

iCollect

User's Reference Manual

All specifications subject to change without notice.

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Intended use

iCollect data collection software (also called iCollect) is intended to be used as a research tool for collecting data from specified GE products. This product does not affect the intended use of these other products.

WARNING

This data collection software is not intended for clinical use, and is not a medical device.

Responsibility of the manufacturer

GE Healthcare shall in no event be liable for any direct, indirect, incidental, special, or consequential damages caused by this product.

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| | | |
|----------|---|-------------|
| 1 | Introduction | 1-1 |
| | Overview | 1-1 |
| | About this manual | 1-1 |
| | Typeface conventions | 1-1 |
| | Safety precautions | 1-2 |
| | Hardware and software requirements | 1-2 |
| | PC and interfacing | 1-2 |
| | Compatible GE Healthcare devices | 1-2 |
| 2 | Installation and startup | 2-3 |
| | Installing iCollect | 2-3 |
| | Startup and registration | 2-4 |
| | Loading PHY files | 2-5 |
| | Exiting the iCollect | 2-5 |
| 3 | Using iCollect online | 3-7 |
| | Starting the online mode | 3-7 |
| | Online main window | 3-8 |
| | Command buttons | 3-9 |
| | Resizing the main window | 3-9 |
| | Online waveforms | 3-9 |
| | Selecting the displayed waveforms | 3-9 |
| | Changing the waveform sampling interval | 3-10 |
| | Data file size | 3-10 |
| | Changing the period of waveform display | 3-11 |
| | Online trends | 3-11 |
| | Selecting the displayed trends | 3-12 |
| | Auto-selection of displayed trends | 3-12 |
| | Checking the latest numerical parameter value | 3-12 |
| | Changing the trend sampling interval | 3-12 |
| | Changing the trend scale | 3-13 |
| | Clearing the trends | 3-13 |
| | Freezing the online trends and waveforms | 3-13 |
| | Displaying alarms | 3-13 |
| | Displaying events | 3-14 |
| | Saving data in .drc files | 3-14 |
| | Saving data in ASCII files | 3-14 |
| | Entering and modifying notes | 3-15 |
| | Taking snapshots | 3-16 |
| | All page - snapshots off all selected waveforms or trends | 3-16 |
| | Overlaid page - overlaid snapshots of waveforms or trends | 3-17 |
| | One page - a snapshot of one waveform or trend | 3-18 |
| | Working with graphical snapshots | 3-18 |
| | Numeric presentation of trend and waveform snapshot data | 3-19 |
| | Exporting snapshot data to ASCII and Excel | 3-20 |
| | Tips for using the data in Excel | 3-20 |
| | Using plug-ins | 3-21 |
| | Printing the current window | 3-21 |
| | Exiting the online mode | 3-21 |
| 4 | Using the iCollect offline | 4-23 |

| | |
|---|-------------|
| Starting the offline mode | 4-23 |
| Offline main window | 4-24 |
| Replaying the data in offline mode | 4-25 |
| Offline waveforms | 4-26 |
| Selecting the displayed waveforms | 4-26 |
| Changing the waveform sampling interval | 4-26 |
| Changing the period of waveform display | 4-26 |
| Clearing the waveforms | 4-27 |
| Offline trends | 4-27 |
| Showing data as XY graphs | 4-27 |
| Moving to a specific time in the offline graphs | 4-28 |
| Stopping an action at a desired time | 4-29 |
| Searching for markers | 4-30 |
| Loading PHY files | 4-30 |
| Saving data in PHY files | 4-31 |
| Saving data in .drc files | 4-32 |
| Saving data in ASCII files | 4-32 |
| Saving selected data in an ASCII file | 4-32 |
| Saving all data in an ASCII file | 4-33 |
| Viewing ASCII files | 4-33 |
| Opening a new .drc file | 4-33 |
| Printing | 4-33 |
| Taking snapshots | 4-33 |
| Notes | 4-34 |
| Using plug-ins | 4-34 |
| Exiting the offline mode | 4-34 |
| 5 Help and troubleshooting | 5-35 |
| Getting help | 5-35 |
| Getting context-sensitive help | 5-35 |
| Displaying the manual | 5-35 |
| Showing registration information | 5-35 |
| Displaying GE Healthcare web site | 5-35 |
| Showing program information | 5-35 |
| Error situations | 5-36 |
| RS232 Communication buffer indicator bar | 5-36 |
| Error messages | 5-36 |
| Unexpected errors | 5-36 |
| 6 Editing the database configuration | 6-37 |
| Parameters | 6-37 |
| Waveforms | 6-38 |
| Time format for ASCII files | 6-38 |
| Defining the digit field color behavior | 6-39 |
| 7 Using LabVIEW palettes | 7-41 |
| Plot Legend palette | 7-41 |
| Scale legend palette | 7-42 |
| Graph palette | 7-43 |
| Cursor legend palette | 7-43 |
| 8 File Formats | 8-45 |

| | |
|---------------------------|------|
| Configuration files | 8-45 |
| Params5.txt | 8-45 |
| Waves5.txt | 8-51 |
| ASCII output files | 8-53 |
| Alarms.asc | 8-53 |
| Trends.asc | 8-57 |

9 Plug-ins **9-61**

1 Introduction

Overview

iCollect data collection software (also called iCollect) is a 32-bit LabVIEW application designed for collecting measurement data from various GE Healthcare monitoring products to a PC for analysis, for example, in Microsoft Excel.

iCollect features:

- Collects trend, waveform and alarm data directly from a monitor through a PC serial interface cable, or from a monitor in the network through the GE Healthcare S/5 Central, and visualizes data online and offline for research studies.
- Allows data collection from minutes to days.
- Both online and offline data can be saved for analysis in external applications, such as Excel.
- In online mode, the collected data can be saved in .drc files (Datex Record Interface format) for further analysis in offline mode.
- Saving in ASCII format available in both modes.
- In offline mode, allows converting physiological data files archived by the GE Healthcare S/5 Central into .drc format, and back.
- You can make notes and add markers during the data collection for easy analysis.
- Saves all configured settings, making it easy to manipulate the cases belonging to a research study.
- Expandable with user-designed plug-ins for LabVIEW, C++ or as DLL.
- For general LabVIEW interface guidelines, see appropriate LabVIEW manuals at www.ni.com.
- iCollect runs on Windows XP, Windows 7,8 and 10.

About this manual

This manual provides instructions for installing, registering and using the iCollect.

The manual can be found in .pdf format on the product CD-ROM in the directory \Documents. This directory also contains a readme.txt file.

Typeface conventions

To help you find and interpret information easily, the manual uses consistent text formats for certain text types:

- Command buttons are written in the following way: **Cancel**.
- Keyboard key names are written in the following way: ESC.
- Menu commands and names of dialog box parts (text boxes, list boxes, checkboxes) are written in bold italic typeface: ***Location***.
- Menu access is described from top to bottom. For example, the selection of the menu command ***Waves*** in the ***Snapshot*** menu would be shown as ***Snapshot - Waves***.
- File names, file paths and commands are written in the following way: `comm.exe`.
- Messages displayed on the screen are written inside single quotes: 'Learning'.

- Warnings are displayed in the following way:

WARNING This data collection software is not intended for clinical use, and is not a medical device.

Safety precautions

Refer to GE Healthcare Bx50 manuals for safety precautions.

Hardware and software requirements

PC and interfacing

- IBM compatible x86 PC with a minimum of 500 MB of memory.
- At least 1 GB free disk space.
- Microsoft Windows XP, Windows 7,8 or 10.
- Screen settings: Windows default small font size.
- For serial communication PC serial interface cable, order code 881167. Use only GE specified interface cables.
- When using a serial to USB converter it must support hardware handshaking.
- For ethernet communication an existing TCP/IP link to the GE Healthcare S/5 Central.

Compatible GE Healthcare devices

The iCollect is compatible with the following GE Healthcare devices:

- Anesthesia Monitor
- Critical Care Monitor
- Compact Anesthesia Monitor
- Compact Critical Care Monitor
- Light Monitor
- Cardiocap™/ 5 Monitor
- FM Monitor
- B40, B40i, B20 and B20i Monitors
- CARESCAPE™ Monitor B450, B650, B850
- S/5 Central CSNET 02 version 2.2 or higher

Refer to the manual of the GE Healthcare devices for instructions how to safely connect your PC to the patient monitor.

AS/3 Anesthesia and Light monitor software released before 1998 are not able to send more than one waveform at a time.

NOTE: AS/3 software released before 1995 does not work with iCollect.

2 Installation and startup

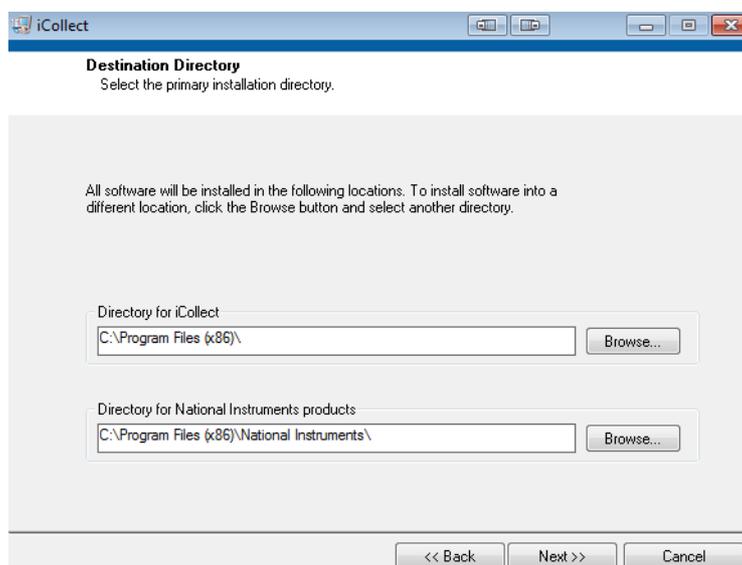
The iCollect is shipped on a CD-ROM. The installation program copies all the files that make up the application package in a directory of your choice.

NOTE: If you have ordered software license L-COLLECT 4, the CD-ROM contains four program licenses. You can get up to 4 four passwords, and use the application on 4 PCs.

Installing iCollect

NOTE: Before installing, close other Windows programs.

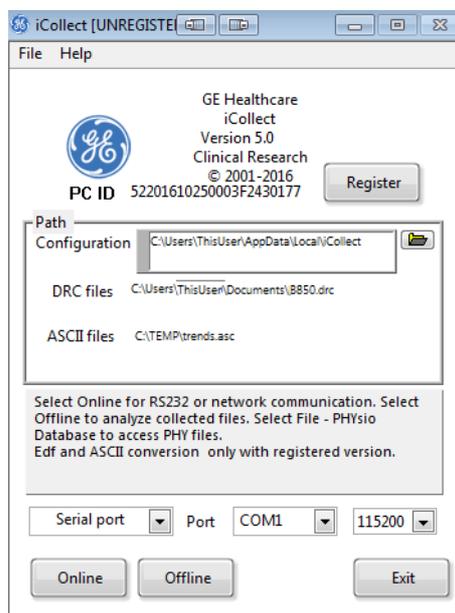
1. Insert the iCollect CD-ROM in the CD-ROM drive.
2. Select **Start - Run** and locate the setup.exe on the CD-ROM. Run the *setup.exe*. Click **Next** to continue.



3. Start Installation. Click **Next** to continue.
4. Once installation is complete click **Next** to complete the installation. The iCollect program will then start automatically.
The iCollect entry is added in the **Start** menu. The installation program automatically installs also the LabVIEW runtime engine.
You can also access this manual in *.pdf* format through the **Start** menu.

Startup and registration

1. Select **Start - Programs - S5 Collect - S5 Collect**. The startup window is displayed.



NOTE: In the startup window, you can define the path for storing the trend and wave configuration files. This enables the use of several configurations for several research projects on one PC. Each new configuration starts with the default configuration files.

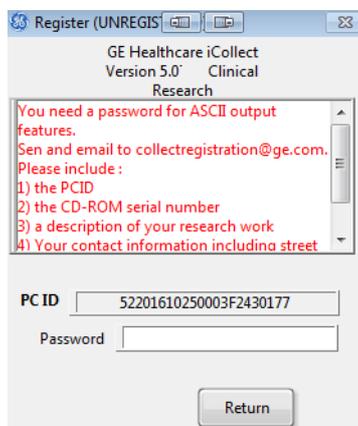
Also the paths for the latest saved ASCII file (.asc) and Datex Record Interface file (.drc) are shown.

2. The **Register** button is displayed in the startup window if you have not yet registered the application.

In online mode, to be able to save data in ASCII format, you need to send a registration and get a password. In offline mode, unregistered applications can save only 4 lines of trend data or 10 seconds of waveform data to ASCII files. In both modes, saving snapshots as .bmp, .jpeg and .png files is not supported if you are not registered.

Go to registering by clicking **Register**.

If you already have registered, continue to step 5.



3. Get a password by sending an email or fax including the displayed PC ID and all the other information requested in the Register dialog box.

NOTE: You can use the L-COLLECT4 on up to four PCs. To do this, register each PC separately by sending the information requested in the Register dialog for each PC. The password is connected to the PC ID, and cannot be used on another PC. You can first register one PC, and at a later date (but within a period of 3 years) register the other PCs.

NOTE: Do not delete or change names of subdirectories in the installation directory of iCollect. If the iCollect directory and its subdirectories are, for some reason, deleted from the hard disk, the software must be registered again.

4. After receiving a password, enter it in the **Password** box. If the password is correct, the window will disappear automatically.

NOTE: If you do not have a password, you may evaluate the application, but every now and then a reminder to register will be displayed.

5. From the startup window, select **Online** or **Offline**.

When the program is started, the settings in the configuration file *S5 Collect.ini* are read. This file is always saved when the program exits.

Loading PHY files

You can access data that has been stored by the S/5 Central, and data on a PCMCIA card that has been used in the M-MEM module. For further information see "Loading PHY files" on page 2-5

Exiting the iCollect

In the main window, select **File - Exit** (Ctrl+Q). The iCollect startup window is displayed. Click **Exit** to exit the program.

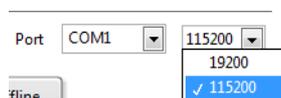
3 Using iCollect online

Starting the online mode

1. Connect the iCollect PC to the monitor through serial communication port or through GE Healthcare S/5 Central.

If you use serial communication, do as follows:

- Connect the serial cable between the monitor and the PC. The monitor should not be on while connecting the serial cable to the monitor.
- In the startup window, select **Serial port** and the name of the port (**COMx**). Only available ports are displayed.
- When connecting to a Bx50 monitor with software version 3.0 you can connect at high baud rate to get more waveforms collected.

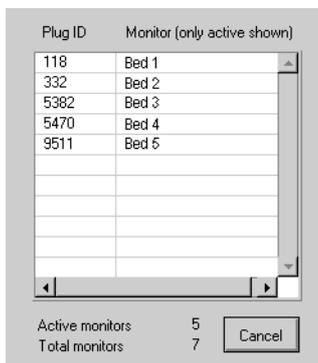


NOTE: Make sure that the serial cable is properly connected. If it is not properly connected, or a wrong COM port is selected the message 'Communication Timeout' will be displayed. When using a USB to serial converter cable insert the USB cable to show it as an available port.

If you connect to a monitor through a Central, do as follows:

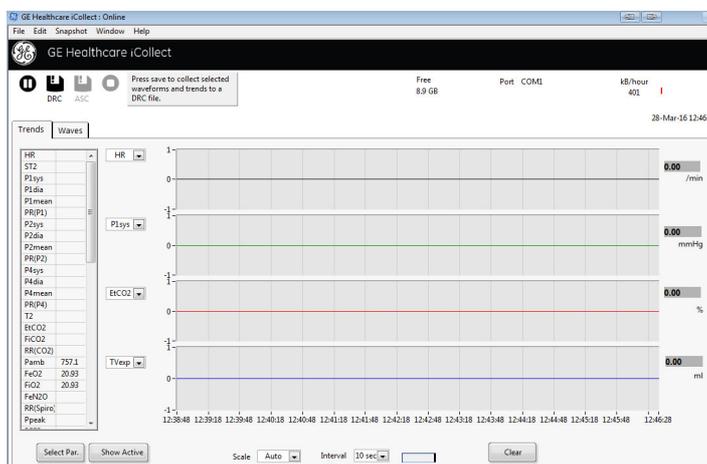
- Connect your computer to the Central (to the TCP/IP network board) with a cross-over cable, or with a normal cable if you are using a hub between your computer and the Central.
- If the Central is not connected to a server in an office network, the IP address for the PC running iCollect has to be set manually from **Start - Settings - Network and Dial-Up Connections - Local Area Connection - Properties - Internet Protocol (IP) - Properties**:
IP Address: 192.168.1.56
Subnet Mask: 255.255.255.0
- For each additional iCollect PC in the system, add 1 to the last number of the IP address, so the second PC will be 192.168.1.57, the third 192.168.1.58 and the fourth 192.168.1.59. The total amount of the iCollect PCs connected in the system may not exceed 4.
- In the startup window, select **Network Server** and enter the name of the Central to connect to. If you have more than one Central in your system, separate the Central names with a space or a semicolon (;).
- Verify that the PC is connected to the Central in the Network Neighborhood desktop icon on your PC.

- Click **Online** in the startup window. After a while, the Monitor selection dialog is displayed. Select the monitor.



- The program displays the main window and starts reading the data from the selected monitor.

Online main window



Top

- Command buttons
- Message area
- Available free disk space
- Port number
- Path and name of the latest .drc or ASCII file saved
- Data rate in kB.
- A communication buffer indicator is displayed for serial communication. See “RS232 Communication buffer indicator bar” on page 5-36.

Left

- Tab pages for selecting of trends and waves
- Selection of parameters

Right

- Current time. The time is updated every second.
If you are using a network connection, the monitor id is displayed (from the network plug connected to the monitor, if available).
- Use the graph palette to scroll the display area of the graph and to zoom in and out of sections of the graph. The graph palette is available only when graphs are frozen. See “Graph palette” on page 7-43 for details.

Command buttons



Pause stops updating the waveform and trend graphs.

DCR saves all alarm, trend and waveform data shown to a Datex Record Interface format file (.drc) starting from the moment you press this button. For details, see “Saving data in .drc files” on page 3-14

ASC saves alarm, trend and waveform data to separate ASCII files. The button is available only if DRC saving has been activated. For details, see “Saving data in ASCII files” on page 3-14.

Stop stops the current recording to a file.

Resizing the main window

You can resize the main window by selecting **Window - Resize** (Ctrl+S). This may be useful when you use, for example, Office applications on the same PC while collecting data.

Online waveforms

In the main window, select the Waves page.

The waveform selected to be displayed in the first waveform box.

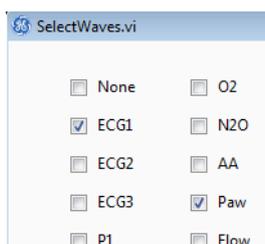
Use the graph palette in the bottom right to scroll the display area of the graph and to zoom in and out of sections of the graph. The graph palette is available only when graphs are frozen. See “Graph palette” on page 7-43 for details.

Red waveform cursor. The waveform at the waveform cursor is 3 seconds delayed from the actual waveform shown on the monitor screen.

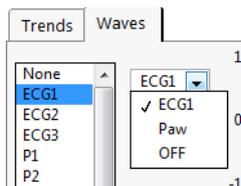
Scroll bar and scroll box on the bottom. By moving the scroll box you can move to the desired part of the waveform.

Selecting the displayed waveforms

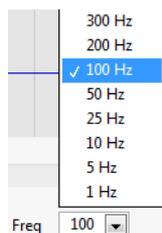
The waveform selection list on the left (**Waveforms**) defines the waveforms that are available for viewing in the boxes. The list contains all the waves that have been selected from the **Select Waves** button.



After selecting the wave(s), click the arrow button next to the waveform selection box and select the wave you wish to see in the waveform box.



Changing the waveform sampling interval



Click **Freq** and select the frequency. The sampling frequency in the online mode can be selected from 300 to 1 Hz.

During network communication and with Bx50 monitors with software version 3.0 at high baud rate the maximum number of waves that can be requested is 24.

During serial communication at 115200 bit/s, the number of waveforms that can be collected is not limited by the baud rate. The total amount of waveforms can be 24. If ECG12 has been selected the maximum is 17.

During serial communication at 19200 bit/s, the maximum frequency available depends on which waveforms are being collected. For example, ECG has 300 Hz, hemodynamic waveforms 100 Hz and gas and spirometry waveforms 25 Hz.

If too many waves are selected, a prompt to reduce the amount of waveforms is displayed. The limit is a total of 600 samples per second; for example

2 * 300 Hz or
 1 * 300 Hz + 3 * 100 Hz or
 6 * 100 Hz or
 2 * 100 Hz + 6 * 25 Hz or
 8 * 25 Hz.

If you are collecting data from a longer period of time to an ASCII file, select a low frequency to reduce the file size.

Data file size

The table on "Waves5.txt" on page 8-51 shows the frequency for each wave. The value must be multiplied by 2 to get the number of bytes/second. The overhead each second is 40 bytes. Trend data takes about 1500 bytes per request.

An example of asking parameters each hour for a total period of 2 days (all trend parameters are saved in the .drc file regardless of your selection):

$(2 \times 24) \times 1500 = 72 \text{ kB}$.

An example of collecting 2 waveforms per hour and trend data each 5 seconds:

$$\begin{array}{rcl}
 3600 & 2 \times \text{InvBP waves} & \text{trend each 5 seconds} = \\
 \text{seconds} & + & \\
 3600 \times & 2 \times (100 \times 2 + 40) & 3600/5 \times 1500 = \\
 & + &
 \end{array}$$

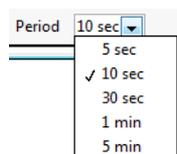
$$864 \text{ kB} + 144 \text{ kB} = 1008 \text{ kB}$$

It is not possible to predict the exact file size of the ASCII files. The number of characters in the values may make a big difference in the file size, for example, if the invasive pressure is 3.00 mmHg or 120.00 mmHg there are 4 or 6 characters written in the file.

The online data collecting shows the file sizes while saving the data and the data rate in kB/min. From these values, you can estimate the hard disk occupation and when the saving can be made.

NOTE: The frequency selection does not affect the data transfer rate, which is always the maximum. The data is stored in .drc files for each wave at its individual rate. The data is displayed and saved in ASCII files at the chosen frequency.

Changing the period of waveform display



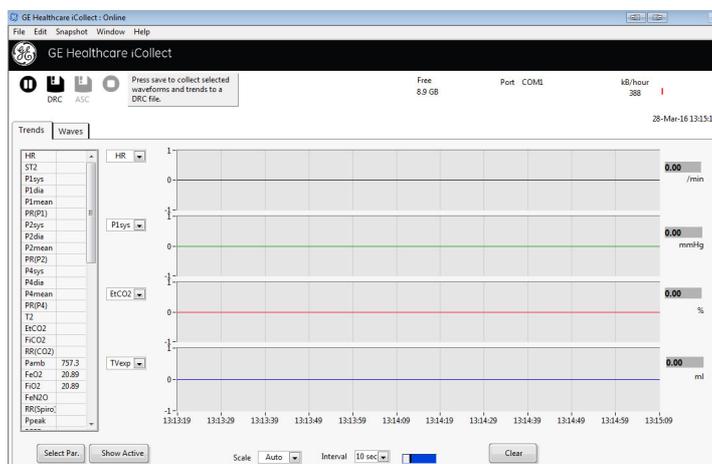
Click **Period** and select **5 sec, 10 sec, 30 sec, 1 min., 5 min.**

When you change the period of the waveform display, the start and end times on the scroll bar at the bottom of the page change accordingly. By moving the scroll box you can move to the desired part of the waveform.

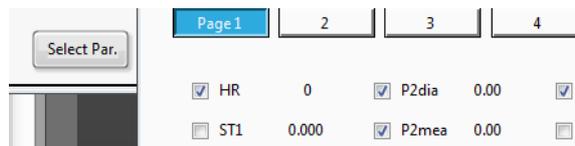
The recommended value depends on the selected waveform. For example, if you select 1 minute for ECG waveforms, the artifacts cannot be read from the displayed waveforms. When you change the period, for example, to 10 seconds, the waveform becomes much clearer.

Online trends

In the main window, select the **Trends** page.



Trends available for graph selection can be selected from the **Select Par.** button in the lower right. Select from the 4 pages all parameters to display or save.



A maximum of 4 graphical trend boxes is available.

Use the graph palette to scroll the display area of the graph and to zoom in and out of sections of the graph. The graph palette is available only when graphs are frozen. See "Graph palette" on page 7-43 for details.

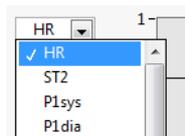
Trend times

The online trend data is real-time. If the PC is very slow and a lot of waves are being asked, trend data may also be buffered. This is indicated in the communication buffer indicator in the upper right corner.

Selecting the displayed trends

The list on the left shows the parameters that are available for viewing. The list contains all parameters that the maximum monitor configuration can measure.

- After selecting the parameters from the button Select Par, click the arrow button next to the trend box and select the parameter you wish to see in the trend box.



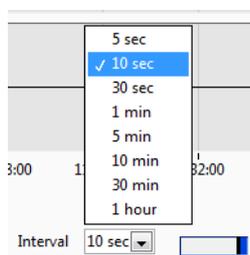
Auto-selection of displayed trends

Clicking **Show Active** will select and display all data with a positive value greater than 1 times the resolution as defined by the divider for the parameters in the configuration window.

Checking the latest numerical parameter value

The latest read numerical parameter value is shown to the right of the trend box under the trend selection box in a digit field. The latest read values are also displayed next to the parameters in the **Parameters** list.

Changing the trend sampling interval



Click **Interval** and select **5 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, 30 min** or **1 hour**.

NOTE: **5 sec** is not available during network connection.

When you want to see quick changes in the trends, select a short interval, for example, 5 seconds. When you want to see the overall direction of the trends, select a longer interval, for example, 1 minute. If you are collecting data from a long period of time, for example several hours, and have selected a short interval, the .drc file becomes quite large.

Changing the trend scale



Click **Scale** and select the desired trend time scale from values **1 min, 5 min, 10 min, 20 min, 30 min, 1 hour, 2 hours, 4 hours, 6 hours, 8 hours, 12 hours, 24 hours** and **Auto**. The trend boxes start showing trends using the selected scale. The start and end times under the trend panel change accordingly.

If you select **Auto**, the time scale is autoscaling all the time: the start time is the start of the collection period, or the moment the graph was cleared last, and the end time is the time of the last package received.

Clearing the trends

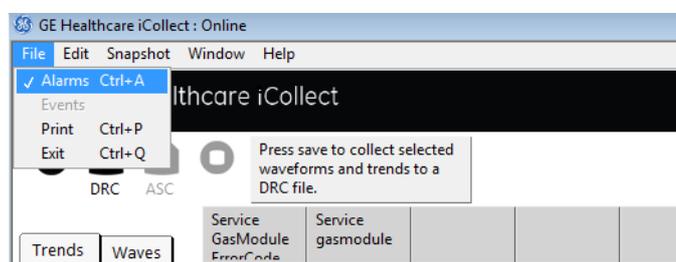
Clicking the **Clear** button clears the displayed graphs and deletes the history of each graph.

Freezing the online trends and waveforms

If you want to stop updating both the trends and the waveforms simultaneously, click the **Pause** button in the upper left. Click it again to continue updating the display.

Displaying alarms

Select **File - Alarms (Ctrl+A)** to display all parameter alarms from the monitor. By default, the alarms are not displayed.

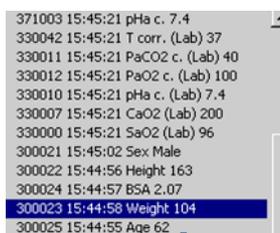


NOTE: If this selection is off, the alarms are not saved in .drc and ASCII files.

Displaying events

Select **File -Events** (available only with network communication) to display all events from the monitor.

Events include, for example, changes in demographic data, values entered in the calculation view, setting changes of interfaced devices, or changes in record keeping menus. By default, the events are not displayed.



The event is preceded by an event code and its time of occurrence. The last 100 events are shown in the list.

All events will be automatically added to the notes belonging to the saved *.drc* file after the online window has been closed.

Saving data in *.drc* files

- To start recording data in a *.drc* file, click the **DRC** button. All trend parameters will be saved regardless of the selection. Only the selected waveforms will be saved (at a maximum frequency).
- To include alarm data in the *.drc* file, remember to first display the alarms by selecting **File - Alarms (Ctrl+A)**. By default the alarms are not displayed nor saved.
- To include event data in the *.drc* file, remember to first display the events by selecting **File -Events** (only available with network communication).By default the events are not displayed nor saved.
- When you have clicked the **DRC** button, the application starts saving the data. You will be prompted for the filename. You can see the amount of saved data under the **DRC** button.
- Click the **Stop** button when you have saved the desired amount of data.

Saving data in ASCII files

NOTE: This function is not available for unregistered users.

NOTE: The **ASCII** button is available only, if DRC saving has been started.

- To start saving data in ASCII files, click **ASC**. Only the selected trends and waveforms will be saved.
- To save alarm data in an ASCII file, remember to have the **File - Alarms (Ctrl+A)** selection on. By default this is off.
- You will be prompted for the name of the trends file, waves file and alarms file separately. By default, file names *trends.asc*, *waves.asc* and *alarms.asc* are used. The waveforms will be saved at the chosen frequency.
- You can see the total size of all saved ASCII files under the **ASC** button.
- When you have saved a desired amount of data, click the **ASC** button again. The output file formats are shown in "File Formats" on page 8-45.

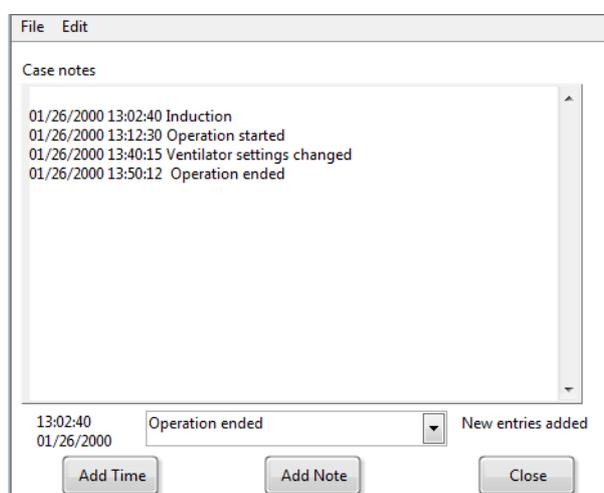
The decimal symbol saved in the ASCII file follows the Windows settings (**Start - Settings - Control Panel - Regional Settings**). Programs like Microsoft Excel also follow this setting. When transferring the ASCII files between different computers, make sure that the decimal symbol has been set the same on all computers.

NOTE: If you click **Stop**, both DRC saving and ASCII saving are stopped.

Entering and modifying notes

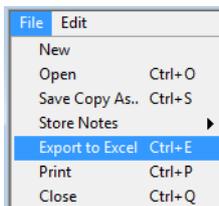
You can enter and modify case notes by selecting **Edit - Notes (Ctrl+N)** in the main window. You can select notes from a predefined list, or enter notes of your own. Here you can, for example, enter drug administrations and their effects on the patient. The information entered in notes is first saved in a temporary `.txt` file and copied to a `.txt` with the same root as the `.drc` file when the saving is completed. The notes can be viewed and re-edited in the offline mode.

The notes are not copied when saving only to an ASCII file.



- To select a predefined note from the list at the bottom and add it in your notes, click the list of predefined notes, select the desired note and then select **Edit - Add Note (F2)** or click **Add Note**. The note is added in the list of notes together with a timestamp.
- In the Notes window, to enter a note that is not predefined, first insert a timestamp by selecting **Edit - Add Time (F1)** or clicking **Add Time**. If you also wish to add a date, select **Edit - Add Date + Time**. After this, enter the note manually.
- You can generate a marker automatically by pressing the **Take Snapshot** button on the patient monitor. At the next reading of the parameter data to the notes, a line is automatically added in the **Case notes** with the time and the marker number.
- You can remove the contents of the Case notes by selecting **File - New**.
- The predefined notes are stored in `notes.lst`, which can be edited using a text editor. You can add the current case notes in the selection list by selecting **File - Store Notes - Add Case Notes to Selection List**. You can replace the contents of the selection list with the current case notes by selecting **File - Store Notes - Replace Selection List with Case Notes**. All data and time stamps will be automatically removed before the line is made a predefined note.
- To print the **Case notes** shown in the **Notes** window, select **File - Print (Ctrl+P)**.
- You can open a saved `notes.txt` file by selecting **File - Open (Ctrl+O)**.

- You can export the note entries directly to an Excel worksheet by selecting **File - Export to Excel (Ctrl+E)**.



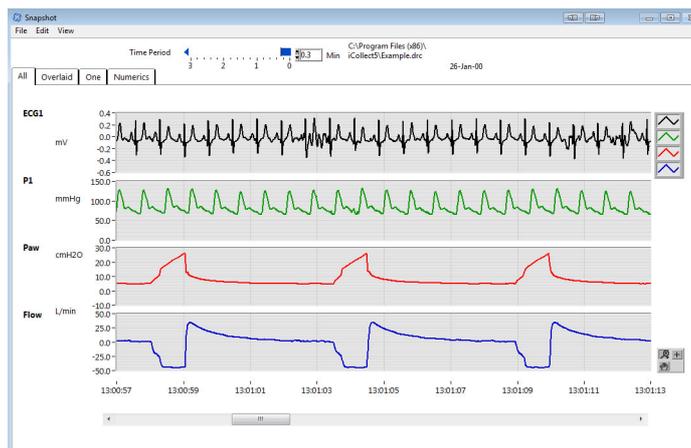
Taking snapshots

A snapshot contains all data in the memory (max. 30000 samples). A maximum of four parameters or waveforms can be displayed at a time. The snapshots are shown for the parameters that have been selected to be displayed in the main window.

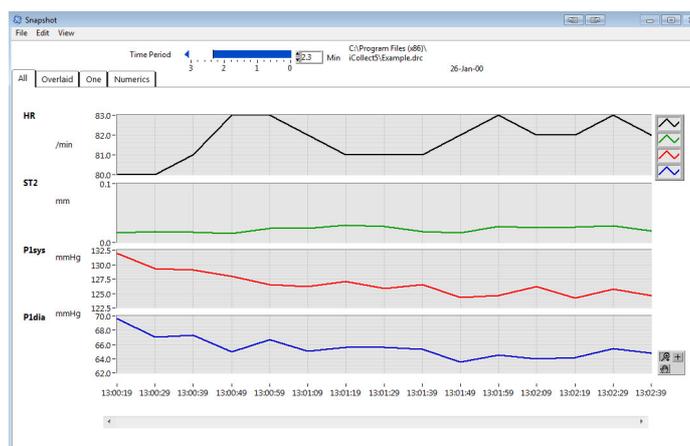
To display snapshots in the online mode, select **Snapshot - Trend (Ctrl+T)** or **Wave (Ctrl+W)**.

All page - snapshots off all selected waveforms or trends

Select **Snapshot - Trends (Ctrl+T)** or **Wave (Ctrl+W)** and All to show snapshots for all four parameters or waveforms selected to be displayed in the main window. The X axis shows the time and the Y axis the parameter values.



Waveform snapshots - All snapshots page in online mode



Trend snapshots - All snapshots page

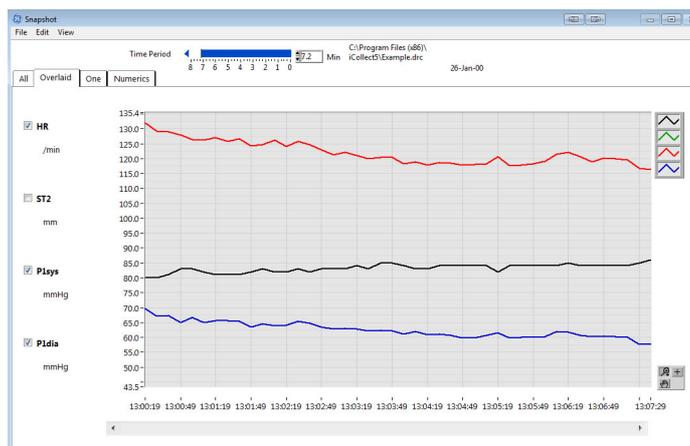
Overlaid page - overlaid snapshots of waveforms or trends

Select **Snapshot - Trend (Ctrl+T)** or **Wave (Ctrl+W)** and **Overlaid** to display a snapshot for 4 overlaid trends or waveforms at a time. You can select and deselect each parameter from the check boxes on the left. The X axis shows the time and the Y axis the parameter values.

The Overlaid page is useful, for example, when you are comparing two trends or waveforms.



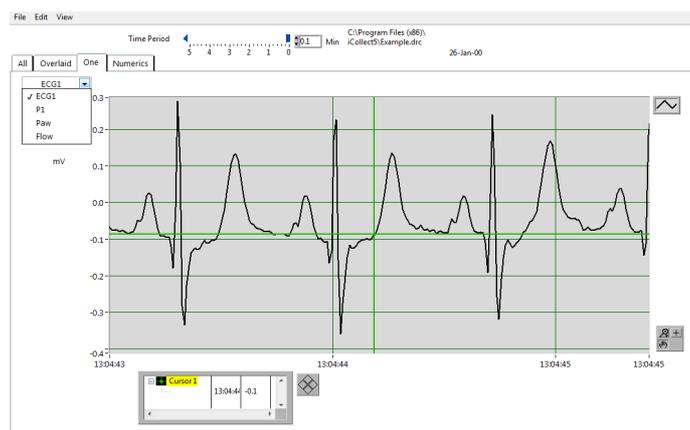
Waveform snapshots - Overlaid snapshots page



Trend snapshots - Overlaid snapshots page

One page - a snapshot of one waveform or trend

Select **Snapshot - Trend (Ctrl+T)** or **Wave (Ctrl+W)** and **One** to show a snapshot for one trend or waveform at a time. You can select the parameter from the parameter list. The X axis shows the time and the Y axis shows the parameter values.



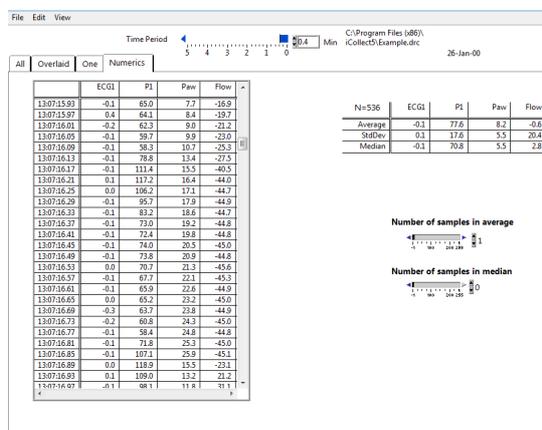
Working with graphical snapshots

- The **Time period** bar defines the total time period. To rescale the snapshot in time, click the bar above the number of seconds or minutes needed. For example, if you wish to display trend for a period of 33 seconds, click the bar above 33.
- To have a closer look at a snapshot, use the  to zoom the desired part. By clicking the left end of the **Time period** bar at the top of the snapshot screen you get the total period again.
- You can refresh the snapshot with the latest collected data using the **Refresh** button at the top.
- The slide bar at the bottom defines which part of the data is visible. To show another time point, slide the slide box to the desired start point.
- To display the pop-up menu for the graphical snapshot window, click the right mouse button.

- To autoscale the X axis or Y axis, click the graph area with the right mouse button and select **AutoScale X** or **AutoScale Y** to autoscale the X axis or Y axis respectively.
- You can clear the chart by selecting **Clear Chart** from the pop-up menu.
- To display or hide the X scale and Y scale for all of the graphs simultaneously, select **Visible Items - X Scale** or **Y scale** from the pop-up menu.
- To display a numeric data box under each the graph, select **Visible Items - Digital Display** from the pop-up menu. The value is the last value in the right part of the graph.
- To display or hide the scrollbar, select **Visible Items - Scrollbar** from the pop-up menu.
- There are several palettes available for working with the graphs. To show them, select **Visible Items** from the pop-up menu and select the desired palette. For details about these palettes, see "Using LabVIEW palettes" on page 7-41.
- To print the currently shown snapshot page on paper on your default printer, select **File - Print (Ctrl+P)**.
- To hide the Time period bar and tab page names, select **View - Graph Only**.
- To save the snapshot page in a picture file, select **File - Save Graph As** and select **.bmp (Ctrl+B)**, **.png (Ctrl+J)** or **.jpeg (Ctrl+G)**. The picture file contains same data as the paper printout. The **.bmp** files are big in size, **.jpeg** files are smaller, but may cause loss of some pixel information. The **.png** files are the smallest containing all text and lines. They can be read by most Microsoft Office applications.

Numeric presentation of trend and waveform snapshot data

Select **Snapshot - Trend (Ctrl+T)** or **Wave (Ctrl+W)** and **Numerics** to show a numeric presentation of the data shown currently in all four trends or waveforms in the selected time period.



- The **Time period bar** defines the total time period. To rescale the snapshot in time, click the bar above the number of seconds or minutes needed. For example, if you wish to display trend for a period of 33 seconds, click the bar above 33.
- Click **Refresh** to update with the latest data collected.
- The table contains the total time period defined by the **Time period** bar and the four parameters or waveforms selected in the main window together with their values.
- The values next to the table are average, standard deviation and median values of the displayed parameters.

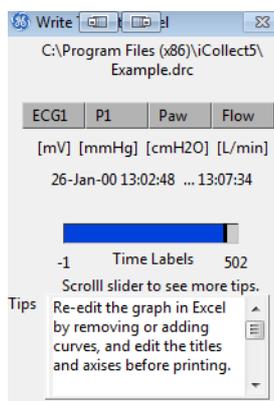
- The **Number of samples in average** and **Number of samples in median** field can be used to filter the data in the table and all graphs in the snapshot. Increasing **Number of samples in average** will apply a sliding window average, where the **Number of samples in average** is the same as the number of samples in the window. This filter smoothens the effect of the artifacts. Increasing **Number of samples in median** will sort each window by **Number of samples in median**, and pick up the middle value of the sorted data. This filter can be used to completely rule out artifacts in the data.
- To show the currently selected table cells, click the right mouse button and select **Show Selection** from the pop-up menu.
- To hide the Time period bar, select **View - Graph Only**.
- To print the currently shown snapshot page on paper, select **File - Print (Ctrl+P)**.
- To save the snapshot page in a picture file, select **File - Save Graph As** and select **.bmp (Ctrl+B)**, **.png (Ctrl+J)** or **.jpeg (Ctrl+G)**. The picture file contains same data as the paper printout. The **.bmp** files are big in size, **.jpeg** files are smaller, but may cause loss of some pixel information. The **.png** files are the smallest containing all text and lines. They can be read by most Microsoft Office applications.

Exporting snapshot data to ASCII and Excel

You can save the data in the displayed snapshot to an ASCII file by selecting **File - Export Table - To ASCII (Ctrl+S)**.

You can save the data in the displayed snapshot to an Excel worksheet by selecting **File - Export Table - To Excel (Ctrl+E)**. This may take a while.

Status window displayed during data transfer to Excel



Tips for using the data in Excel

- Re-edit the graph in Excel by removing or adding curves, and edit the titles and axes before printing.
- Set the Window size in Excel to **Selection** to view the complete graph. You can do this by selecting **View - Zoom - Fit selection**.
- If the Time column includes a Date, Excel may not interpret the fields correctly. In such a case, select the column and use **Edit - Replace** and replace **":" with ":**.
- When placing a curve on the right axis, remember to edit the order of unit texts on the Y-axis.
- Select graph in Excel and click the **Chart Wizard** icon to select, for example, a chart type with markers or smoothing data.

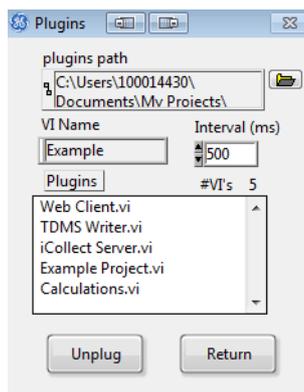
Using plug-ins

A plug-in is a virtual LabVIEW instrument that can be modified using LabVIEW. Plug-ins can be used for customizing the format of showing the collected data on the screen, or for performing additional calculations with the data online or offline.

A plug-in can run on any PC when called by the iCollect without having the LabVIEW editor itself installed on the PC. The iCollect uses the NI LabVIEW RunTime Engine to run the plug-ins.

NOTE: The iCollect needs to be registered to be able to run plug-ins.

In the main window, select **Window - Select Plugin**. A list of available plug-ins is displayed.



The plug-in files should be located in the directory indicated in the Plugins path.

If the program has been installed to *C:\Program Files (x86)\iCollect5*, the default directory at first startup is *C:\Program Files (x86)\iCollect5\plugins*. You can change the plug-in path using the browse button.

When the plug-in has been selected, the virtual LabVIEW instrument will be opened and called at regular intervals passing new data to the plug-in.

The calling interval can be changed in the online mode, see Figure on page 3-20 above.

The plug-in window may be reopened by selecting **Window - "Plugin Name"**.

See "Plug-ins" on page 9-61 for information how to program plug-ins.

Printing the current window

You can print a paper copy of the current iCollect window on your default printer by selecting **File- Print (Ctrl+P)**.

Exiting the online mode

In the main window, select **File - Exit (Ctrl+Q)** or click **Esc**. The iCollect startup window is displayed. Now you can exit the program, start serial communication or go to offline mode.

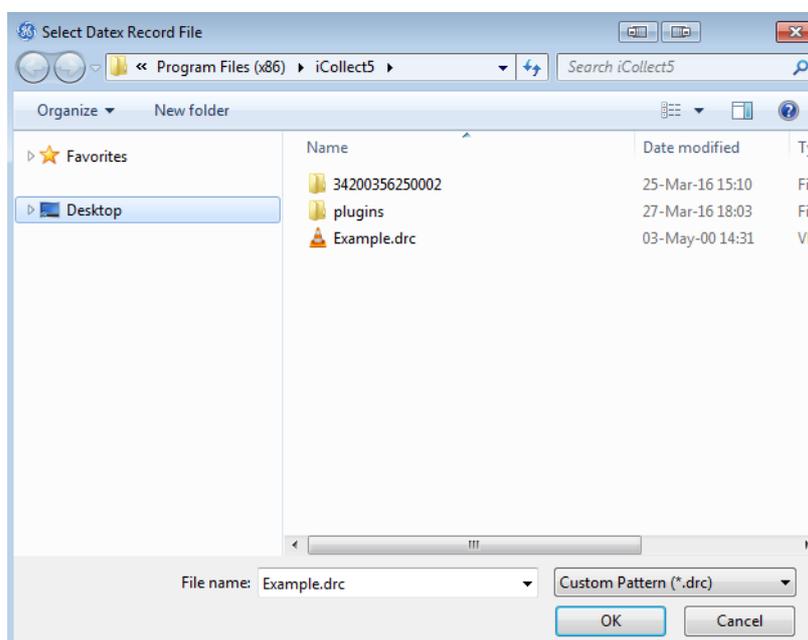
4 Using the iCollect offline

Starting the offline mode

To be able to use the iCollect offline, you need to have *.drc* files saved in your system.

NOTE: If you do not have any *.drc* files yet, and want to see how they look like, you can open one of the example *.drc* files, which the installation program has installed in the iCollect program directory. The example *.drc* files can also be found on the product CD-ROM in the directory *\Patient Data*.

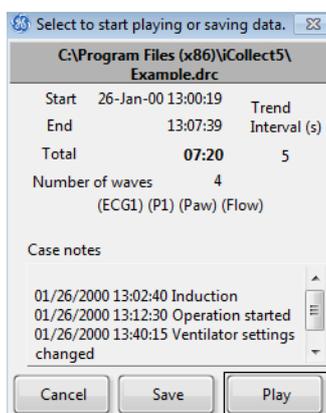
1. Click **Offline** in the startup window. A window for selecting the *.drc* file is displayed.



2. Select the desired *.drc* file and click **Open**.

The program starts replaying the first data record. After a few trend data points the following prompt is displayed:

Select to start playing or saving data



- To save all data in the *.drc* into an ASCII file without replaying the file on the screen, select **Save**.
Trends will be saved with the trend interval that was set while saving to a *.drc* file in online mode.
Waves will be saved at the previously selected frequency.
 - To start replaying the data, select **Play**.
- 
- To stop the replaying, click  or press F3.
 - To cancel and return to the startup window, select **Cancel**.

Offline main window



Command buttons for replaying data, saving, taking snapshots and opening new files.

Four tab pages: **Trends**, **Waves**, **Trends XY** and **Waves XY**.

Name of the opened *.drc* file.

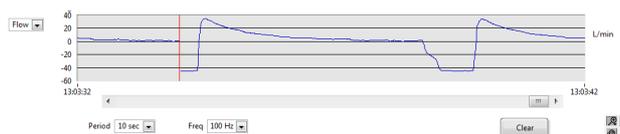
The amount of data to read

Date and time on the monitor screen, relative time, total time in the file.

Use the graph palette to scroll the display area of the graph and to zoom in and out of sections of the graph. The graph palette is available only when data reading has stopped. “Graph palette” on page 7-43 for details.

On the Trends page, the rightmost time is the time of the last data package read. The leftmost time depends on the **Scale** setting. If the **Scale** is, for example, **10 min**, and the time of the last data package is 13:07:36, the leftmost time is 12:57:36.

If the **Scale** setting is **Auto**, the leftmost time is the time of the first package in the memory, or if you clicked **Clear**, the time of the first package after clicking **Clear**.



On the Waves page, the rightmost time under the waveform boxes is the leftmost time plus the **Period** setting. The red waveform cursor shows the moment of the last package received.

Replaying the data in offline mode

The following command buttons that are needed for replaying the data saved in the .drc files are available on all offline mode main window pages.



Click **Clear** to clear the display memory.

This button is useful, for example, if you change the parameters displayed in the trend boxes or waveform boxes, and wish to show the data from that point onwards.

The program automatically selects **Clear**, if you change display settings, and the button color turns to red. This clears the display memory. The trend and waveform boxes show the data from the point you clicked **Clear**.



1 2 3 4 5 6 7 8 9 10

1. Open another .drc file.
2. Save data to ASCII file
3. Stop the current action at any moment.
4. Start replaying the data slowly from the .drc file.
This shows trend, alarm and waveform data.
5. Play the data fastPlay data fast button.
6. Start winding forward without showing any trends or waveforms. Each record will be read. You can check the time and the percentage read indicators for progress and click the **Stop** button (F3) at the time you are looking for.
7. Start reading from the beginning of the file.
8. Jump to a desired time in the file. You can also use **Edit - Go to Time**.
9. Set an automatic stop for any action. You can also use **Edit - Auto Stop**.
10. Take a snapshot of the Waves page or Trends page.

Offline waveforms

In the main window, select the Waves page.



The Waveforms selection list defines the waveforms that are available for displaying in the waveform boxes.

A maximum of 4 boxes for waveforms. The X axis indicates the time and the Y axis indicates the values.

You can change the waveform displayed in a particular box from the **Select Wave** button.

The red waveform cursor shows the moment of the last package read.

Use the graph palette to scroll the display area of the graph and to zoom in and out of sections of the graph. The graph palette is available only when data reading has stopped. See "Graph palette" on page 7-43 for details.

The number indicates the number of waveform records read from the file.

You can move to the desired part of the waveform by moving the scroll box.

Selecting the displayed waveforms

- The waveforms available are in the selection windows. Select waveforms you want available for graphical display or ASCII saving.



- After selecting the wave(s), click the arrow button next to the waveform box and select the wave you wish to see in the waveform box.

Changing the waveform sampling interval

Click **Freq** and select the frequency. The sampling frequency in the offline mode can be selected from 300 to 1 Hz. This effects the frequency shown in the offline window and the frequency of samples stored to ASCII files.

Changing the period of waveform display

Click **Period** and select **5 sec, 10 sec, 30 sec, 1 min., 5 min.**

When you change the period of the waveform display, the start time and the end time values change accordingly on the scroll bar at the bottom. By moving the scroll box you can move to the desired part of the waveform.

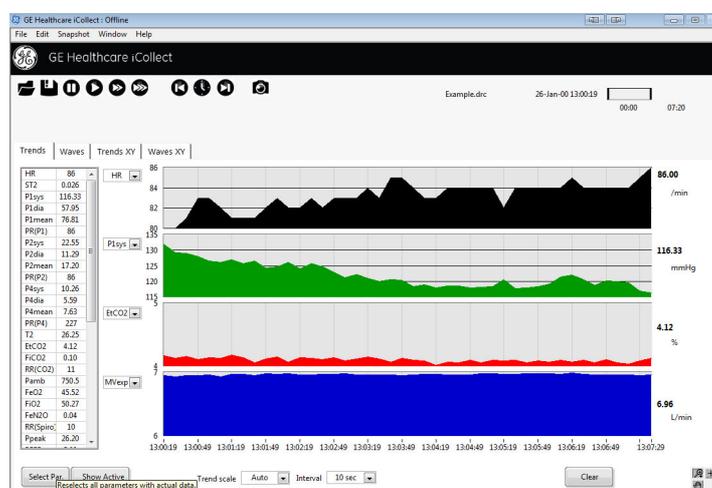
The recommended period value depends on the selected waveform. For example, if you select 1 minute for ECG waveforms, the artifacts cannot be read from the displayed waveforms. When you change the period, for example, to 10 seconds, the waveform becomes much clearer.

Clearing the waveforms

Click Clear to clear the displayed graphs and the display memory.

Offline trends

In the offline main window, select the Trends page.



The **Parameters** selection list on the left defines the trends that are available for displaying in the trend boxes.

The window contains 4 boxes for trends. The X axis indicates the time and the Y axis indicates the values.

You can change the parameter displayed in a trend box from the parameter selection box. The latest numerical parameter value and the unit are also displayed.

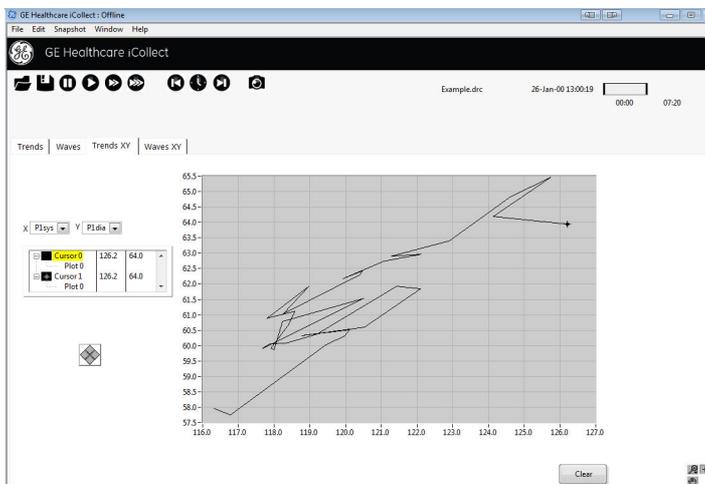
Use the graph palette to scroll the display area of the graph and to zoom in and out of sections of the graph. The graph palette is available only when data reading has stopped. See “Graph palette” on page 7-43 for details.

The functions available from the bottom of the view are identical as in the Online Trends paragraph explained earlier.

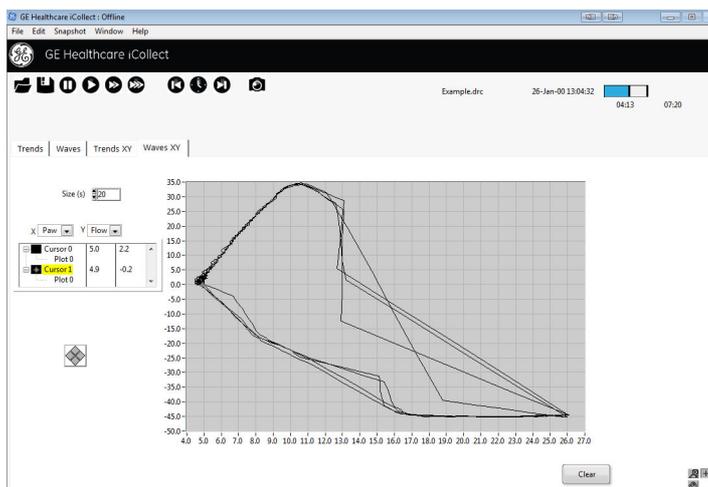
Showing data as XY graphs

You can show trend and waveform data also in an XY graph. To do this, select the **Trends XY** or **Waves XY** page in the main window.

For trend parameters, XY graph is an easy way to find out a correlation between different parameters. For waveforms, the XY graphs make it possible to show, for example, spirometry loops.



Trends XY page



Waves XY page

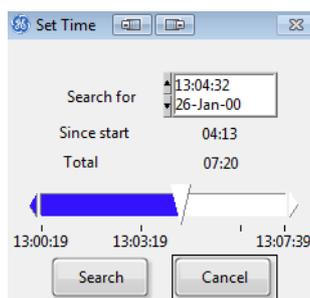
You can change the displayed parameters from the parameter boxes on the left. Change the size to have more or less history on the graph on the Waves XY page. You can clear the graphs from the page and the display memory with the **Clear** button. You can use the cursor movement tool to move the cursor. Use the graph palette to scroll the display area of the graph and to zoom in and out of sections of the graph. See "Graph palette" on page 7-43 for details. Use the cursor legend palette for putting the cursor on the graph. For details about the cursor legend palette, see "Cursor legend palette" on page 7-43.

Moving to a specific time in the offline graphs

You can move directly to the desired time point by

- selecting **Edit - Go to time (Ctrl+I)**
- or by clicking **Clock**.

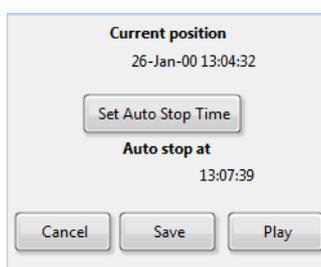
The Set Time dialog is displayed.



The leftmost time is the time of the first data package and the rightmost time the time of the last data package.

- Drag the bar to the desired time before or after the current time, enter the time in the **Search for** field, or use the arrow buttons in the **Search for** field to enter the desired time.
- Click **Search** to move to the desired point in the *.drc* file.

Once the nearest time point has been found the following dialog will be displayed.

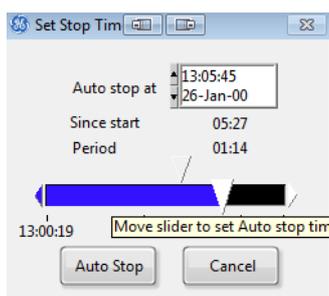


Found. What next? dialog box

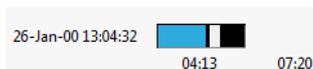
- Click **Set Auto Stop Time** to go directly to the dialog for setting the auto stop time (see below). After leaving that dialog you will return to the Found. What next? dialog again.
- Click **Play** to start playing again at high speed. The program starts showing graphs from the selected time onwards.
- Click **Cancel** to stop at the current position.
- Click **Save** to save all data from the current position to the auto stop time, or if auto stop time has not been set, to the end of the file.

Stopping an action at a desired time

1. To automatically stop an action at a desired time, click  or select **Edit - Auto Stop** (Ctrl+A). This can be used to stop any actions, for example, playing, winding and saving.



2. Enter the desired time by entering the time in the **Auto stop at** box or by using the slide bar.
3. Click **Auto Stop**. The auto stop time information will be shown in the upper right corner of the window. Selecting **Cancel** will close this window and also cancel a previously set auto stop time.

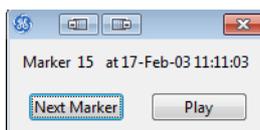


4. Once the desired time is reached, the following message is displayed. Click **OK**.



Searching for markers

You can move to the next marker in the file by selecting **Edit - Next Marker (Ctrl+M)**. The program starts searching for the markers. Trends are updated during the search. Once the marker has been found, the following message is displayed:



You can go to the next marker by clicking **Next Marker** or start playing the data by selecting **Play**.

NOTE: If the display interval is more than 60 times the input interval (for example, 5 min interval with dt 5 sec), markers will not be found.

The search may take a while since all trend data has to be read. You can also jump to the time of the marker by looking in the notes for the time of the marker, selecting **Edit - Go to time (Ctrl+I)** and entering the time of the marker.

Loading PHY files

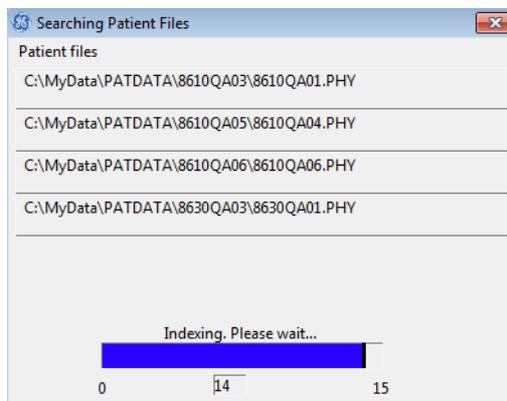
You can access data that has been stored by the S/5 Central, and data on a PCMCIA card that has been used in the M-MEM module. To do this:

1. Select **File - PHYsio Database**.
2. In the Select Patient File dialog box, give the path name in the Directory field and click Select Cur Dir.

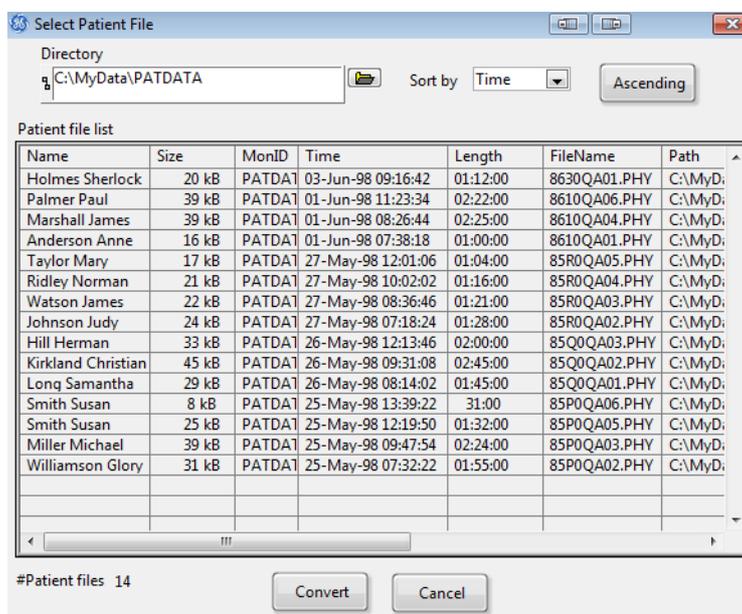
The patient data is stored on the hard disk drive of the Central in `D:\Patdata`. In a local office network the drive of the Central server may be mapped on the PC running the iCollect to, for example, `P:\Patdata`.

NOTE: It is not allowed to choose the current active Central directory `\PATDATA` due to potential file access conflicts. It is only possible to select inactive, already archived data in the `\PATDATA\ARC` for patients that have already been discharged. To look at data on

patients currently on the ward, copy a selection of the data in `\PATDATA` using, for example, Windows Explorer to a directory on your local hard disk drive. The name of the root directory on your local hard disk drive must be other than `\PATDATA`.



- When the search is completed, the patient files are displayed in the Select Patient File window.



The number of the patient files is indicated in the lower left corner of the window. You can sort the files by name, size, monitor ID, time, length, file name or path.

- To convert a file to `.drc` format, select it and click **Convert**. Enter the path in the Save as dialog box. The file is saved and opened in the offline mode. You can select to play it or save it in ASCII format.
Events stored in the patient data directory are also converted and will be copied to the notes.

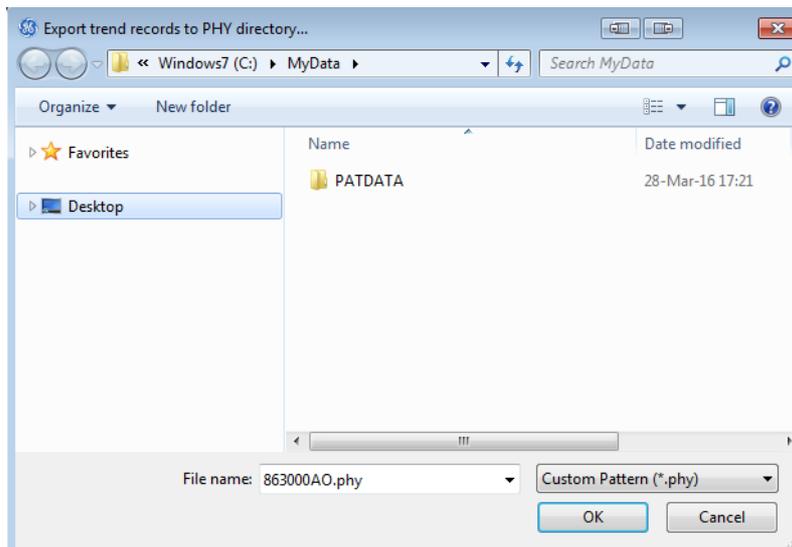
You can also find examples of data that has been stored by Central on the CD-ROM in the directory `\Patient Data\Central`.

Saving data in PHY files

To save `.drc` file format data in PHYsio files:

- Open a `.drc` file in the offline mode.

2. Select **File - Save as - PHYsio files of 1 min trend**. Enter the path in the Export trend records to PHY directory dialog box. The file name is generated automatically.



Only trend data is saved in PHYsio files. The program saves one data record once a minute (even if the data was originally recorded at a different interval, for example 5 seconds).

NOTE: This option does not work if the .drc file contains intervals longer than 1 minute.

Saving data in .drc files

You can save data in a .drc file

- without waveforms by selecting File - DRC file without waves.
- with waveforms by selecting File - DRC file with waveforms.

You will be prompted for a file name.

Saving data in ASCII files

Saving selected data in an ASCII file



When the desired file position is displayed, click  to start saving the trend, waveform and alarm data in ASCII files.

- Only the selected trend and waveform parameters are saved.
- To save both trends and waveforms, click the save button while the Waves page is displayed.
- If you do not need to save waveforms in ASCII and/or want to reduce the saving time and save only trends, click the save button while the Trends page is displayed.
- To further reduce the saving time, select **Window - Resize** to hide the graph area during saving.
- If alarm data was saved in the .drc file, it is displayed and saved to ASCII.
- Data will be saved at the selected trend interval and waveform frequency. To decrease the ASCII file size, increase the trend interval or reduce the waveform frequency.

- The selected trend scale and the period of waveform display do not have any effect on saving, but are for displaying purposes only.
- You will be prompted for the name of the trends file, waves file and alarms file separately. By default, file names *trends.asc*, *waves.asc* and *alarms.asc* are used.

- To stop saving at the desired point, click  .

In the ASCII files, the columns are separated by tabs. The output formats are shown in “File Formats” on page 8-45.

NOTE: The decimal symbol saved in the ASCII file follows the Windows settings (**Start - Settings - Control Panel - Regional Settings**). Programs like Microsoft Excel also follow this setting. When transferring the ASCII files between different PCs, make sure that the decimal symbol has been set the same on all PCs.

NOTE: Unregistered applications can save only 4 lines of trend data or 10 seconds of waveform data in ASCII files.

Saving all data in an ASCII file

You can save all data in the .drc file in ASCII format by selecting **File - Save All**. You will be prompted for the file name.

NOTE: Saving all data is also possible without replaying the file on the screen. When you have started the program and selected **Offline** from the startup window, select **Save All to ASCII**. See Figure on page 4-23 for details.

Viewing ASCII files

Select **File - View ASCII** file to open a file that has been stored before as an ASCII file. This selection opens a *.asc or *.txt file with the default editor or viewer configured in the Windows operating system (for example Notepad).

Opening a new .drc file

At any moment, you can start working with another .drc file. To do this:

- select **File - Open (Ctrl+O)**
- or

- click  .

Locate the new file and open it. The program closes the previous file and starts reading the new one.

Printing

You can print the currently displayed data on your default printer by selecting **File - Print Screen (Ctrl+ P)**.

Taking snapshots

You can take the snapshots

- by selecting **Snapshots - Trends (Ctrl+T)** or **Waves (Ctrl+W)**

or

- by clicking  .

The functionality of the snapshot pages is basically the same as in the online mode. See section “Taking snapshots” on page 3-16 for details.

Notes

You can view and edit case notes by selecting **Edit - Notes (Ctrl+N)** in the main offline window. The functionality of the note editor is basically the same as in the online mode. See section “Entering and modifying notes” on page 3-15 for details.

Using plug-ins

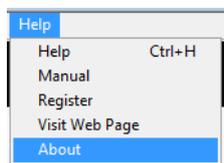
You can use the plug-ins in the same way as in the online mode. For instructions, see section “Using plug-ins” on page 3-21 and “Plug-ins” on page 9-61.

Exiting the offline mode

In the main window, select **File - Exit (Ctrl+Q)** or click **Esc**. The iCollect startup window is displayed. Now you can exit the program, start serial communication or go to online mode.

5 Help and troubleshooting

Getting help

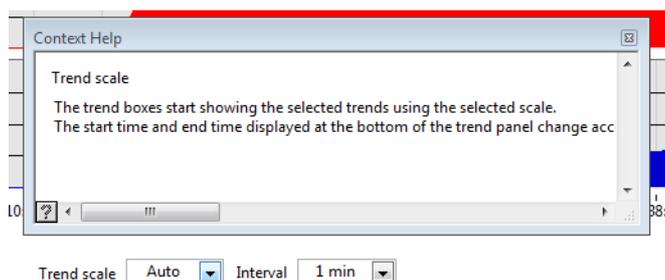


Help menu

Getting context-sensitive help

Selecting **Help - Help** displays context-sensitive help for different parts of the iCollect window. The help text is displayed in a separate help panel, and the text changes according to the cursor position.

If there is a key combination or function key connected to the function, it is indicated in the help panels. Below is an example of a help panel. In this example, the cursor is currently pointing the **Waveforms** list on the Waves page.



Example of a Context Help window

Displaying the manual

To display this manual in *.pdf* format, select **Help - Manual**. The manual can also be found in on the product CD-ROM in the directory `\Documents`.

Showing registration information

If you have registered the application and entered your password and select **Help - Register**, the Register window with the text 'This is a registered version' is displayed. The password field is protected.

If you have not registered your application, a prompt for registering the application and entering the password is displayed.

Displaying GE Healthcare web site

To go to the GE Healthcare web site, select **Help - Visit Web Page**.

Showing program information

Selecting **Help - About** shows the program version and the program generation date.

Error situations

The iCollect program may be interrupted by other applications, and can run in the background. If other applications use a lot of CPU time, there is a risk that communication buffers get overloaded. This may also be the case if the program is run on a slow PC (< 1 GHz x86).

RS232 Communication buffer indicator bar

In the upper right corner an indicator bar displays the status of the RS232 communication buffers.

- The presence of a **green** bar indicates data has been received from the monitor but some data is being buffered. If the green bar disappears, all buffered data has been processed.
- The size of the **yellow** bar indicates how much data has been read by the software but not displayed on the screen yet. The data has not been fully processed, usually due to too heavy CPU load. If more than 10 kB is buffered, an overload message is displayed.
- The size of the **red** bar indicates how much data has been received but not read yet at all (maximum buffer size is 30kB).

Error messages

If there is a communication failure between the PC and the connected GE Healthcare monitor, a corresponding error message is displayed on the top.

If for some reason the data is not received intact from the connected GE Healthcare monitor, a corresponding error message is displayed on the top.

The error message disappears automatically when the communication restarts normally.

Possible error messages:

| Message | Cause and solution |
|-------------------------|---|
| 'Communication Timeout' | No data received for 5 seconds. Check the cable (order number 881167). Check the monitor and make sure no other PC applications reserve the communication port. |
| 'Package Length Error' | Package size does not correspond to header information. Check that the cable is connected properly. |
| 'Checksum Error' | Calculated checksum does not correspond to checksum send with package. Check that the cable is connected properly. |

Unexpected errors

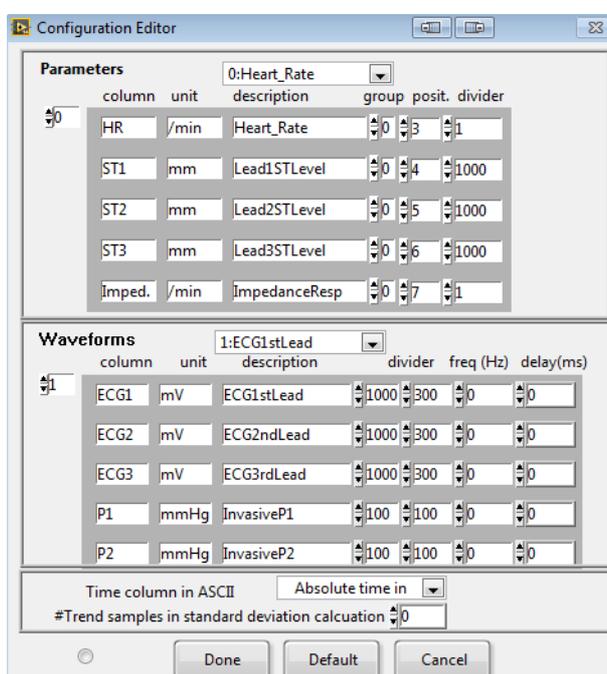
If you get an unexpected error that you cannot solve yourself using this documentation, please write down the error code, restart the program and try again. If the same error appears again, please contact the local GE Healthcare technical support and give the error code.

6 Editing the database configuration

NOTE: The configuration does not usually need to be changed by the users. If you need to add a new parameter or a waveform, please consult your GE Healthcare representative.

The database configuration including the current selections is saved in the program directory in configuration files *params5.txt* and *waves5.txt* each time when you exit the program. See "Params5.txt" on page 8-45 and "Waves5.txt" on page 8-51 for the contents of these two files.

Select **Edit - Configuration** in the online or offline mode. The Configuration Editor is displayed.



Configuration Editor window

Parameters

Use the trend box  or the selection box  to display the desired parameters.

For parameters, the column, unit, description, group, position and divider settings are given. The value in the **column** indicates the label shown in parameter selection lists and ASCII files. The description is only shown in the Configuration Editor window.

NOTE: You can change the **column** and **description** values. It may be that additional parameters or waveforms have been added to a monitor after the release of this collection program. When adding new parameters, you can also add data to other fields. When adding new parameters, please consult your GE Healthcare representative.

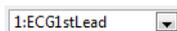
NOTE: Special caution should be taken with the group and position settings.

The monitor sends the parameter data in packages of several parameters. A **group** means the numerical code of the package of parameters the parameter belongs to. A **position** refers to the parameter's position in a specific group.

The **divider** setting depends on the unit in use. The divider modifies the data string given by the monitor into physiological values.

Waveforms

Use the waveform box



or the selection box



to display the desired waveforms.

For waveforms, the column, unit, description, divider, frequency, delay and filter settings are given.

NOTE: Do not change any values in the existing fields. You may add new waveforms in the configuration. When adding new waveforms, please consult your GE Healthcare representative.

The value in the **column** indicates the label shown in waveform selection lists and ASCII files.

The **description** is only shown in the Configuration Editor window.

The **divider** setting depends on the unit in use.

The **frequency** is defined by the monitor.

The **delays** are used for synchronizing data on the screen, in the XY graphs and in the saved ASCII files. The waveform delay for gas is set to 2 seconds; this is the default for a 3-meter sampling line. If the waves are generated by mainstream CO₂ (Light Monitor), the delay should be set to 0.

If a negative number is used for the **filter**, it will fasten the waveform. A positive number will slow down the waveform.

Time format for ASCII files



The **Time column in ASCII files** selection box defines how the time in the time column in the trend ASCII files is formatted. **Absolute time in ASCII** will make a string according to the Regional settings as defined in Windows Control Panel. With **Relative to start** the time is cumulative from the start of the time of saving. **Time in unix format** will use unix format in indicating the time. The header line in ASCII files will include the local time in ASCII as well as the Time in Unix format at GMT.

NOTE: The above user selection will only effect the trend data.

For trends it also shows the interval between line in the header. For waveform data the sampling frequency is listed, and the first column will always be in **Time in Unix format** with a fixed sample interval between each line.

NOTE: In case the raw data files contained gaps, e.g. caused due to communication errors, the time label may not be correct from the moment the waveform looks discontinuous.

Defining the digit field color behavior

The color of the digit fields on the main window Trend page indicates the stability of trend data. The color selection is affected by the value in the **#Trend samples in standard deviation calculation** box. In this box, enter the number of trend values to be included in standard deviation calculation. The number indicates the number of samples.

Ranges for coloring the digit fields are the following:

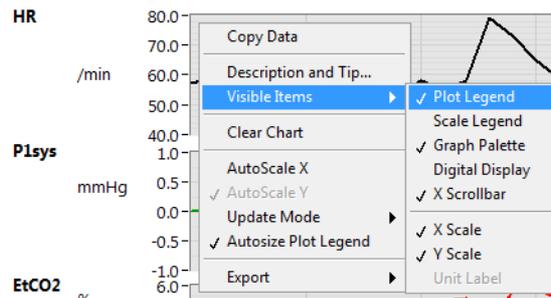
| | |
|---------------|--------|
| 0 to 2.5% | Green |
| 2.5 to 5% | White |
| 5 to 10% | Yellow |
| 10% or higher | Red |

You may use this feature to establish a steady state for selecting the moment to start collecting data.

7 Using LabVIEW palettes

NOTE: The following is a modified version of the instructions given in the LabVIEW help pages. LabVIEW is a registered trademark of National Instruments Corporation. For more information about using LabVIEW, see LabVIEW manuals in www.ni.com.

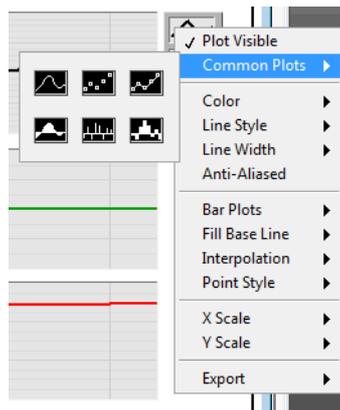
Click the right mouse button and select **Visible Items**.



Plot Legend palette



To display or hide the Plot Legend palette, click the right mouse button and select **Visible Items - Plot Legend**. Right-click a wave in the palette to show the commands available for formatting the plot on the screen.



- To change the type of the plot, click **Common Plots**.
- To change the color of the plot, select **Color**.
- To select a new style for the plot line, select **Line Style**.
- To select a new width for the plot line, select **Line Width**.

- Select **Anti-Aliased** to add a low pass filter (a filter that passes low frequencies but attenuates the high frequencies) before the sampler and the ADC. By attenuating the higher frequencies, it prevents the aliasing components from being sampled.
- To show the data as a bar plot, select **Bar Plots** and the desired bar plot style.
- To change the way the bars are displayed in reference to the baseline, select **Fill Base Line**.
- To select the style for drawing the lines between samples, select **Interpolation**.

Scale legend palette

To display or hide the Scale Legend palette, click the right mouse button and select **Visible Items - Scale Legend**. With this palette, you can format the X and Y scales of a graph. By using the palette, you can maintain run-time control over the format of the X and Y scale markers respectively.



Scale Legend palette on All snapshots page



Scale Legend palette on One snapshots page

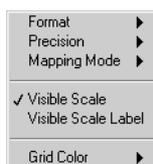
The first scale from the top of the palette on the All page is the X scale and the second is the Y scale of the first graph from the top, the third is the Y scale of the second graph from the top, etc.

If you want the graph to autoscale either of the scales continuously, click on the lock switch, to lock autoscaling on.

Lock switch



Click the scale you want to format. This opens the formatting menu for that scale. 



- To select the numeric for-mat of the data shown on X or Y axis select **Format** and one of the options. The de-fault for the X scale is **Absolute Time**, and the default for the Y scale is Decimal.
- To define how precise in-formation you wish to show, select **Precision** and one of the values.
- To change the mapping mode, select **Mapping Mode** and **Linear** (default) or **Logarithmic**. You can change the mapping mode only on the Y scale.
- To show the scale for the select axis, select **Visible Scale**. The scale is displayed by default.
- To change the color of the grid, select **Grid Color**.

Graph palette

To display or hide the Graph palette, click the right mouse button and select **Visible Items - Graph Palette**. The Graph Palette has controls for panning (scrolling the display area of a graph) and for zooming in and out of sections of the graph.



Use the cursor movement tool  to move the cursor on the graph.

Use the panning tool  to pick up the plot and move it around on the screen.

The Zoom tool  allows you to zoom in or out on the graph. If you click the Zoom tool, you see a pop-up menu to choose methods of zooming.



Zoom by rectangle.



Zoom by rectangle, with zooming restricted to x data (the y scale remains unchanged).



Zoom by rectangle, with zooming restricted to y data (the x scale remains unchanged).



Undo last zoom. Resets the graph to its previous setting.



Zoom in about a point. If you hold down the mouse on a specific point, the graph continuously zooms in until you release the mouse button.

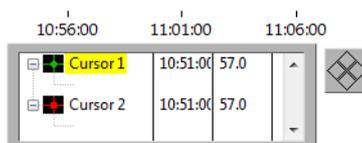


Zoom out about a point. If you hold down the mouse on a specific point, the graph continuously zooms out until you release the mouse button.

NOTE: For the last two modes, zoom in and zoom out about a point, clicking Shift zooms in the other direction.

Cursor legend palette

To display or hide the Cursor legend palette, right-click the mouse and select **Visible Items - Cursor Legend**.

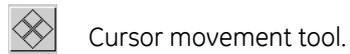
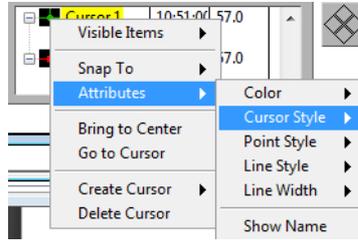


The Cursor palette used for putting cursors on the graph. You can label the cursor on the plot, and use a cursor as a marker. When you use a cursor as a marker, you lock the cursor to a data plot so the cursor follows the data.

Each cursor for a graph has the following parts.

The cursor label. You can change the name by entering a new name in the box.
X and Y coordinates.

- A button that marks the plot for movement with the plot cursor pad.
- A button that controls the look of the cursor. The following selections are available:



Cursor movement tool.

8 File Formats

Configuration files

The configuration files are located in the program directory. Each file may be edited with spreadsheet programs like Excel.

Be very careful when adding or making changes in database definition files. Before doing so, please consult your GE Healthcare representative.

NOTE: Be very careful when adding or making changes in database definition files. Before doing so, please consult your GE Healthcare representative.

Params5.txt

This file contains the parameter definitions.

| Sel | Gr | Pos | Div | Name | Unit | Description |
|-----|----|-----|------|---------|------|------------------|
| 2 | 0 | 3 | 1 | HR | /min | Heart_Rate |
| 0 | 0 | 4 | 1000 | ST1 | mm | Lead1STLevel |
| 1 | 0 | 5 | 1000 | ST2 | mm | Lead2STLevel |
| 0 | 0 | 6 | 1000 | ST3 | mm | Lead3STLevel |
| 0 | 0 | 7 | 1 | Imped. | /min | ImpedanceResp |
| 2 | 0 | 11 | 100 | P1sys | mmHg | P1Systolic |
| 1 | 0 | 12 | 100 | P1dia | mmHg | P1Diastolic |
| 1 | 0 | 13 | 100 | P1mean | mmHg | P1Mean |
| 1 | 0 | 14 | 1 | PR(P1) | /min | P1PulseRate |
| 1 | 0 | 18 | 100 | P2sys | mmHg | P2Systolic |
| 1 | 0 | 19 | 100 | P2dia | mmHg | P2Diastolic |
| 1 | 0 | 20 | 100 | P2mean | mmHg | P2Mean |
| 1 | 0 | 21 | 1 | PR(P2) | /min | P2PulseRate |
| 0 | 0 | 25 | 100 | P3sys | mmHg | P3Systolic |
| 0 | 0 | 26 | 100 | P3dia | mmHg | P3Diastolic |
| 0 | 0 | 27 | 100 | P3mean | mmHg | P3Mean |
| 0 | 0 | 28 | 1 | PR(P3) | /min | P3PulseRate |
| 1 | 0 | 32 | 100 | P4sys | mmHg | P4Sys |
| 1 | 0 | 33 | 100 | P4dia | mmHg | P4Diastolic |
| 1 | 0 | 34 | 100 | P4mean | mmHg | P4Mean |
| 1 | 0 | 35 | 1 | PR(P4) | /min | P4PulseRate |
| 0 | 0 | 39 | 100 | NIBPsys | mmHg | NonInvBPSystolic |
| 0 | 0 | 40 | 100 | NIBPdia | mmHg | NonInvBPDia |

| | | | | | | |
|---|---|-----|------|-----------|----------|-------------------------|
| 0 | 0 | 41 | 100 | NIBPmean | mmHg | NonInvBPMean |
| 0 | 0 | 42 | 1 | PR(NIBP) | /min | NonInvBPHeartRate |
| 0 | 0 | 46 | 100 | T1 | C | Temperature1 |
| 1 | 0 | 50 | 100 | T2 | C | Temperature2 |
| 0 | 0 | 54 | 100 | T3 | C | Temperature3 |
| 0 | 0 | 58 | 100 | T4 | C | Temperature4 |
| 0 | 0 | 62 | 100 | SpO2 | % | SpO2 |
| 0 | 0 | 63 | 1 | PR(SpO2) | /min | SpO2PulsRate |
| 0 | 0 | 64 | 100 | SpO2_ir | % | InfraRedAmplitude |
| 0 | 0 | 65 | 100 | SvO2p | % | SvO2(SpO2) |
| 2 | 0 | 69 | 100 | EtCO2 | % | CO2EndTidal |
| 1 | 0 | 70 | 100 | FiCO2 | % | CO2InspFraction |
| 1 | 0 | 71 | 1 | RR(CO2) | /min | CO2RespRate |
| 1 | 0 | 72 | 10 | Pamb | mmHg | AmbientPressure |
| 1 | 0 | 76 | 100 | FeO2 | % | O2ExpFraction |
| 1 | 0 | 77 | 100 | FiO2 | % | O2InspFraction |
| 1 | 0 | 81 | 100 | FeN2O | % | N2OExpFraction |
| 0 | 0 | 82 | 100 | FiN2O | % | N2OInspFraction |
| 0 | 0 | 86 | 100 | FeAA | % | AgentExpFraction |
| 0 | 0 | 87 | 100 | FiAA | % | AgentInspFraction |
| 0 | 0 | 88 | 100 | MAC | - | AgentMacSum |
| 1 | 0 | 92 | 1 | RR(Spiro) | /min | SpiroRespRate |
| 1 | 0 | 93 | 100 | Ppeak | cmH2O | Ppeak |
| 1 | 0 | 94 | 100 | PEEP | cmH2O | PEEP |
| 1 | 0 | 95 | 100 | Pplat | cmH2O | Pplat |
| 1 | 0 | 96 | 10 | TVinsp | ml | TidalVollInsp |
| 2 | 0 | 97 | 10 | TVexp | ml | TidalVolExp |
| 1 | 0 | 98 | 100 | Compl | ml/cmH2O | Compliance |
| 1 | 0 | 99 | 100 | MVexp | L/min | MinuteVolExp |
| 1 | 0 | 103 | 1000 | C.O. | L/min | CardiacOutput |
| 1 | 0 | 104 | 100 | Tblood | C | BloodTemperature |
| 0 | 0 | 105 | 100 | RVEF | % | RightVentrEjectFraction |
| 1 | 0 | 106 | 100 | PCWP | mmHg | PulmWedgePress |
| 0 | 0 | 110 | 10 | T1% | % | NMT1 |
| 0 | 0 | 111 | 10 | TOF% | % | TrainOfFourPerc |
| 0 | 0 | 112 | 1 | PTC | 0xFF00 | PTC |
| 1 | 0 | 113 | 1 | HR(ECG) | /min | ECGhr |

| | | | | | | |
|---|---|-----|-----|-----------|--------|---------------|
| 1 | 0 | 114 | 1 | HRmax | /min | HeartRateMax |
| 1 | 0 | 115 | 1 | HRmin | /min | HeartRateMin |
| 0 | 0 | 119 | 100 | SvO2 | % | SvO2 |
| 0 | 0 | 123 | 100 | P5sys | mmHg | P5Systolic |
| 0 | 0 | 124 | 100 | P5dia | mmHg | P5Diastolic |
| 0 | 0 | 125 | 100 | P5mean | mmHg | P5Mean |
| 0 | 0 | 126 | 1 | PR(P5) | /min | P5PulseRate |
| 0 | 0 | 130 | 100 | P6sys | mmHg | P6Systolic |
| 0 | 0 | 131 | 100 | P6dia | mmHg | P6Diastolic |
| 0 | 0 | 132 | 100 | P6mean | mmHg | P6Mean |
| 0 | 0 | 133 | 1 | PR(P6) | /min | P6PulseRate |
| 0 | 0 | 135 | 1 | Marker | 0x00FF | Marker |
| 1 | 1 | 3 | 1 | HR(aECG) | /min | ArrhHeartRate |
| 0 | 1 | 4 | 1 | RRt(aECG) | mmHg | ArrhRRTime |
| 0 | 1 | 5 | 1 | PVC | - | PVC |
| 0 | 1 | 6 | 1 | aStatus | - | ArrhStatus |
| 0 | 1 | 27 | 100 | ST(I) | mm | ST(I) |
| 1 | 1 | 28 | 100 | ST(II) | mm | ST(II) |
| 0 | 1 | 29 | 100 | ST(III) | mm | ST(III) |
| 0 | 1 | 30 | 100 | ST(AVL) | mm | ST(AVL) |
| 0 | 1 | 31 | 100 | ST(AVR) | mm | ST(AVR) |
| 0 | 1 | 32 | 100 | ST(AVF) | mm | ST(AVF) |
| 0 | 1 | 33 | 100 | ST(V1) | mm | ST(V1) |
| 0 | 1 | 34 | 100 | ST(V2) | mm | ST(V2) |
| 0 | 1 | 35 | 100 | ST(V3) | mm | ST(V3) |
| 0 | 1 | 36 | 100 | ST(V4) | mm | ST(V4) |
| 0 | 1 | 37 | 100 | ST(V5) | mm | ST(V5) |
| 1 | 1 | 38 | 100 | ST(V6) | mm | ST(V6) |
| 1 | 1 | 42 | 100 | P7sys | mmHg | P7Systolic |
| 1 | 1 | 43 | 100 | P7dia | mmHg | P7Diastolic |
| 1 | 1 | 44 | 100 | P7mean | mmHg | P7Mean |
| 1 | 1 | 45 | 1 | PR(P7) | /min | P7PulseRate |
| 0 | 1 | 49 | 100 | P8sys | mmHg | P8Systolic |
| 0 | 1 | 50 | 100 | P8dia | mmHg | P8Diastolic |
| 0 | 1 | 51 | 100 | P8mean | mmHg | P8Mean |
| 0 | 1 | 52 | 1 | PR(P8) | /min | P8PulseRate |
| 0 | 1 | 56 | 100 | SpO2_2 | % | SpO2_ch2 |

| | | | | | | |
|---|---|----|-----|------------|------|-----------------------|
| 0 | 1 | 57 | 1 | PR(SpO2_2) | /min | SpO2PulsRate_ch2 |
| 0 | 1 | 58 | 100 | SpO2_ir_2 | % | InfraRedAmplitude_ch2 |
| 0 | 2 | 3 | 1 | NMT(Count) | - | NMTcount |
| 0 | 2 | 4 | 1 | NMT(R1) | - | NMTTrainResponse1 |
| 0 | 2 | 5 | 1 | NMT(R2) | - | NMTt2 |
| 0 | 2 | 6 | 1 | NMT(R3) | - | MMTt3 |
| 0 | 2 | 7 | 1 | NMT(R4) | - | NMTt4 |
| 0 | 2 | 15 | 10 | FEMG | uV | FrontalEMG |
| 0 | 2 | 16 | 10 | Ampl1 | uV | Ampl1 |
| 0 | 2 | 17 | 10 | SEF1 | Hz | Sef1 |
| 0 | 2 | 18 | 10 | MF1 | Hz | MF1 |
| 0 | 2 | 19 | 1 | Delta1 | % | Delta%1 |
| 0 | 2 | 20 | 1 | Theta1 | % | Theta%1 |
| 0 | 2 | 21 | 1 | Alpha1 | % | Alpha%1 |
| 0 | 2 | 22 | 1 | Beta1 | % | Beta%1 |
| 0 | 2 | 23 | 1 | BSR1 | % | BSR1 |
| 0 | 2 | 24 | 10 | Ampl2 | uV | Ampl2 |
| 0 | 2 | 25 | 10 | SEF2 | Hz | Sef2 |
| 0 | 2 | 26 | 10 | MF2 | Hz | MF2 |
| 0 | 2 | 27 | 1 | Delta2 | % | Delta%2 |
| 0 | 2 | 28 | 1 | Theta2 | % | Theta%2 |
| 0 | 2 | 29 | 1 | Alpha2 | % | Alpha%2 |
| 0 | 2 | 30 | 1 | Beta2 | % | Beta%2 |
| 0 | 2 | 31 | 1 | BSR2 | % | BSR2 |
| 0 | 2 | 32 | 10 | Ampl3 | uV | Ampl3 |
| 0 | 2 | 33 | 10 | SEF3 | Hz | Sef3 |
| 0 | 2 | 34 | 10 | MF3 | Hz | MF3 |
| 0 | 2 | 35 | 1 | Delta3 | % | Delta%3 |
| 0 | 2 | 36 | 1 | Theta3 | % | Theta%3 |
| 0 | 2 | 37 | 1 | Alpha3 | % | Alpha%3 |
| 0 | 2 | 38 | 1 | Beta3 | % | Beta%3 |
| 0 | 2 | 39 | 1 | BSR3 | % | BSR3 |
| 1 | 2 | 40 | 10 | Ampl4 | uV | Ampl4 |
| 1 | 2 | 41 | 10 | SEF4 | Hz | Sef4 |
| 1 | 2 | 42 | 10 | MF4 | Hz | MF4 |
| 1 | 2 | 43 | 1 | Delta4 | % | Delta%4 |
| 1 | 2 | 44 | 1 | Theta4 | % | Theta%4 |

| | | | | | | |
|---|---|-----|------|----------|-----------|-----------------------|
| 1 | 2 | 45 | 1 | Alpha4 | % | Alpha%4 |
| 1 | 2 | 46 | 1 | Beta4 | % | Beta%4 |
| 1 | 2 | 47 | 1 | BSR4 | % | BSR4 |
| 1 | 2 | 51 | 1 | BIS | - | BIS |
| 0 | 2 | 52 | 1 | BisSQI | % | BisSignalQualityIndex |
| 1 | 2 | 53 | 1 | BisEMG | dB | BisEMG |
| 1 | 2 | 54 | 1 | BisSR | - | BisSuppRatio |
| 1 | 2 | 59 | 1 | SE | - | StateEntropy |
| 0 | 2 | 60 | 1 | RE | - | ResponseEntropy |
| 0 | 2 | 61 | 1 | BSR | - | BSR |
| 1 | 2 | 118 | 1 | SPI | - | SurgicalPlethIndex |
| 1 | 3 | 3 | 10 | VO2 | ml/min | O2consumption |
| 0 | 3 | 4 | 10 | VCO2 | ml/min | CO2production |
| 0 | 3 | 5 | 1 | EE | kcal/day | EnergyExpenditure |
| 0 | 3 | 6 | 1000 | RQ | - | RespQuotient |
| 0 | 3 | 10 | 100 | PEEPi | cmH2O | IntrinsicPEEP |
| 0 | 3 | 11 | 100 | Pmean | cmH2O | Pmean |
| 0 | 3 | 12 | 100 | Raw | cmH2O/L/s | AirwayResistance |
| 0 | 3 | 13 | 100 | MVinsp | L/min | MinuteVollInsp |
| 0 | 3 | 14 | 100 | PEEPe | cmH2O | ExtrinsicPEEP |
| 0 | 3 | 15 | 100 | MVspont | L/min | SpontMinVol |
| 0 | 3 | 16 | 100 | I:E | - | RatiInspExpTime |
| 1 | 3 | 17 | 100 | Tinsp | sec | InspTime |
| 0 | 3 | 18 | 100 | Texp | sec | ExpTime |
| 1 | 3 | 19 | 100 | StCompl | ml/cmH2O | StaticCompliance |
| 1 | 3 | 20 | 100 | StPplat | cmH2O | StaticPplat |
| 0 | 3 | 21 | 100 | StPEEPe | cmH2O | StaticPEEPe |
| 0 | 3 | 22 | 100 | StPEEPi | cmH2O | StaticPEEPi |
| 0 | 3 | 33 | 100 | FeBal | % | BalanceGasFe |
| 0 | 3 | 34 | 100 | FiBal | % | BalanceGasFi |
| 0 | 3 | 38 | 100 | PgCO2 | kPa | TonometryCO2 |
| 0 | 3 | 39 | 100 | EtPgCO2 | kPa | EndTidalCO2 |
| 0 | 3 | 40 | 100 | PaCO2 | mmHg | ArterialCO2 |
| 0 | 3 | 41 | 1 | Delay | sec | Delay |
| 0 | 3 | 42 | 100 | pHi | pH | pHi |
| 0 | 3 | 43 | 1 | pHiDelay | sec | pHiDelay |
| 0 | 3 | 44 | 10 | Pamb | mmHg | AmbientPressure |

| | | | | | | |
|---|---|----|-----|--------|-------------------|-------------------------------------|
| 0 | 3 | 45 | 1 | CPMA | - | CPMA |
| 0 | 3 | 49 | 100 | MACage | - | AgentMACageSum |
| 0 | 3 | 61 | 100 | SPV | mmHg | SystolicPressureVariation |
| 0 | 3 | 62 | 100 | PPV | % | PulsePressureVariation |
| 0 | 3 | 66 | 100 | CPP | mmHg | CerebralPerfusionPressure |
| 0 | 3 | 70 | 100 | CPP2 | mmHg | CerebralPerfusionPressure2 |
| 0 | 3 | 74 | 1 | CCI | ml/min/m2 | ContinuousCardiacIndex |
| 0 | 3 | 75 | 1 | CCO | ml/min | ContinuousCardiacOutput |
| 0 | 3 | 76 | 100 | CFI | /min | CardiacFunctionIndex |
| 0 | 3 | 77 | 1 | CI | ml/min/m2 | CardiacIndex |
| 0 | 3 | 78 | 1 | CO | ml/min | CardiacOutput |
| 0 | 3 | 79 | 1 | CPI | mW/m2 | CardiacPowerIndex |
| 0 | 3 | 80 | 1 | CPO | mW | CardiacPowerOutput |
| 0 | 3 | 81 | 1 | dPMax | mmHg/s | IndexOfLeftVentricularContractility |
| 0 | 3 | 82 | 10 | ELWI | ml/kg | ExtravascularLungWaterIndex |
| 0 | 3 | 83 | 1 | EVLW | ml | ExtravascularLungWater |
| 0 | 3 | 84 | 1 | GEDI | ml/m2 | GlobalEnd-DiastolicVolumeIndex |
| 0 | 3 | 85 | 1 | GEDV | ml | GlobalEnd-DiastolicVolume |
| 0 | 3 | 86 | 10 | GEF | % | GlobalEjectionFraction |
| 0 | 3 | 87 | 1 | ITBI | ml/m2 | IntrathoracicBloodVolumeIndex |
| 0 | 3 | 88 | 1 | ITBV | ml | IntrathoracicBloodVolume |
| 0 | 3 | 89 | 10 | PPV | % | PulsePressureVariation |
| 0 | 3 | 90 | 100 | PVPI | - | PulmonaryVascularPermeabilityIndex |
| 0 | 3 | 91 | 10 | SV | ml | StrokeVolume |
| 0 | 3 | 92 | 10 | SVI | ml/m2 | StrokeVolumeIndex |
| 0 | 3 | 93 | 1 | SVR | dyne*s/cm5 | SystemicVascularResistance |
| 0 | 3 | 94 | 1 | SVRI | dyne*s*m2/ cm5 | SystemicVascularResistanceIndex |
| 0 | 3 | 95 | 10 | SVV | % | StrokeVolumeVariation |
| 0 | 3 | 96 | 100 | TBlood | C | BloodTemperature |
| 0 | 3 | 97 | 100 | TInj | C | InjectateTemperature |
| 0 | 0 | 1 | 1 | Free1 | - | Free1 |
| 0 | 0 | 1 | 1 | Free2 | - | Free2 |
| 0 | 0 | 1 | 1 | Free3 | - | Free3 |
| 0 | 0 | 1 | 1 | Free4 | - | Free4 |
| 0 | 0 | 1 | 1 | Free5 | - | Free5 |

Waves5.txt

This file contains the waveform definitions

| Sel | Freq. | Delay | Divider | Filter | Column | Unit | Description |
|------------|--------------|--------------|----------------|---------------|---------------|-------------|--------------------|
| 2 | 300 | 0 | 1000 | 0 | ECG1 | mV | ECG1stLead |
| 2 | 300 | 0 | 1000 | 0 | ECG2 | mV | ECG2ndLead |
| 2 | 300 | 0 | 1000 | 0 | ECG3 | mV | ECG3rdLead |
| 1 | 100 | 0 | 100 | 0 | P1 | mmHg | InvasiveP1 |
| 0 | 100 | 0 | 100 | 0 | P2 | mmHg | InvasiveP2 |
| 0 | 100 | 0 | 100 | 0 | P3 | mmHg | InvasiveP3 |
| 0 | 100 | 0 | 100 | 0 | P4 | mmHg | InvasiveP4 |
| 0 | 100 | 0 | 100 | 0 | Pleth | % | Plethysmogram |
| 0 | 25 | 2000 | 100 | 0 | CO2 | % | CO2 |
| 0 | 25 | 2000 | 100 | 0 | O2 | % | O2 |
| 0 | 25 | 2000 | 100 | 0 | N2O | % | N2O |
| 0 | 25 | 2000 | 100 | 0 | AA | % | AnestheticAgent |
| 0 | 25 | 500 | 10 | 0 | Paw | cmH2O | AirwayPressure |
| 0 | 25 | 500 | 10 | 0 | Flow | L/min | Flow |
| 0 | 25 | 0 | 100 | 0 | Resp | Ohm | ImpedanceResp |
| 0 | 100 | 0 | 100 | 0 | P5 | mmHg | InvasiveP5 |
| 0 | 100 | 0 | 100 | 0 | P6 | mmHg | InvasiveP6 |
| 0 | 100 | 0 | 10 | 0 | EEG1 | uV | EEG1 |
| 0 | 100 | 0 | 10 | 0 | EEG2 | uV | EEG2 |
| 0 | 100 | 0 | 10 | 0 | EEG3 | uV | EEG3 |
| 0 | 100 | 0 | 10 | 0 | EEG4 | uV | EEG4 |
| 2 | 4000 | 0 | 250 | 0 | ECG12 | mV | ECG12 |
| 0 | 25 | 500 | 10 | 0 | Vol | ml | Volume |
| 0 | 25 | 0 | 10 | 0 | Ptono | cmH2O | TonometerPressure |
| 0 | 25 | 0 | 10 | 0 | PawVent | cmH2O | PawVent |
| 0 | 25 | 0 | 10 | 0 | FlowVent | L/min | FlowVent |
| 0 | 25 | 0 | 1 | 0 | VolVent | ml | VolVent |
| 0 | 100 | 0 | 100 | 0 | NIBPcuff | mmHg | NonInvCuffPress |
| 0 | 25 | 500 | 1 | 0 | SpiroStatus | - | SpiroLoopInsp |
| 0 | 100 | 0 | 10 | 0 | EP | uV | EvokePotential |
| 0 | 100 | 0 | 1 | 0 | PlethC | - | PlethComposite |
| 0 | 100 | 0 | 10 | 0 | Ent100 | uV | Entropy100Hz |
| 0 | 400 | 0 | 40 | 0 | Ent400 | uV | Entropy400Hz |
| 0 | 100 | 0 | 1 | 0 | NMT | - | NMT |

| | | | | | | | |
|---|-----|---|-----|---|----------|------|----------------|
| 0 | 300 | 0 | 10 | 0 | BIS | uV | EEGBIS |
| 0 | 100 | 0 | 100 | 0 | P7 | mmHg | InvasiveP7 |
| 0 | 100 | 0 | 100 | 0 | P8 | mmHg | InvasiveP8 |
| 0 | 100 | 0 | 100 | 0 | Pleth2 | % | Plethysmogram2 |
| 0 | 100 | 0 | 100 | 0 | Resp100 | Ohm | ImpedanceResp |
| 0 | 200 | 0 | 10 | 0 | EEG1-200 | uV | EEG1-200Hz |
| 0 | 200 | 0 | 10 | 0 | EEG2-200 | uV | EEG2-200Hz |
| 0 | 200 | 0 | 10 | 0 | EEG3-200 | uV | EEG3-200Hz |
| 0 | 200 | 0 | 10 | 0 | EEG4-200 | uV | EEG4-200Hz |
| 0 | 100 | 0 | 1 | 0 | RES1 | - | RES1 |
| 0 | 100 | 0 | 1 | 0 | RES2 | - | RES2 |
| 0 | 100 | 0 | 1 | 0 | RES3 | - | RES3 |
| 0 | 100 | 0 | 1 | 0 | RES4 | - | RES4 |

ASCII output files

Alarms.asc

| Time | ID | Prio | Sound | Type | Priority | Box1 | Box2 | Box3 | Box4 | Box5 |
|----------|-----|------|-------|------------------|---------------------|----------------|-----------|------------|------|------|
| 10:04:19 | | | | | | | | | | |
| 10:04:56 | 300 | 1 | 0 | Status Alarm | White alarm | Apnea | | | | |
| 10:05:14 | 300 | 0 | 0 | Status Alarm | Alarm is not active | | | | | |
| 10:05:16 | 303 | 1 | 0 | Status Alarm | White alarm | SpO2 probe off | | | | |
| 10:05:30 | 303 | 0 | 0 | Status Alarm | Alarm is not active | | | | | |
| 10:05:46 | 303 | 1 | 0 | Status Alarm | White alarm | SpO2 probe off | | | | |
| 10:05:50 | 303 | 0 | 0 | Status Alarm | Alarm is not active | | | | | |
| 10:06:00 | 28 | 2 | 0 | Status Alarm | Yellow alarm | Tachy | | | | |
| 10:06:04 | 28 | 0 | 0 | Status Alarm | Alarm is not active | Brady | | | | |
| 10:06:04 | 27 | 2 | 0 | Status Alarm | Yellow alarm | Brady | | | | |
| 10:06:08 | 27 | 0 | 0 | Status Alarm | Alarm is not active | | | | | |
| 10:06:48 | 524 | 1 | 0 | High Limit Alarm | White alarm | EtCO2 high | | | | |
| 10:06:54 | 524 | 0 | 0 | High Limit Alarm | Alarm is not active | | | | | |
| 10:07:18 | 524 | 1 | 0 | Low Limit Alarm | White alarm | EtCO2 low | | | | |
| 10:07:28 | 524 | 0 | 0 | Low Limit Alarm | Alarm is not active | | | | | |
| 10:07:58 | 28 | 2 | 1 | Status Alarm | Yellow alarm | Tachy | Resp high | | | |
| 10:07:58 | 523 | 1 | 1 | High Limit Alarm | White alarm | Tachy | Resp high | | | |
| 10:08:10 | 524 | 1 | 1 | High Limit Alarm | White alarm | Tachy | Resp high | EtCO2 high | | |

| | | | | | | | | | | |
|----------|-----|---|---|------------------|---------------------|----------|-----------|-----------|------------|-----------|
| 10:08:14 | 522 | 2 | 1 | High Limit Alarm | Yellow alarm | Tachy | SpO2 high | Resp high | EtCO2 high | |
| 10:08:38 | 523 | 2 | 1 | High Limit Alarm | Yellow alarm | Tachy | SpO2 high | Resp high | EtCO2 high | |
| 10:08:48 | 524 | 2 | 1 | High Limit Alarm | Yellow alarm | Tachy | SpO2 high | Resp high | EtCO2 high | |
| 10:09:06 | 28 | 3 | 1 | Status Alarm | Red alarm | Tachy | SpO2 high | Resp high | EtCO2 high | |
| 10:09:16 | 522 | 3 | 1 | High Limit Alarm | Red alarm | Tachy | SpO2 high | Resp high | EtCO2 high | |
| 10:09:22 | 534 | 2 | 1 | Low Limit Alarm | Yellow alarm | Tachy | SpO2 high | Resp high | EtCO2 high | MVexp low |
| 10:10:00 | 28 | 0 | 0 | Status Alarm | Alarm is not active | FiO2 low | | | | |
| 10:10:00 | 522 | 0 | 0 | High Limit Alarm | Alarm is not active | FiO2 low | | | | |
| 10:10:00 | 523 | 0 | 0 | High Limit Alarm | Alarm is not active | FiO2 low | | | | |
| 10:10:00 | 524 | 0 | 0 | High Limit Alarm | Alarm is not active | FiO2 low | | | | |
| 10:10:00 | 534 | 0 | 0 | Low Limit Alarm | Alarm is not active | FiO2 low | | | | |
| 10:10:00 | 527 | 2 | 0 | Low Limit Alarm | Yellow alarm | FiO2 low | | | | |
| 10:10:10 | 527 | 0 | 0 | Low Limit Alarm | Alarm is not active | | | | | |

Below is a list of alarm IDs and the corresponding alarms. This list may be useful for you when you are reading the alarms.asc file.

| ID | Alarm |
|----|-------------------------------|
| 1 | Asystole |
| 2 | Ventricular fibrillation |
| 3 | Rapid ventricular tachycardia |
| 4 | Ventricular tachycardia |

| ID | Alarm |
|-----|---------------------|
| 308 | NIBP air leakage |
| 309 | NIBP cuff occlusion |
| 310 | EtN2O >= 82 |
| 311 | EtAA > 3 MAC |

| | |
|-----|------------------------------|
| 5 | Extreme bradycardia |
| 6 | Extreme tachycardia |
| 7 | PVC run >3 |
| 8 | PVC triplet |
| 9 | PVC couplet |
| 10 | R-on-T PVC |
| 11 | Idioventricular rhythm |
| 12 | Ventricular bigeminy |
| 13 | Ventricular trigeminy |
| 14 | Frequent PVCs |
| 15 | Multifocal PVCs |
| 16 | Supraventricular tachycardia |
| 17 | Frequent SVCs |
| 18 | Missing beat |
| 19 | Unclassified arrhythmia |
| 20 | Noisy ECG |
| 21 | Problem QRS |
| 22 | Low amplitude |
| 23 | Salvo |
| 24 | Pacer non-functional |
| 25 | Pacer non-capture |
| 26 | New QRS |
| 27 | Bradycardia |
| 28 | Tachycardia |
| 29 | Long R-to-R interval |
| 30 | R-to-R interval |
| 31 | PVCs/min |
| 300 | Apnea |
| 301 | Apnea disconnection |
| 302 | Occlusion |
| 303 | SpO2 probe off |
| 304 | SpO2 check probe |
| 305 | No SpO2 probe |
| 306 | No SpO2 pulse |
| 307 | NIBP cuff loose |

| | |
|-----|----------------------------------|
| 312 | No QRS detected |
| 313 | No Art pulse |
| 314 | Transducer off |
| 315 | Check resp cable |
| 316 | Air leak |
| 317 | Flow disconnection |
| 318 | No P1 transducer |
| 319 | No P2 transducer |
| 320 | No P3 transducer |
| 321 | No P4 transducer |
| 322 | No P5 transducer |
| 323 | No P6 transducer |
| 324 | NMT alarm |
| 325 | SvO2 cable off |
| 326 | SvO2 poor signal |
| 327 | SvO2 temp error |
| 328 | Leads off |
| 329 | Batt low 1 |
| 330 | Batt low 2 |
| 331 | Network down 1 |
| 332 | Network down 2 |
| 333 | Network down 3 |
| 334 | Network down 4 |
| 335 | All source monitors disconnected |
| 336 | Source monitor 1 disconnected |
| 337 | Source monitor 2 disconnected |
| 338 | Source monitor 3 disconnected |
| 339 | Source monitor 4 disconnected |
| 340 | Source monitor 5 disconnected |
| 341 | No CO2 sensor |
| 342 | CO2 sensor failure |
| 343 | Unspecified CO2 sensor |
| 344 | CO2 adapter blocked |
| 345 | Faulty probe |
| 346 | Check NIBP |

| | |
|-----|-----------|
| 500 | HR |
| 501 | NIBP sys |
| 502 | NIBP dia |
| 503 | NIBP mean |
| 504 | P1 sys |
| 505 | P1 dia |
| 506 | P1 mean |
| 507 | P2 sys |
| 508 | P2 dia |
| 509 | P2 mean |
| 510 | P3 sys |
| 511 | P3 dia |
| 512 | P3 mean |
| 513 | P4 sys |
| 514 | P4 dia |
| 515 | P4 mean |
| 516 | P5 sys |
| 517 | P5 dia |
| 518 | P5 mean |
| 519 | P6 sys |
| 520 | P6 dia |
| 521 | P6 mean |
| 522 | SpO2 |

| | |
|-----|--------|
| 523 | Resp |
| 524 | EtCO2 |
| 525 | FiCO2 |
| 526 | EtO2 |
| 527 | FiO2 |
| 528 | EtN2O |
| 529 | FiN2O |
| 530 | EtAA |
| 531 | FiAA |
| 532 | Ppeak |
| 533 | TV |
| 534 | MV |
| 535 | PEEP |
| 536 | TEMP1 |
| 537 | TEMP2 |
| 538 | SvO2 |
| 539 | Tblood |
| 540 | ST1 |
| 541 | ST2 |
| 542 | ST3 |
| 543 | SaO2 |
| 544 | iPEEP |
| 545 | ePEEP |

Waves.asc

| | | | |
|--------------------|--------|--------|-----------|
| 26-Jan-00 13:02:14 | 300 | Hz | 948898934 |
| Time | ECG1 | P1 | Paw |
| 948898935.000 | 0.055 | 74.660 | 6.600 |
| 948898935.003 | 0.053 | 74.400 | 6.600 |
| 948898935.007 | 0.050 | 74.130 | 6.600 |
| 948898935.010 | 0.044 | 73.870 | 6.600 |
| 948898935.013 | 0.036 | 73.720 | 6.500 |
| 948898935.017 | 0.028 | 73.570 | 6.500 |
| 948898935.020 | 0.016 | 73.420 | 6.500 |
| 948898935.023 | 0.005 | 73.230 | 6.500 |
| 948898935.027 | -0.007 | 73.050 | 6.500 |
| 948898935.030 | -0.018 | 72.860 | 6.400 |

| | | | |
|---------------|--------|--------|-------|
| 948898935.033 | -0.029 | 72.670 | 6.400 |
| 948898935.037 | -0.037 | 72.490 | 6.400 |
| 948898935.040 | -0.043 | 72.300 | 6.400 |
| 948898935.043 | -0.047 | 72.150 | 6.400 |
| 948898935.047 | -0.049 | 72.000 | 6.400 |
| 948898935.050 | -0.050 | 71.850 | 6.400 |
| 948898935.053 | -0.051 | 71.740 | 6.400 |
| 948898935.057 | -0.052 | 71.620 | 6.400 |
| 948898935.060 | -0.052 | 71.510 | 6.400 |
| 948898935.063 | -0.051 | 71.400 | 6.400 |
| 948898935.067 | -0.049 | 71.280 | 6.400 |
| 948898935.070 | -0.048 | 71.170 | 6.400 |
| 948898935.073 | -0.046 | 71.100 | 6.400 |
| 948898935.077 | -0.045 | 71.020 | 6.400 |
| 948898935.080 | -0.045 | 70.950 | 6.400 |
| 948898935.083 | -0.044 | 70.870 | 6.400 |
| 948898935.087 | -0.042 | 70.800 | 6.400 |
| 948898935.090 | -0.039 | 70.720 | 6.400 |
| 948898935.093 | -0.041 | 70.680 | 6.400 |
| 948898935.097 | -0.052 | 70.650 | 6.400 |
| 948898935.100 | -0.076 | 70.610 | 6.400 |
| 948898935.103 | -0.106 | 70.570 | 6.400 |

Trends.asc

NOTE: Values below -32000 have a special meaning:

-32764 The data exceeds lower valid limit.

-32767 There is no valid data.

-32766 Data is not updated

-32765 Data discontinuity (calibration ...).

-32764 Data exceeds lower valid limit.

-32763 Data exceeds upper valid limit.

-32762 Data is not calibrated.

-32699 Data discontinuity range end.

-32500 Data discontinuity range start.

11.12.2002 13:26:43

| Time | SpO2 | SpO2hr | CO2Et | CO2rr |
|------|-------|--------|-------|-------|
| 0.00 | 99.00 | 59.00 | 5.06 | 15.00 |
| 8.00 | 99.00 | 55.00 | 5.24 | 15.00 |
| 9.00 | 99.00 | 55.00 | 5.24 | 15.00 |

| | | | | |
|-------|-------|-------|------|-------|
| 10.00 | 99.00 | 55.00 | 5.24 | 15.00 |
| 11.00 | 99.00 | 55.00 | 5.24 | 15.00 |
| 12.00 | 99.00 | 55.00 | 5.16 | 15.00 |
| 13.00 | 99.00 | 55.00 | 5.16 | 15.00 |
| 14.00 | 99.00 | 55.00 | 5.16 | 15.00 |
| 15.00 | 99.00 | 56.00 | 5.16 | 15.00 |
| 16.00 | 99.00 | 56.00 | 4.95 | 14.00 |
| 17.00 | 99.00 | 56.00 | 4.95 | 14.00 |
| 18.00 | 99.00 | 56.00 | 4.95 | 14.00 |
| 19.00 | 99.00 | 56.00 | 4.95 | 14.00 |
| 20.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 21.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 22.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 23.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 24.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 25.00 | 99.00 | 67.00 | 4.95 | 14.00 |
| 26.00 | 99.00 | 67.00 | 4.95 | 14.00 |
| 27.00 | 99.00 | 67.00 | 4.95 | 14.00 |
| 28.00 | 99.00 | 67.00 | 4.95 | 14.00 |
| 29.00 | 99.00 | 67.00 | 4.95 | 14.00 |
| 30.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 34.00 | 99.00 | 62.00 | 4.95 | 14.00 |
| 35.00 | 99.00 | 58.00 | 4.95 | 14.00 |
| 36.00 | 99.00 | 58.00 | 0.00 | 0.00 |
| 37.00 | 99.00 | 58.00 | 0.00 | 0.00 |
| 38.00 | 99.00 | 58.00 | 0.00 | 0.00 |
| 39.00 | 99.00 | 58.00 | 0.00 | 0.00 |
| 40.00 | 99.00 | 56.00 | 0.00 | 0.00 |
| 41.00 | 99.00 | 56.00 | 0.00 | 0.00 |
| 42.00 | 99.00 | 56.00 | 0.00 | 0.00 |
| 43.00 | 99.00 | 56.00 | 0.00 | 0.00 |
| 44.00 | 99.00 | 56.00 | 0.00 | 0.00 |
| 45.00 | 99.00 | 54.00 | 0.00 | 0.00 |
| 46.00 | 99.00 | 54.00 | 0.00 | 0.00 |
| 47.00 | 99.00 | 54.00 | 0.00 | 0.00 |
| 48.00 | 99.00 | 54.00 | 0.00 | 0.00 |
| 49.00 | 99.00 | 54.00 | 0.00 | 0.00 |

| | | | | |
|-------|-----------|-----------|------|-----------|
| 50.00 | 99.00 | 56.00 | 0.00 | 0.00 |
| 51.00 | -32767.00 | -32767.00 | 1.11 | -32767.00 |
| 52.00 | -32767.00 | -32767.00 | 1.11 | -32767.00 |
| 53.00 | -32767.00 | -32767.00 | 1.11 | -32767.00 |
| 54.00 | -32767.00 | -32767.00 | 4.93 | -32767.00 |
| 60.00 | -32767.00 | -32766.00 | 4.54 | 13.00 |
| 61.00 | -32767.00 | -32766.00 | 4.54 | 13.00 |
| 62.00 | -32767.00 | -32766.00 | 4.54 | 13.00 |
| 63.00 | -32767.00 | -32766.00 | 4.54 | 13.00 |
| 64.00 | -32767.00 | -32766.00 | 4.54 | 13.00 |
| 65.00 | -32767.00 | -32766.00 | 5.00 | 12.00 |
| 66.00 | -32767.00 | -32766.00 | 5.00 | 12.00 |
| 67.00 | -32767.00 | -32766.00 | 5.00 | 12.00 |
| 68.00 | -32767.00 | -32766.00 | 5.00 | 12.00 |
| 69.00 | -32767.00 | -32766.00 | 5.04 | 12.00 |
| 70.00 | -32767.00 | -32766.00 | 5.04 | 12.00 |
| 71.00 | -32767.00 | -32766.00 | 5.04 | 12.00 |
| 72.00 | -32767.00 | -32766.00 | 5.04 | 12.00 |
| 73.00 | -32767.00 | -32766.00 | 5.12 | 13.00 |
| 74.00 | -32767.00 | -32766.00 | 5.12 | 13.00 |
| 75.00 | -32767.00 | -32766.00 | 5.12 | 13.00 |
| 76.00 | 99.00 | 71.00 | 5.12 | 13.00 |
| 77.00 | 99.00 | 71.00 | 5.25 | 13.00 |
| 78.00 | 99.00 | 71.00 | 5.25 | 13.00 |
| 79.00 | 99.00 | 71.00 | 5.25 | 13.00 |
| 80.00 | 99.50 | 68.00 | 5.25 | 13.00 |
| 81.00 | -32767.00 | -32767.00 | 5.25 | 13.00 |
| 82.00 | -32767.00 | -32767.00 | 4.93 | 13.00 |
| 86.00 | -32767.00 | -32766.00 | 5.39 | 13.00 |
| 87.00 | -32767.00 | -32766.00 | 5.39 | 13.00 |
| 88.00 | -32767.00 | -32766.00 | 5.39 | 13.00 |
| 89.00 | -32767.00 | -32766.00 | 5.39 | 13.00 |
| 90.00 | -32767.00 | -32767.00 | 5.34 | 13.00 |
| 91.00 | -32767.00 | -32767.00 | 5.34 | 13.00 |
| 92.00 | -32767.00 | -32767.00 | 5.34 | 13.00 |
| 93.00 | -32767.00 | -32767.00 | 5.34 | 13.00 |
| 94.00 | -32767.00 | -32767.00 | 5.36 | 14.00 |

| | | | | |
|-------|-----------|-----------|------|-------|
| 95.00 | -32767.00 | -32766.00 | 5.36 | 14.00 |
| 96.00 | -32767.00 | -32766.00 | 5.36 | 14.00 |
| 97.00 | -32767.00 | -32766.00 | 5.36 | 14.00 |
| 98.00 | -32767.00 | -32766.00 | 5.28 | 14.00 |

9 Plug-ins

The iCollect includes a number of plug-in examples. The iCollect will recognize all LabVIEW Virtual Instrument files (*.vi) with the below type definition. A plug-in is called by default each 500 ms offline. You can change the interval in online mode for the selected plug-in. The minimum rate is 50 ms. The data passed to the plug-in is trend and wave data including the configuration data.

The directory \plugins under the installation path contains examples of plug-ins.

To design your own plug-in, copy the example file *Your Project.vi* to a new file and modify it using LabVIEW to include your specific parameters and your specific user interface.

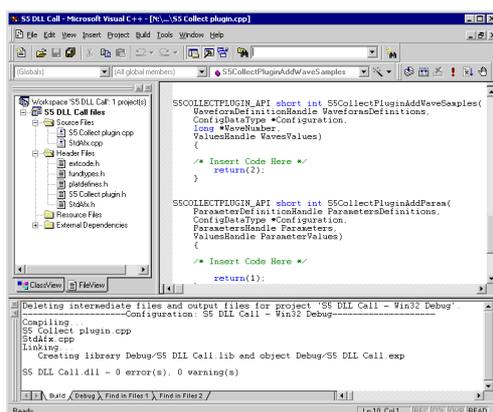
An example of how additional calculations can be done on trended parameters is included in the file *Calculation.vi*.

If your LabVIEW project contains a main Virtual Instrument (.vi) that calls other sub-vi's, do as follows:

1. Store your entire project to the plug-in directory used by iCollect in LabVIEW by selecting **File - Save with options - Development Distribution** and clicking **Include vi.lib files**.
2. Open the .lib file with the LabVIEW VI Library manager and copy the main .vi to the plug-in directory used by iCollect.
3. Delete the file with the name of the main .vi from the library.

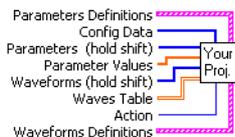
NOTE: If more projects are stored in the same subdirectory, all .vi names that appear in multiple libraries must be identical to each other.

An example of how algorithms in a .dll file generated with Microsoft Visual C++ can be linked to a LabVIEW Virtual Instrument plug-in is included in file S5 DLL Call.vi. For more information on how to make a .dll, see the National Instruments web site www.ni.com and select **NI Developer Zone - Development Library - Measurement and Automation Software - LabVIEW - Development System - Communicating with External Applications - Using External Code - Integrating DLLs : How to Build a DLL with Visual C++**.

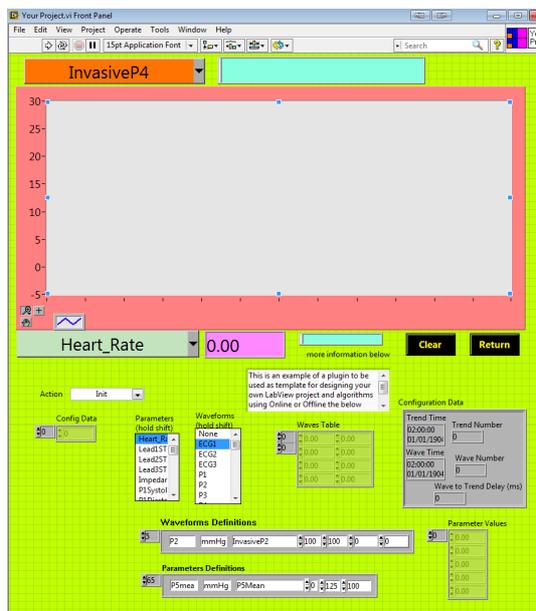


All C++ source files that are needed to regenerate a .dll file are copied in the plug-in directory. When running the .vi under iCollect it is possible to resize the online and offline windows to make sufficient room to display the plug-in, while maintaining full control over the icons and menus of the Online and Offline windows.

Your Project.vi Connector Pane



Front Panel



Controls and Indicators



Action Possible actions :

0=Init : When opening the online or offline view or after selecting a new plug-in

During init at opening of the online or offline windows only **Parameters**, **Parameters Definitions** and **Waveform Definitions** are valid. All the other input parameters are equal to zero.

1=Process : In the online window called each 500 ms (default) or at the interval indicated in the Plug-in selection window.

In the offline window called each time a new package has been read from file. Note that duplicate data may arrive in the plug-in. The Configuration data date-time stamp could be checked to see if the new package is the same as in the previous call. Alternatively the latest datex_hdr_rd could be checked to see what the latest updated package has been before the plug-in call.

During process all input variables contain valid data.

2=Exit :When exiting the online or offline window the plug-in will be called with the Exit action. This may be used to save latest data and close the plug-in view.

3=View :In the offline window called each 500 ms (default) or at the interval indicated in the Plug-in selection window. During view none of the other input variables contain valid data.

Parameter Values A list of single precision values in the order indicated in the Configuration Editor.

Parameters A list of references to positions in the parameters list indicated in black in the selection list on the online and offline view.

Waveforms A list of references to positions in the waves list indicated in black in the selection list in the online and offline view.

[SQL] **Waves Table** Two-dimensional array of single precision values with for each row a list of the new samples of all selected waveforms from the last 2 seconds. The amount of columns depends on the Frequency defined in the online or offline window.

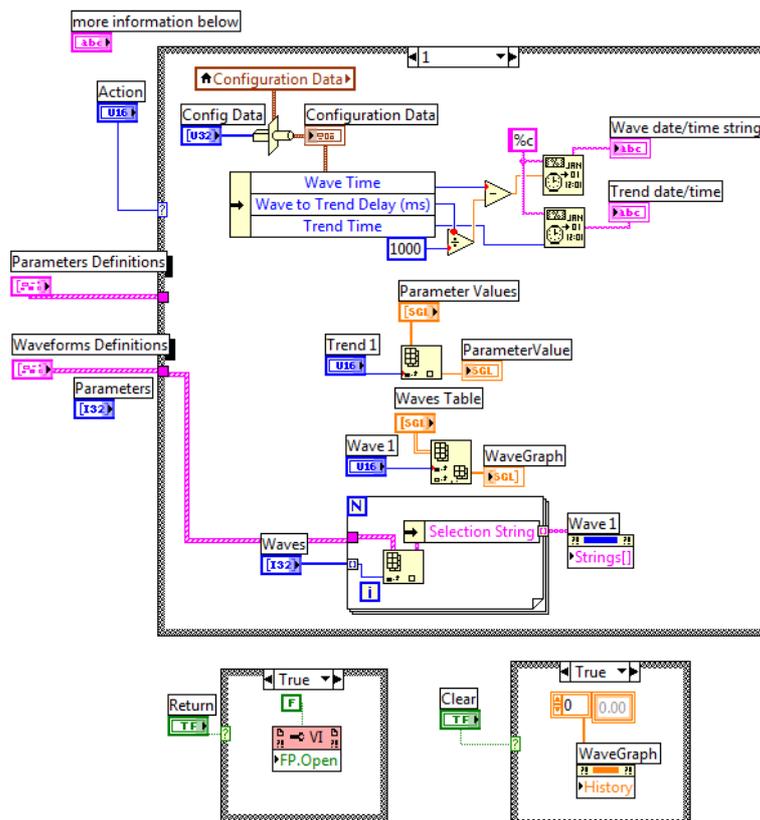
[SQL] **Waveforms Definitions** See section “Editing the database configuration” on page 6-37. Use this table to get all needed string constants for your plug-in.

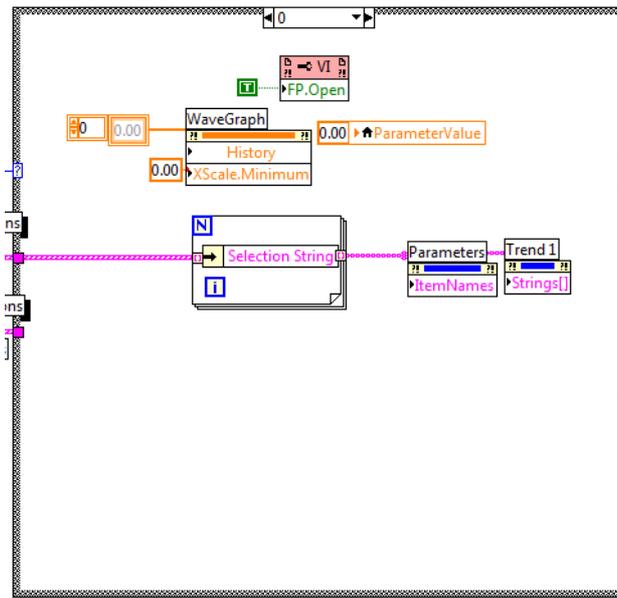
[SQL] **Parameters Definitions** See section “Editing the database configuration” on page 6-37. Use this table to get all needed string constants for your plug-in.

[SQL] **Configuration Data** Includes

- Information needed to set time stamps to the received trend and waveform data.
- The latest package number of the last trend and wave package.
- The time difference between the trend and wave packages (wave packages are buffered for 3 seconds plus the maximum delay used in the Configuration window).

Block Diagram





Index

A

Alarms

- displaying 3-13
- saving in ASCII files 3-14, 4-32
- saving in drc files 3-14

Alarms IDs 8-54

Alarms.asc 8-53

All page 3-16

ASCII button 3-9, 3-14

ASCII files 3-11, 3-14, 4-24, 4-29, 4-32

- decimal symbol 3-15, 4-33
- output format 8-53
- saving data 3-14, 4-24, 4-29, 4-32
- time format 6-38
- total size 3-14
- viewing 4-33

ASCII output files 8-53

Auto Stop 4-29

Auto Stop button 4-30

Autoselection of trends 3-12

C

C++ 1-1, 9-61

Cancel button 4-24, 4-29, 4-30

Clear button 3-13, 4-24, 4-25, 4-27, 4-28

Command buttons

- offline mode 4-25
- online mode 3-9

Communication buffer 3-8, 3-12

Communication buffer overload 5-36

Configuration 6-37

- defining the digit field color behavior 6-39
- files 8-45
- time format for ASCII files 6-38
- waveforms 6-38

Configuration Editor 6-37

Configuration parameters 6-37

Context-sensitive help 5-35

Convert button 4-31

Cursor Legend palette 7-43

Cursor legend palette 4-28

D

Data file size 3-10

Database configuration 6-37

Decimal symbol in ASCII files 3-15, 4-33

Digit field 3-12

- defining the color behavior 6-39
- Trends page 3-12

Displaying alarms 3-13

Displaying events 3-14

DLL 1-1, 9-61

DRC button 3-9, 3-14

Drc files 3-14, 4-23, 4-32

- opening 4-23
- opening a new 4-33
- saving data 3-14, 4-32
- selecting 4-23

E

Error messages 5-36

Events

- displaying 3-14
- saving in drc files 3-14

Exiting the program 2-5

Export trend records to PHY directory dialog 4-32

F

Found. What next? dialog 4-29

G

GE Healthcare web site 5-35

Go to time 4-29

Go to time button 4-25

Graph palette 7-43

H

Help menu 5-35

I

iCollect

- Registering 2-5

iCollect 1-1

- exiting 2-5
- installing 2-3
- offline mode 4-23
- online mode 3-7
- showing version and generation date 5-35
- version 5.0 2-3

iCollect features 1-1

Installation 2-3

IP address 3-7

K

Key combinations 5-35

L

LabVIEW 3-21
 palettes 3-19, 4-27, 4-28, 7-41

LabVIEW editor 3-21

Loading PHY files 4-30

M

Manual

 about this manual 1-1
 accessing through Start menu 2-3
 displaying in pdf format 5-35
 on CD-ROM 1-1

Marker 3-15

 searching 4-30

Moving to a desired time 4-28

N

NI LabVIEW Run Time Engine 3-21

Notes 3-15, 4-34

 adding 3-15
 adding markers 3-15
 adding ner to predefined 3-15
 exporting to Excel 3-16
 predefined 3-15
 printing 3-15
 removing contents 3-15
 replacing the predefined 3-15

Numerical parameter values 3-12

Numerics page 3-19

O

Offline main window 4-24

Offline mode

 command buttons 4-25
 exiting 4-34
 replaying data 4-25
 starting 4-23

One page 3-18

Online main window 3-8

Online main window resizing 3-9

Online mode

 command buttons 3-9
 exiting 3-21

Online mode starting 3-7

Overlaid page 3-17

P

Parameters

 configuration 6-37

Params5.txt 8-45

Password 2-5

Pause button 3-9, 3-13

PCMCIA card 4-30

PHY files 4-30

 converting to drc format 4-31
 saving drc data into PHY files 4-31

Play data fast button 4-25

Play data slowly button 4-25

Plot Legend palette 7-41

Plug-in 3-21, 4-34, 9-61

 designing 9-61
 examples 9-61
 file location 3-21

Predefined notes 3-15

Printing

 current window 3-21
 currently displayed data 4-33
 offline mode 4-33

Printing current snapshots 3-20

printing current snapshots 3-19

Printing notes 3-15

Program version 5-35

R

Readme file 1-1, 2-3

Register button 2-4

Registration 2-5, 3-14, 3-21, 4-33, 5-35

Registration window 5-35

Replaying data in offline mode 4-25

Resizing main window 3-9

RS232 communication buffer indicator bar 5-36

S

S/5 Central 3-7, 4-30

Save All to ASCII button 4-24, 4-33

Save to ASCII button 4-29

Saving data in ASCII files 3-14, 4-24, 4-29

 saving all data 4-33
 saving selected data 4-32

Saving data in drc files 3-14, 4-32

Saving data in PHY files 4-31

Scale Legend palette 7-42

Searching for markers 4-30

Select Patient File dialog 4-30, 4-31

Set Auto Stop Time button 4-29

Set Time dialog 4-29

Snapshot button 4-25

Snapshots 3-16, 4-33

 All page 3-16
 exporting to ASCII 3-20
 exporting to Excel 3-20

- Numerics page 3-19
- One page 3-18
- Overlaid page 3-17
- printing currently displayed 3-19, 3-20
- using snapshot data in Excel 3-20
- working with graphical 3-18
- working with numerical 3-19
- Start Play button 4-24, 4-29
- Start reading from beginning button 4-25
- Startup 2-4
 - network communication 3-7
 - offline mode 4-23
 - online mode 3-7
 - serial communication 3-7
- Stop button 3-9, 3-14, 3-15, 4-24, 4-25
- Stopping an action 4-29
- T
- TCP/IP network board 3-7
- Time format for ASCII files 6-38
- Trends
 - autoselect 3-12
 - clearing from screen 3-13
 - configuration 6-37
 - freezing 3-13
 - latest numerical parameter value 3-12
 - sampling interval 3-13
 - saving in ASCII files 3-14
 - saving selected in ASCII files 4-32
 - selecting displayed 3-12
 - showing data as XY graphs 4-28
 - trend scale 3-13
- Trends page 3-11, 4-27
 - digit field 3-12
- Trends saving in ASCII files 4-24
- Trends XY page 4-27
- Trends.asc 8-57
- U
- Unexpected errors 5-36
- V
- Virtual Instrument 9-61
- Virtual labView instrument 3-21
- W
- Waveforms
 - clearing 4-27
 - configuration 6-38
 - freezing 3-13
 - period of waveform 3-11
 - period of waveform display 4-27
 - sampling interval 3-10
 - saving in ASCII files 3-14
 - saving selected in ASCII files 4-32
 - showing data as XY graphs 4-28
- Waveforms sampling interval 4-26
- Waveforms saving in ASCII files 4-24
- Waveforms selecting displayed 3-9
- Waves page 3-9, 4-26
- Waves XY page 4-27
- Waves.asc 8-56
- Waves5.txt 8-51
- Wind forward button 4-25