The Motionlogger® Micro Sleep Watch® Actigraph

User's Manual to Accompany Act Millennium version 3.31.0.0 and higher

Manual Revision 1.2

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Introduction

Micro Sleep Watch Features

- **Real time Display** – a standard 12-hour clock which can be adjusted using the side buttons for time zone changes, etc. while the actigraphy remains time-stamped with the original time reference.
- **Off-Wrist Detection** – proprietary high-sensitivity "Life Measure" recording helps discriminate periods of sleep or extreme sedentary behavior from periods when the actigraph is not being worn.
- **Event Marking** – side mounted EVT button to mark events of any type. Display momentarily blanks to provide visual feedback that the event has been marked.
- **Status Feedback** - a momentary press of the TIME button invokes a visual feedback to ensure that the Micro Sleep Watch is collecting data.
- **192K Memory yielding 1-4 Months of Runtime** – depending on the number and type of recording channels selected using a fixed 1-minute epoch length. The memory is "non-volatile" which means data remain intact even if the battery is exhausted or gets removed.
- **Multi-Channel Collection** – selectable simultaneous collection of frequency (ZCM) and intensity (PIM) of motion along with Life Measures and a recording of battery level.
- **Water Resistant** – Tested water resistant to 10M static pressure.

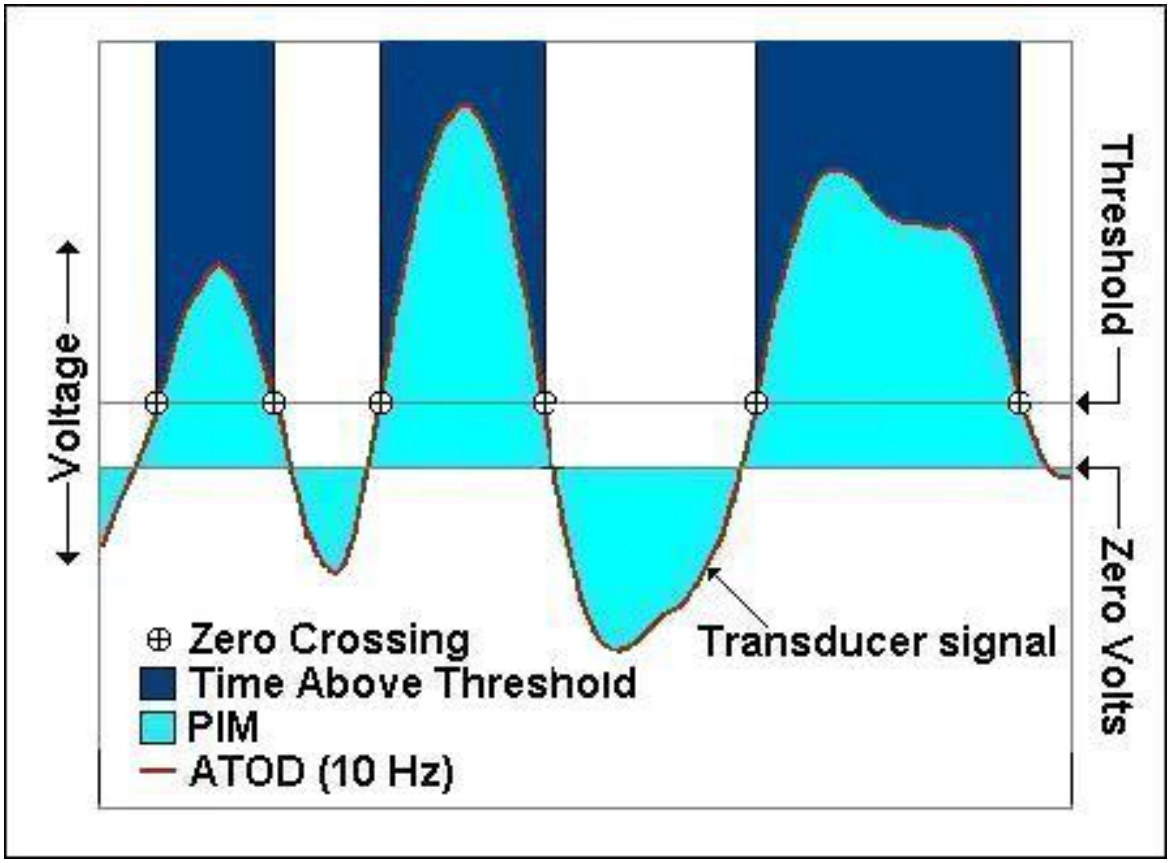
About the Micro Sleep Watch

Motionlogger® Actigraphy

The Motionlogger Micro Sleep Watch utilizes a precision piezoelectric bimorph-ceramic cantilevered beam, which generates a voltage each time the actigraph is moved. That voltage is passed to the second essential element of the Motionlogger, the analog circuitry. Here the original signal is amplified, and filtered according to the 2-3 Hz bandpass filter. What is done with this conditioned signal depends on the mode of operation employed by the Motionlogger (see descriptions below). Derived information based on the mode of operation is accumulated over a fixed 1 minute time period know as an epoch before being stored in the memory of the device. Once memory is full, data collection stops. Memory is never overwritten unless the Motionlogger has been re-initialized.

Motionlogger® Modes of Operation

The conditioned analog activity signal can be processed in many different ways to provide information about the subject's motion. The Micro Sleep Watch uses the most popular subset of all the possible Motionlogger modes of operation and can measure either frequency or intensity of motion. The following is a discussion of these modes:



Zero Crossing (ZC) Mode
The conditioned transducer signal is compared with a fixed sensitivity threshold. The number of times the signal voltage crosses the reference voltage is accumulated in temporary memory storage until the user-defined epoch length has transpired. If the time base of the above graph were a 1-minute epoch, then the value stored in memory for this epoch would be 6. *Zero Crossing is a measure of frequency of movement.*

Proportional Integrating Measure (PIM) Mode
A high-resolution (maximum value is 65,535) measurement of area under the rectified (absolute value) conditioned transducer signal is known as the PIM (Proportional Integrating Measure) Mode. *Proportional Integrating Measure is a measure of activity level or vigor of motion.*

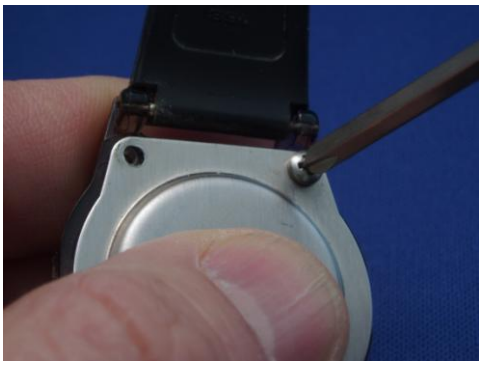
Which Mode is Right for My Application?
Historically, Zero Crossing was the most popular mode of operation because of its ability to estimate sleep with a high degree of accuracy. The bulk of the literature published to date has been using this mode of operation, particularly on the topic of sleep. PIM mode has proven very useful in studies on energy expenditure and hyperactivity. Because of its high resolution, PIM mode uses device memory twice as fast as ZCM. When in doubt, both modes can be recorded simultaneously.

Battery Usage and Replacement

The Micro Sleep Watch uses a DL2430 or equivalent battery. With normal usage and a fresh battery, approximately 3000 hours of data collection can be expected. The Micro Sleep Watch keeps track of the number of hours of runtime. Note that idle time, when the actigraph is not being used uses a small trickle charge for the purpose of maintaining the time-of-day display. Long idle periods may reduce the expected runtime. ActMe software allows the user to pre-set a warning and refusal (to initialize) level for the battery log, allowing the user to be as conservative with battery usage as he/she wants. See the section on Configuration for more information. Note that a blank LCD on the Motionlogger can indicate either a dead battery or memory full. Check the "battery status" of a downloaded file for indications of "battery low" to verify.

Installing/Replacing the Battery

The DL2430 battery is inserted PLUS (+) side up beneath the battery cover which is opened by removing the four screws holding down the backplate. The positive contact goes over the battery, while the negative contact goes under. The graphic within the battery compartment illustrates this. **Make sure the rubber O-ring is intact and in place and that all four screws are securely fastened.** Replace the cover tightening the screws securely "hand tight." A slight compression of the rubber O-ring will insure a watertight seal.



ActMe Software Installation, Registration and Configuration

Software Installation

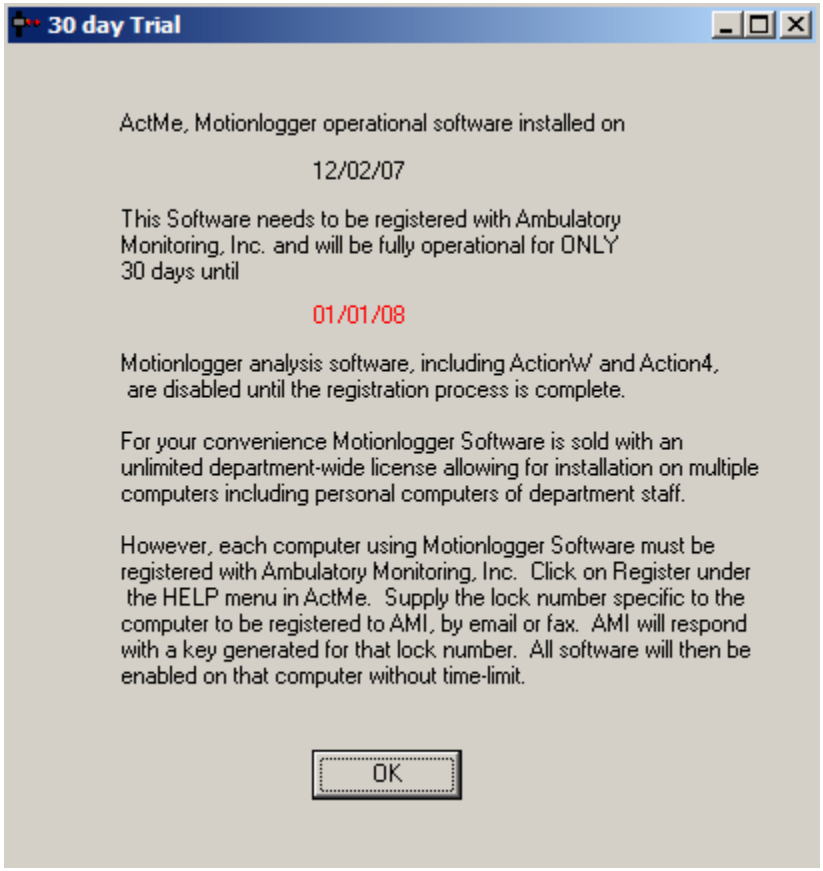
ActMe is usually supplied on CD along with delivered equipment. Occasionally, some customers may download the installation from AMI's website. CDs normally come with an Auto-Play sequence that guides the user through the installation process. Downloaded softwareware is typically contained in a file called ActMeInstall.exe which must simply be run to begin the installation procedure. Again, follow the instructions presented to install the software.

Registration

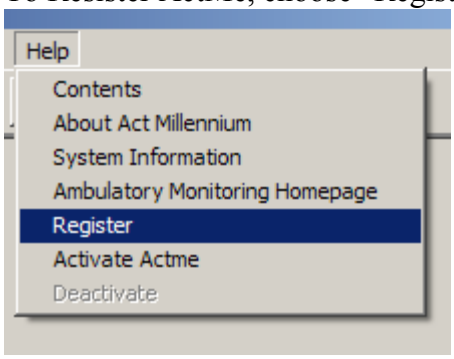
ActMe must be registered on each computer it is installed on. **Registration is free on as many computers as needed, but must be completed within 30-days of installation on any particular computer or the program becomes disabled.** ActMe comes with a 30-day grace period during which the program can be run without restriction.

Registration must be done for each computer for which AMI software will be run. Registration never expires and is done once for all AMI software on that particular computer. AMI uses a "lock and key" method for registering computer systems. ActMe generates a unique **lock code** for each computer it runs on and a corresponding **key code** to unlock that computer for AMI software.

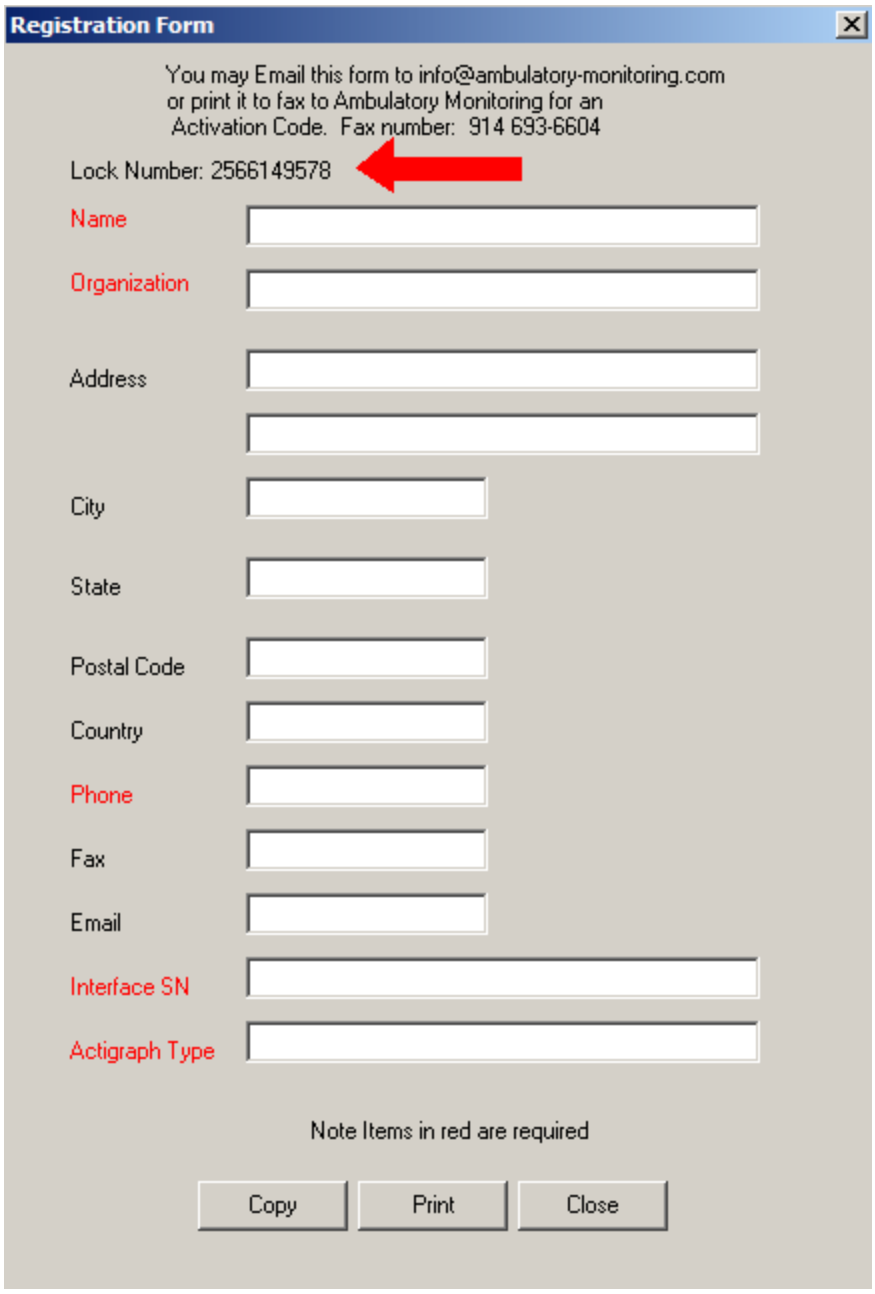
A thirty-day trial is automatically granted starting from the first time ActMe is run on that computer. See a typical example below.



To Resister ActMe, choose "Register" from the help menu:

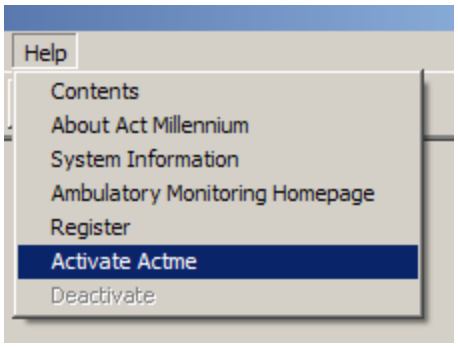


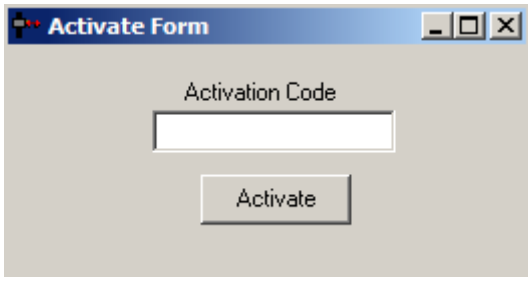
The registration form will be presented displaying the lock code as shown below. Fill out the form and the information can then be copied to your computer's clipboard using the "COPY" button. Paste this information into an email to Ambulatory Monitoring, Inc. to obtain the key code for your computer. As an alternative the completed form may be printed and faxed to AMI.



Activating your Registered ActMe

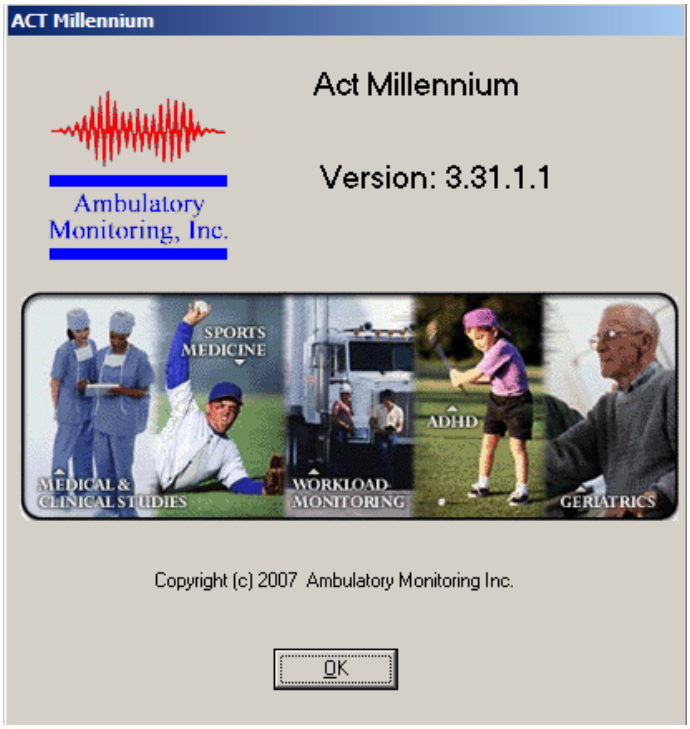
When AMI delivers your key code enter in ActMe via the help screen as shown below:



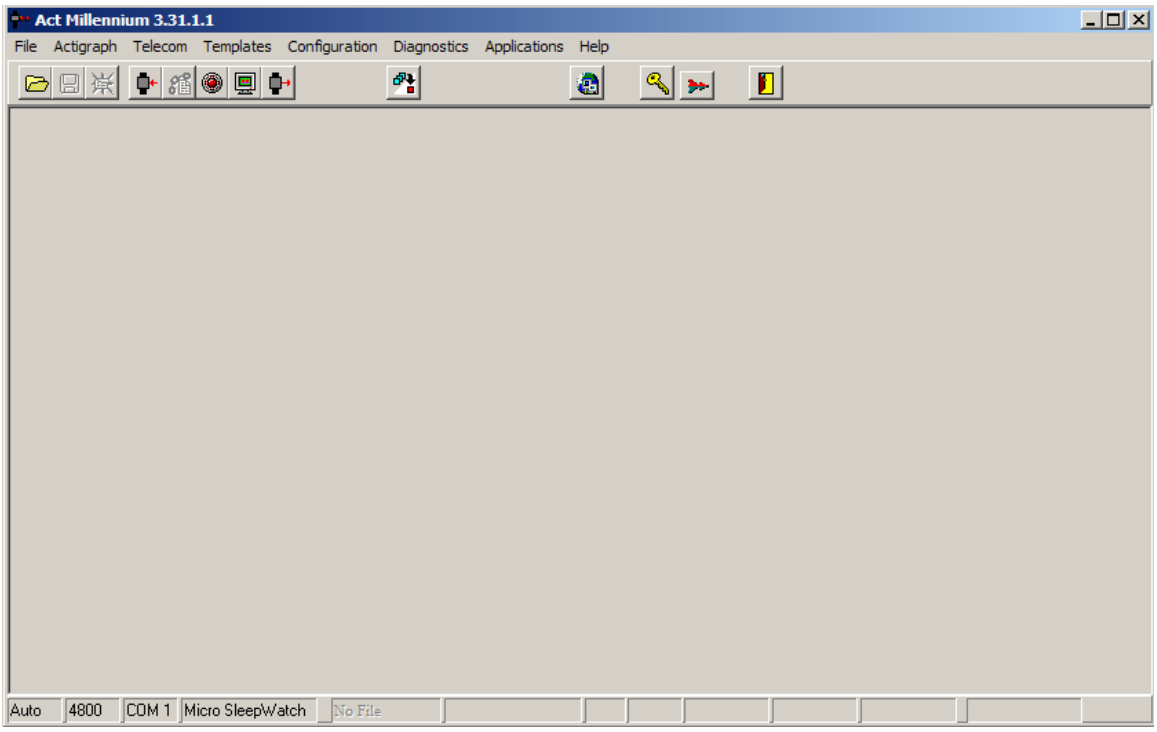


Running ActMe

After installation, ActMe will run automatically if the "Launch" button is left checked. A shortcut on the desktop is also created. This can be double-clicked to launch ActMe. Thee default installation of ActMe installs the program on your computer's hard drive in the folder: \Program Files\AMI\.



After ActMe is launched, clear the splash screen by clicking OK. The program main window will appear as follows:



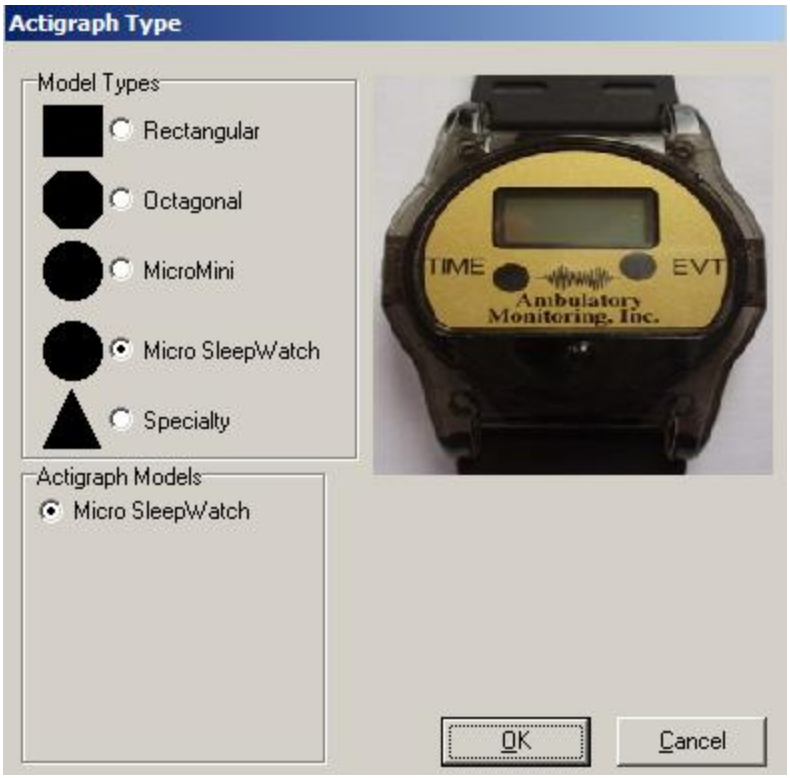
Configuring ActMe

Notice that the configuration settings are displayed along the bottom of the Window. When using the Micro Sleep Watch the configuration settings should be **Auto**; **4800**; **COM x** (where x is the active serial port connected to your interface) and **Micro SleepWatch.** These settings reflect the interface type, the communications baud rate, the communications port used and the default Motionlogger Model being used, respectively. All of these settings can be changed and saved via the **Configuration** menu as described further below.

Configuring Actigraph Type

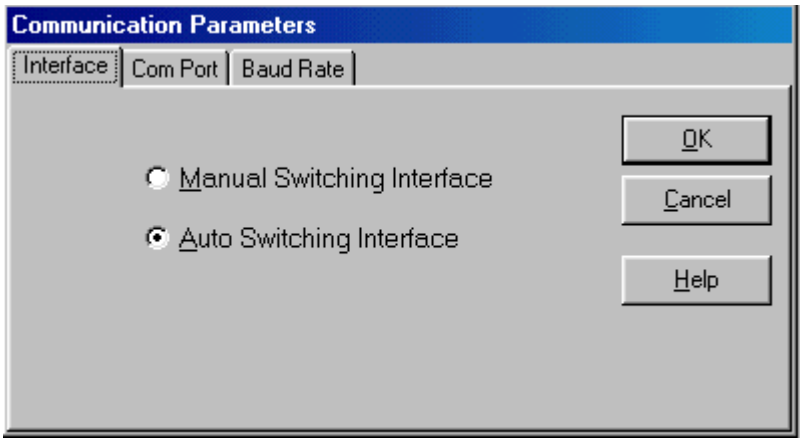
Setting and saving Micro Sleep Watch as your actigraph type will insure that ActMe presents this actigraph as the default type during the initialization process.

Under *Model Type* choose Micro Sleep Watch. If more than one type of device will be used at a given computer, choose the one that will be used most frequently. Within the initialization process there will be an opportunity to make temporary modifications to this setting.



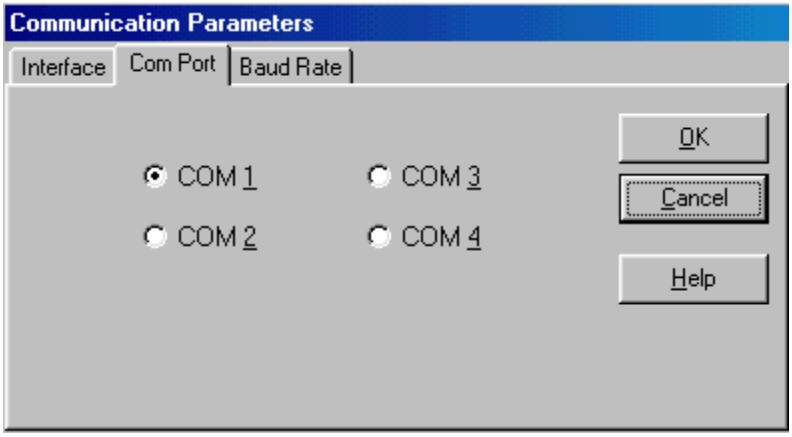
Configuring Communications (Interface Type, Com Port and Baud Rate)

The figure below shows the configuration window when the *Communications* item is selected:



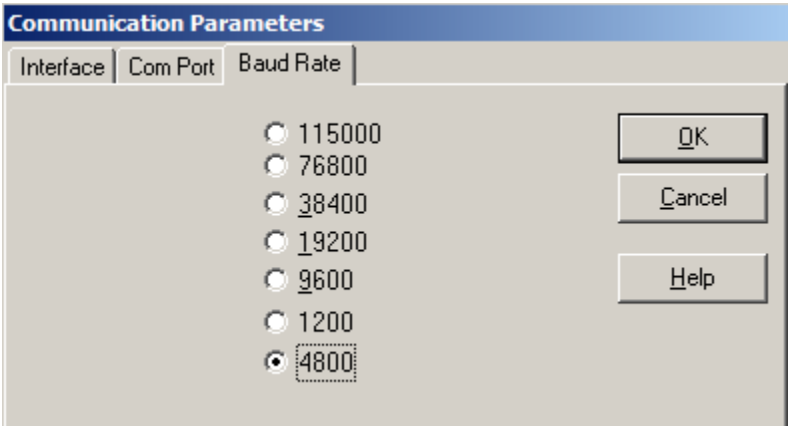
Notice the four tabs appearing at the top. These tabs permit one to select which configuration parameters need to be set. The Micro Sleep Watch is supplied with an **Auto Switching Interface**.

Pressing the Com Port Tab shows this selection:



Here is the serial port selection. Choose the computer port that one has (or will) attach one's interface unit to. Many computers and laptops sold these days have only one serial port available and it is COM1. So when in doubt choose this. If your computer has no serial port then a USB to Serial converter (available from most electronics stores). Follow the instructions supplied with this converter to configure it as one of the four ports that ActMe supports.

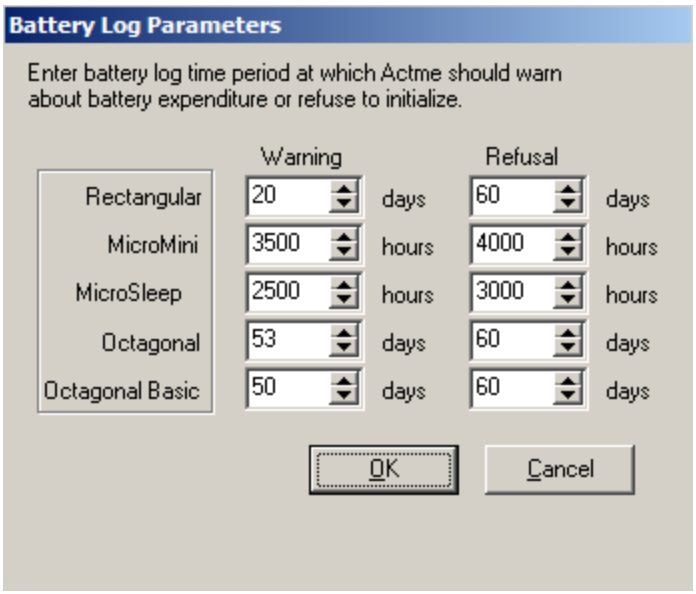
Selecting the Baud Rate Tab shows this screen:



Note that the Micro Sleep Watch **requires** 4800 Baud. This value is automatically set if Micro Sleep Watch type has been chosen

Configuring Battery Life Warning and Refusal Levels

From the Configuration menu, choosing *Battery Logs* causes this screen to be displayed:



"Battery Log Parameters" allows one to customize a warning level and refusal level for battery life. During the initialization process, if the battery life has been exceeded then initialization will be refused until the devices battery has been changed or the refusal level has been increased. At the warning level one will be informed of the number of hours logged on the device's battery and remind the user about the approaching refusal level. One can ignore the warning levels and proceed with initialization or choose to change the battery at this time.

The default levels presented are there as a reference. Different battery types and batteries of varying ages may require different values. Shelf life can affect the capacity of a battery. Make the warning and refusal levels them as conservative as needed.

After completing the configuration settings, make sure that the configuration is saved. (Configuration: Save).

For temporary changes in configuration, one can click items on the status bar to bring up their corresponding configuration menu.

The Interface

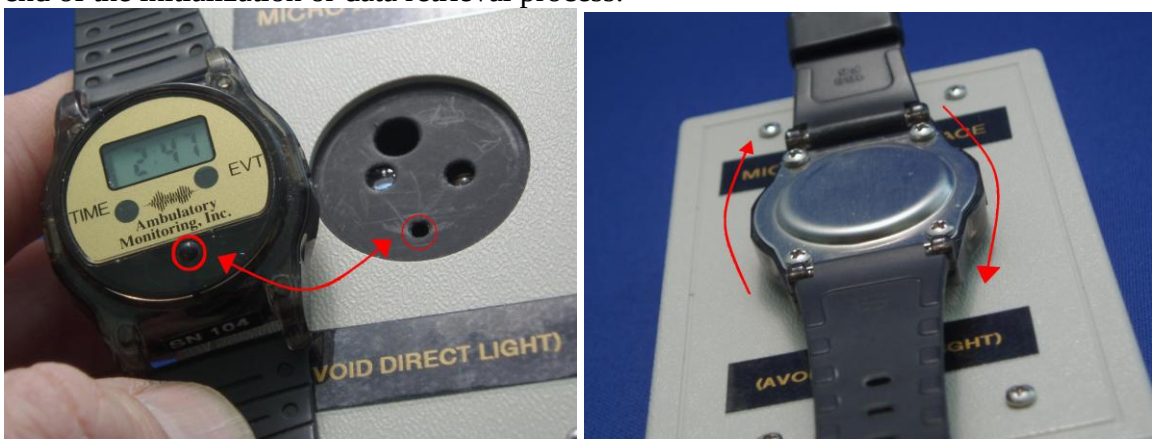
Connecting the Interface

The interface is connected to one of the computer's serial communication port (COM1 through COM4). Make sure the physical port corresponds with the port configured in the software (see the section on Configuration). USB to Serial converters may be used but must themselves be

configured using the software supplied with the converter.

Putting the Micro Sleep Watch on the Interface

In order to initialize the Micro Sleep Watch (prepare it to collect data) or to retrieve collected data, the Micro Sleep Watch must be placed in the interface. The interface uses an Infrared (IR) system for communications. The Micro Sleep Watch and interface have matching pairs of sending and receiving components which must be properly aligned in order for successful communication. In order to facilitate proper alignment the Micro Sleep Watch has an alignment pin on its face which falls into a small hole in the interface when properly aligned. Place the Micro Sleep Watch on the interface face-down as shown below. A slight rotation of the actigraph may be necessary. The actigraph will resist further rotation when properly aligned. Simply lift the actigraph to remove at the end of the initialization or data retrieval process.



Avoiding Ambient Light

Brightly lit environments, illuminated directly or indirectly especially by sunlight or incandescent lighting, because of their high infrared content can interfere with IR communications and prevent initialization or data retrieval. In these extreme situations it may be necessary to shield the interface/actigraph combination. This can be done with one's hand temporarily or with a folded piece of (preferably dark) paper or cardboard placed tent-style over the interface and actigraph.

Operating the Motionlogger® Micro Sleep Watch

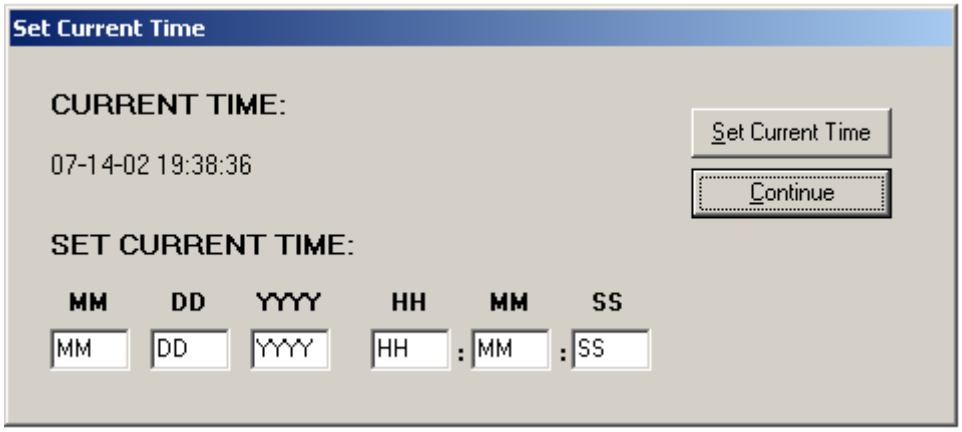
Micro Sleep Watch Initialization

Select the Actigraph: Initialize menu item or simply click the button. Make sure that the Micro Sleep Watch is in the Interface. The first dialog box to appear is shown in the figure below. This box permits one to correctly set the computer's time and date.

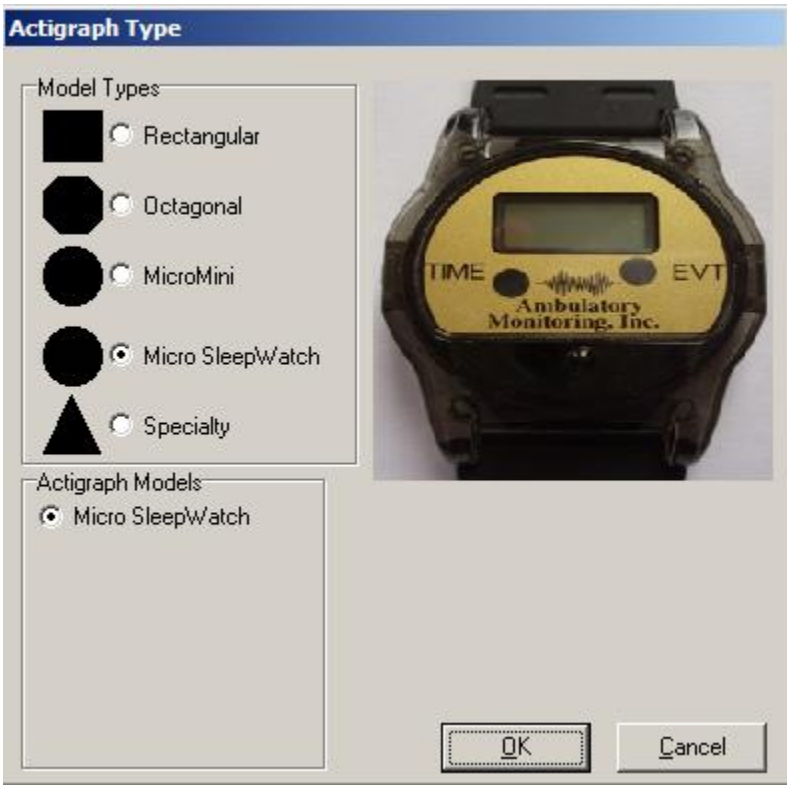
Note that the Micro Sleep Watch initially sets the time-of-day display based on the computer's time. While this displayed time can be manipulated (for time zone changes, for example), the actigraphs internal time for time-stamping data is

FIXED and is based on the initializing computer's time. For accurate time synchronization, please be certain that your computer's time is correct.

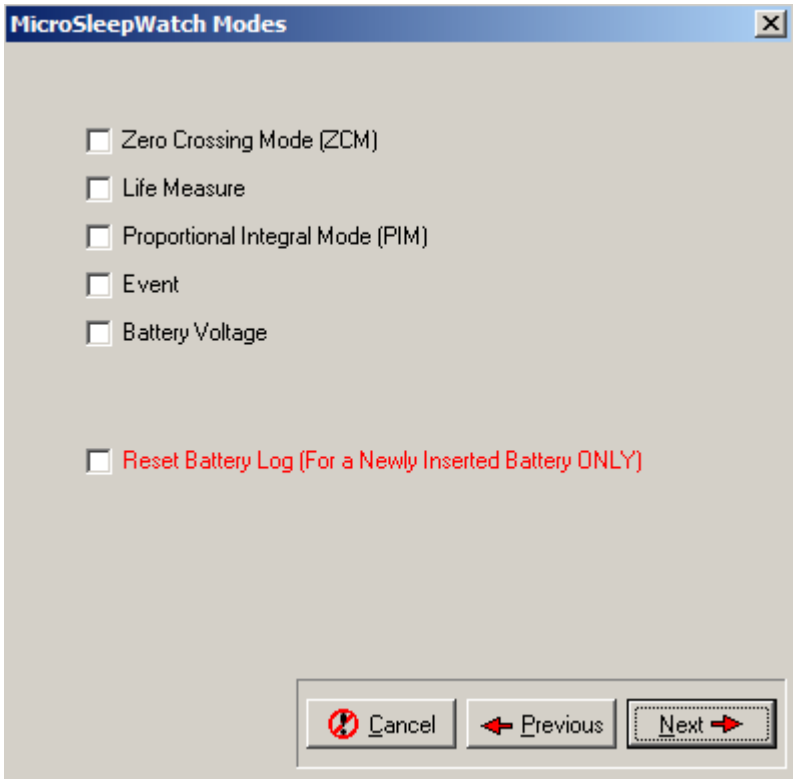
Many computers with internet access have their internal clocks regularly synchronized with the correct local time. If not the computer's system time can be modified within ActMe. Type in the correct month, day, year, hour, minutes and seconds, using the tab key to move between fields. Then click the Set Current Time button to set the time. If the computer's time does not need adjustment, just click on the Continue button.



Next, the Actigraph Type window is displayed as shown in the figure below. Select Micro Sleep Watch.



Next, one is presented with the operational modes supported by the Micro Sleep Watch.

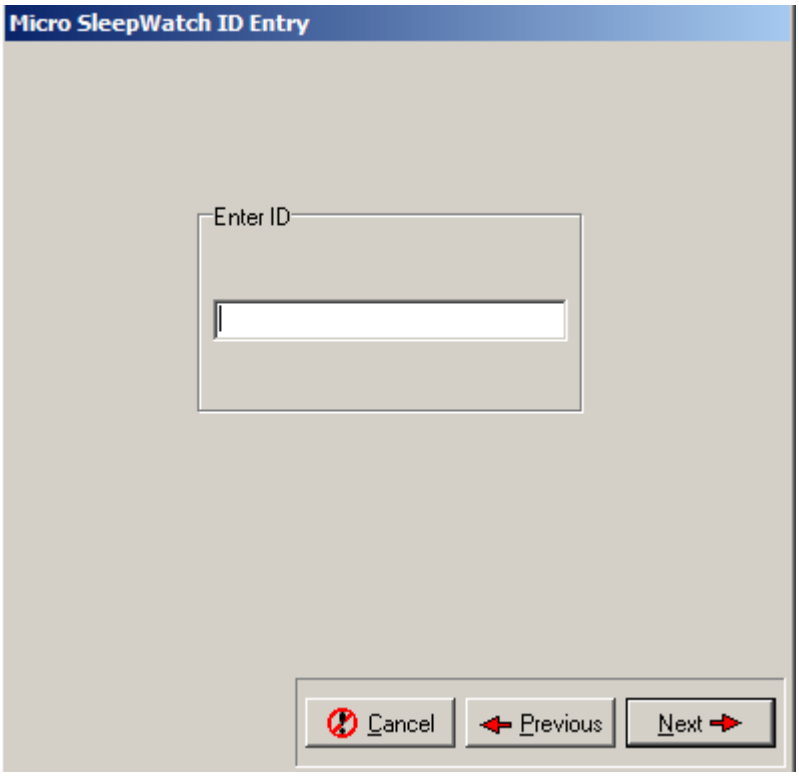


Choose any or all of the possible recording modes. Remember that runtime is directly related to the number and type of recording channels selected. See the introduction for a discussion of the recording modes. ActMe will display the runtime based on selected channels before the initialization process is complete. If the runtime based on selected channels is insufficient, you may return to this window (via the "Previous" button) to change your selection.

Click on the "Reset Battery Log" ONLY if a new battery has been installed. Otherwise the Battery Log and the Warning/Refusal system which depends on it will be inaccurate.

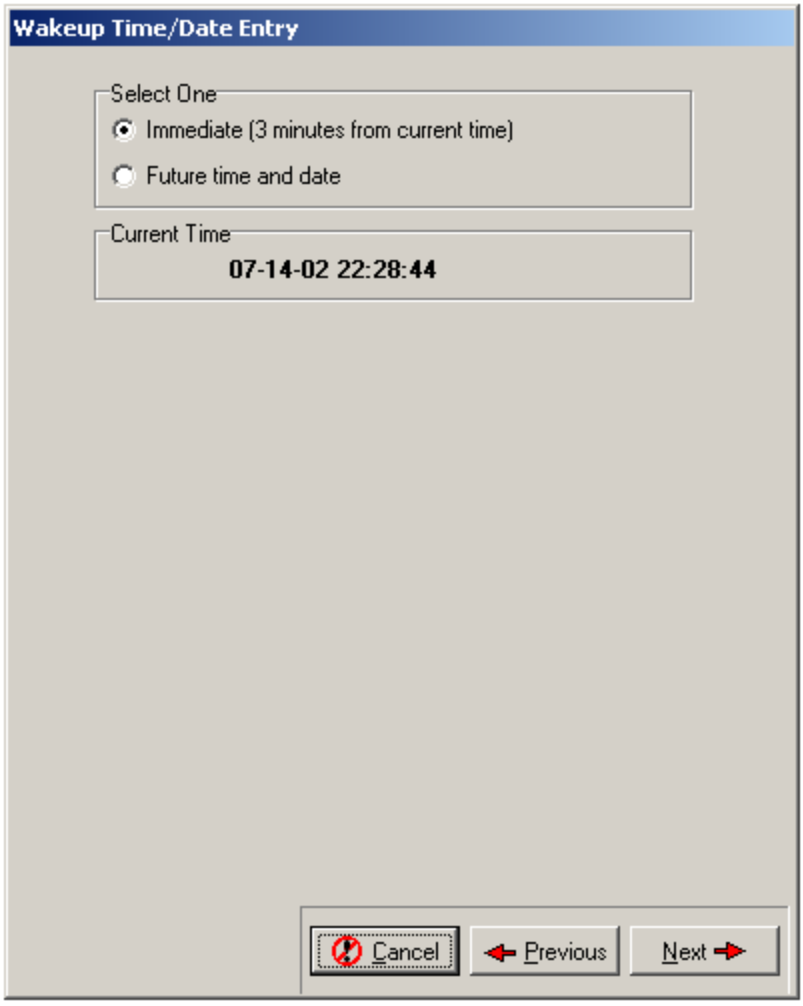
After choosing a mode, click Next button to continue.

Next enter an ID up to 30 characters for the Micro Sleep Watch sampling session. The figure below shows the dialog box used to type in an ID. After entering an ID, click the Next button to continue.



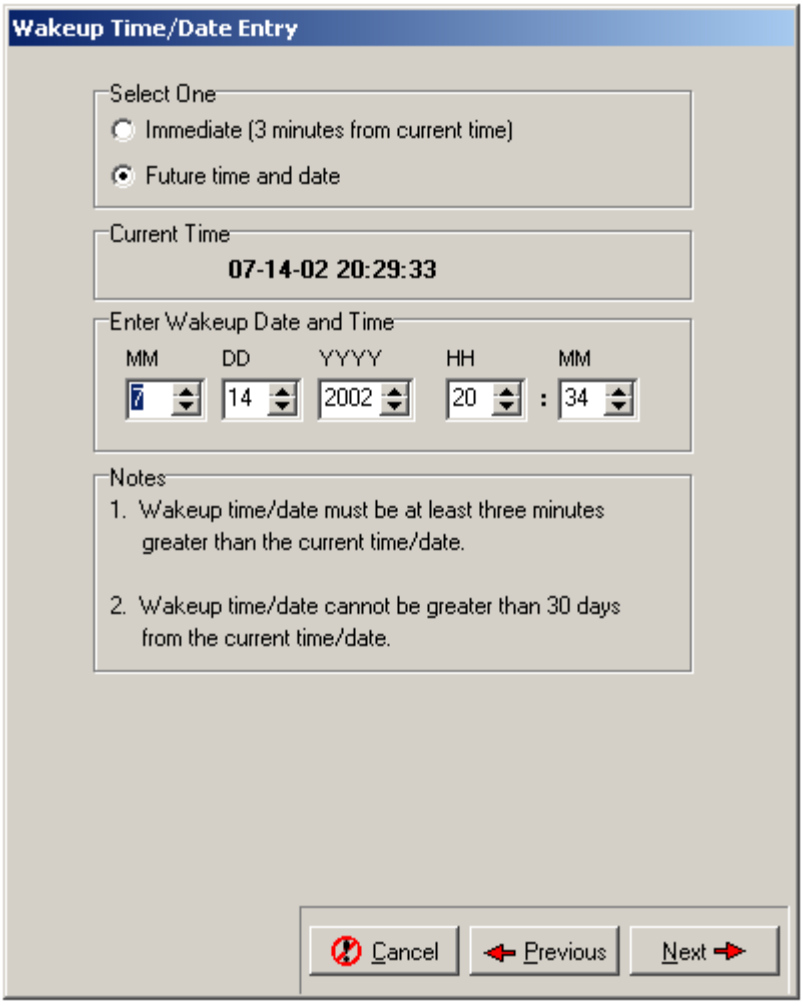
At this point it is necessary to decide whether the Micro Sleep Watch will start immediately (within three minutes) or start at some future time. The Future startup feature is convenient when multiple Micro Sleep Watches are to be synchronized. The figure below shows the dialog box that is used to make that decision. Click on the startup condition desired and then click the Next button to continue.

"Immediate' start ups automatically sets the startup time 3 minutes past the current time. to continue, click on the Next button (see figure below).

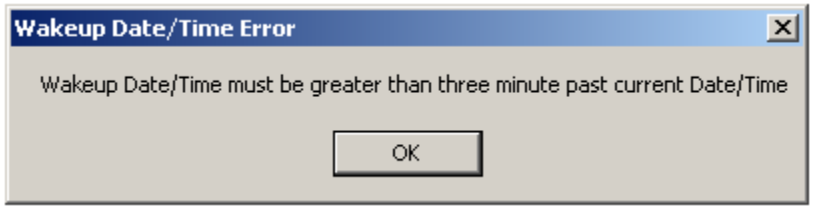


If a future start up condition is selected, one will be presented with the dialog box shown in the figure below. Enter in the month, day, year, hour and minute of the device should commence data collection. Time spent waiting for the startup time and date expend a very small amount of battery power which would be insignificant. To continue, click on the Next button.

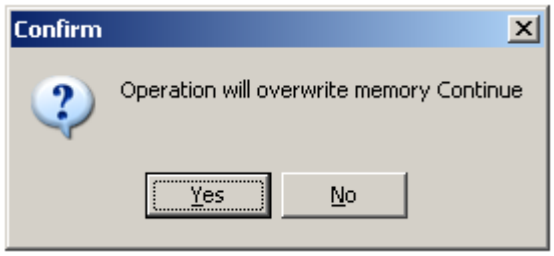
Note that ActMe time fields use the military time format (no AM or PM). Hours after noon are expressed as 12:00 PLUS the PM time (i.e., 1 PM = 13:00).



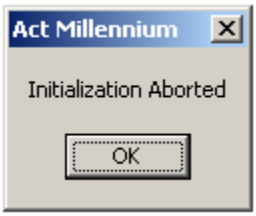
The Wakeup Time/Date cannot be greater than 30 days from the current Time/Date. If the Wakeup Time/Date is larger than 30 days from the current date the following message will be displayed as shown in the figure below. Clicking the OK button will take one back to the Wakeup Time/Date Entry form.



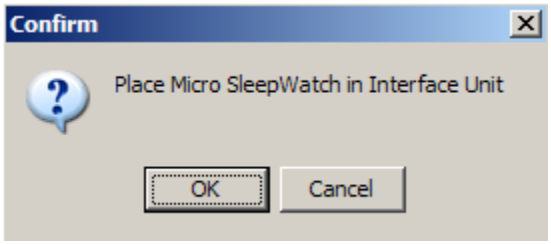
Since initialization erases any previous data, an Overwrite verification dialog box is displayed as shown in the figure below. If one are sure that one want to initialize the Micro Sleep Watch click the YES button.



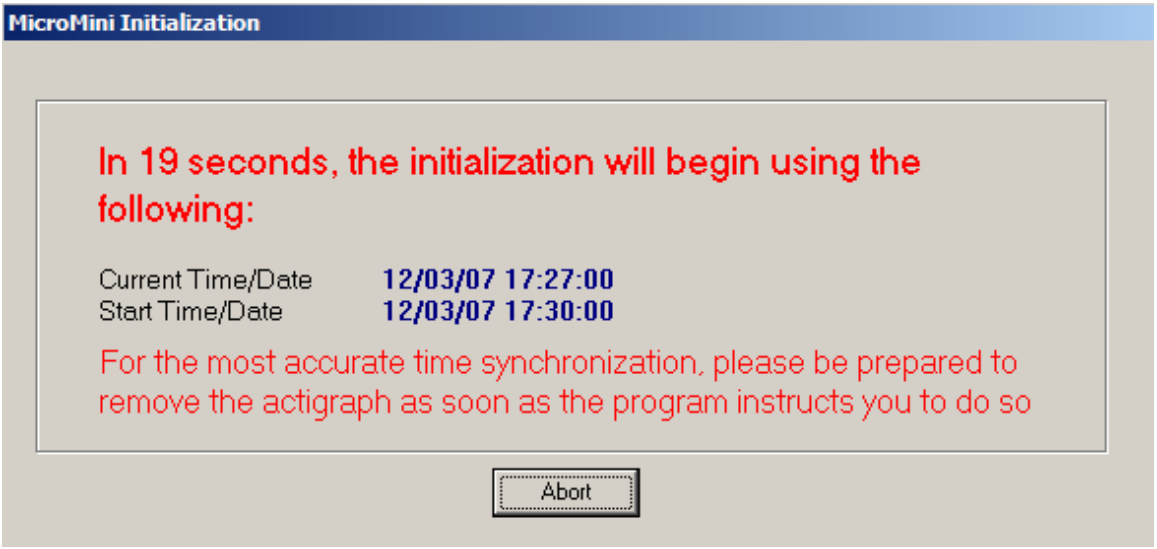
If one does not wish to initialize the Micro Sleep Watch click the NO button. The following message will be displayed as shown in the figure below.



If the Yes button was chosen, the following message will be displayed as shown in the figure below. After inserting the Micro Sleep Watch, click the OK button.

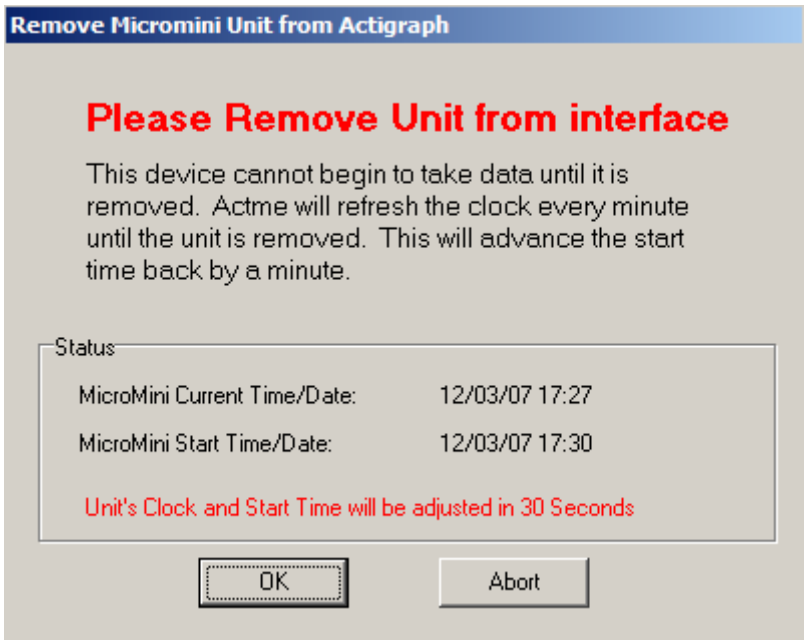


Place the Micro Sleep Watch in the interface as previously described and click OK. ActMe then attempts to synchronize the Micro Sleep Watch to your computer's system time.



This countdown is only for the START of the initialization process. DO NOT REMOVE

the Micro Sleep Watch until you are told to do so. To ensure the most precise initialization, remove the device as soon as instructed.

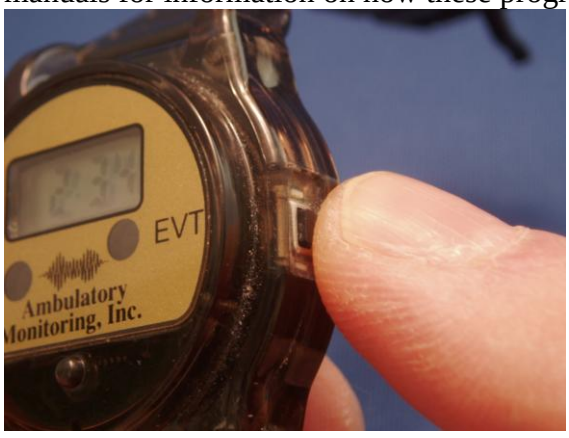


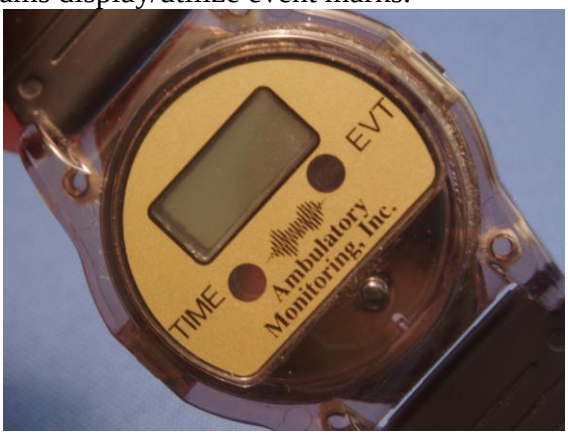
If you fail to remove the Micro Sleep Watch the device time will be updated each minute until you do so.

At the completion of the initialization process the software will instruct you to remove the Micro Sleep Watch. Do so and click the OK button.

Event Marking

When enabled, the Micro Sleep Watch has the capability of allowing the subject/patient to mark a significant event by pressing the right button marked "EVT." If this feature is enabled the time-of-day display will blank momentarily providing visual feedback that an event has been marked. ActMe presents marked events in the graphical display whenever a data file is downloaded or opened from storage. See ActionW and Action4 instruction manuals for information on how these programs display/utilize event marks.





Checking that the Micro Sleep Watch is Running

The Micro Sleep Watch has a visual feedback feature that allows you to verify that the device is collecting data. A *momentary* press of the TIME button invokes this feedback feature. The usual Time-of-Day display will disappear and two-digit counter will appear which responds to motion. The number will increase when the actigraph is moved and stop when the actigraph is placed on a solid, non-moving surface. If the actigraph has not yet begun collecting, then two zeros (00) will be presented and will not change. Pressing the TIME button again returns to the Time-of-Day display.

Other Status Indications

A blank display can be an indicator of two possible conditions. A low battery will cause the LCD to blank. When the Micro Sleep Watch has a full memory, the LCD will also blank to alert the wearer. If the device has a low battery it will probably not communicate with the interface until the battery is replaced (data are never lost when exchanging batteries). If the device does communicate, then the blank display is an indicator of full memory. This can be verified from the "Memory Status" and "Battery Status" lines of the file summary after download.

Adjusting the Time-of-Day Display

The initial setting of the displayed time occurs during initialization and both the display and the Micro Sleep Watches internal time-stamping are synchronized with your computer's system time. But the displayed time can be changed to adjust for different time zones or seasonal changes in time (i.e., Daylight Savings Time). Follow these steps to adjust the displayed time:

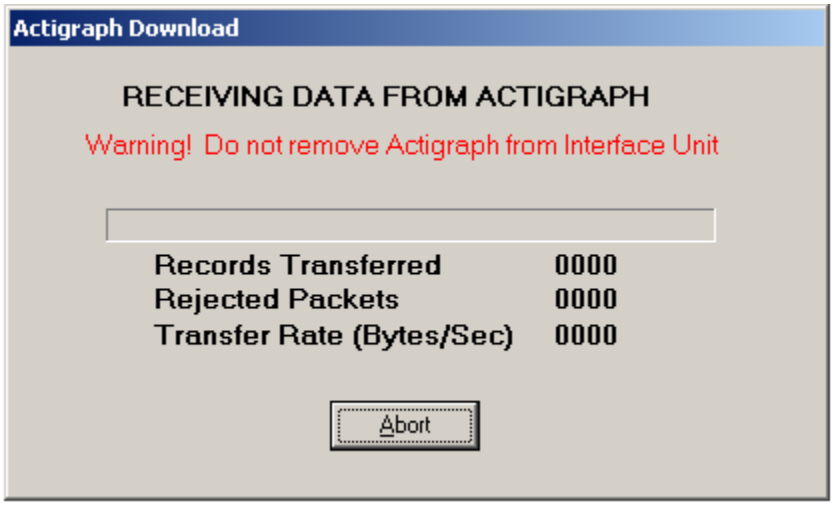
1. Hold down the TIME (left) button until hour blinks
2. Press left button to decrease hour, right button to increase hour.
   NOTE: It takes a second for the time to change
4. After hour is set. Press and hold down TIME (left) button until minutes flash
5. Set minutes as in step 2.
6. When time is correct, press and hold left button until minutes stop flashing and colon starts flashing. The time display is now adjusted.

Note: The Micro Sleep Watch will time out in 30 seconds if no action is taken once time set has begun.

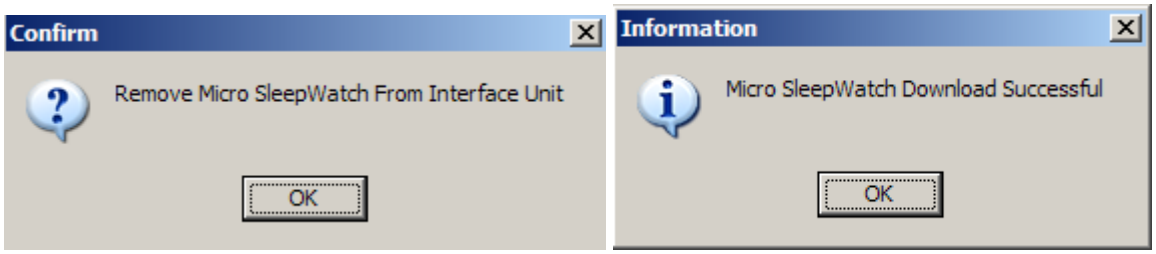
Micro Sleep Watch Data Download

Before starting, make sure that the status line at the bottom of the screen indicates that the Micro Sleep Watch actigraph type has been selected. Place the Micro Sleep Watch in the interface as described earlier.

When downloading a Micro Sleep Watch Actigraph select the Actigraph: Download menu item or simply click the button. After a few seconds the Actigraph will start downloading automatically (see the figure below). Remember that the data is traveling at 4800 baud. This means that it could take several minutes for a full download. So be patient. One can watch the progress of the download on this form or stop the transfer by clicking the Abort button.

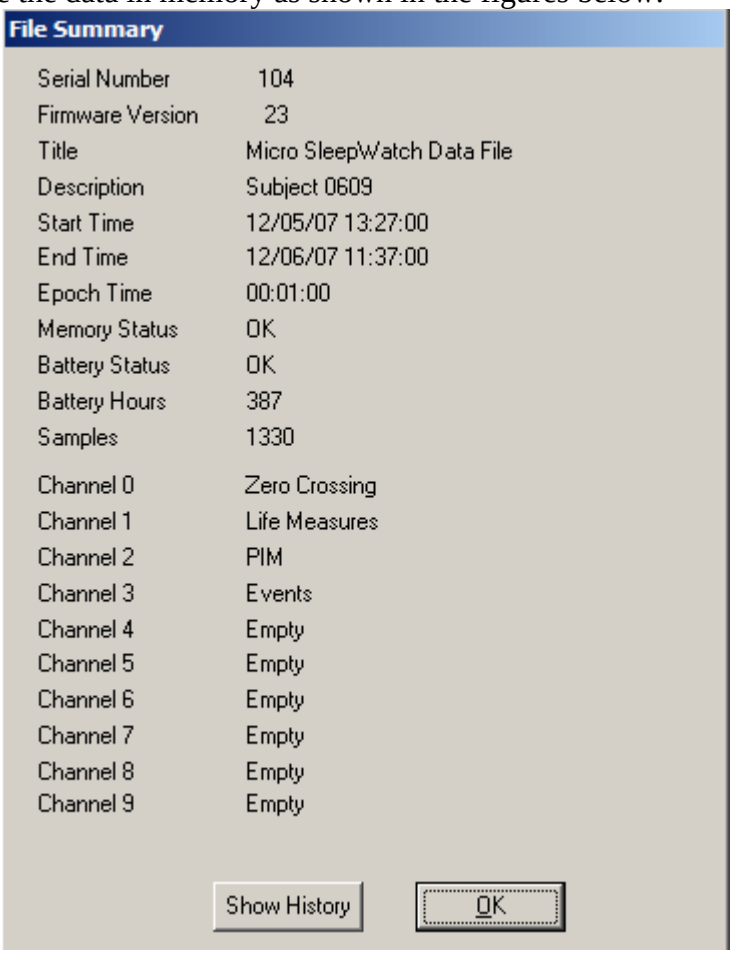


When the Micro Sleep Watch download is successfully completed, the following message prompting the removal of the Micro Sleep Watch from the Interface Unit will be displayed:

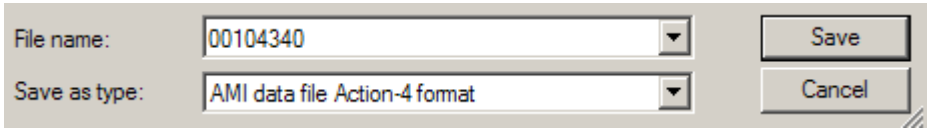


Please note that the Micro Sleep Watch loses time when in the interface during data retrieval and for any time period left idle in the interface. Interim data examination is discouraged for this reason unless the actigraph is going to be re-initialized.

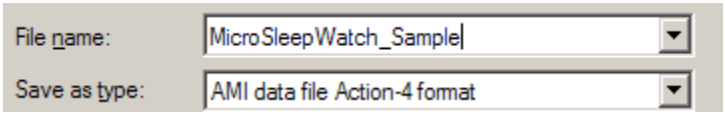
After a successful download, one will be presented with the downloaded data summary prompted to save the data in memory as shown in the figures below:



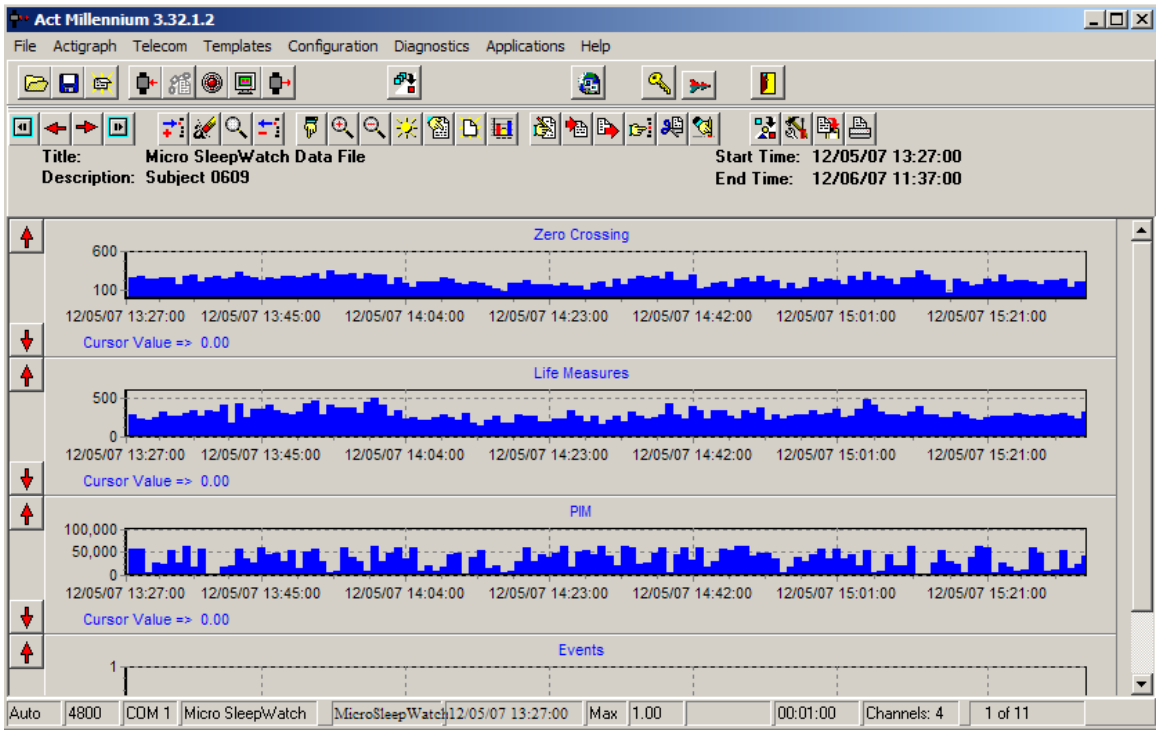
ActMe offers a default file name to either use or overwrite with one of your own choosing. The default file name is composed of the Micro Sleep Watch serial number and the Julian date (1-366) of the download. Use the default **AMI data file Action-4** format in order to properly interface with all AMI analysis software.



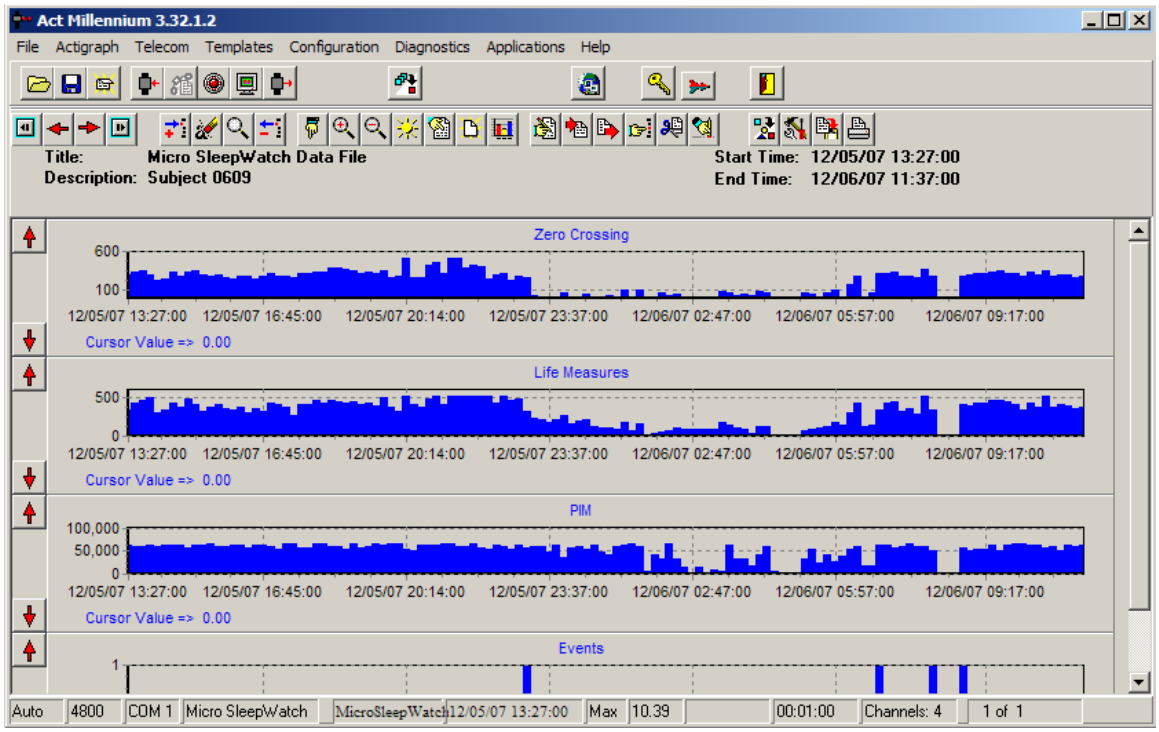
or



After completing the download process, a graphical representation of the data is presented as shown in the figure below.



Click the SUN icon to display one 24-hr period of data per page.

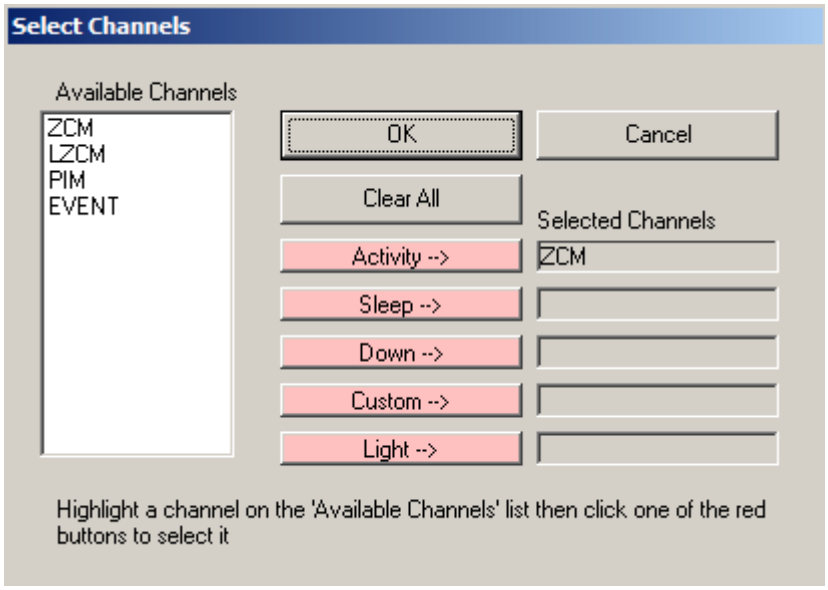


Introduction to Data Analysis using ActionW

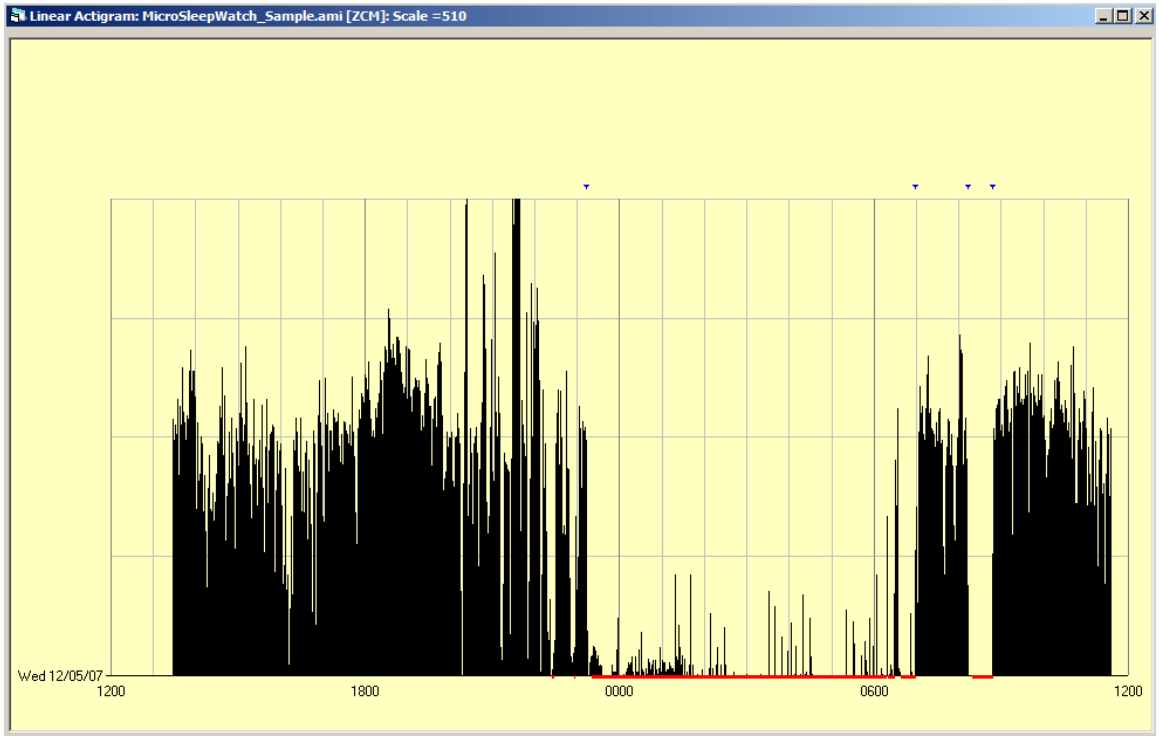
The graphics within ActMe have limited capabilities and are provided for the purpose of performing an initial inspection of data only. This allows the user to verify that a proper download has been accomplished before reinitializing the Micro Sleep Watch. This is important since initialization is the one process that will clear the memory of the Micro Sleep Watch.

For more in depth analysis the user is referred to ActionW or Action4 software programs from Ambulatory Monitoring, Inc. ActionW is a clinical sleep scoring package which allows swift analyses of the types of interest to sleep laboratories. Action4 is a research level software package. Action4 also allows sleep scoring of actigraph data but has additional features particular to circadian rhythm analysis as well as a multi-channel display.

ActionW displays only a single channel of activity at a time. So the user must chose the activity channel for analysis when the program opens:



ZCM is typically the channel used for sleep estimation. Below is a typical plot including one sleep period. Sleep scoring appears in red below the histogram and event marks are the small blue triangles above the histogram. See the ActionW manual for more information.



ACT Millennium Diagnostics

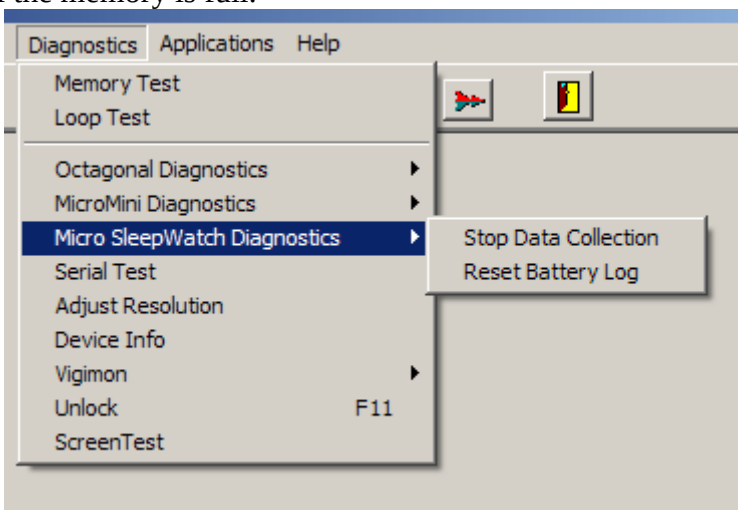
Except for functions specifically designated in this manual such as the Stop Data Collection, diagnostic features should not be used without consultation with AMI technical staff.

Checking the Micro Sleep Watch Battery Log

Whenever a Micro Sleep Watch is downloaded the device Header Information is presented. Battery Runtime Hours is a field presented in that header. Alternately, the latest downloaded data file has the Battery Runtime Hours at the time the Micro Sleep Watch was downloaded. This information is presented whenever a saved file is opened. Any time a file is open the information can be displayed via the File/Summary command.

Conserving Battery Power using "Stop Data Collection"

In order to place the Micro Sleep Watch into a power conservation one must re-initialize the Micro Sleep Watch with a "Stop Data Collection" mode of operation after one has successfully retrieved collected data. Otherwise data collection will continue, utilizing the battery, until the memory is full.



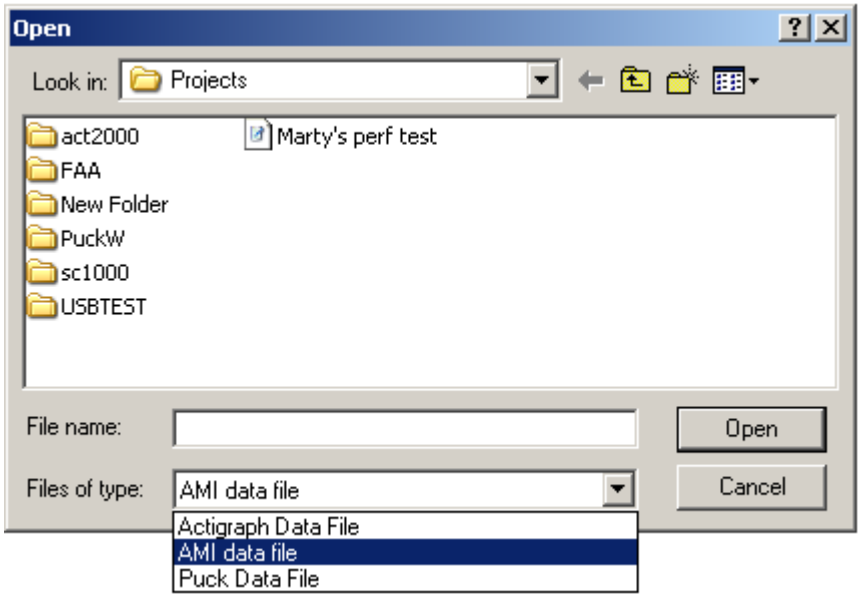
More ACT Millennium

File Submenu

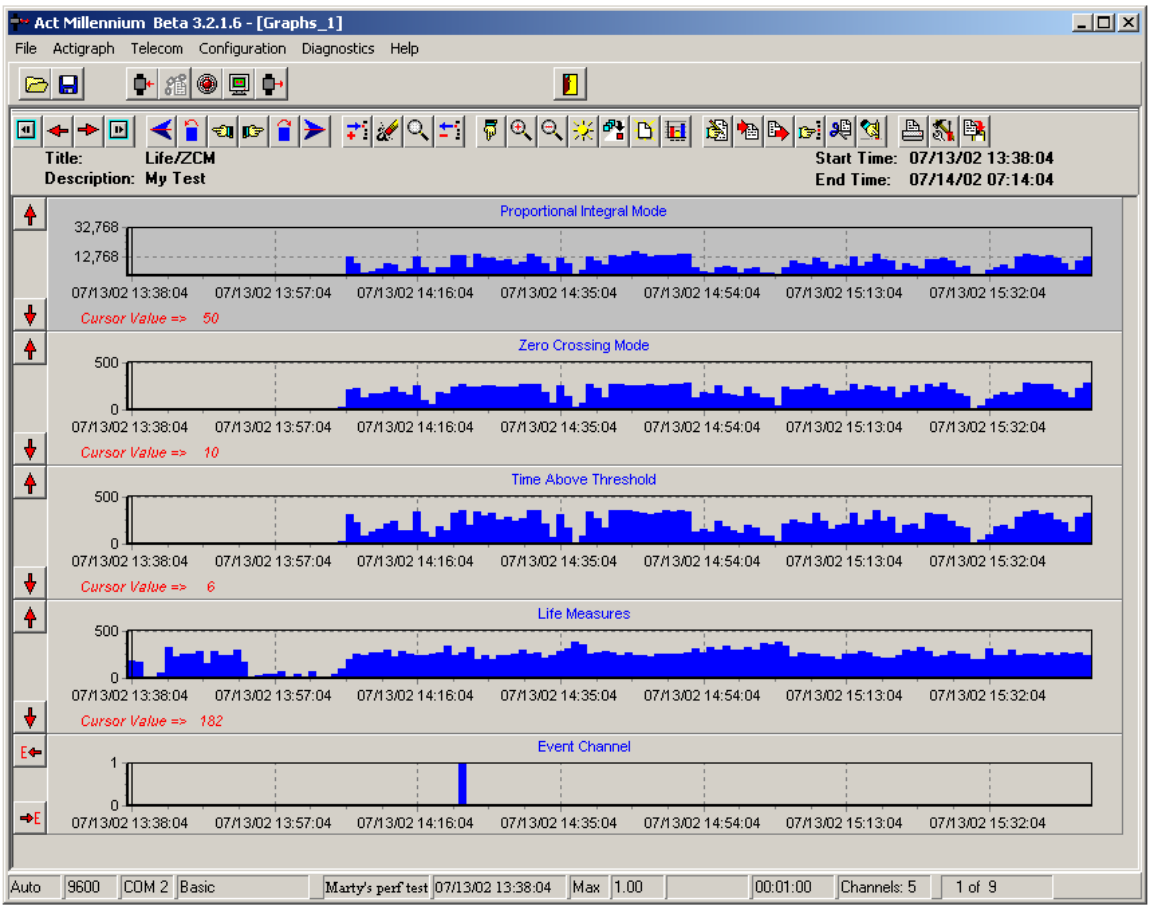
The File submenu contains items that permit one to open, save, and print Actigraph files. An exit item is also included in this submenu to leave the program. Actigraph submenu contains items that permit one to initialize and download Actigraphs. The Telecom menu permits one to have direct communication with the Actigraph (this feature does not apply to the Micro Sleep Watch). The Configuration menu permits one to make various ACT Millennium setup changes such as Baud Rate, Communication Port, Actigraph type, and Interface type. The Diagnostics submenu contains items that permit one to perform testing operations on the Actigraph and Interface Unit.

Opening a File

To open a file with ACT Millennium, simply select File: Open from the menu or click the button from the Toolbar. An Open dialog box as shown in the figure below should appear which will permit one to choose a file to open. Notice that the option of changing the file type. Currently ACT Millennium supports DAT and AMI file formats. One can either double-click the desired file or single-click it and click the Open button on the dialog box to open the file.

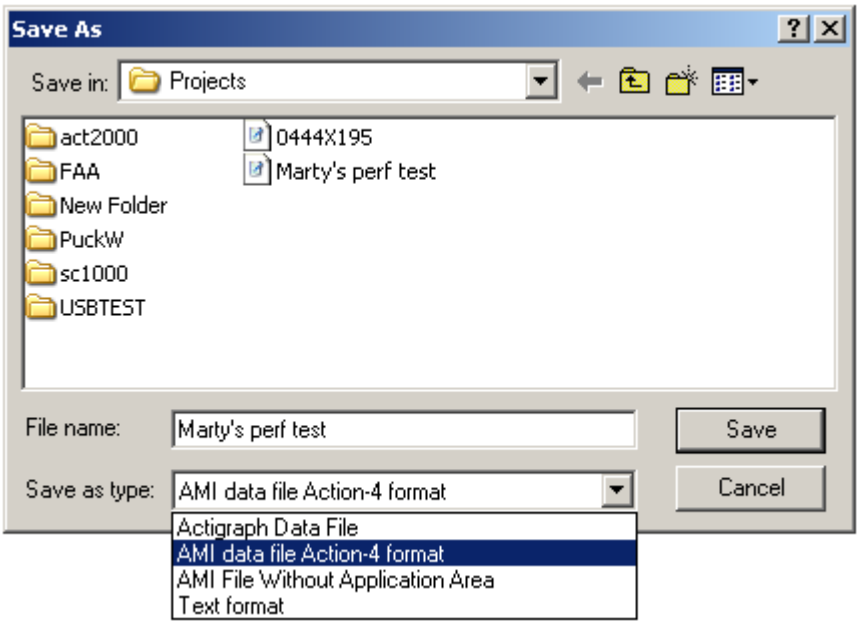


Upon the successful opening of an Actigraph file, ACT Millennium will display a graphical representation of the data as shown in the figure below.



Saving an Motionlogger File

After downloading or opening an Actigraph file, one can save it by selecting the File: Save menu item or by simply clicking the button on the Toolbar. ACT Millennium responds by displaying the Save As file dialog window as shown in the figure below.



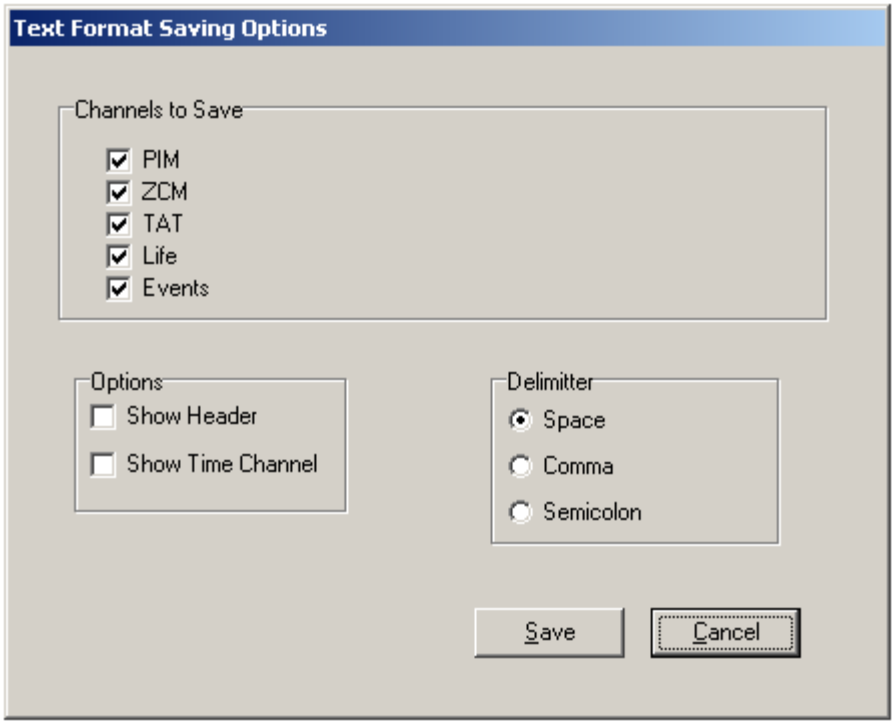
As with the Open file dialog window, one has the choice of selecting one of the following ways to save a file:

* DAT file format
* AMI file format
* Text file format

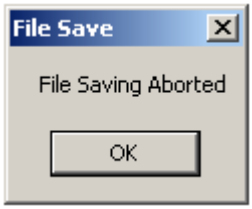
The DAT file format is the original unpacked file format used by Ambulatory Monitoring, Inc. It is an obsolete format and is retained for compatibility with older software.

The Text file format permits the user to store Actigraphy data as ASCII text. This is useful for exporting Actigraphy files into analysis packages such as MathCad or Excel. Upon selecting the Text format ACT Millennium displays the form as shown in the figure below.

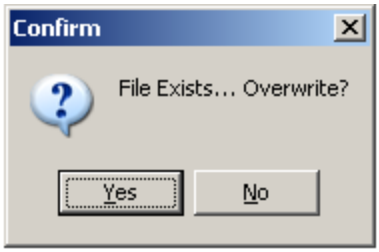
This form permits the user to choose which Channels to Save, Options and which data delimiter to use.



Click on the Cancel button to abort the saving process. The following message will be displayed as shown in the figure below.

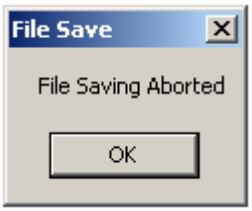


By clicking on the Save button one will be saving the Actigraphy data as a text file. If the file already exists the following message will be displayed as shown in the figure below.



Clicking the Yes button will overwrite the existing file and the following message will be displayed as shown in the figure below.

Clicking the No button will abort the saving process and the following message will be displayed as shown in the figure below.

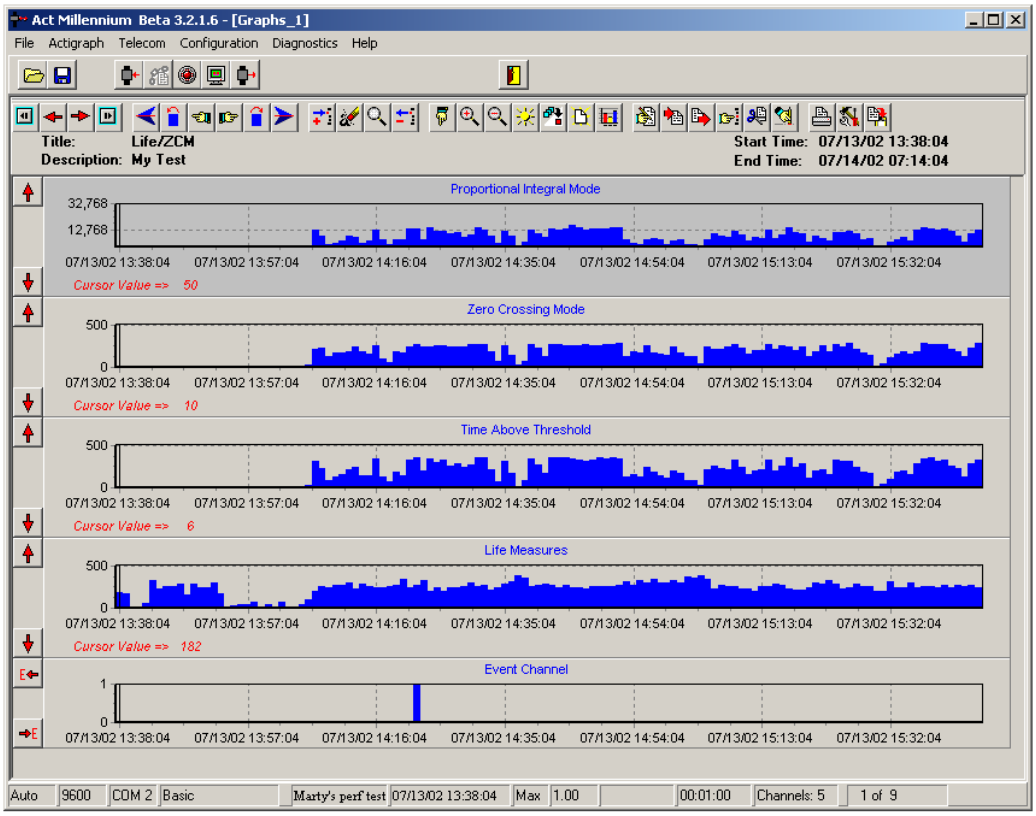


ACT Millennium Graphics

Upon successful data download or after loading a file, a graphical presentation of data will appear on the computer screen. These graphics are designed to allow the user to visually inspect data. For in-depth data analysis, the user is directed to Action-W for (clinical sleep studies) or Action4 for circadian or more general statistical and mathematical processing.

To illustrate the capabilities of the graphics in ACT Millennium, open the sample file SAMPLE.DAT included in the installation.

Click or select File: Open and choose SAMPLE.DAT. After presenting header information from the selected file, the graphical presentation will appear.

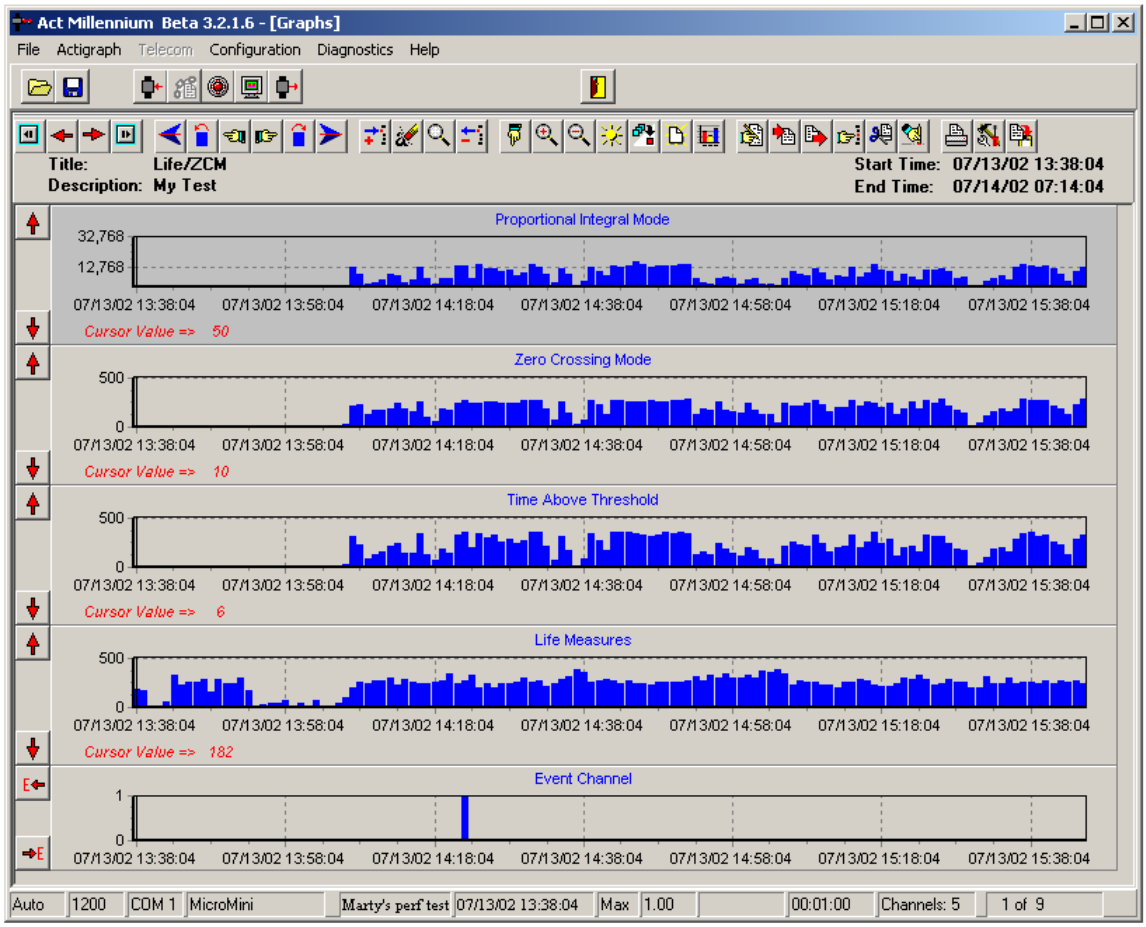


To the left of the graph are four values associated with the data at the current cursor position. The cursor is the thin black vertical bar that appears in each graph and which responds to mouse clicks by moving. Cursor navigation will be discussed in a later section. At the top of the graph the Mode, Serial number, ID, Start Time, End Time, Epoch Length, Event mode and Compression are displayed as the heading.

Notice that we have five separate graphs displayed: Proportional Integral Mode, Zero Crossing Mode, Time Above Threshold, Life Measures and Event Channel as shown in the figure below.

Notice that the first four graphs have the and keys. These buttons are used for scaling the graph.

One may also notice that the last graph (Event Channel) have the and keys. These buttons are used to search backward and forward for Events.



When compressing data for display onto a computer screen two methods can be utilized. One may display the maximum value of an epoch that occurs within the time range of a displayed histogram or one may display the average epoch value.

By default ACT Millennium limits the initial number of histograms to 128. This means that a day's worth of data would have to be compressed by a little over 11 to 1. (Each histogram would contain 11 epochs). ACT Millennium permits the user to change the number of histograms up to 1024 per page. This sometimes helps with graphic details but will cause slower screen updates and some corruptions to the graph.

ACT Millennium permits one to change the page width, compression technique and compression ratio in order to optimize data viewing. The lower right corner of the heading shows the compression type and ratio that can be changed by simply clicking on them (explained later).

Page Navigation

These keys are used to page through the Actigraph file. The button or the Home key

places the graph in the beginning of the data file. The buttons (Page Up and Page Down keys) permit one to page through the Actigraphy data like one were paging through a word processing document. The button (or the End key) will place the graph at the end of the data file.

Cursor Movement

The cursor is a vertical line associated with each graph used to isolate individual epochs and their values.

The and buttons with the Left and Right arrow keys move the cursor one epoch to the left or right. Notice the cursor time should change in response to the operation. Additionally, the values to the left of the graphs should change as well. These values are the data stored in the epoch at that cursor position. An important note, if one is viewing data that is compressed, the cursor will not move one histogram position per keystroke. If the compression ratio is 2:1 then it will take two key presses to move the cursor one histogram. Remember there is not always a 1:1 ratio between a histograms and epochs. In compressed graphs the Next button provide a faster way of moving cursors.

The and buttons with the <Shift> Left and Right arrow keys move the cursor exactly one histogram to the left or right. This will change the cursor time as well as the cursor values to reflect the new position. If the compression is 1:1, these buttons operate exactly like the previous two (one epoch).

The and buttons with the <Control> Left and Right arrow keys move the cursor 10% of the current graphics window to the left and right. These keys are useful to quickly move the through the graph.

In addition, clicking the mouse on a histogram will cause the cursor to be moved to that location.

Marker Manipulations

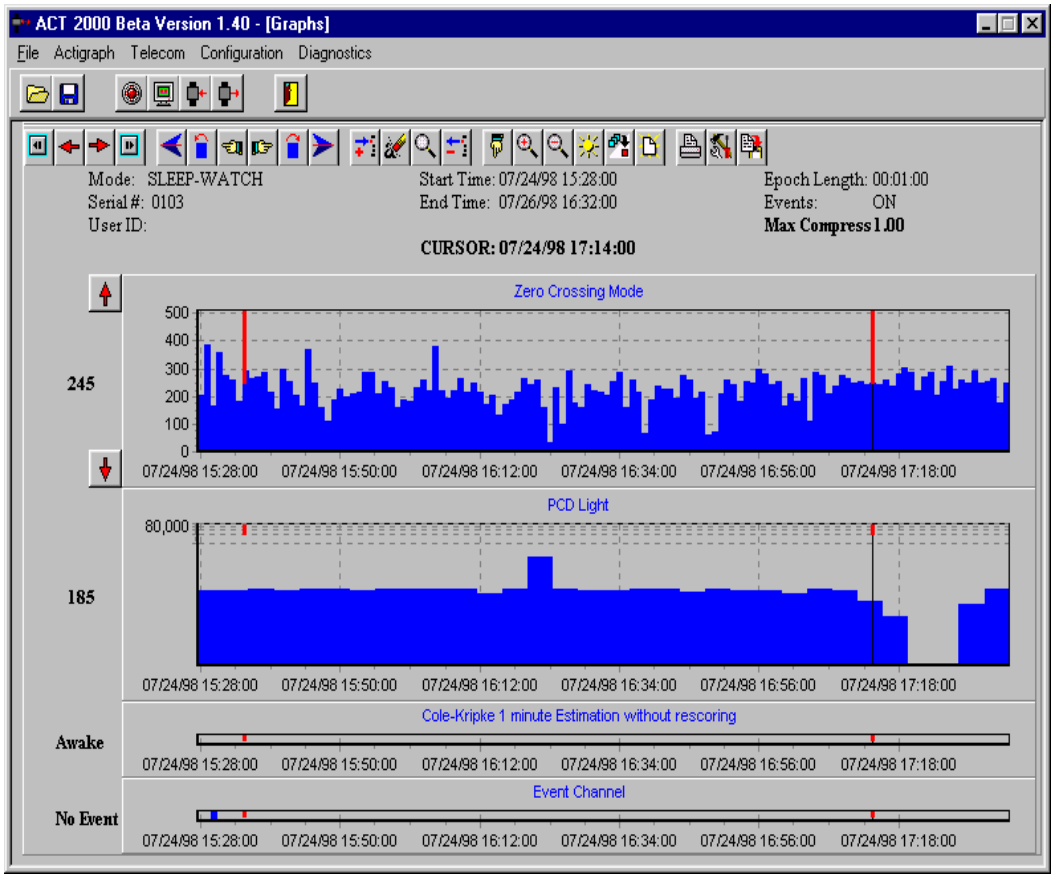
Markers are used to select areas of the graph for later zooming. Red vertical lines extending partially down the graph display markers.

The button or Insert key causes a marker to be placed at the current cursor position. A maximum of two markers can be inserted.

The button or <Control-M> key clears all markers

The button or <Control-Z> keys zooms the graph to the marker values

The button or Delete key causes the marker at the cursor location to be deleted.

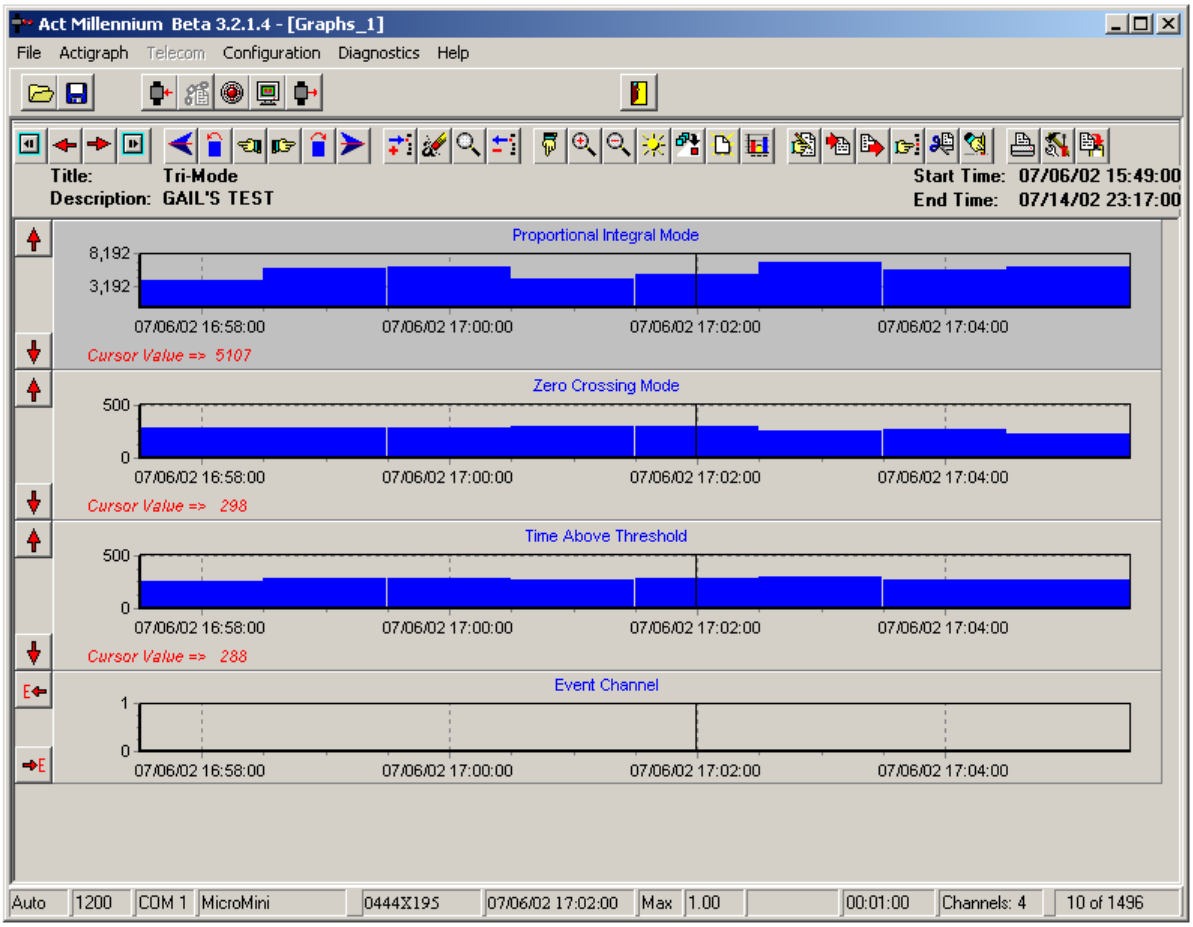


Zooming

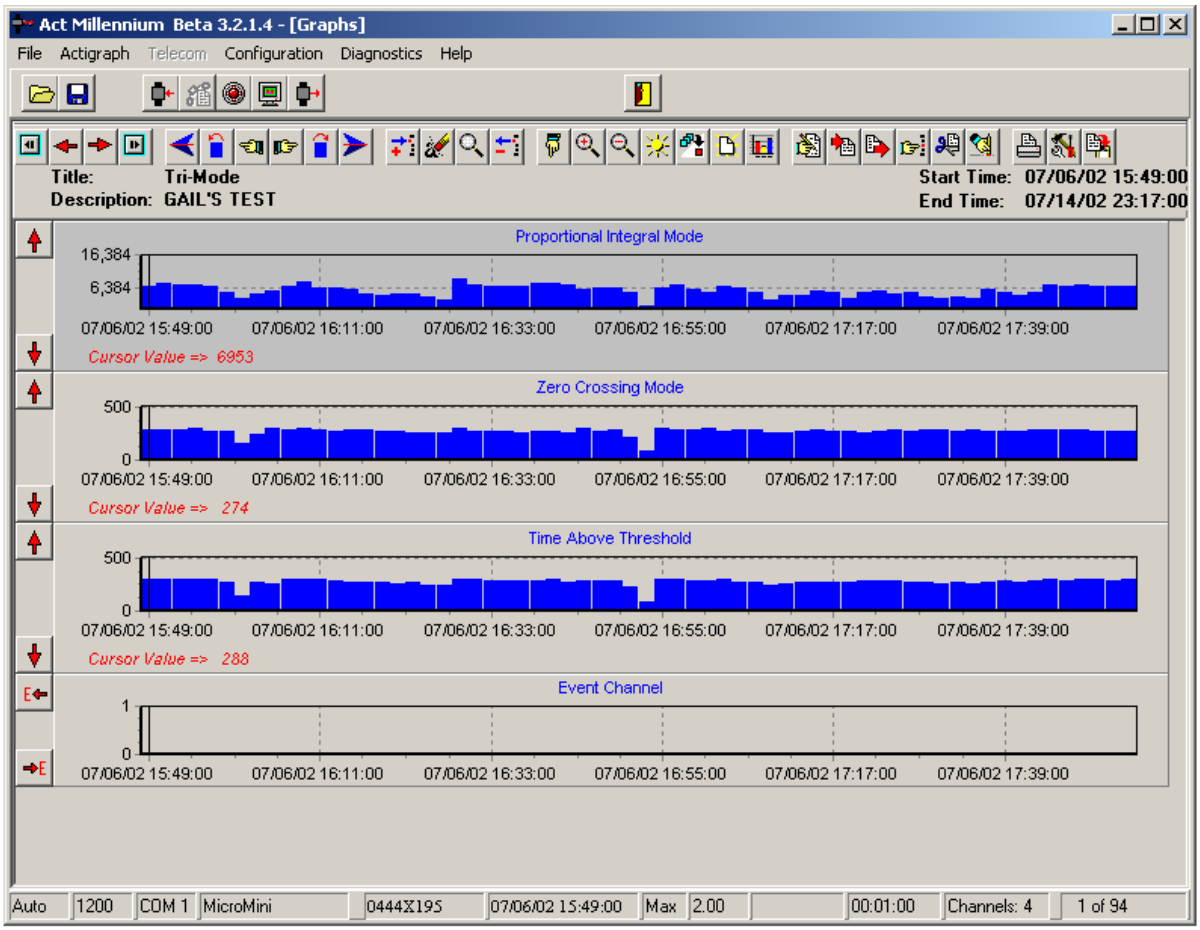
Zooming permits one to change the page size (in epochs) of the graphics screen. The compression ratio gets changed to reflect the current resolution setting (more later).

The button permits one to reposition the start of the page to the location of cursor.

After repositioning, the starting location is now at 7/24/98 16:26:00.

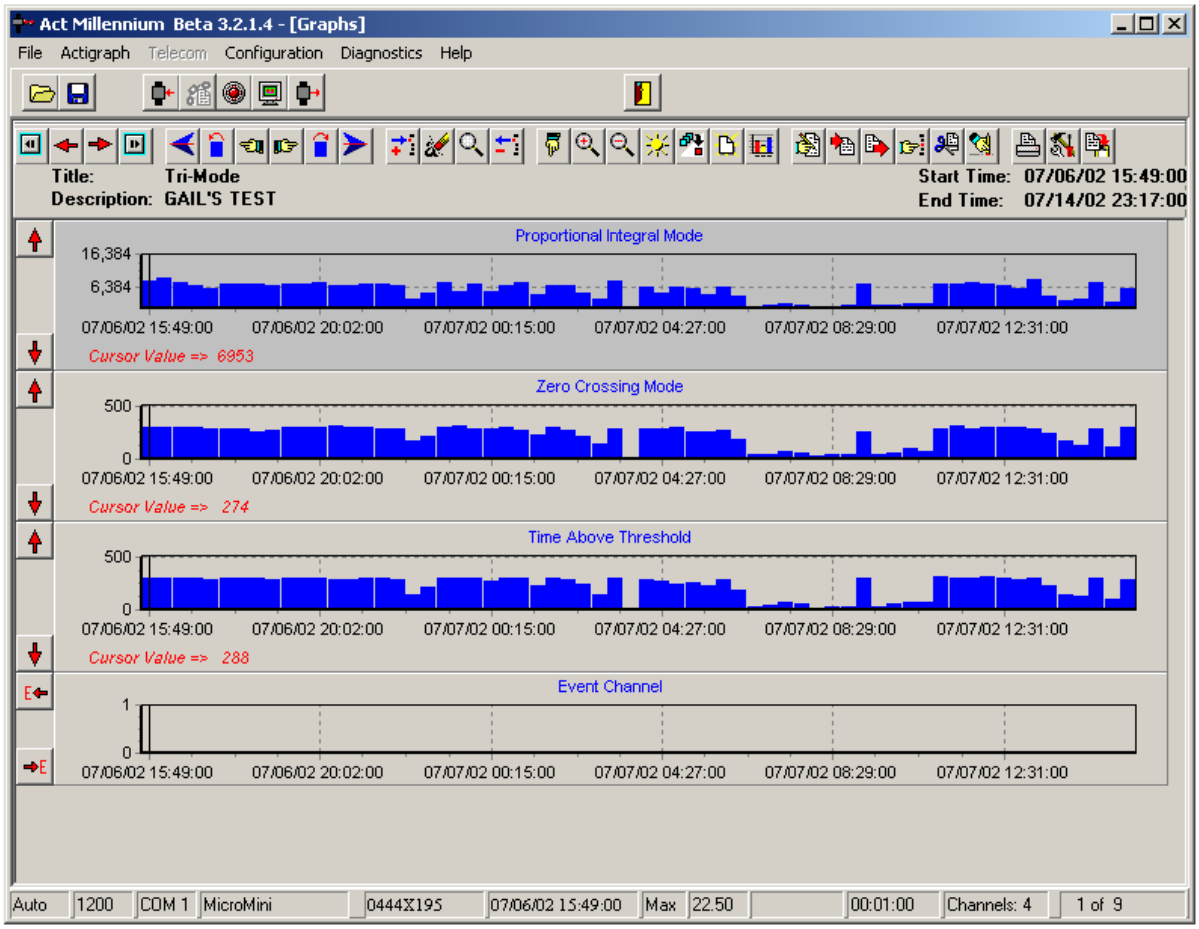


The and buttons with the + and - keys permit one to zoom in and out of graphs by a factor of two. ACT Millennium attempts to center the new graph on the last cursor position. Note that the compression ratio should change based on the number of epochs being displayed.



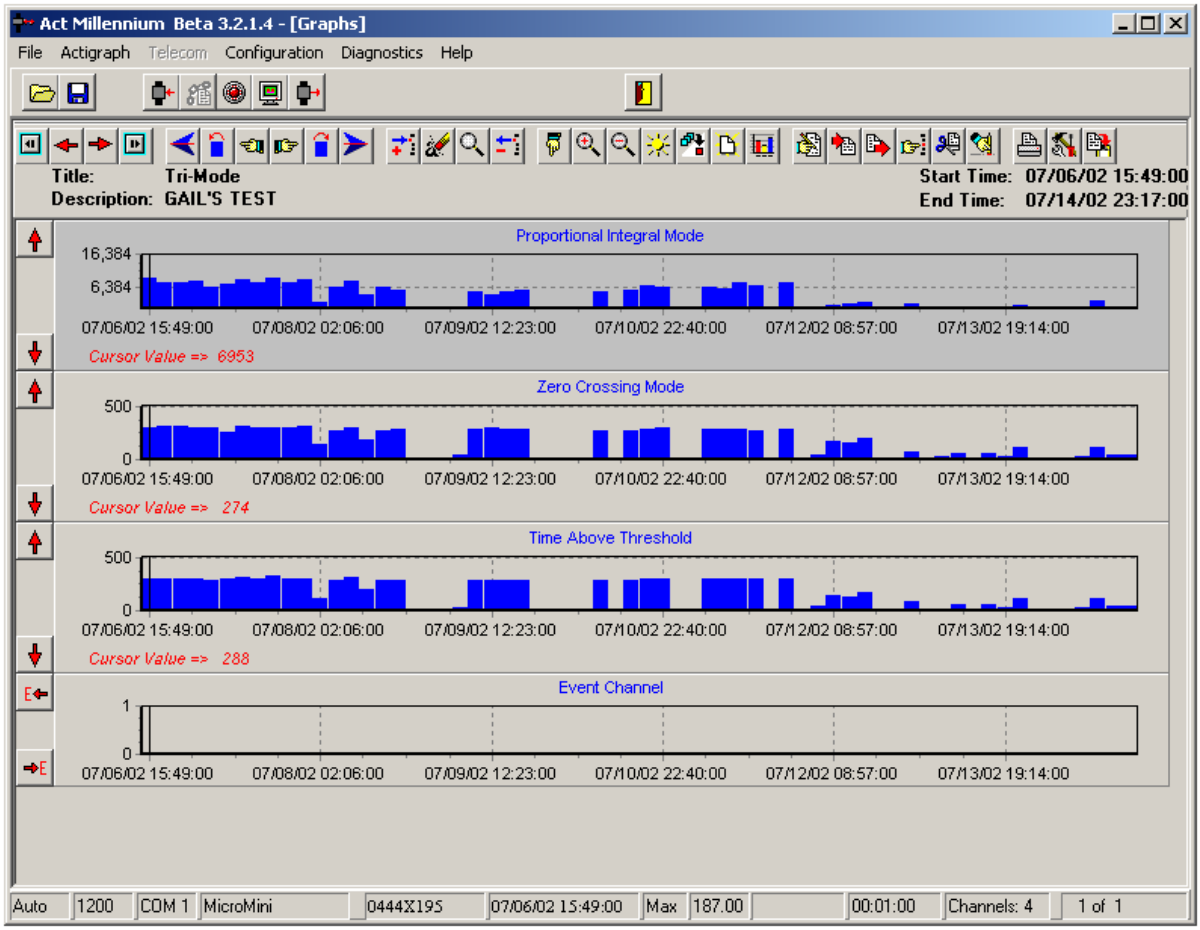
The button or <Control> D keys displays an entire day's worth of data on one page.

Note that the compression ratio has changed due to the increased number of epochs displayed.



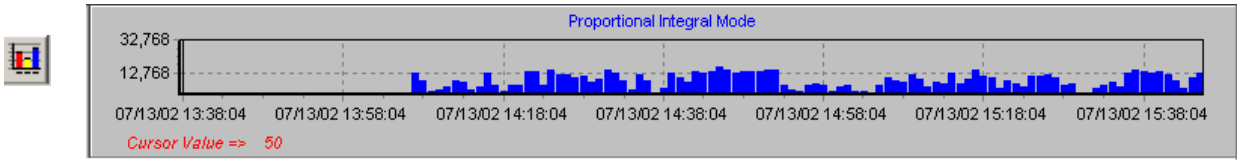
The button with the <Control> V keys permits the user to display all the epoch data on one graph.

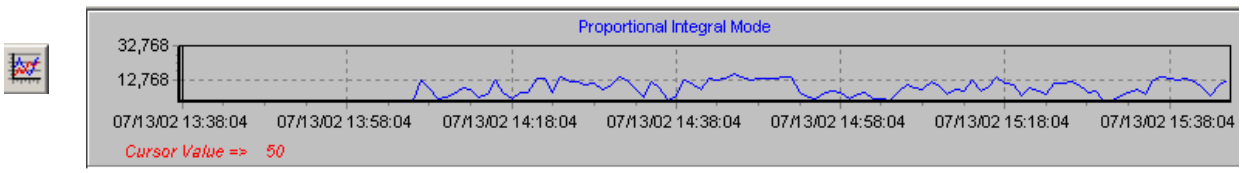
Note that the compression ratio will change based upon the increased number of epochs.



The button with <Control> R simply resets the graph and displays it with original settings (128 epochs per page).

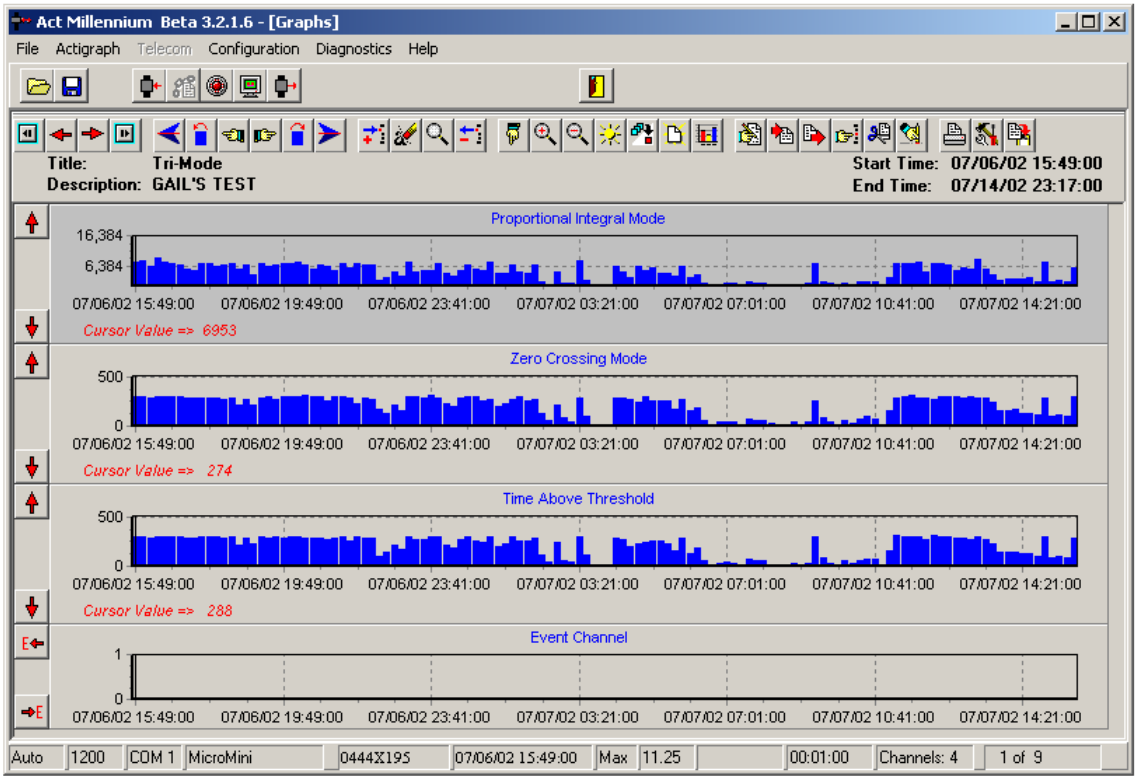
The and buttons permit one to choose which style of graph one want to view.



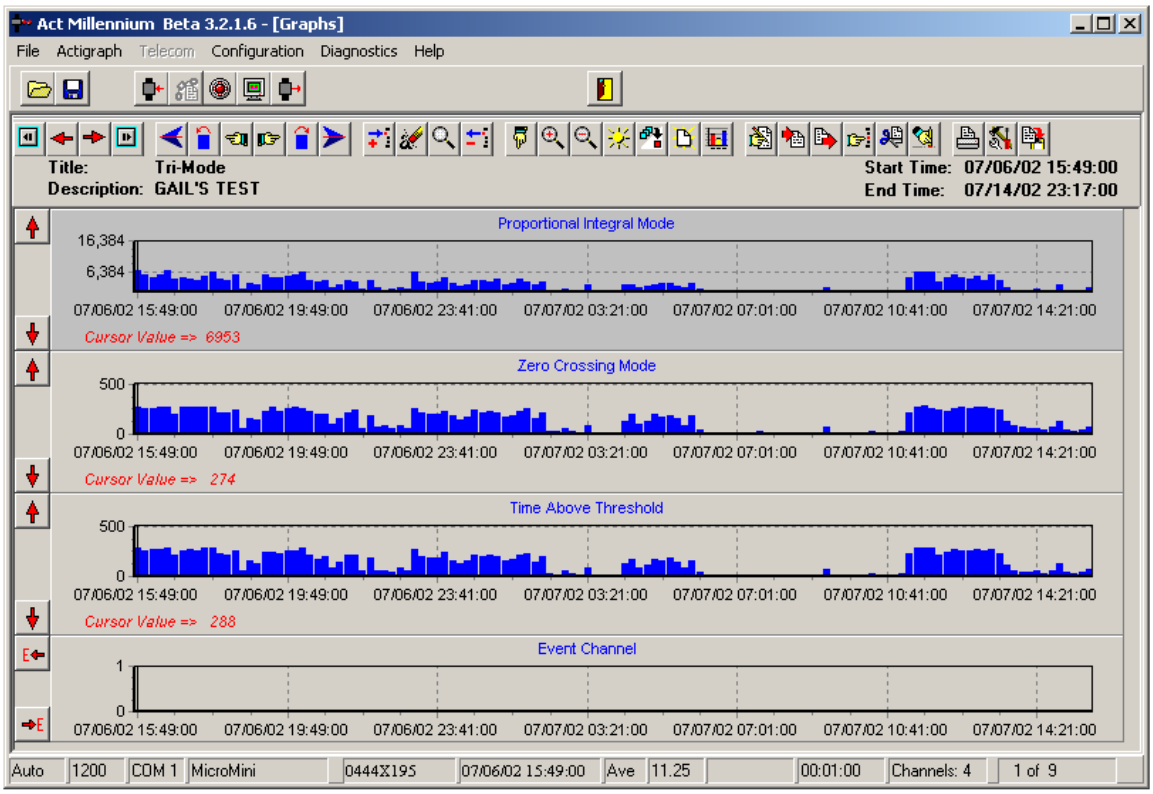


Compression

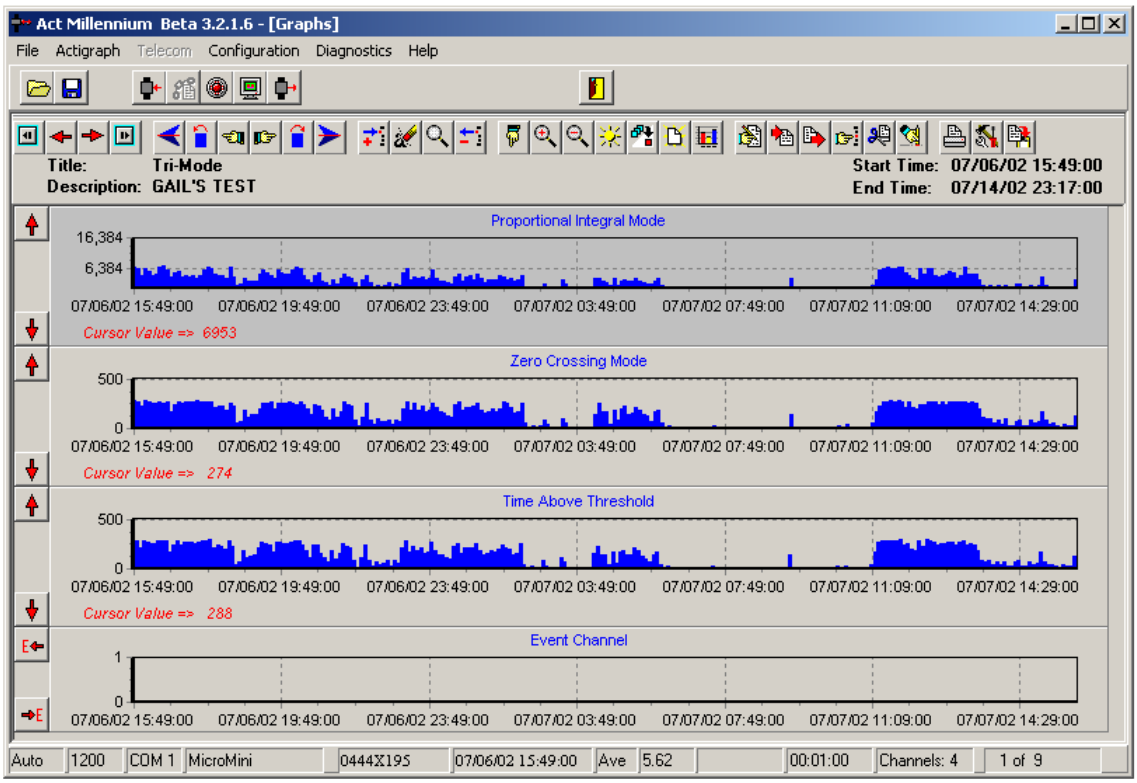
Clicking on the **Max Compress** label located on the status bar will switch the compression mode to average.



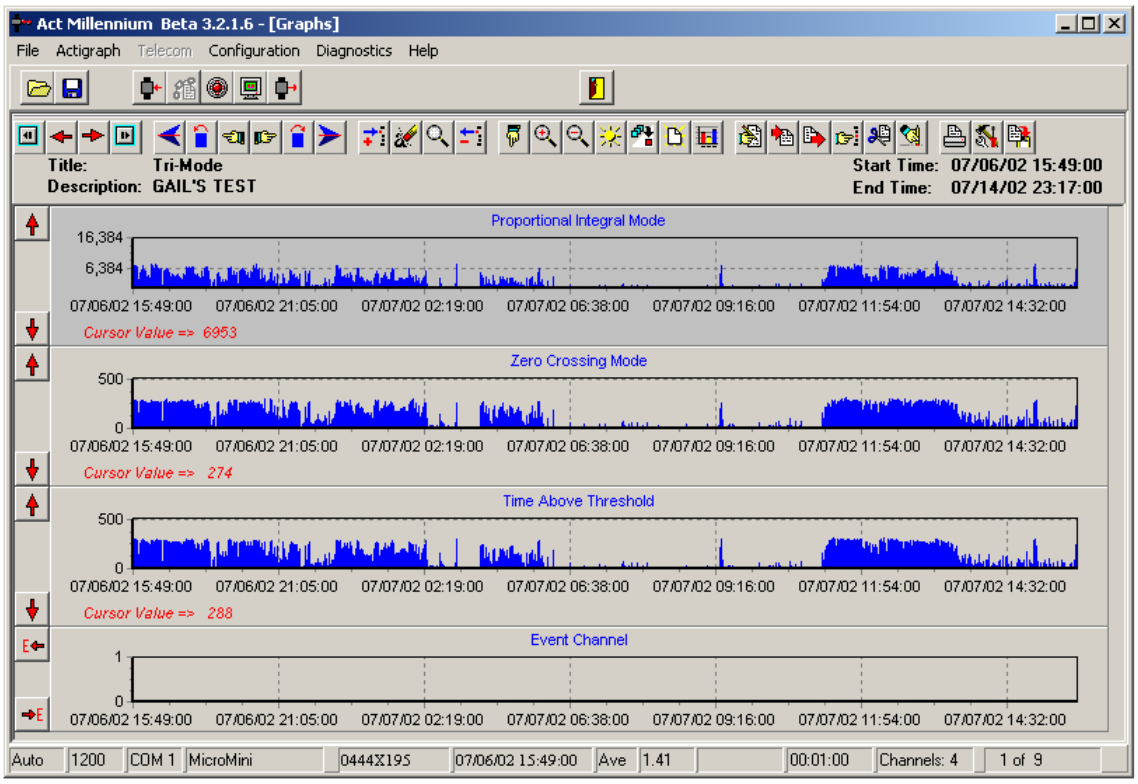
Notice the label now displays Ave Compress as shown in the figure below. The overall graph appears to have lower values since we are now using average values rather than maximum values to compress our epochs.



Pressing the compression value label (11.25) will double the number of histograms displayed as shown in the figure below.



Now we are using 256 epochs per page, the compression ratio has dropped to 5.62. One can see that the graph looks a little rough. This is because the histograms are overlapping each other. Clicking the ratio label 2 more times for the finest resolution (1024 epochs per page) as shown in the figure below.



Clicking on the ratio label (now 1.41) will restore the graph to full compression (11.25).

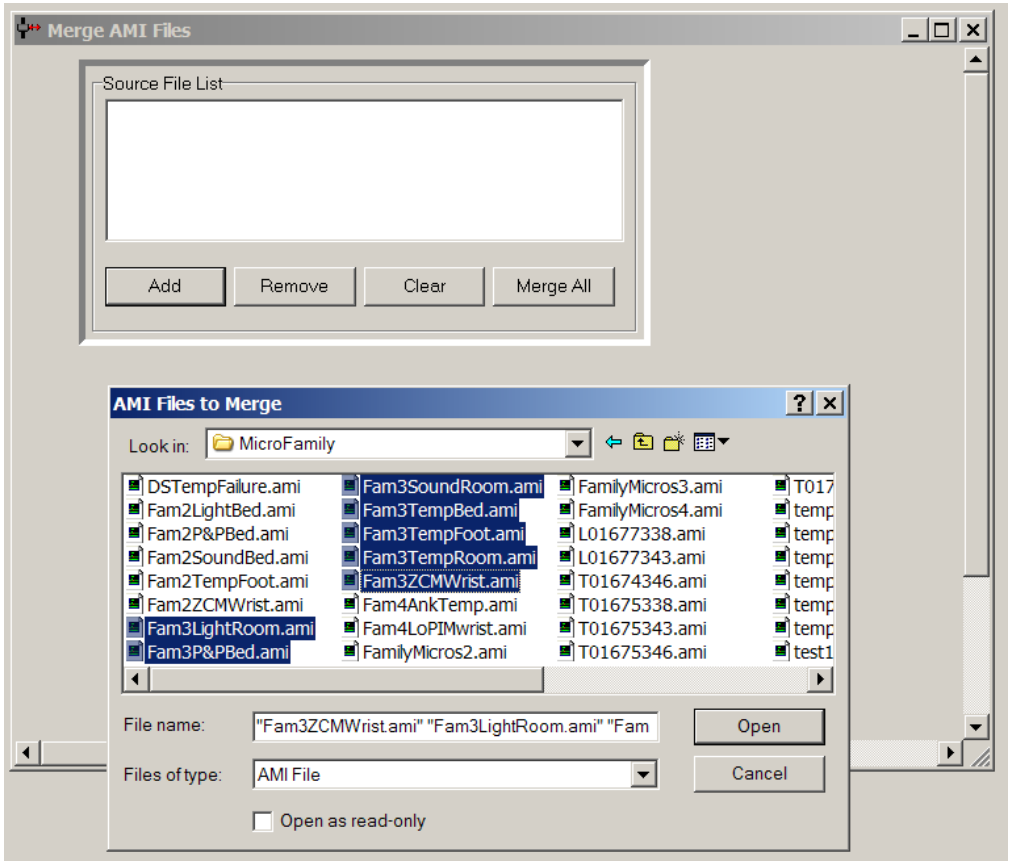
Printing and Copying

The above Icons represent, respectively, print, print setup and copy to clipboard. These functions should be self-explanatory to Windows users. For further explanation please consult the Windows manual.

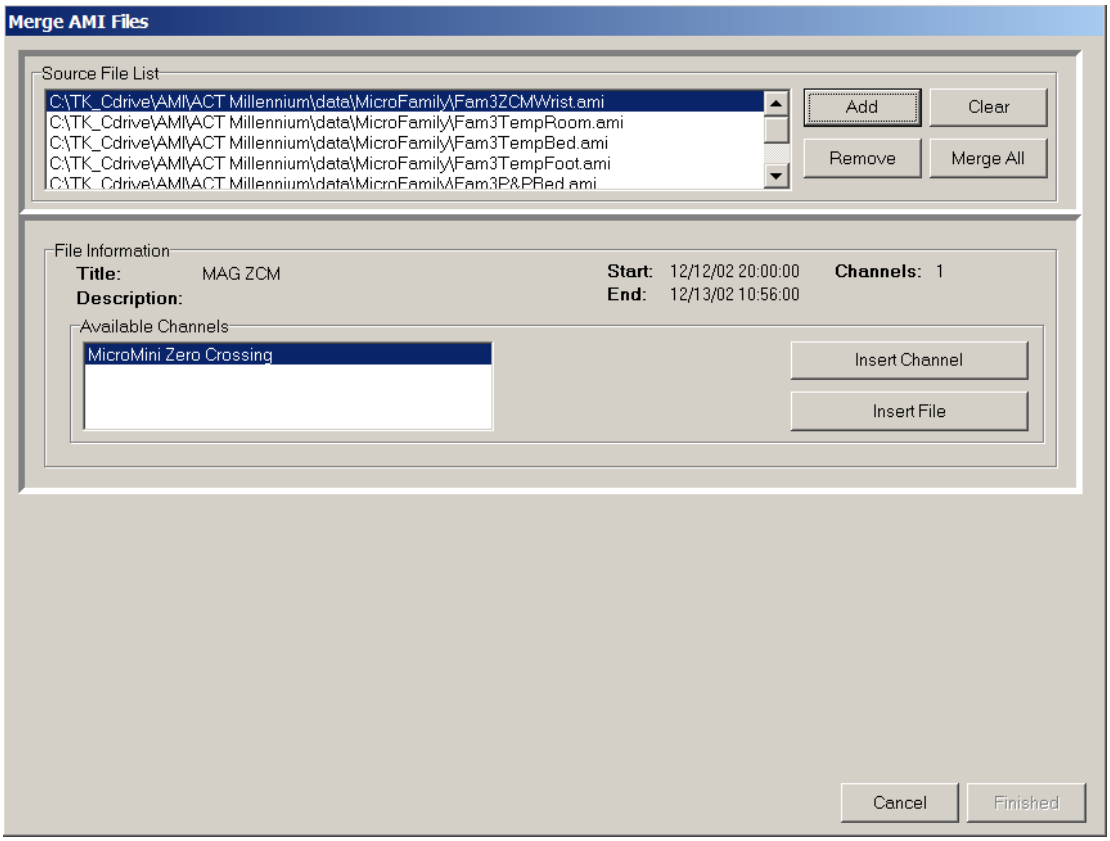
AMI File Merging

This feature in ActMe allows multiple AMI files to be merged into a single AMI file in a single step. Action4 analysis software also has file merging capabilities but is limited to merging two files at a time. A typical application of this feature applies to the Family of MicroMini Single Channel sensors which, to date, include actigraphy, temperature, light and sound recorders.

In the following example, 7 MicroMinis were initialized with the same start time. A Motionlogger MicroMini actigraph was initialized in Zero Crossing mode and worn on the subject's wrist in order to assess sleep. A second MicroMini was initialized in the high sensitivity HiPIM mode and placed under the subject's mattress to record time in bed (sometimes referred to the "Princess and the Pea" method for determining time in bed). Two temperature sensors were placed on the ankle (one with sensor facing the skin, the other outwards) and a third on the nightstand. These recorded distal skin temperature, bed temperature and ambient room temperature, respectively. Also on the nightstand were light and sound recorders for the purposes of assessing the subject's sleep hygiene. All seven sensors were subsequently downloaded and named in a manner so that they would be easily recognized as belonging to this group. After each recorder was downloaded the "Merge AMI Files" command was selected from the file menu. The "ADD" button allows the user to select files. Because the files were similarly named it was easy to use the "Click" and "Shift Click" mouse combination to select ALL the files in the group as seen below:

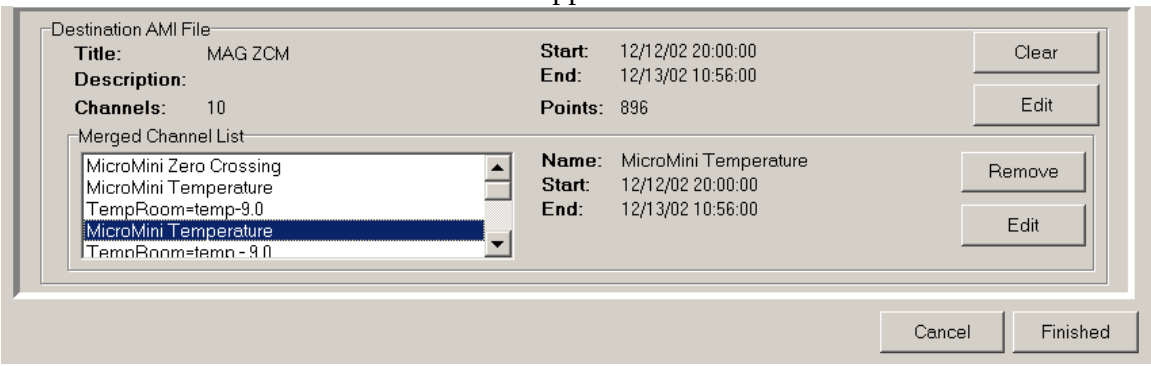


The data paths for the selected files are then indicated in the "Source File List" window as seen below:

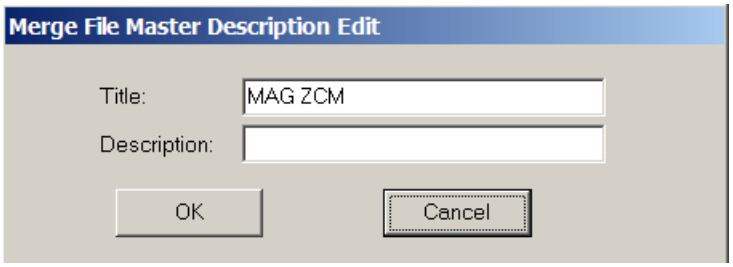


One can highlight any of the files in the Source File List window and see the channels contained within that file in the "Available Channels" window as seen above. Selecting "Merge All" in the upper right corner allows the user to quickly merge all channels of all files. However by highlighting individual files in the Source File List and then using the "Insert Channel" and "Insert File" buttons one may customize the contents of a merged file and the order that the channels are presented.

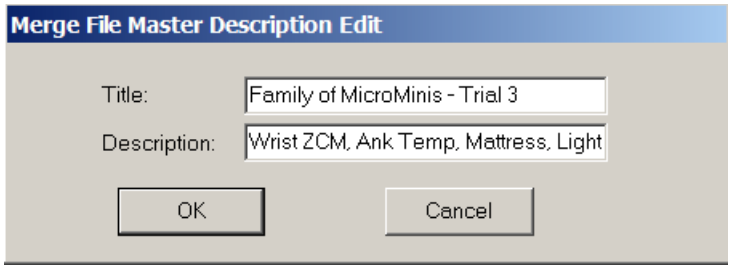
Next a Destination AMI file window will appear as seen below:



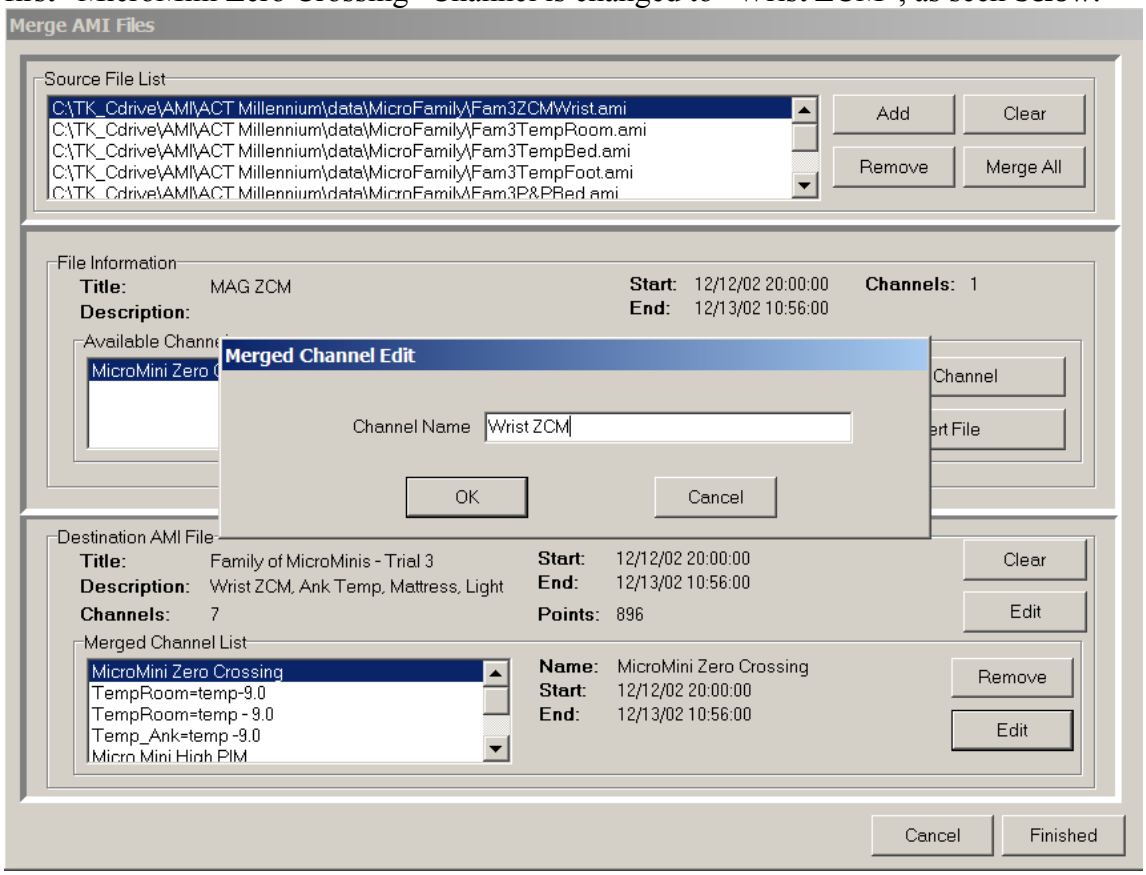
The default description is taken from the first channel in the Merged Channel list. To modify the file description click "Edit" button next to the file information.



Enter a new title and description for the merged, for example:



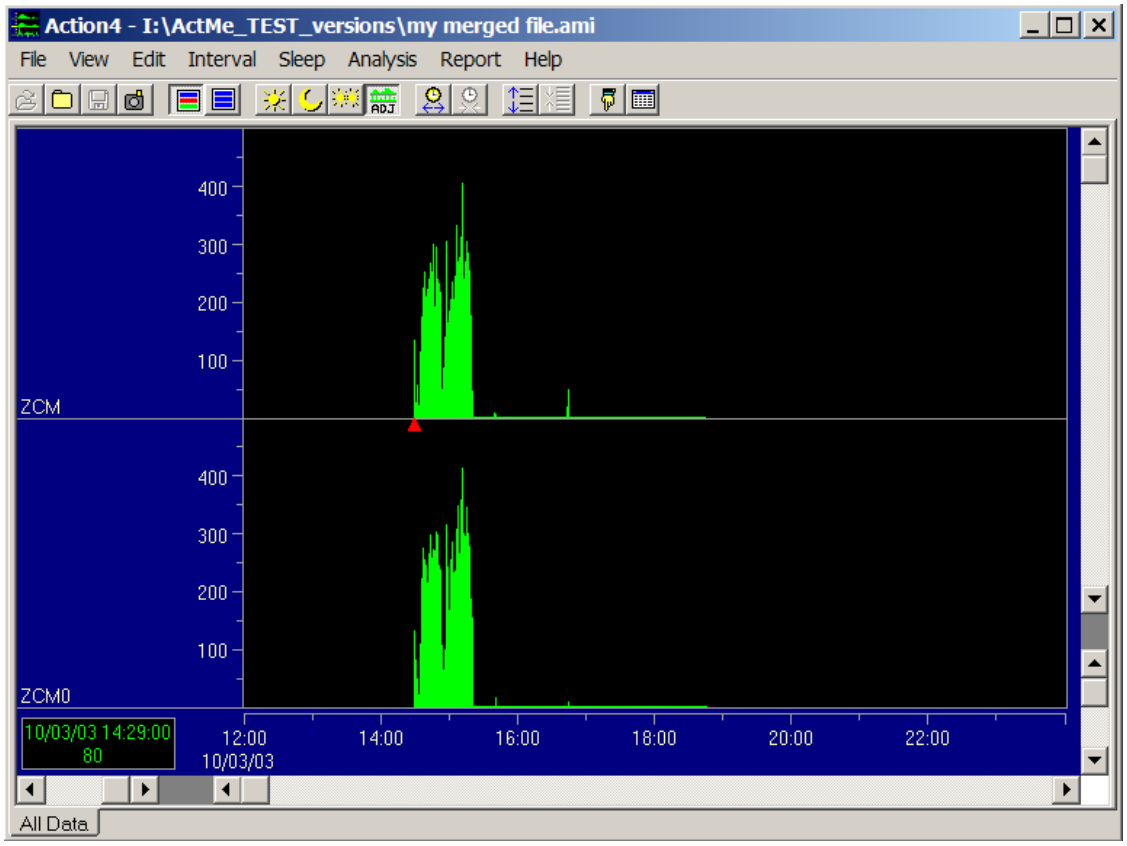
In a similar fashion descriptions of individual channels may also be edited. Below, the first "MicroMini Zero Crossing" Channel is changed to "Wrist ZCM", as seen below:



When one is satisfied with all the channels and descriptions choose "Finished." One can save the file immediately, later or not at all.

Viewing Merged Files in Action4

When ActMe merges files containing the same type of data channel (for example two files each containing a channel of Zero Crossing information), it changes the short channel name that Action4 uses to prevent conflicts. Action4's merge feature assumes channels with the same name should be appended to each other (in the case where time frames are the same the channels will overwrite each other in the order they are merged). Only channels with different names are presented separately. So in the example just mentioned, ActMe modifies the last character of the channel name that Action4 uses (ZCM, and ZCM0) as seen below:



Channel names may be further modified within Action4 from the Edit menu, or by clicking in the panel containing the channel name.

Drag & Drop and "History" Convenience Feature

When using Windows Explorer one or more files may be highlighted (by clicking, or Ctrl-click, or Shift-Click) and then dragged into Act Millennium. When a single file is dragged to the main window, it is simply opened. When multiple files are dragged to the main window, ActMe assumes that the user wishes to merge the files. Similarly, one or many files may be dragged from Windows Explorer into the source file list if it is already open. Clicking "History" in the source file list presents a list of files saved within the last session of ActMe.