CleveMed

Cleveland Medical Devices Inc.

User's Guide

for

RatPaak®

RatPaak™ Users Guide

Part Number: TBD

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Chapter 1: Introduction

About RatPaak™

The RatPaak™incorporates state-of-the-art wireless technology for viewing and recording physiological signals such as electroencephalogram (EEG), electromyogram (EMG), electrocardiogram (ECG), or electroculogram (EOG), in small laboratory animals, weighing 100 grams or more.

This two-channel general purpose signal monitor is the most unobtrusive, flexible, and convenient way of measuring and transmitting physiological signals. Subjects can now be untethered. This allows behaviors such as feeding, nesting, sleeping, and sexual activity to be observed without having the animal wired to a cage. The remote monitoring and real-time data viewing capabilities of the RatPaak™ offer new opportunities for researchers and scientists in the wireless monitoring of lab animals.

The RatPaak™ wireless physiological signal monitor consists of a Transmitter, a Receiver Assembly (the receiver, receiver cable, and power supply), accessories (mounting band, screwdriver, batteries, and harness), and a PC Operator Interface Software program. The integrated transmitter is compact enough that it can fit comfortably on rats and other small animals without impeding their activities. The RatPaak™ transmitter weighs about one-quarter of an ounce and can transmit signals to a nearby receiver up to a distance of 50 feet.

The RatPaak™ collects signals from wires attached to the subject, performs analog-to-digital conversion, encoding, formatting, and transmitting of all signals. The signals are communicated using a 902-928 MHz radio transmitter. Over one hundred transmitters can be used in the same area without interference with one another. The Receiver Assembly receives the transmitted data packets, performs extensive error detection and correction, and then sends the data through a Receiver cable to the PC Operator interface where data can be stored, monitored in real time, or analyzed at a later time.

The RatPaak™ Capture program consists of several software components which allow the user to acquire, store, view, and export physiological data as acquired by the RatPaak™ Transmitter. The software provides a simple graphical interface for setting up and controlling data acquisition. In addition, several functions are available to allow data acquired from the RatPaak™ Transmitter to be used in other software applications, such as Matlab®, LabView™, and Excel. Programmability at the time of manufacture allows various applications to be integrated into one system, allowing Cleveland Medical Devices to customize the number of input channels, sampling rates, filters, gains and RF frequencies according to your research needs.(is this correct?) As a flexible research tool by design, the RatPaak™ offers a new, low cost monitoring solution for unrestrained animals, simplifying traditional monitoring applications.

This device is not FDA approved to market and is available for non-medical use only unless it is to be used in an IRB approved program

Package Contents and Warranty Information

Cleveland Medical Devices Inc. thanks you for your recent product purchase. For your benefit, we recommend that you record the pertinent details below. If necessary, this information will allow us to better serve your needs. We highly recommend that you staple a copy of the sales receipt to the blank pages in the back of this manual.

Please check to make sure your kit has the required components and record the requested data:

S/N: _____ ❒ Transmitter
S/N: _____ ❒ Receiver
❒ Receiver data cable (3 feet)
❒ Serial cable for extension (9 pin - 9 pin, 6 feet)
❒ 9-volt battery adapter wire plug
❒ AC Power adapter for Receiver
❒ Three #675 batteries
❒ Adjustable Velcro Mounting Band (36")
❒ Screwdriver
❒ Harness
Ver: _____ ❒ BioRadio Capture Installation Software (1 CD)
❒ User's Guide, this document
❒ Warranty Form

Date of Purchase: _____

Minimum System Requirements

- Personal computer with Pentium™/MMX™ 200 MHz or higher processor (or equivalent);
- Microsoft® Windows 95, Microsoft Windows 98, or Microsoft Windows NT Workstation version 3.51 or higher;
- 16 MB of installed memory for use on Windows 95 or Windows 98, 32 MB for use on Windows NT;
- Minimum 50 MB free hard disk space (100 MB recommended);
- One 3.5" high-density floppy disk drive;
- VGA or higher resolution video adapter (SVGA 256-color recommended);
- Mouse or other pointing device;
- One free RS-232 serial port

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

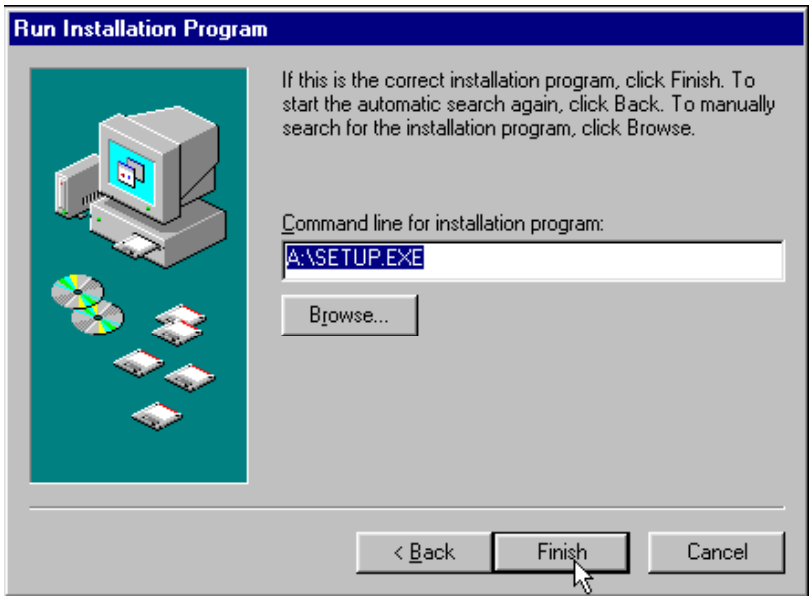
Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

Chapter 2: Installing Software & Setting-up Hardware

Installing RatPaak™Capture Software

Close all Windows programs.

1. Place the CD in your cd-rom drive (usually D:).
2. Click the **Start Button** and choose **Run** and click on the **Browse** Button.
3. Select **My Computer** and choose the cd-rom drive (usually D:).
4. Select **Setup.exe** and follow the instructions for the installation of the software.
5. Click the **Start Button** and choose **Run** and click on the **Browse** Button.
6. Select **My Computer** and choose the cd-rom drive (usually D:).
7. Select Error! No property name supplied.**.exe** and follow the instructions for the installation of the software.

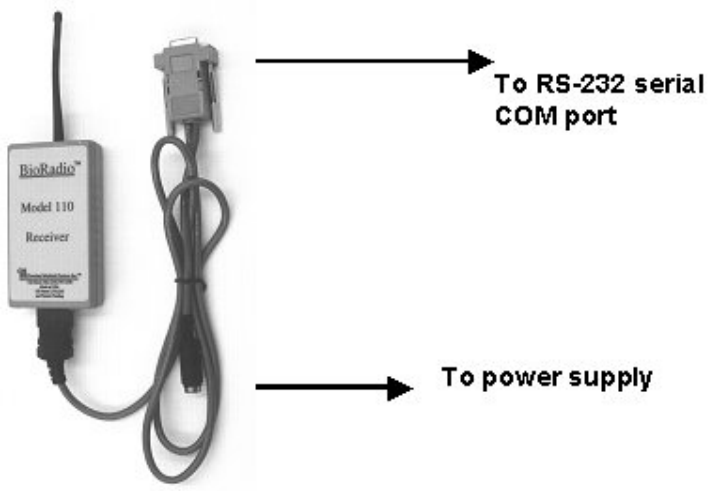


Connecting the Receiver

1. Connect the Receiver to a laptop or desktop computer using the Receiver data cable. The small end of the 3-foot cable fits into the jack on the bottom of the Receiver. You will hear two clicks when the connector is properly attached. The 9-pin end fits into your computer's available RS-232 serial port. Use the 6-foot DB-9 extension to add length to the 3-foot cable.

   Note which port is used; (COM1, COM2, etc.) for configuration of the software. Refer to your PC's manual for information on setting up COM ports.

   If the only available port is a 25-pin port, you will need to use a 25-9 pin adaptor (not provided but available at most electronic stores).



2. Power the Receiver by plugging in the AC adapter power cord (primary power source, typically used for desktop applications), **or** attaching a 9-volt battery via the 9-volt battery adapter wire plug (typically used for mobile laptop applications)

Power Mains Interruptions

If the user of the RatPaak™ requires continued operation during power mains interruptions, it is recommended that the RatPaak™ Receiver be used in conjunction with a laptop instead of a desktop computer. A laptop can continue processing the data for extended periods of time through power main interruptions or in stand-alone remote situations. (Refer to the laptop's manual for more specific details on the length of duration of its batteries.) For reliable data collection in a laboratory setting, the RatPaak™ Receiver and personal computer can be powered from an uninterruptible power supply (UPS). The usage of a UPS will only enable continued monitoring of patient signals during power mains interruptions and not extended power loss. If there is a power loss the UPS will signal the operator and a controlled suspension of patient monitoring and the closing of recorded data can be performed.

Transmitter Characteristics

The RatPaak™ system consists of a transmitter and receiver operating in the ISM frequency band (902 to 928 MHz). This device has been type certified by the FCC and therefore the user does not need a license. There are 256 possible frequency settings or channels selected by the manufacturer. The RatPaak™ default is channel 148 or a frequency of 916.5312 MHz. The Receiver has a 110 kHz bandwidth.

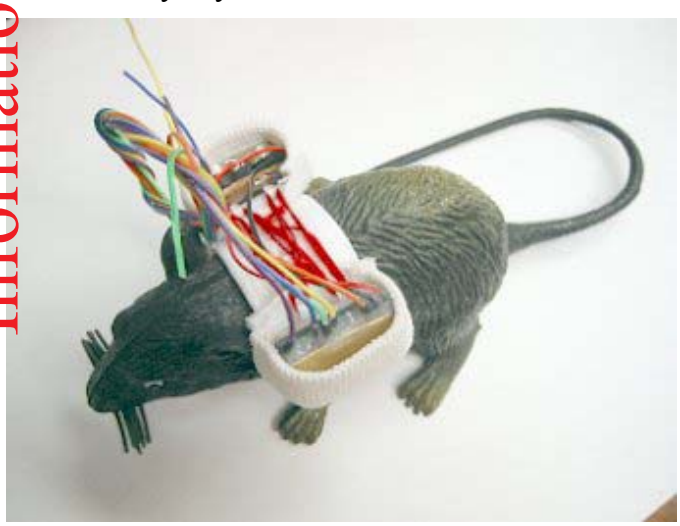
Warning: Other equipment may interfere with the RatPaak™, even if that other equipment complies with emission requirements.

Inserting or Replacing the Batteries

The batteries need to be put in the first time you use your RatPaak™ Insert each #675 battery into one of the three battery compartments of the battery holder; making sure that the positive (+) side is facing upwards.

Warning: It is important that the batteries are installed with the proper polarity.

Warning: The isolation and safety of the patient is assured by battery operation. The powering of the Transmitter by any other means is NOT RECOMMENDED.



Harness

A harness is provided with the RatPaak™ as a means to secure the RatPaak™ and batteries to the subject. The harness has two fitted pockets. The batteries should be stored in one pouch of the vest and the battery holder in the other pouch.

Wires

The RatPaak™ has multi-colored wires protruding from the transmitter. Two of these wires, the black and red wires, are attached to both of the RatPaak™ and the battery. These wires should be routed over the subject's back as the devices are being placed in the pockets of the harness. The blue wire serves as the antenna, which will transfer the signal from the RatPaak™ to the Receiver. It should be tucked under the harness in a manner that will prevent damage to the wire from the subject. *It is important that the blue wire be kept straight so that it can transfer the signal.* The remaining wires should be connected to the subject to produce the two output Channels. Each Channel has two inputs, a positive input and a negative input. In Channel 1, orange is the positive input and orange with a white tracer is the negative input. In Channel 2, violet is the positive input and violet with a white tracer is the negative input. Brown should be connected to a ground..

Chapter 3: Introduction to the Capture Software

The **RatPaak** Wireless Physiological Monitor consists of several software components that allow the user to acquire, store, view, and translate the analog signal data acquired by the **RatPaak** Transmitter. The software provides a simple graphical interface for setting up and controlling data acquisition. In addition, several functions are available to allow data acquired from the **RatPaak** Transmitter to be used in other software applications, such as Matlab®, Microsoft® Excel, etc.

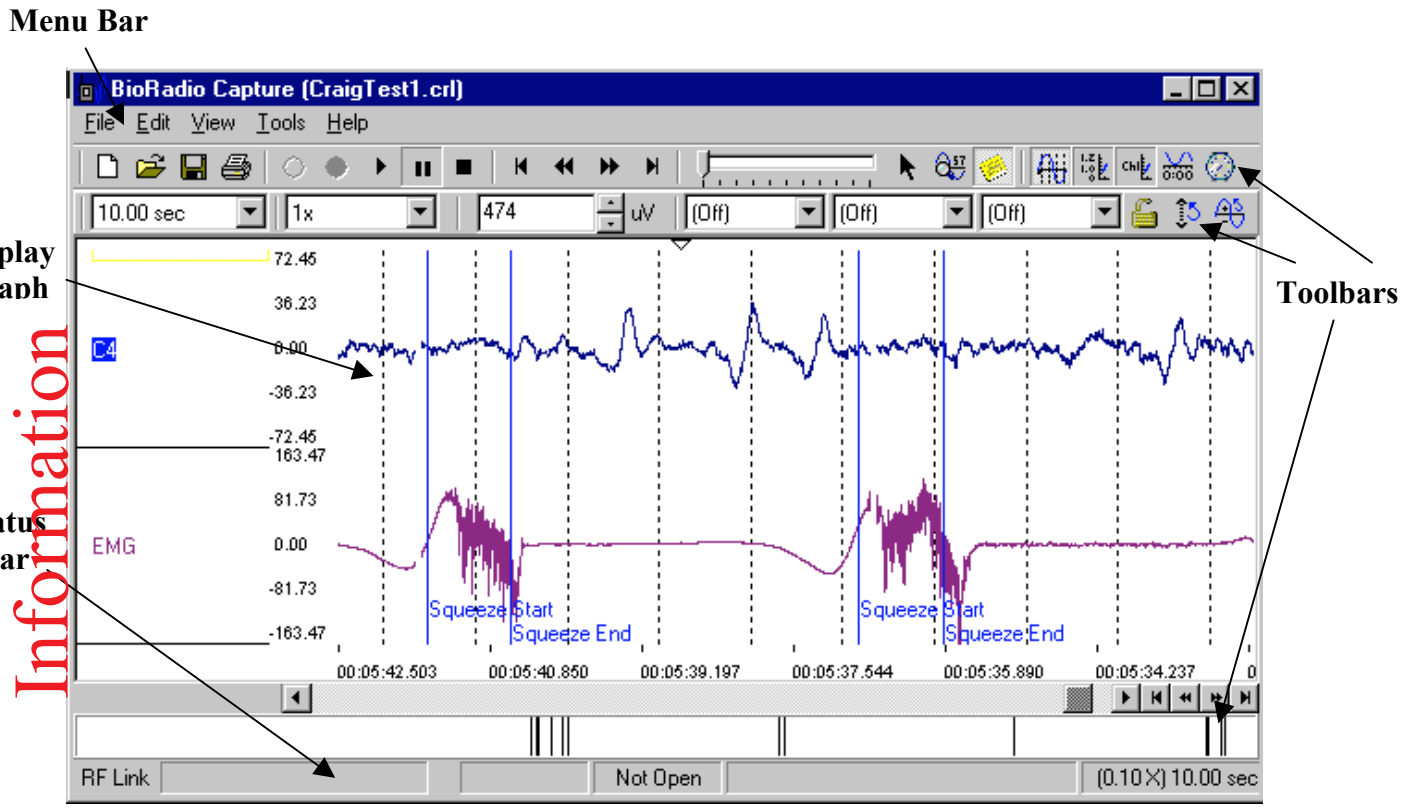
This chapter serves as a brief tutorial designed to help you quickly begin using your **RatPaak**. It covers the basic tasks of capturing test signals, changing the display screen, recording the signals, and configuring the **RatPaak**. The **RatPaak** Capture Program is factory set for an EEG configuration. Thus the Transmitter and Receiver are programmed to use the **RatPaak** EEG configuration and will need to be reprogrammed using the **RatPaak** Configuration Wizard for other applications. For more detailed help on Commands refer to *Chapter 5: **RatPaak Command Reference.***

Starting the RatPaak Capture Program

1. Click on the **Start** Menu
2. Point to **Programs**
3. Point to RatPaak folder
4. Click on **RatPaak Capture**

Main Window

The Capture program displays physiological signals as measured by the Transmitter in a real-time scrolling graph. Multiple channels can be viewed simultaneously. The graphical display can be customized: each analog channel can be scaled (Y-axis) and the Timescale (X-axis) can be zoomed. The display color of each channel can be customized. Commands can be accessed either using the drop down menus located on the Menu Bar or by clicking on the command buttons on the Toolbar.



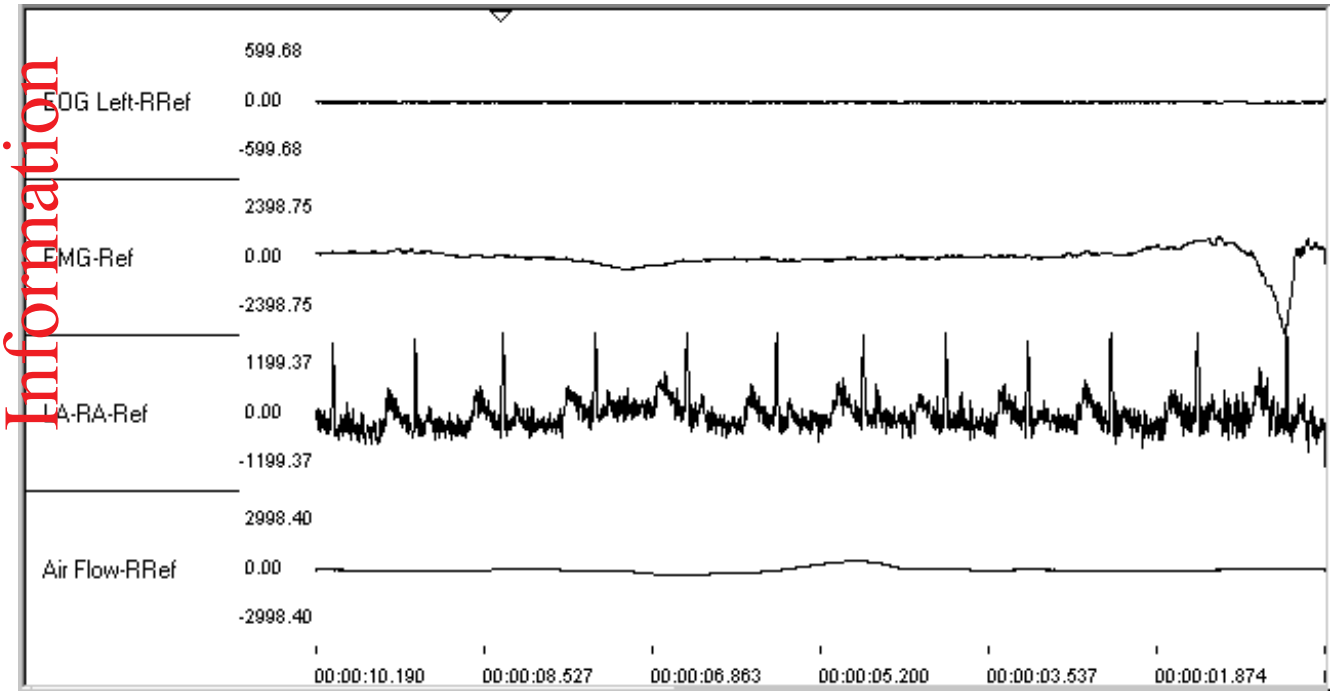
Menu Bar

The Menu Bar 

contains the **File**, **Edit, View, Tools,** and **Help** menus. The File drop-down menu has commands that allow you to open and save a file, as well as accessing other options. The Edit menu contains commands for prompt revisions to a file. The View menu contains all of the screen configuration commands. The Tools menu contains a set of commands to alter the viewing mode. The Help menu contains software versioninformation.The Help menu contains a search index of all the commands and how to use them in addition to version information.

Display Graph

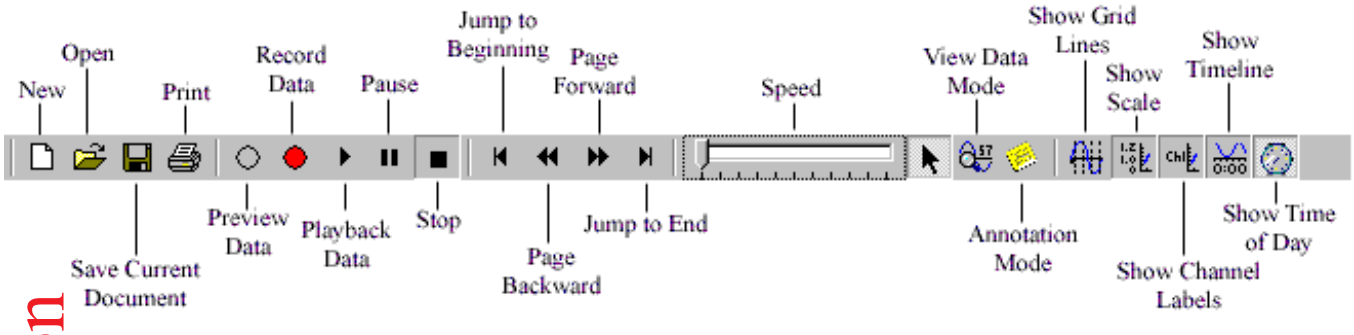
The Display Graph shows up to eight channels of data. You can customize which channels are viewed by selecting them from the Channels section under the View Menu.



Toolbars

The toolbars are sets of buttons and other tools, such as drop-down boxes and sliders, that provide command shortcuts for working with Capture. Using a toolbar button is usually quicker than choosing a command from a menu. There are two toolbars on the Capture screen, the main toolbar and the View Toolbar. Pause your mouse pointer over a toolbar button to see a tooltip that defines the button's function.

Main Toolbar



File Menu Shortcuts

The following toolbar buttons provide quick access to the most used functions available from the File Menu:

New: starts a new capture session with the current transmitter configuration.
Open: displays the open dialog to view a data file.
Save: displays the save dialog in order to save the current data file.
Print: displays the print dialog in order to print the current screen.

Operation Controls

The following toolbar buttons comprise the data recording and playback console:

Preview Data: allows the user to view live data without having to save it to disk.
Record Data: begins streaming of live data to disk.
Playback Data: begins playback of a data file.
Pause: pauses record and playback operations.
Stop: stops the current operation
Speed: controls the playback speed with a range of 1/10 to 100 times the sampling rate.

* See "Chapter 4: Opening and Playing Back Data Files" for more details

Navigation Controls

The following toolbar buttons provide convenient navigation functions to aid in reviewing data files:

Jump to Beginning: moves the display to the beginning of the data file.
Page Backward: moves to display back one page (page size dictated by the Timescale setting.)

Page Forward: moves to display forward one page (page size dictated by the Timescale setting.)

Jump to End: moves the display to the end of the data file.

* See "Chapter 4: Opening and Playing Back Data Files" for more details

Viewing Mode Shortcuts

The following toolbar buttons allow you to change viewing modes:

View Data Mode: puts the display into View Data Mode.

Annotation Mode: puts the display into Annotation Mode.

Display Setting Shortcuts

The following toolbar buttons allow you to customize several display settings:

Show Grid Lines: toggles the display of vertical grid lines, which appear for every one second of data.

Show Scales: toggles the display of the scales for all channels.

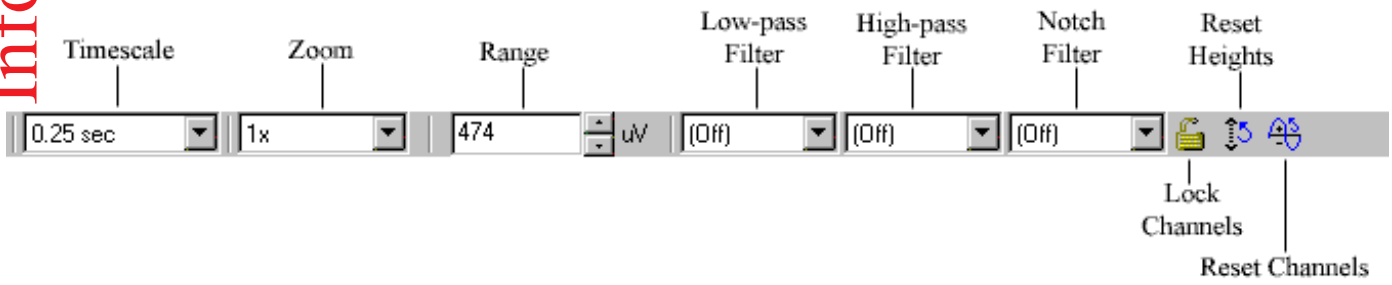
Show Labels: toggles the display of the name labels for all channels.

Show Time line: toggles the display of the time line.

Show Time of Day: toggles the display of real time and time of day.

View Toolbar

The View Toolbar is a collection of controls that allow provide access to various settings that allow you to control how you view your data.



The **Timescale** control is a drop down box of times that will be displayed on the screen ranging from 0.25 seconds to 60 seconds. The same Timescale will be displayed for each channel.

The **Zoom** control allows you to increase the size of the channel displays on the display graph without changing the actual range of the voltages you are viewing. Zoom is a drop down menu that allows you to increase the display to 1, 2, 3, or 4 times its original size.

The **Range** control allows you to adjust the displayed viewing scale for each channel in the group (see Group Settings on page 24). Click on the **up arrow** to increase the displayed signal range, or the **down arrow** to decrease the range.

**Note: changing the scale controls does not affect how the data is stored*

The **Low and High Pass Filter** settings for all channels using group settings can also be set on this tool bar. The filters can be turned off, or the cutoffs can be selected from the values in the drop down menus.

The **Notch Filter** setting for all channels using group settings can be turned off, set to 50Hz, or set to 60Hz.

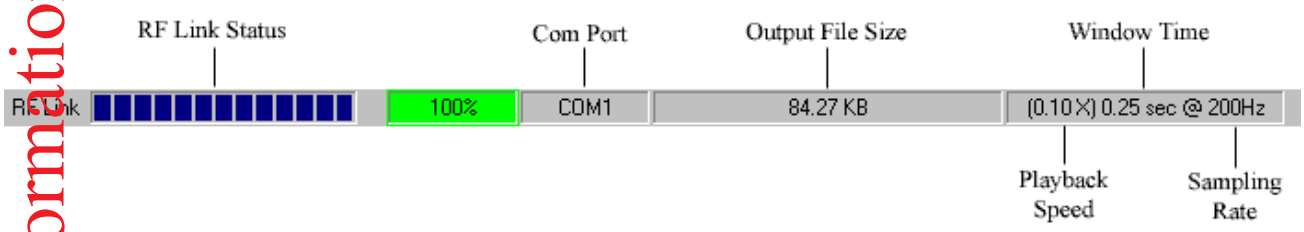
To modify the parameters for ALL channels at once, click on the **Lock/Unlock Controls** button on the View Toolbar. The properties (including range, zoom, and filtering options) for all channels will now be set using the controls on the View Toolbar.

Clicking on **Reset Channels** will reset ALL of the channel parameters to the default settings.

Clicking on **Reset Heights** will cause all channels to revert to the default height on the screen, which is defined to give all channels an equal height.

Status Bar

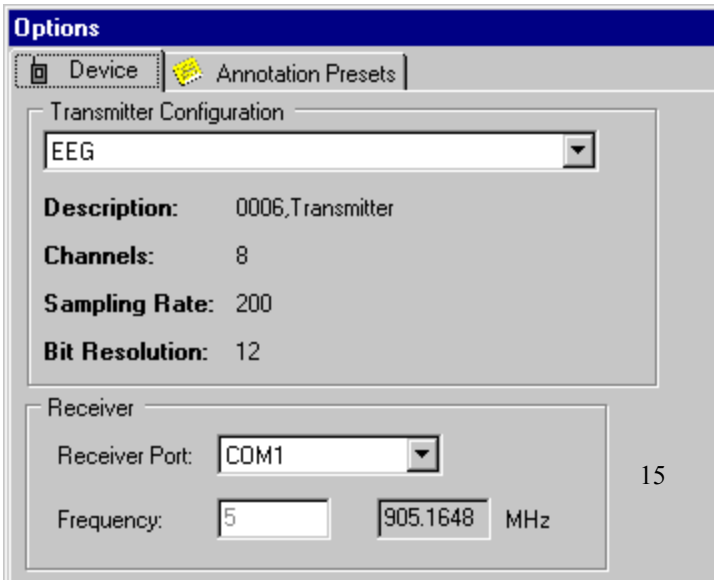
Located at the bottom of the screen, the Status Bar provides real-time status of the data acquisition and RF link operation. This information includes:



- **RF Link Status:** The bar graph shows an approximate measure of the signal strength from the Transmitter. The bar shrinks when the received signal is getting weaker and there is greater chance for losing data. The percentage displays the current percent of received packets from the transmitter. When the percent of received packets is 100%, the percentage displayed is highlighted in green. When this number drops below 100%, the percentage displayed appears highlighted in yellow. If this number drops below 50% it is highlighted in red. This occurs because RF transmission is being impeded. When this happens, move the Transmitter closer to the Receiver or remove the number of obstacles between the Transmitter and Receiver.
- **COM Port:** Displays the current serial port setting for communicating with the Receiver.
- **Output File Size:** Displays the size of the current output file, when recording data to a file.
- **Playback Speed/Timescale/Sample Rate:** Displays the speed of playback for a file, timescale (viewing width), and the sample rate of the Transmitter.

Setting Capture Options

Before capturing data with Capture, you must configure the hardware.



Access the **Capture Options** dialog by selecting **Options** from the Tools menu.

Transmitter Configuration:

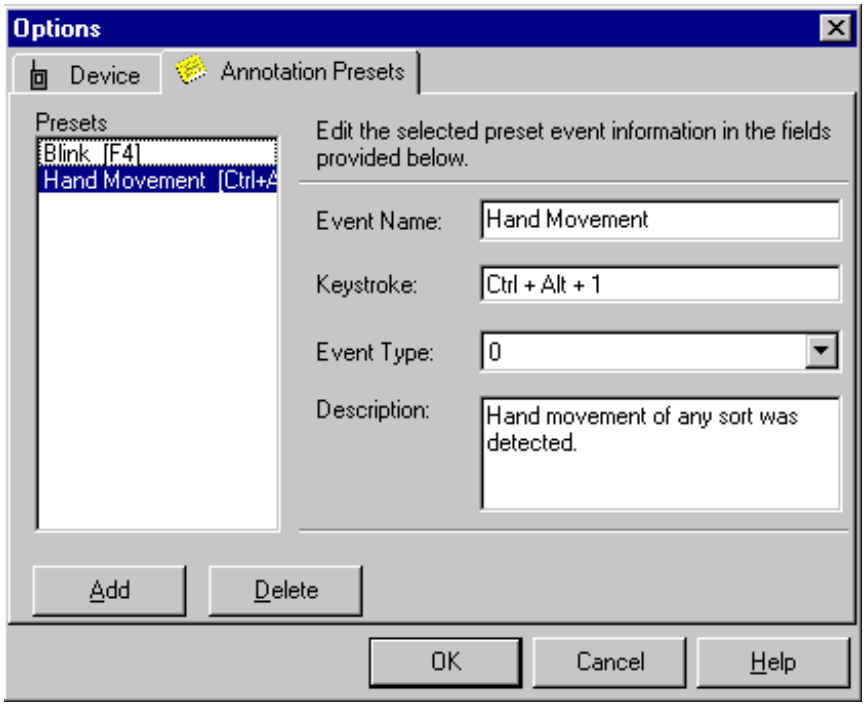
The Device Options tab allows you to view the configuration to which the Transmitter was programmed. You can specify the transmitter configuration from the options listed in the drop-down box.

Setting the Receiver Port:

Using the Receiver Port drop-down menu, choose the port to which your Receiver is attached (e.g. COM 1, 2, 3 or 4). (the port to which your Receiver is attached) If you are uncertain about the COM port setting, refer to the documentation that came with your computer. The Device Options tab also allows you to view the frequency to which the Receiver was programmed. Click **OK** when finished.

Annotation Presets:

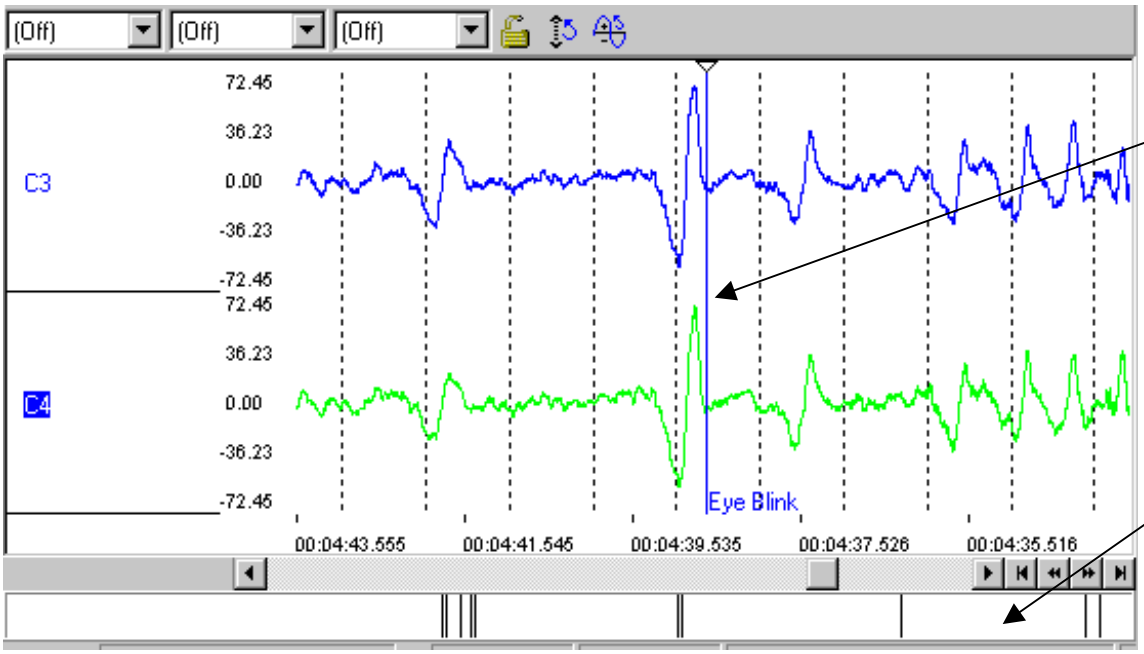
Capture Options allows you to create predetermined bookmarks to identify specified points of interest in a data file. These annotations can be added to a file while data is being collected in real-time, or they can be added later to a saved data file. These annotations serve as an indicator when tracking occurrences of a specified event.



To create a new annotation, first enter the name of the event. Next, type in the keystroke for the annotation (this can be any of the F<#> keys or <CTRL> + <ALT> in combination with any letter or number). Whenever this keystroke is entered, while data is being collected, a vertical line will appear in the recorded waveform along with the name of the event. A description of the event can also be entered (a brief statement of the purpose for each annotation might be helpful when the user is reviewing the list of annotations). The annotations are stored under Presets for future manipulation.

Directly beneath the list of annotations is the **Add** and **Delete** Buttons. The **Add** button clears the fields and allows the user to enter information for another annotation. The **Delete** button erases the annotation that is highlighted in the list of Presets.

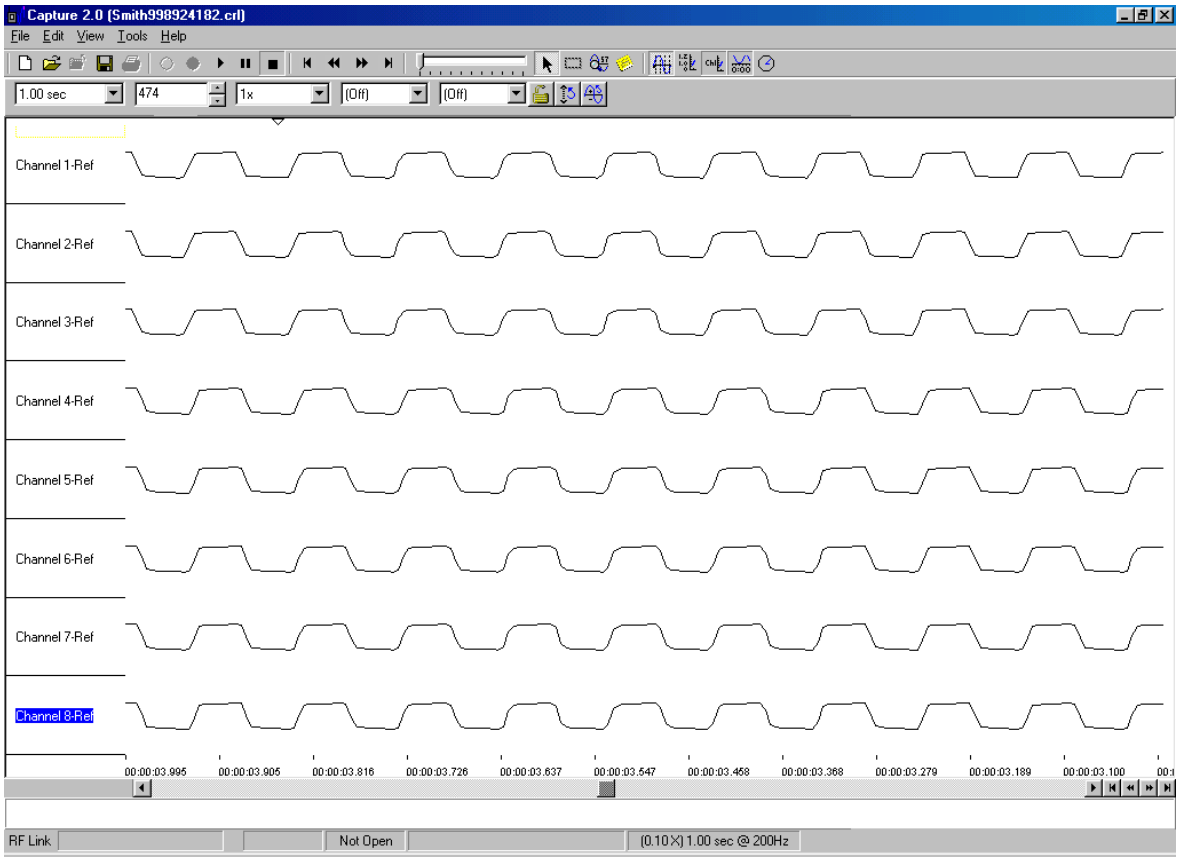
To annotate the waveform while the system is collecting data in real-time or while reviewing a file, enter the annotation's keystroke. The annotation will appear in the waveform wherever the upside down triangle marker is located when the keystroke is pressed. This marker can be moved back and forth on the top of the display graph by clicking on it and dragging it with the mouse. All annotation lines can be seen in the annotation toolbar. Double-clicking on one of these annotation lines will move the display graph to that point in time.



Testing the Equipment with the Test Pack

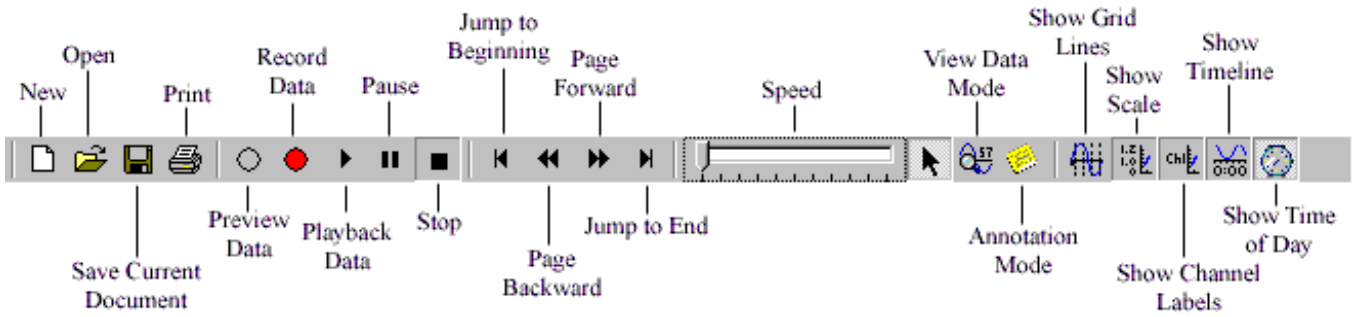
1. Plug the Receiver into an available RS-232 computer port using the serial port cable and connect the AC Adapter power cord (or 9V battery) to the serial port cable.
2. Check to see that the COM port is displayed on the Status Bar. It should correspond with the COM port chosen in the Device tab of the **Options** screen.
3. Connect the Transmitter to the Test Pack.
4. Turn the Transmitter "**ON**" by flipping the ON/OFF switch. The Transmitter serves as the power source to the Test Pack.
5. Click the **Preview Data** button on the Main Toolbar.

A 10 Hz, 300µV peak-to-peak square wave should scroll across the screen. If you do not receive a visible signal, refer to **Capturing Data** or **Chapter 6, Troubleshooting**.



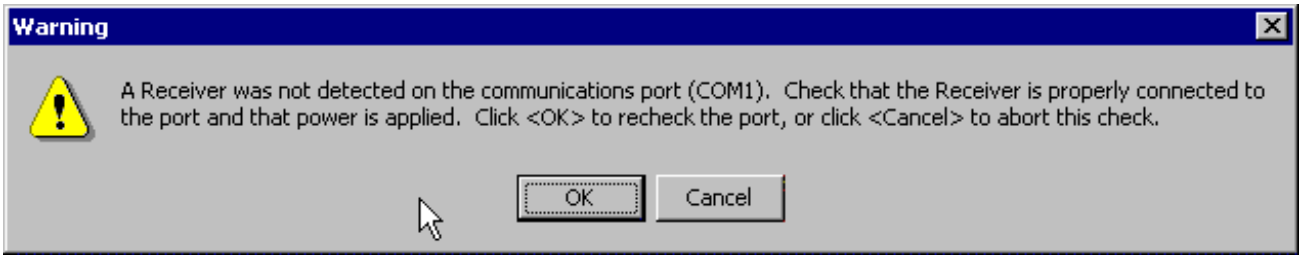
Chapter 1: Capturing Data

Capture provides the ability to acquire and store physiological data, which has been acquired and transmitted over the RF data link by the Transmitter. In order to begin recording physiological data, click on the **New** button located on the Main Toolbar. This will start a new session for recording data.

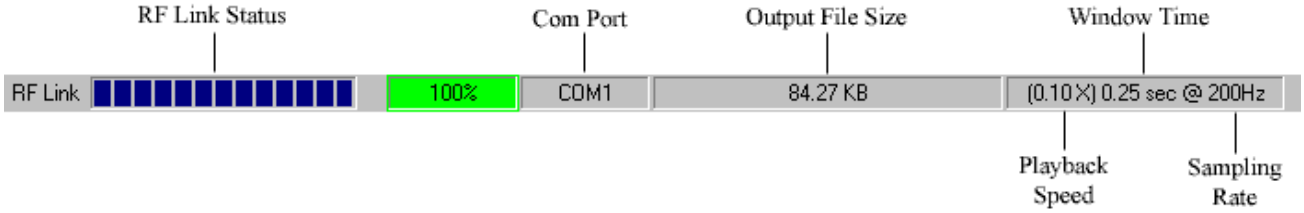


If you have properly connected the Receiver to the COM port and the Transmitter is ON, you are ready to begin viewing and recording signals. It is possible to preview the data that is being transmitted before you actually save it to file. Click on **Preview Data** on the Main Toolbar to do this. In order to stop previewing the data, click on the **Stop** button. When you are ready to begin recording the data to a file, click on the **Record Data** button. Data will now be shown in real-time on the display and recorded to a file. In order to stop the data collection, click on the **Stop** button.

Upon previewing or recording data, Capture determines if the Receiver on the configured serial port is properly communicating. If the Receiver is connected and properly configured, the physiological data will begin scrolling across the Display Graph. Please note, there is a several second delay when the data will first start. If the port is not properly configured, or if a problem is detected with the Receiver, an error message is displayed. Refer to ***Chapter 6: Troubleshooting and Frequently Asked Questions*** for more information.



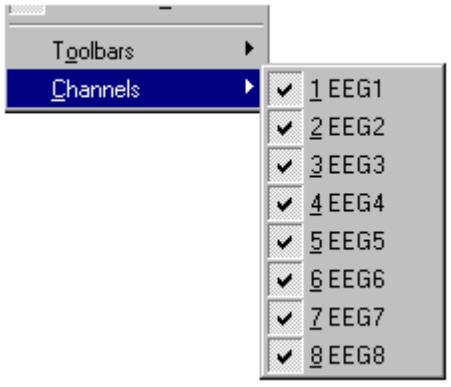
Once data collection has started, the **Status Bar** provides information on the status of the RF link and data files. Notice the Status Bar will constantly update you on the Received Signal Strength, the percentage of data packets being received, and the size of the recorded file.



Changing the Display

Once Capture Mode is started and real-time data is visible in the Display Graph, you can alter the way the data is viewed. The changes you make to the display, filters, etc. are stored and will be used the next time you run the Capture application.

Selecting the Number of Channels to Display



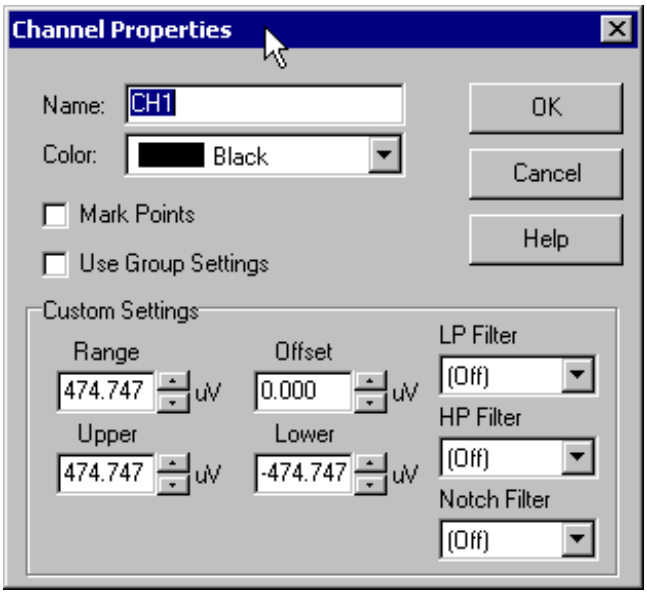
Capture allows you to view multiple channels or display any subset of them simultaneously in the Display Graph. To set which channels will be displayed, select **Channels** from the **View** menu.

Any Channel with a check mark (next to the channel's name) will be shown on the **Display Graph**.

Changing a Channel's Viewing Scale

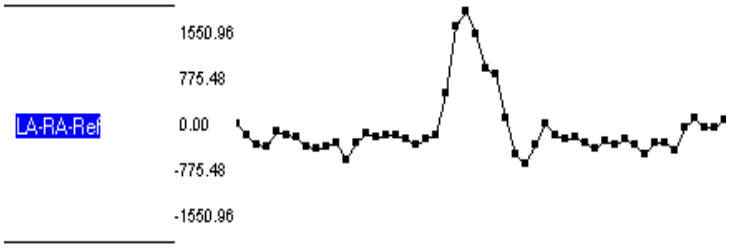
The **Range** control in the View Toolbar allows you to adjust the displayed viewing scale for each channel in the group (see Group Settings on page 24). Click on the **up arrow** to increase the displayed signal range, or the **down arrow** to decrease the range

Channel Properties



The properties of each channel can be configured on an individual basis. **Channel properties** can be viewed by double clicking on any channel name on the display graph. Later we will discuss setting the properties for all channels at once by locking or using group settings. The default names for the channels are taken from the configuration file that the unit was programmed with. The channel name can be changed by entering the desired name in the field labeled "Name". Additionally, clicking on the **Color** drop-down box and choosing a color can change the color of the trace for a specific channel.

The **Mark Points** option will show the data points of a waveform. If this option is selected, the waveform will appear as shown below. **Use Group Settings** will be discussed later.



Custom Settings

Range refers to the range of values that will be displayed on the y-axis of the Display Graph. The value entered here represents +/- the range that will be displayed on the plot.

Offset refers to the value that the Display Graph for the particular channel will be centered around. You can select the offset either by typing in the value or using the mouse to turn the dial to the appropriate manual.

Upper refers to the upper bound of the Display Graph for that particular channel.

Lower refers to the lower bound of the Display Graph for that particular channel.

Filter Settings

The **Low Pass Filter** can be turned off or set to a desired value. This filter is a 1st order IIR filter.
The **High Pass Filter** can be turned off or set to a desired value. This filter is a 1st order IIR filter.
The **Notch Filter** can be turned off or set to 50 or 60Hz.

Group Settings

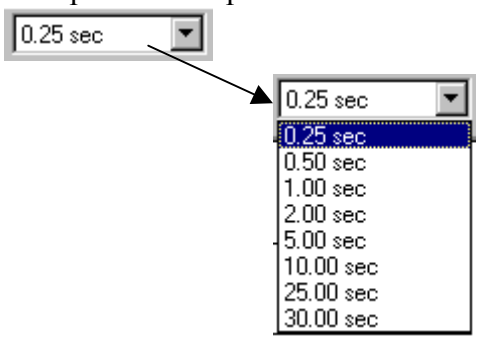
In addition to customizing each channel property on an individual basis, as described above, the properties of all the channels or a select group of channels may be modified at once. Once these channels are selected, using the controls found on the View Toolbar can modify their parameters.

To modify the parameters for ALL channels at once, click on the **Lock/Unlock Controls** button  on the View Toolbar. The properties for all channels will now be set using the controls on the View Toolbar.

To modify a select group of channels, double-click on the channel name you wish to include in the group. The Channel Properties box will appear. When you click on the Use Group Settings, a check mark will appear in the box adjacent to the label. The parameters for this channel will now be set (along with all other Channels the using the controls on the View Toolbar. To remove this channel from using group settings, click on this box again and the check will disappear.

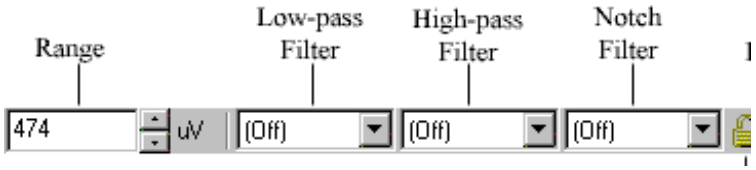
Changing the Timescale

Clicking on the down arrow to the right of the Timescale field will expose the drop-down menu that shows the possible values of the timescale (viewed time interval). You can select a timescale to specify the width of the Display Graph.



Adding Filters to a Channel

Capture allows you to filter the data during review and data collection. A digital filter permits suppression of undesired signals while maximizing the visibility of the signals of interest. This process is actually implemented as separate high-pass, low-pass filters, and notch filters all of whose respective cutoff and center frequencies are programmable by the software. The high-pass filter rejects DC offsets and slowly changing interference signals due to movement and other types of artifacts. The low-pass filter rejects the very high frequency portion of the acquired signal that is usually associated with unwanted and non-physiological noise. Notch filters allow a specific frequency to be filtered out that may be causing noise on the sampled signal. Typically, this filter is used to filter out electrical noise that occurs at 50Hz or 60Hz. It might also be desirable to "zoom in" a portion of the frequency spectrum while the data is acquired. For example, transition of wakefulness to sleep is usually associated with changes in the alpha band of EEG (8 to 12 Hz). Therefore, it might be desirable to band-pass filter the EEG in the alpha band to monitor the onset of sleep.



Low-pass filters let lower frequency content through and attenuate higher frequencies. This can be useful for removing fast, transient responses from the data. (The filter is a 1st order IIR filter).

High-pass filters let higher frequency content through and attenuate lower frequencies. This can be useful for eliminating drifting artifacts and DC offsets from the data. (The filter is a 1st order IIR filter.)

Notch filters allow a specific frequency to be filtered out that may be causing noise on the sampled signal. Typically, this filter is used to filter out electrical noise that occurs at 50Hz or 60Hz.

Group Filter Settings:
The drop-down boxes for the High-pass and Low-pass filters are located in the View Toolbar as shown above. Each field allows you to enable and/or adjust the value of the filters. Click on the down arrow of either filter to view the available settings. When you find the desired value, click on that value and the field will automatically be updated. Your choice of cutoff frequencies will vary depending on the sampling frequency that is determined by the number of input channels selected and the resolution.

Individual Channel Filter Settings
The same filter settings are available to each channel on an individual basis from the channel properties window in the Custom Settings section.

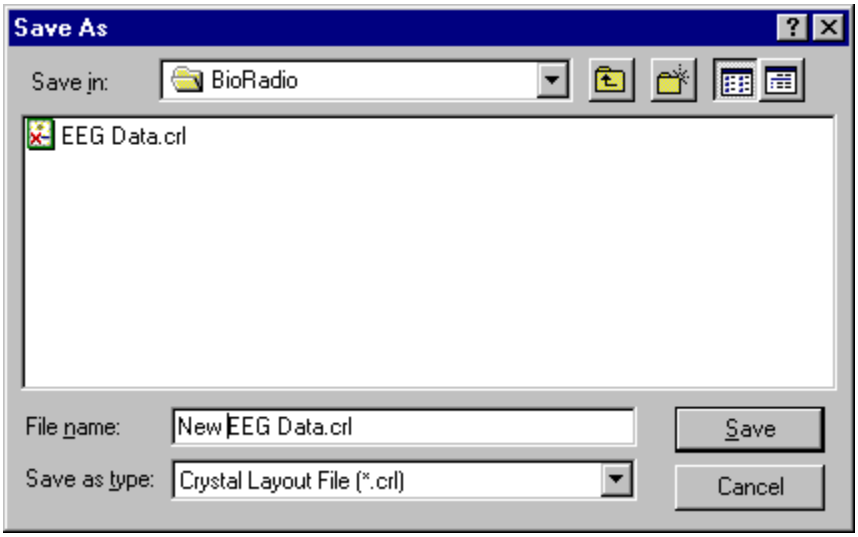
Saving Collected Data

After you have collected your data, made adjustments to the display graph and filters, and/or added any annotations you can save file.

Capture records the acquired data into a binary data file for off-line viewing and analysis.
Save the data to a file by:

- Clicking the **SaveCurrent File** button on the Main Toolbar , or
- Selecting **Save Data to File...** from the **File** menu.

The **Save Data to File** dialog window appears, allowing you to specify the name, format, and location of the file.



Note: Capture supports opening of older BioRadio Data files (.bd), however saving changes will require converting the file to the Crystal File format (*.crl,*.crd). See Converting BioRadio Data Files on page 31.*

Chapter 2: Reviewing Data

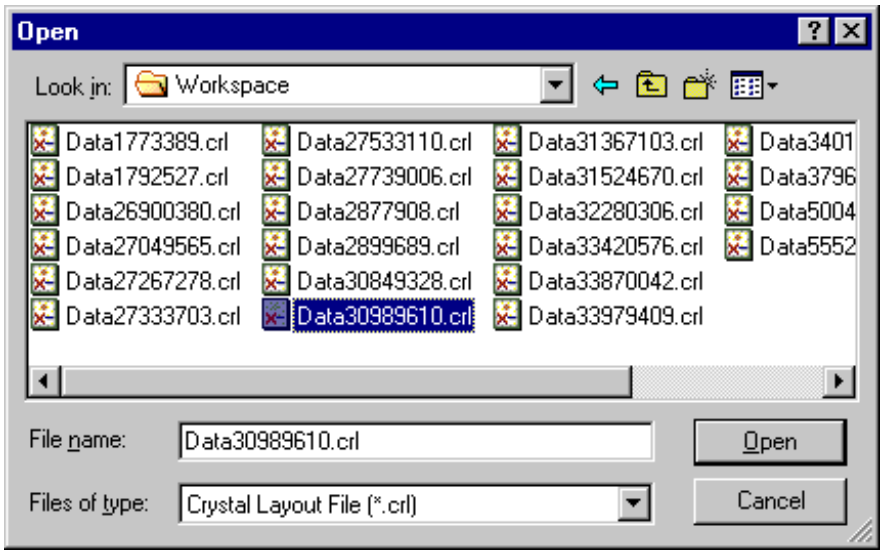
Viewing Saved Files

Once a data file has been recorded, it can be played back. During the playback, it can be annotated or the display settings can be changed, just as during the recording. In order to save these changes to the file, you must click on save before opening another file or beginning a new recording session.

A file can be opened by:

- Clicking the Open button on the Main Toolbar  , or
- Selecting Open ... from the File menu.

This displays the Open Data File dialog window, where you browse to find the file or type in the name of the file you wish to review.

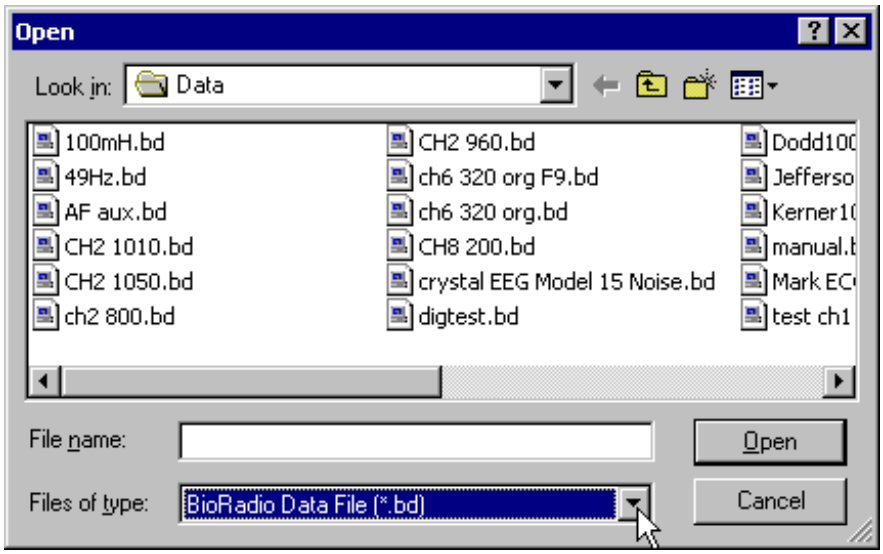


File Formats

The standard format for files in Capture v.2.0 is the Crystal Layout file format. This consists of a Crystal Layout file (*.crl extension) and a Crystal Data file (*.crd extension). Data files recorded with a previous version of Capture use the BioRadio Data format (.bd extension). In order to save changes to these files in Capture 2.0, they must be converted to the Crystal format.

BioRadio Data Files

To open a BioRadio Data file, select Open from the File menu. Under the Files of Type drop-down box in the Open window, select "BioRadio Data File (*.bd)" to show the available BioRadio Data files.



Select the file you wish to open and click the Open button. The data will be displayed as a normal Crystal data file. To save changes to a BioRadio Data File, see "Converting BioRadio Data Files" on page 31.

Changing the Display

Viewing saved data is similar to viewing the data in Capture Mode. All of the display features and commands can be customized in the same way. *Refer to* ***Chapter 3, 'Recording Physiological Data'*** *or* ***Chapter 5, '****RatPaak* ***Command Reference'.***

Searching through Data

When reviewing saved data, you can use the scroll bar that appears at the bottom of the Display Graph to browse through the file. This scroll bar represents the entire length of the data file, and the scroll bar button represents the current view position of the data file.

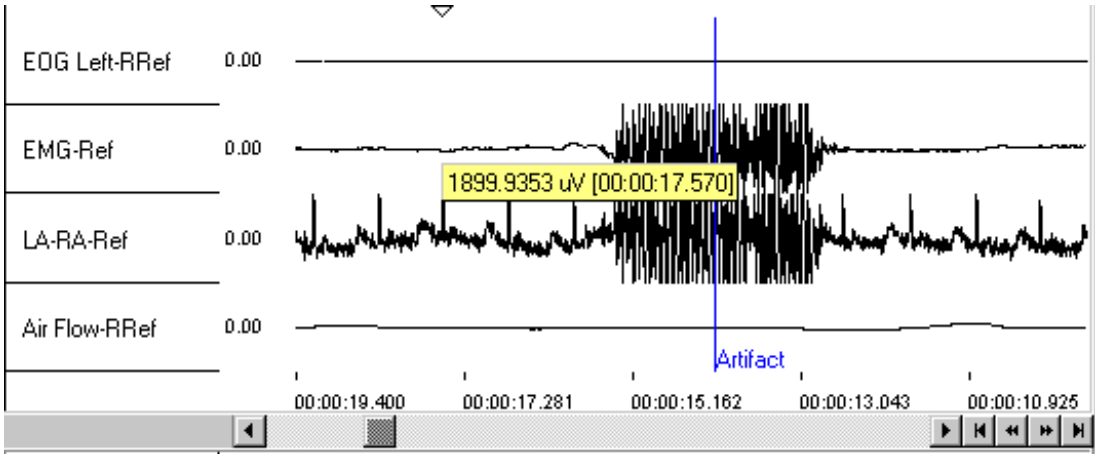
You can click and drag on the scroll bar thumb to quickly move within the recorded data file and search for particular epochs of data. Clicking on the button to the left of the thumb causes you to move backwards through the file slowly. The buttons to the right of the thumb, in order from left to right, replicate the behavior of the navigation controls on the Main Toolbar.

Navigation Controls

Jump to Beginning: moves the display to the beginning of the data file.
Page Backward: moves the display back one page (page size dictated by the Timescale setting.)
Page Forward: moves the display forward one page (page size dictated by the Timescale setting.)
Jump to End: moves the display to the end of the data file.

View Data Mode

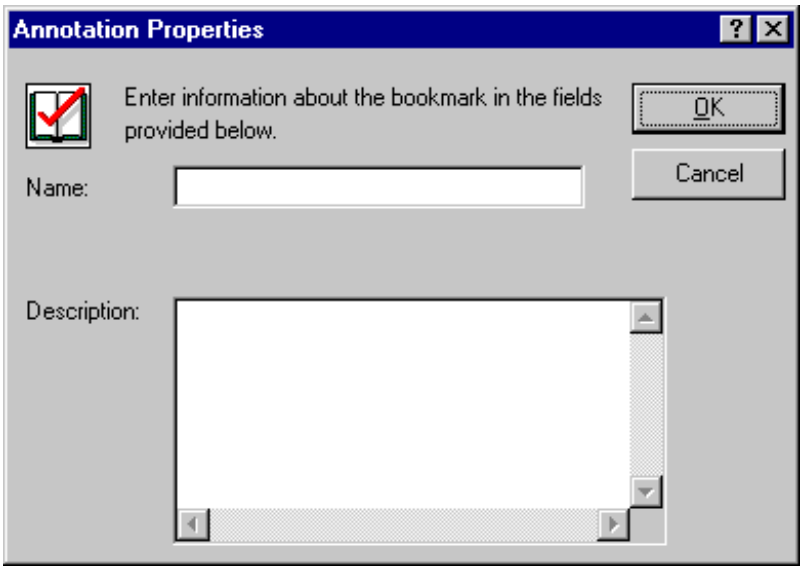
To enter View Data Mode,select **View Data** from the Tools Menu or click on the View Data Mode button on the Main Toolbar. Click on the trace of any channel, hold down the left mouse button, and drag it back and forth. A label will appear showing the time and output voltage of that position on that waveform.



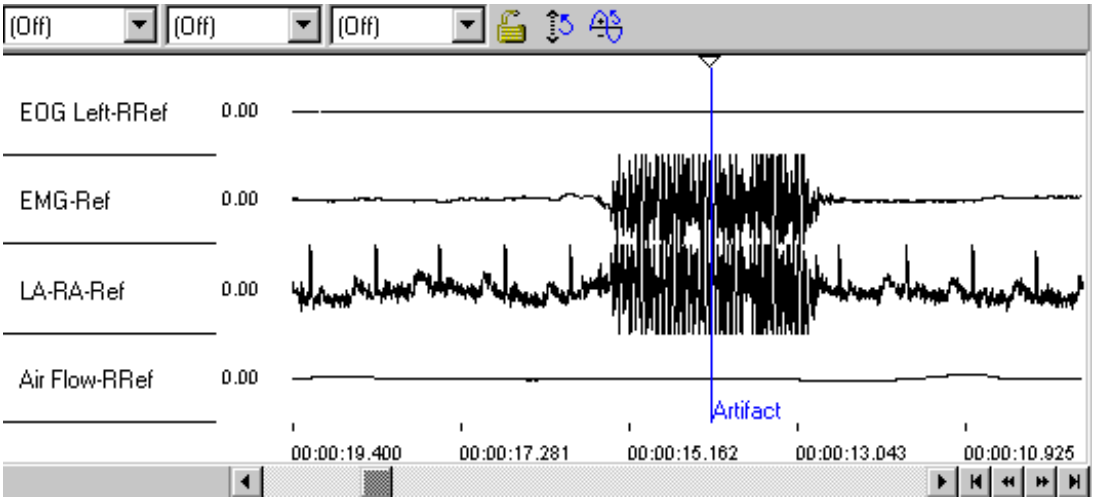
Annotation Mode

To enter "Annotation Mode" select **Annotation Mode** from the Tools Menu or click on the **Annotation Mode** button on the Main Toolbar.

This mode allows you to add, edit, move, or delete annotations. In order to add an annotation, double-click in the **Display Graph** where you would like the annotation to be placed. The Annotation Properties Window will appear.



Give an appropriate label for the new annotation by typing it in the **Name** field. You may give more meaning to the annotation by filling in the details within the **Description** field. Once you have completed filling out the properties, click the OK button to insert the annotation.



To edit an existing annotation, click on the annotation label that you wish to edit. Then select **Properties** from the **Edit Menu**. The Annotation Properties Window will appear and you may make your changes.

You can also move an annotation from one part of the file to another. To do this, the Capture software uses the **Cut**, **Copy**, and **Paste** commands (available from the **Edit Menu**). When you **Cut** an annotation, it is removed from the original position, allowing you to **Paste** it into a new position. **Copy** leaves the original annotation alone, and allows you to paste an identical annotation into a new position. Once you have either cut or copied an annotation, you may paste copies of it into as many positions as you would like.

You may also "**Drag and Drop**" an annotation. This has the same effect as a cut and paste combination. To drag an annotation, click on it with the left button of your mouse, and move the cursor to the desired destination while holding the left mouse button. When you release the button, the annotation will be dropped, or moved to the new location. This is most efficient when you only need to move an annotation to another place already on the screen.

Saving Changes

After you have annotated your file, you can save the changes. Capture records the acquired data into a binary data file for off-line viewing and analysis.

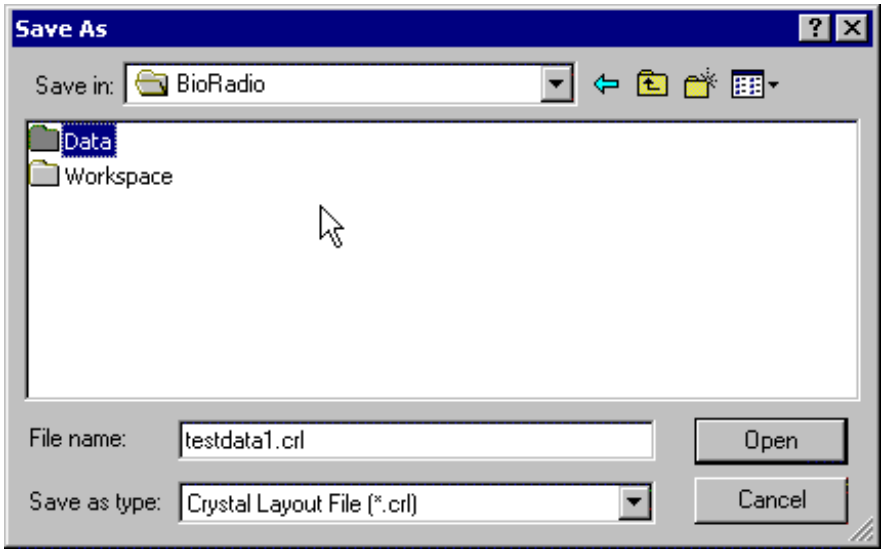
Save the data to a file by:

- Clicking the **Save Current File** button on the Main Toolbar, or
- Selecting **Save** from the **File** menu.

Save the current file to a different file name by:

- Selecting **Save As** from the **File** menu.

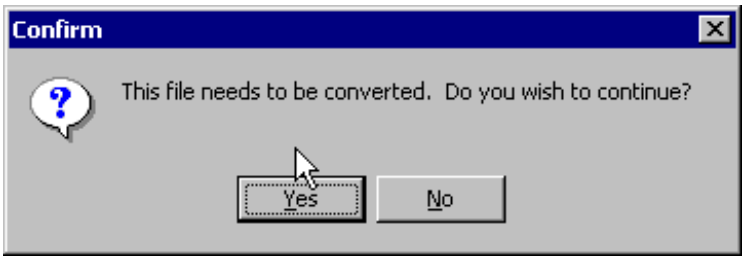
The Save As dialog box will appear.



Enter the name by which to save the file and click the Save button.

Converting BioRadio Data Files

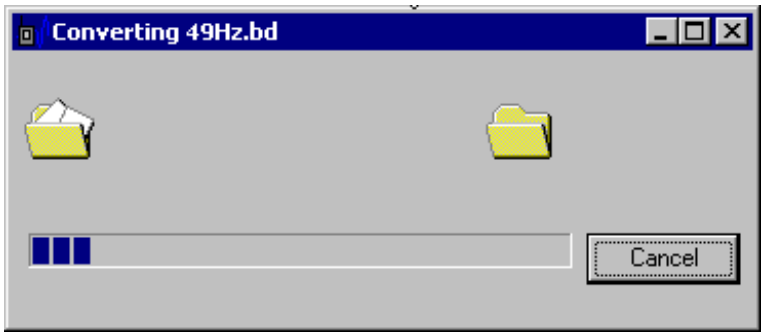
In order to save any changes made to a BioRadio Data File (*.bd), the file must first be converted to the Crystal file format. Begin by selecting **Save** from the File Menu. A confirmation dialog box will appear.



To continue with the file conversion, click the **Yes** button. The Save As dialog box will appear. Enter the name by which to save the file and click the Save button. Please note that the default name is that of the

original BioRadio data file with the extension converted to *.crl. Saving with this name will not overwrite your original file.

The conversion window that appears has a progress indicator to indicate the conversion process. Depending on the size of the file, the conversion time may vary from a few seconds to several minutes.



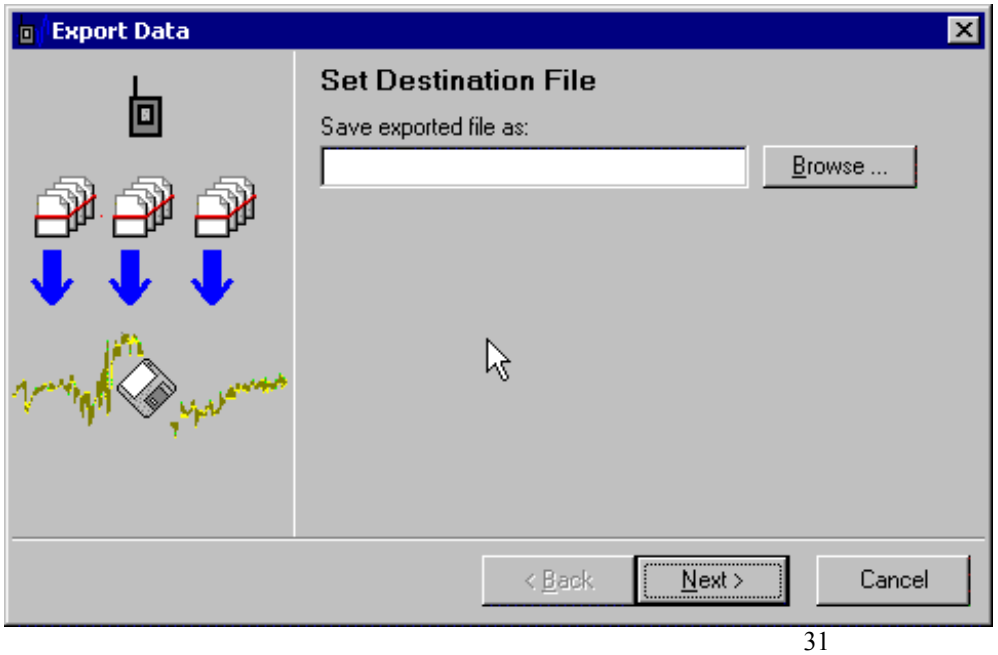
Once the conversion is complete, you will be asked to again confirm the changes to your file, just as when saving any other file. Click the Yes button, and the process is complete.

Exporting Data

Exporting data translates a data file to an alternate format that other programs can import. The data can be exported to ASCII data in column format. In View Mode, you can export all or part of the current data file to a space-delimited ASCII data file, which can be read by programs such as Microsoft Microsoft® Excel, Matlab®, etc. You can select any of the physiological channels to be exported to the ASCII data file, so that only data of interest is exported. This flexibility greatly reduces unnecessary time spent analyzing irrelevant data and saves file space.

Note: that only the raw data (as acquired by the Transmitter) is exported. Any viewing options (such viewing range, filters, etc.) are not reflected in the exported data file.
Begin exporting a file by:

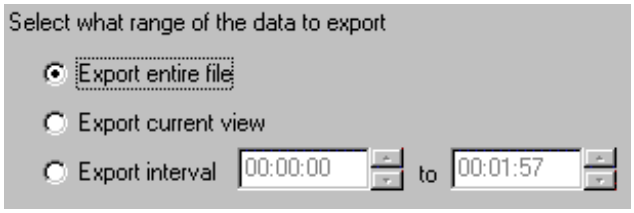
- Selecting Export from the File Menu.



On the Set Destination File page, choose the name and path for the ASCII file that will be created. You can either type in the name and path in the box labeled "Save exported file as:" or click on the **Browse** button to browse for a directory and type in a file name. Once you have selected a name and path for the ASCII file to be created, click on **Next**.

The Export Data dialog windows allow you to select the time interval and channels that will be exported to an ASCII data file from the saved physiological data you are currently viewing.

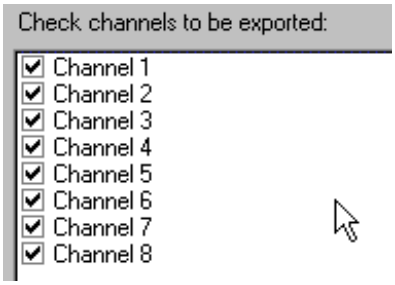
On the **Select Export Range** page, you select the interval of time that will be exported to the ASCII data file:



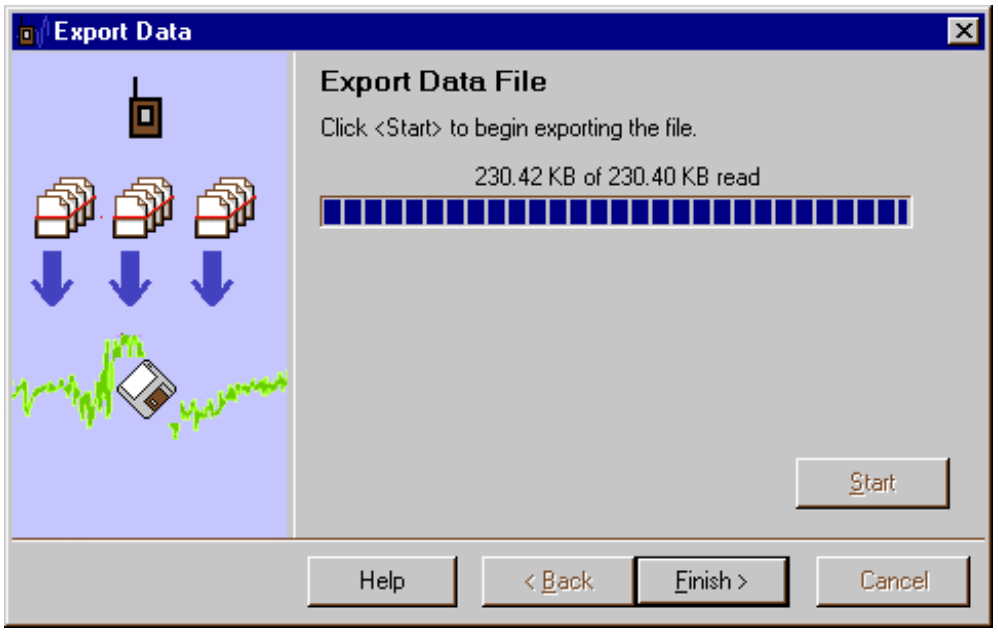
- **Export entire file**: Exports the entire duration of the data file.
- **Export current view**: Exports only the duration of the data file that is visible in the Display Graph based upon the settings for Timescale and the starting position.
- **Export interval**: Exports the duration of the data file as set by the start and end input boxes, in hours, minutes, and seconds (HH:MM:SS). You can use the up/down arrows to change the start and end values, or you can type the times into the input boxes.

Once you have selected the time interval you wish to export click on **Next**.

On the **Select Export Channels** page, you can select which of the input channels will be exported to the ASCII data file. Only channels with a check mark will be written to the ASCII data file. The channels will be written in the order they are displayed in this list. Once you have selected the channels to be exported, click the Next... button to begin exporting the data file.

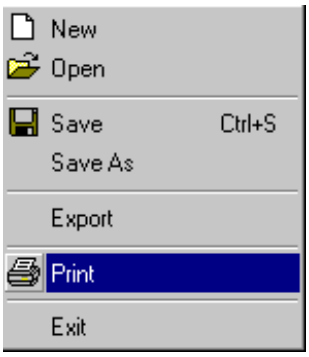


On the Export Data File page, click the **Start** button to begin exporting the data file. A progress bar will display the export progress. Note that, for large data files, this may take several minutes to complete. Once exporting has completed, click **Finish** to return to the main application.



Printing Data

You can print the currently displayed (screen view only) physiological data to any Windows printer. The printed output is time/date stamped including the timescale and sampling frequency of the data segment printed.



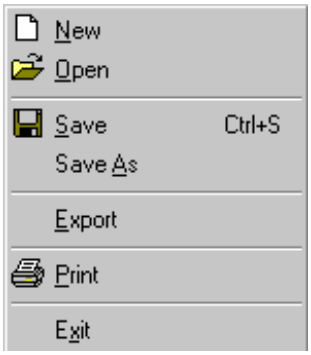
Click **Print** from the **File** menu 

The grid lines will be printed unless they are hidden in the Display Graph.

Chapter 3: Capture Command Reference

This chapter provides a brief summary of the commands in **RatPaak** Capture.

File Menu



Open Data File…

Open a saved file by:

- Clicking the Open button  on the Main Toolbar, or
- Opening the **File** menu and selecting **Open**, or
- Keyboard Strokes**: "Alt+F",** then **"O".**

Save Data to file...

Save your data to a file by:

- Clicking the **Save** button  on the Main Toolbar, or
- Opening the **File** menu and selecting **Save**, or
- Keyboard Strokes: "**Alt+F",** then **"S".**

Export Data File

Export your data to a different file format by:

- Opening the **File** menu and selecting **Export**, or
- Keyboard Strokes: **"Alt+F",** then **"E".**

Print

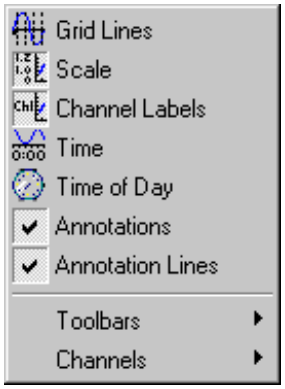
Print your data by:

- Clicking the Print button  on the Main Toolbar, or
- Opening the **File** menu and Clicking **Print** or
- Keyboard Strokes: **"Alt+F",** then **"P"**.

Exit Capture

- Clicking on the **X** in the upper right corner of the screen**,** or 
- Opening the **File** menu and Clicking **Exit**, or
- Keyboard Strokes: **"Alt+F",** then **"X".**

View Menu



Showing/Hiding the Grid

Show or hide the grid on the Display Graph by:

- Clicking the **Grid Lines** button on the Toolbar, or
- Placing a checkmark next to **GridLines** on the **View** menu.

Showing/Hiding the Scale

Show or hide the scale on the Display Graph by:

- Clicking the **Scale** button on the Toolbar, or
- Placing a checkmark next to **Scale** on the **View** menu.

Showing/Hiding the Channel Labels

Show or hide the channel labels on the Display Graph by:

- Clicking the **Channel Labels** button on the Toolbar, or
- Placing a checkmark next to **Channel Labels** on the **View** menu.

Showing/Hiding the Timeline

Show or hide the time on the Display Graph by:

- Clicking the **Time** button on the Toolbar, or
- Placing a checkmark next to **Time** on the **View** menu.

Switching Between Elapsed Time and Time of Day

Show or hide the time of day on the Display Graph by:

- Clicking the **Time of Day** button on the Toolbar, or
- Placing a checkmark next to **Time of Day** on the **View** menu.

Showing/Hiding the Annotations

Show or hide the annotations on the Display Graph by:

- Clicking the **Show/Hide Annotations** button on the Toolbar, or
- Placing a checkmark next to **Annotations** on the **View** menu.

Showing/Hiding the Annotation Lines

Show or hide the annotation lines on the Display Graph by:

- Clicking the **Show/Hide Annotation Lines** button on the Toolbar, or

Placing a checkmark next to **Annotation Lines** on the **View** menu.

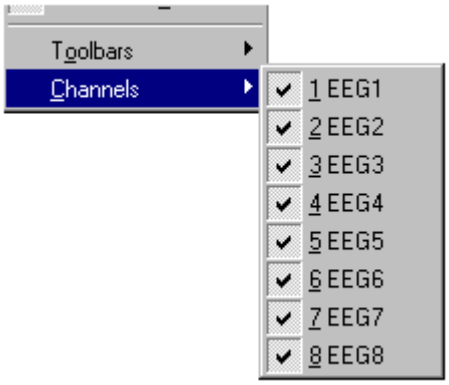
Showing/Hiding the Toolbars

Show or hide the toolbars on the Display Graph by:

Placing a checkmark next to **Main Toolbar, View Toolbar, or Annotation Toolbar** under **Toolbars** on the **View** menu.

Showing/Hiding the Channels

Select channels to view during capture/playback by:



Selecting **Channels** from the **View** menu, or

Keyboard strokes: "**Alt+V"** then **"C"**.

Check/un-check the channels you would like to see in the DisplayGraph.

Tools Menu

View Data Mode

Get the time and value of a data point while dragging your mouse pointer over a trace. Enter View Data Mode by:

Opening the **Tools** menu and selecting **View Data Mode**, or

Keyboard Strokes: **"Alt+T",** then **"V".**

Annotation Mode

Work with your annotations interactively with Cut, Copy, Paste and Drag and Drop features. Enter Annotation Mode by:

Clicking the **View Data Mode** button on the Toolbar,  or

Opening the **Tools** menu and selecting **Annotation Mode**, or

Keyboard Strokes: **"Alt+T",** then **"A".**

Capture Options

The **Capture Options** dialog allows you to configure how the Transmitter acquires and displays data. Access the Capture Options dialog by:

Opening the **Tools** menu and Clicking **Options**

Or

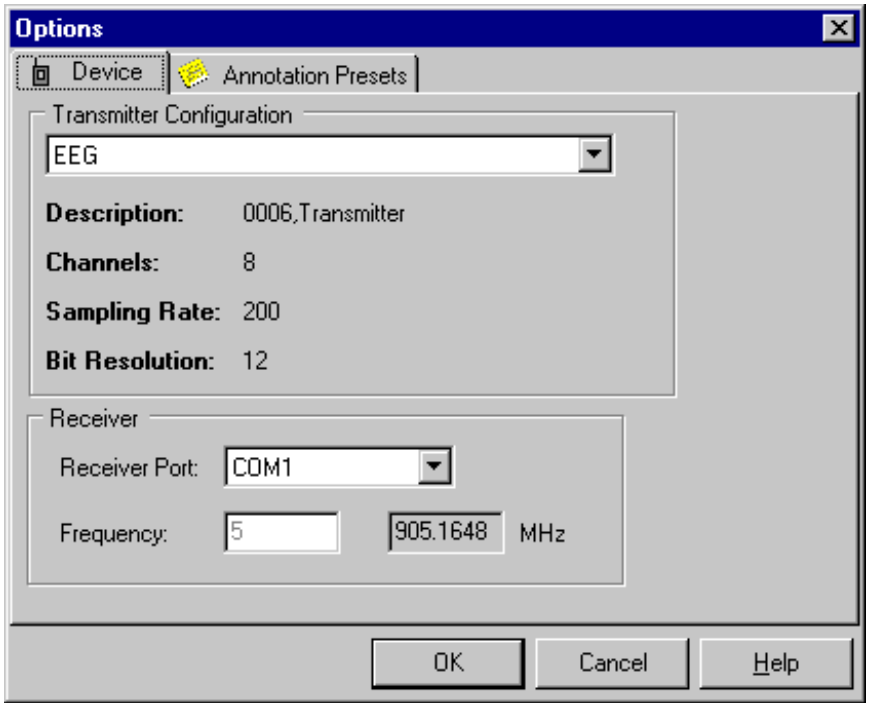
Keyboard Strokes: **"Alt+T",** then **"O"**.

Transmitter Configuration

Allows the user to specify the configuration of the Transmitter. A custom configuration can be created using the Configuration Wizard.

Receiver Port

Allows the user to specify the COM port to which the Receiver is attached. The default is COM1, but you can change this if you have the Receiver attached to a different port.



Record and Playback of Data

Preview Live Data

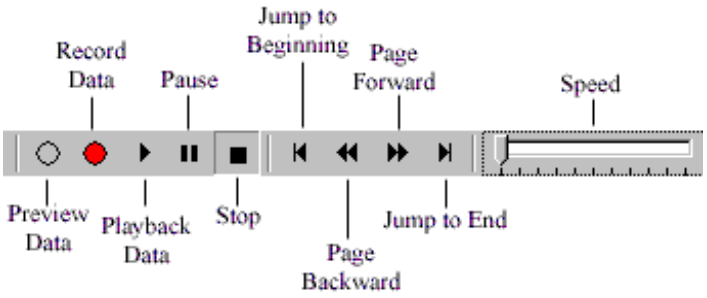
View live data without storing it to disk.

Clicking the **Preview Data button**, on the Main Toolbar  .

Record Live Data

Begin capturing live data to disk:

Clicking the **Record Data button**, on the Main Toolbar  .



Navigation Controls

The following toolbar buttons provide convenient navigation functions to aid in reviewing data files:

Jump to Beginning: moves the display to the beginning of the data file.

Page Backward: moves the display back one page (page size dictated by the Timescale setting.)

Page Forward: moves the display forward one page (page size dictated by the Timescale setting.)

Jump to End: moves the display to the end of the d

Playback Saved Data

View smooth scrolling data as previously captured by:

Clicking the **Playback Data** button on the Main Toolbar 

Adjust the playback speed by moving the Speed control slider in the main toolbar

Glossary

ASCII (American Standard Code for Information Inter-exchange)
A standard character set and coding scheme used to represent letters, numbers, symbols, and control characters.

Bandwidth
The required capacity for the data volume and transmission rate.

Baud Rate
The number of signal elements per second occurring on a communications channel. Since a signal element can represent more than one bit, baud rate is not necessarily the same as bits per second.

BPS
The number of bits that are transmitted in one second. This is the basic unit of measure for serial data transmission.

ISM Band (Industrial, Scientific, and Medical)
In the mid 1980s, the FCC provided an unlicensed radio spectrum in the ISM bands of 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz.

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