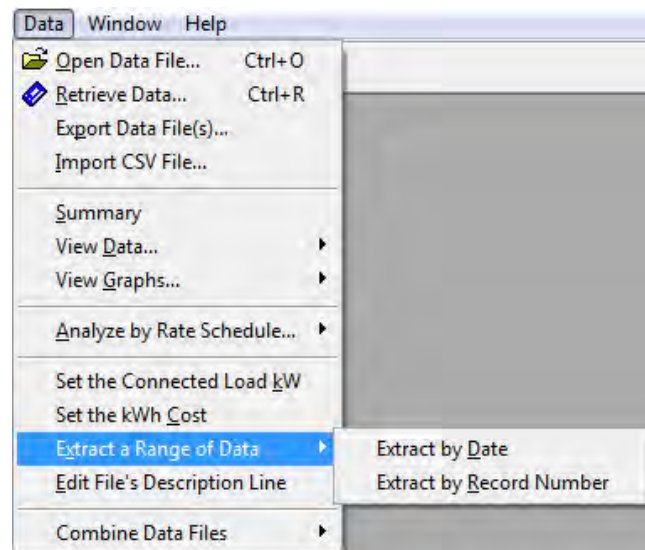
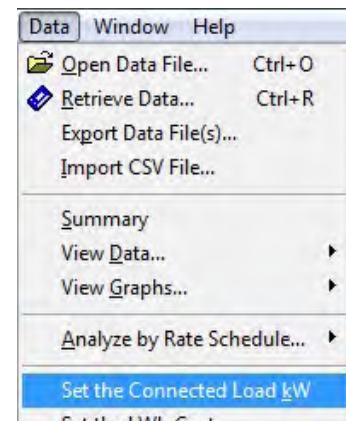
Extract a Range of Data

Occasionally there will be extra transitions recorded into a data file that are not part of the measurement. These can occur during setup and removal. Also, there are times when it is desirable to analyze only a part of the data, perhaps for only one month out of a several month measurement period. For these times, the **Extract a Range of Data** command can be used to extract only a section of data for analysis.

To use this function, first open the desired data file, then select **Extract a Range of Data**. There are two ways to select the data range to extract: by record number and by date range. In addition to the date and time of the transition, each transition is assigned a record number, which appears in the left-most column when viewing the data.

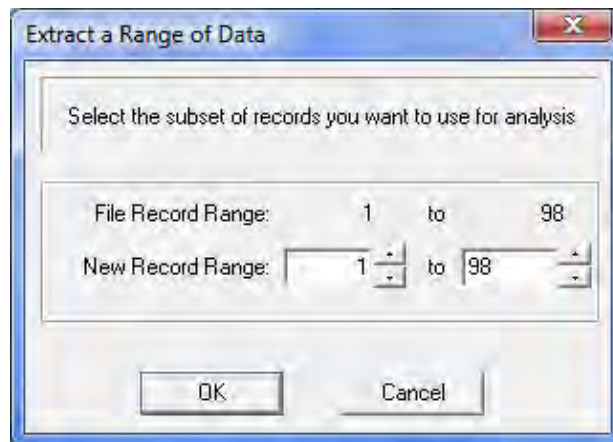
When you click on **Extract by Date** the window to the right appears:

The upper portion of the box [Existing Date/Time Limits] provides the date range that the data covers. In the lower portion [Extracted Dates] enter the desired, new start and end dates and times of the clipped file. Since many analyses begin on a day boundary, note the **Midnight** button that quickly sets the time to 00:00:00.



Note: The time 24:00:00 is not allowed. Use 00:00:00 of the next day.

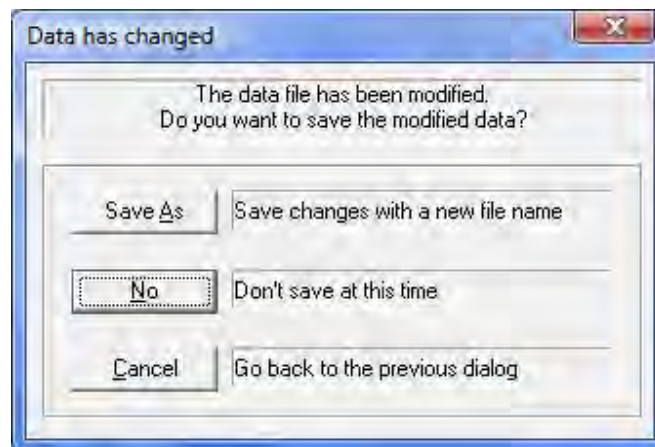
The data file may also be trimmed by choosing a range of record numbers. The logged data has a number assigned to each record starting with 1 and continuing to the last record. Clicking on the **Extract By Record Number** menu item brings up the following window.



Look at the original data file to determine which record numbers bound the data that you wish to extract. Using the up/down arrows next to the starting and ending record numbers set the **New Record Range** using the first and last records *you want to keep*.

Then select **OK**. The extracted data file becomes the active file. You will be prompted to save the data. If you want to keep the original data file (recommended), use **Save As** to save the clipped file under a new name or folder.

When you have created a clipped data file you have three choices as shown below.



Save As allows you to create a new file with a different name than the original and preserves the original data file.

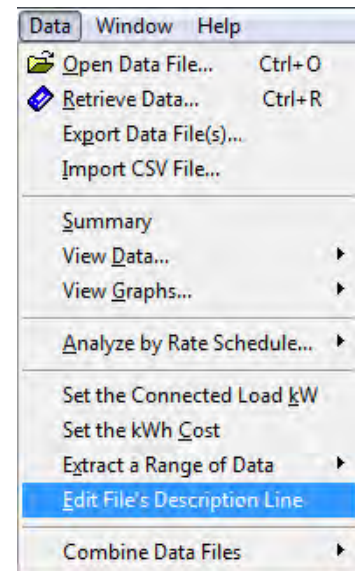
No lets you work with the extracted file but does not save it. When you close the data file or exit SMARTware 11 you will be prompted again to save the clipped file.

Cancel ends the data extracting function.

Edit File's Description Line

A 40 character description may be added to the data file. It can be used for any purpose such as describing the installation, dates, location and so on.

The Description Line appears in the data Summary page, the Rate Schedule Summary and in all graph titles.

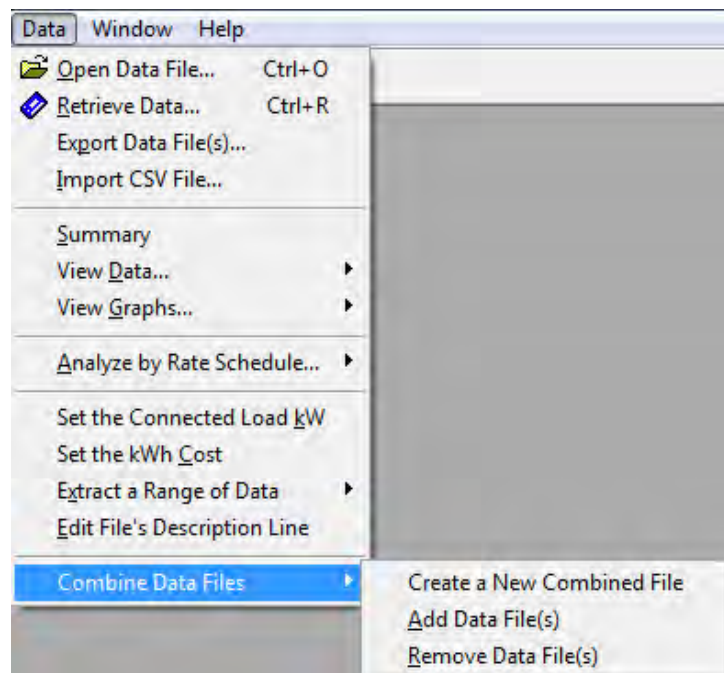


Combine Data Files

This command gives you the ability to combine a number of logger data files together into a single file that can then be analyzed. For example, a number of different data files that together represent the entire lighting of an office building can be combined to provide energy use data for the entire lighting load of the building.

Each individual logger file must have the connected load that they represent included in the analysis to “weight” the contribution of any one logger to the overall energy use. [See **Set the Connected Load kW** menu item] All summary and analysis functions offered by SMARTware can be used on combined files.

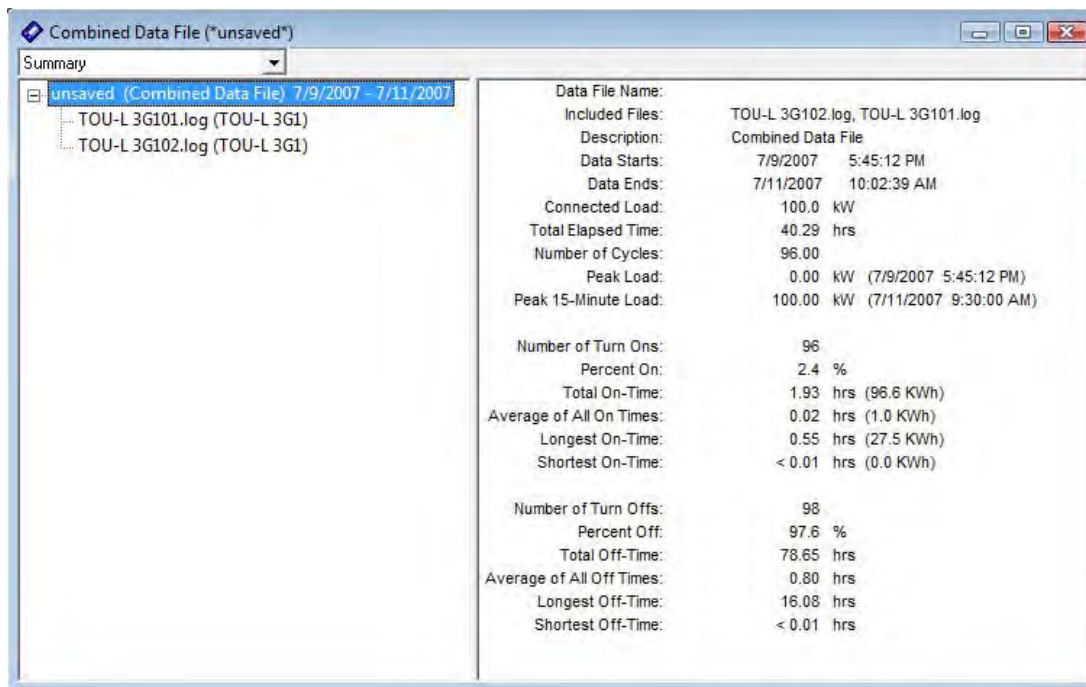
Create a New Combined File will create a combined file for analysis. Selecting this function shows a folder from which you may select the files you wish to combine into a single file. You may select files to combine using standard Microsoft Windows® commands such as left mouse click and Shift+click to select all included files and Ctrl+click to add an individual file. You may also combine files from different folders but you may find it easier to first move all of the files to be aggregated into a single folder.



Note: Creating a combined file does not affect the original data files.

After selecting the files to be combined, SMARTware first checks that all data files have a connected load (Connected Load kW) assigned to them. If not, you will be prompted to add the connected load kW to the files where it is missing or to delete those files from the aggregation. Next, SMARTware checks the beginning and ending dates of each file and trims the ends of each data set as necessary so that the combined data file will include a date range common to all the data files.

After these tests, SMARTware displays the combined data file, as shown above and, on the left side of the

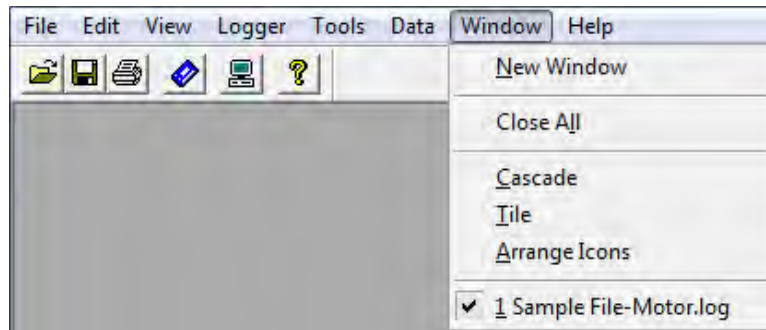


window, the names of the files that are used in the aggregation. At this point, the combined data file has not been saved. Before closing the window or exiting SMARTware, you will be prompted to save or discard the combined file.

Add data File(s) Additional data files may be added to an open combined data file “on the fly” by simply using this menu command. A folder window will open that allows you to select one or more files for adding to the combined file.

Remove Data File(s) Similarly, data files can be removed from an open combined file by using this command as many times as necessary. Multiple files may be removed simultaneously by selected all that are desired. Data files may also be removed by clicking on the file name in the open Combined Data File window and hitting the Delete key.

Window



New Window

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

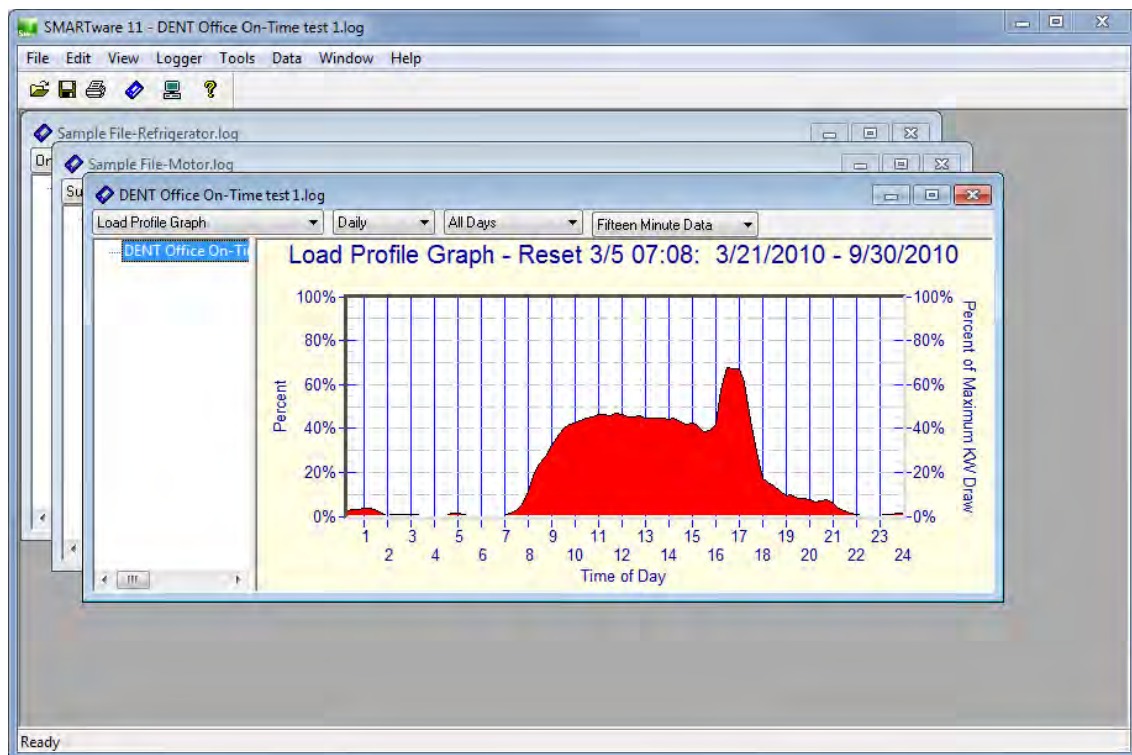
Note: The New Window feature does not work when in the Summary view of the data.

Close All

Closes all open windows (data files or graphs).

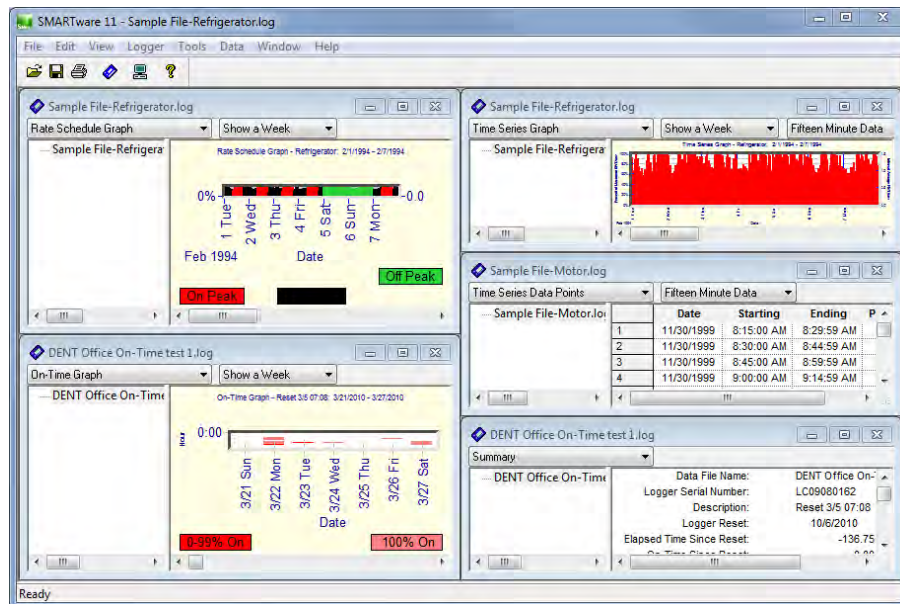
Cascade

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.



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.

Help

About SMARTware...

This menu item is used to check the date and version of the SMARTware software and for contact information for DENT Instruments.

About the Communication Cable...

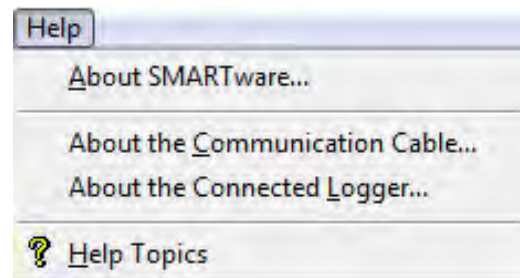
This menu item is used to check the date and version of the software in a connected SMARTlogger Communication Cable as well as the serial number of the cable.

About the Connected Logger...

This menu item is used to check the date and version of the software in a connected SMARTlogger as well as the serial number of the logger.

Help Topics

Help Topics provide this entire SMARTware manual in an Adobe® .pdf format.



Hot Buttons

SMARTware has a number of Hot Buttons that can be used to more quickly access some of the commonly used commands such as retrieving data from the logger or printing. Instead of using the menu commands **File; Open** 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 the hot buttons follows:



File Open: Opens data files for analysis



Save: Saves changes to data files or aggregated data files



Print: Prints the active window (graph or data)



Retrieve Data: Retrieves data from the logger



Setup PC: Quickly access PC setup configurations



Help: Opens the SMARTlogger manual.

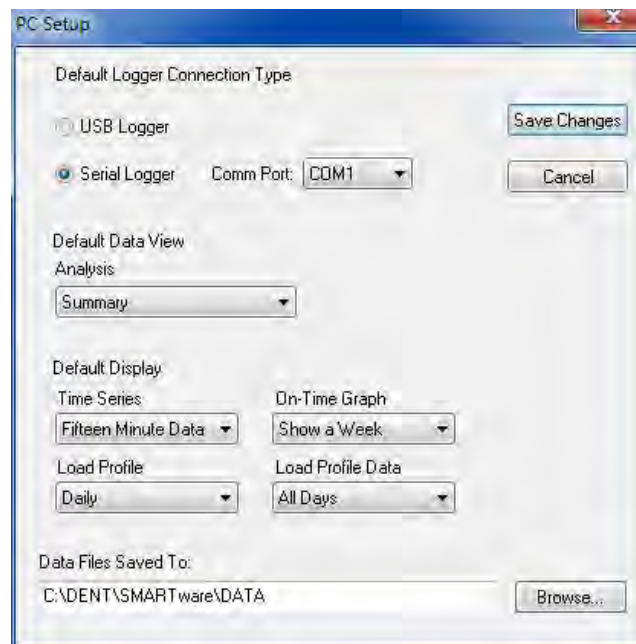
Note: Some buttons are not available (grayed out) if they cannot be used. For example,  and  require an open data file in order to be used.

Appendix A: Using SMARTware 11 with Legacy (Serial) SMARTloggers

SMARTware 11 is backward compatible with older, serial DENT Instrument SMARTloggers.

Note: Older versions of SMARTware are not compatible with the new, 4th Generation SMARTloggers.

To use SMARTware 11 with serial loggers first connect the TOU Serial Cable from a serial port on the PC and into the jack on the back of the logger. SMARTware will automatically switch to the new logger and you should be able to connect to it as you would any of the SMARTloggers.



If SMARTware does not connect to the Serial logger the problem is usually the Com Port that SMARTware is using to find the logger is **not** the Com Port the logger is connected to. To change the serial port, use the menu command: **Tools; PC Setup** to set the Direct Connect RS-232 communication port. Normally the PC Com Port is COM1 but can be any number up to 32. (Com Port 1 is used in the example on this page.)

TECH TIP: If you have both new USB logger and an older Serial logger connected simultaneously, SMARTware will always try to connect to the USB logger. Disconnect the new USB logger before trying to connect to the Serial logger.

To make a direct connection from the PC to the logger, use the supplied SMARTlogger cable to connect from the logger's serial port (a stereo headphone jack on the logger back) to the serial port on the PC. If necessary, use a 9 to 25 pin adapter on the PC.

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

Note: The baud rate between the logger and PC is fixed.

TECH TIP: Most serial communication problems are a result of the PC trying to communicate with the logger on the wrong computer COM port or a communication cable that is not connected properly.