Televet

Televet Version 7.0.0
Veterinary telemetric ECG system
Documentation

http://www.televet.de

Version: 2018/10/20

Contents

1 General Matters

1.1 System Requirements

Minimum requirements for the PC equipment:

- PC or Notebook with min. 1.3 GHz clock frequency

- Windows 7, 8, 10 (32bit or 64bit)

- min. 4Gb of RAM (8 Gb for ECG analysis)

1.2 Technical Data

Sampling rate:	500Hz each channel
Holter SD card:	Micro-SD/-SDHC card
Maximum Holter recording Time:	up to 3 – 4 days depending on micro SD card
size:	113 x 71 x 20 mm (h x w x d)
weight:	81 g without batteries
batteries:	2 x AA (Alcaline)
Filter type:	digital IIR
Signal frequency range:	0.05Hz – 125 Hz
Channels:	2 physical channels correspond to 3 or 6 vectors (I, II, III, aVR, aVL, aVF)
Operating range:	approx. 100m (clear range) with an external USB-Stick

1.3 Safety Issues

⚠ Televet is for veterinary use only.

⚠ Do not expose Televet to any liquid.

⚠ Never use Televet during electrical defibrillation to avoid uncontrollable decrease of defibrillation energy and skin burns.

⚠ Televet can be affected by HF (high frequency) communication devices (e.g. mobile phones). Avoid any use of mobile communication devices in the proximity of Televet 100.

⚠ The Televet must not be used along with HF (high frequency) surgery devices.

⚠ It has to be guaranteed that no part of Televet is in contact with hot (high voltage) parts or earth potential.

⚠ Only use non-rechargeable alkaline batteries (type Mignon AA) with Televet. Never use rechargeable batteries or lithium batteries. In case of destruction or short circuiting rechargeable batteries extremely high currents may result. This may potentially lead to excessive high temperature and fire hazards.

⚠ If the Televet is not used over a longer period of time the batteries should be removed.

⚠ For cleaning take a wipes moistened with isopropyl alcohol.

⚠ During Holter recordings of large animals, it is required to keep the animal on watch to ensure that the device cannot be damaged. Although the system is restricted to be used with Alkaline batteries, destruction of the batteries (e.g. by the hoof of a horse) could lead to high temperatures if a battery is shortened.

1.4 Registration, installation, setup of a Televet version

Please register your product on http://www.support.televet.de (Customer Portal). If you need to install or set up new versions of the Televet Software, it is available at the download area.

We will keep you informed for updates!

2 Getting started

In order to turn the Televet on, push the On-/Off-Switch. The PWR led will light up green.

Figure 1: Televet Power LED (PWR)

The device can be switched off by holding down the PWR button until the ACT led changes it's status. If a Bluetooth connection is established this may take two seconds.

2.1 Entering a memory card

2.1.1 Preparing Televet for memory card recordings

The Televet works with micro SD and micro SDHC cards . The contact side of the SD-/SDHC card is to be inserted into the SD-card-slot, as shown in the picture below.

Figure 2: Televet micro SD-card positioning

The SD card interface of the device works with a „push- / push-mechanism". Enter the card by pushing it into the card slot. Push the card a second time to eject the card.

2.1.2 Supported card types

Televet supports commercially available micro SD cards and micro SDHC cards. The supported file systems are FAT and FAT32. Micro SD and micro SDHC cards are usually preformatted with the FAT or FAT32 standard and can therefore be used out of the box. For reformatting of the cards we recommend using FAT32.

Micro SDXC cards may also be used when they are formatted with the FAT32 standard. Micro SDXC come usually formatted with a default standard which is not supported. Using SDXC therefore requires preparation of the card with a FAT32 format.

2.2 How to establish a connection with Windows-PC's

Some PC's already have Bluetooth on board. An external Bluetooth adapter should not be plugged in if there is already an internal Bluetooth. Plugging in a Bluetooth adapter when there is already an internal one acvtivated, will result in a driver conflict.

2.2.1 "Connection with Windows-PC's with internal Bluetooth

Make sure, Bluetooth is started under Windows. Start the Televet-Software.

Open the dialog "Settings", then "ECG Options …" and in the field "Bluetooth" fill in the serial number of your Televet.
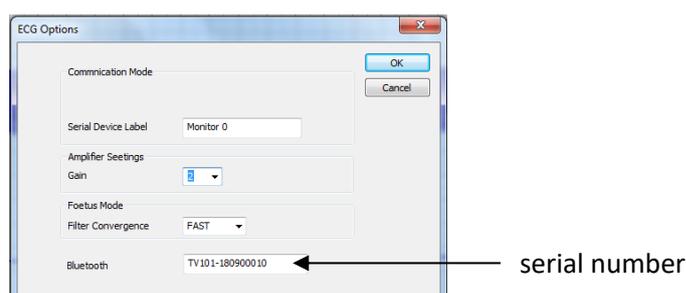
Figure 3: Serial number for Bluetooth connection

Klick "ok" and then "start ECG" . After pushing the "Start ECG" the first time, it takes some seconds, before a trace will appear, because the pairing itself needs some time for initial pairing. After some seconds you should see an ECG-trace on the display.

➔ **Don`t** use an external Bluethooth-Adapter, if it is integrated in you PC. Otherwise there will be the risk of a driver conflict

2.1.2 Connecting a Windows-PC's <u>without</u> integrated Bluetooth

If you PC doesn't contain an integrated Bluethooth, the connection is established via an USB-Stick. Insert the adapter into a USB-Slot. We recommend always to use the same USB-Slot. Wait until Windows has completed the installation of the driver. Open the dialog "Settings", then "ECG Options …" and fill in the field "Bluetooth" the serial number of your Televet.
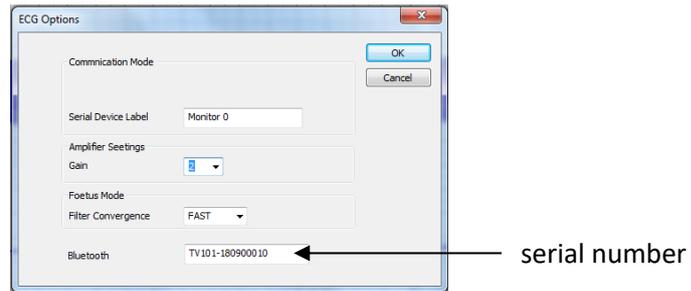
Figure 4: Serial number for Bluetooth connection

Klick "ok" and afterwards "start ECG" . As described in section 2.2.1

3 Using the Televet software for Windows

To start the ECG Software, double click the Televet-Button on your desktop.

The software will always start with the last patient processed as the active patient. When the application is started the first time the active patient will be "Patient #0001". The active patient is displayed in the status bar of the main window.

3.1.1 New buttons on Televet software toolbar

Since version 7 the „Toolbar" contains two new buttons. The functionality of these buttons is dedicated to Televet units with serial number prefixes of "TV101-". On older Televet units these functions are not available. The buttons work, once the Bluetooth connection to the Televet device is established. Therefore the monitor button ("Start ECG") needs to be clicked". The first button allows controlling the micro SD card. If it shows grey colour constantly it is inactive. This will be the case if no card is inserted.
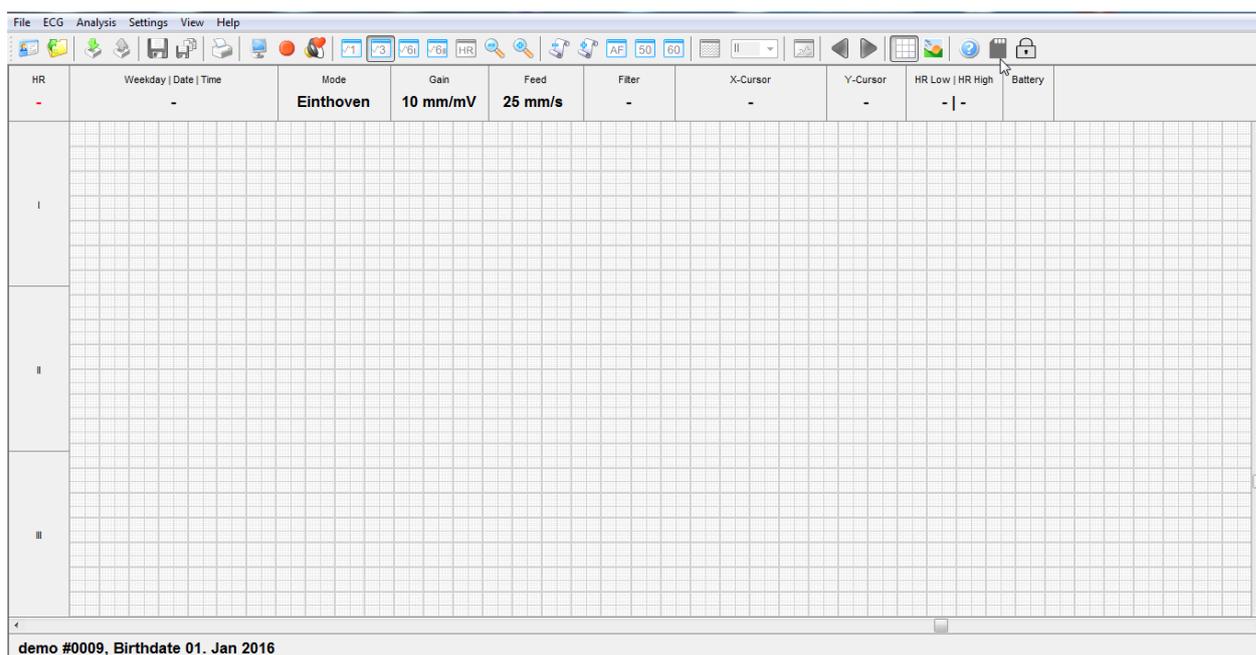
Figure 5: New toolbar button symbols

Once a proper formatted card is inserted the color of the SD-card symbol turns to blue. Now recording to the card can be started by clicking the SD-card symbol. The button confirms proper writing by blinking with a red square in the SD-card symbol. Sometimes it may take some seconds until the button starts blinking. The Bluetooth connection can now be closed, by deactivating the "Start ECG" button. On Televet devices with serial number prefixes "TV101-" the activity LED (ACT) will now flash

indicating proper writing to the SD-card. When a Bluetooth connection is established the ACT led will be statically green. SD-card writing is then indicated by the SD-card symbol of the status bar.

The second new button of the toolbar shows a lock symbol which is initially "open" and can be changed to "locked". The locking status of the device is displayed once the Bluetooth connection is established.

If the Televet device is in "locked" status, the Power-Off button of the Televet device will not work. This is to prevent unintended switching off the device e.g. by an animal.

Figure 6: Televet system window

3.1.2 Menu and Buttons

Each menu contains a number of tasks that can be performed. Sometimes menus are grey. This means that the functionality cannot be accessed at that particular point.
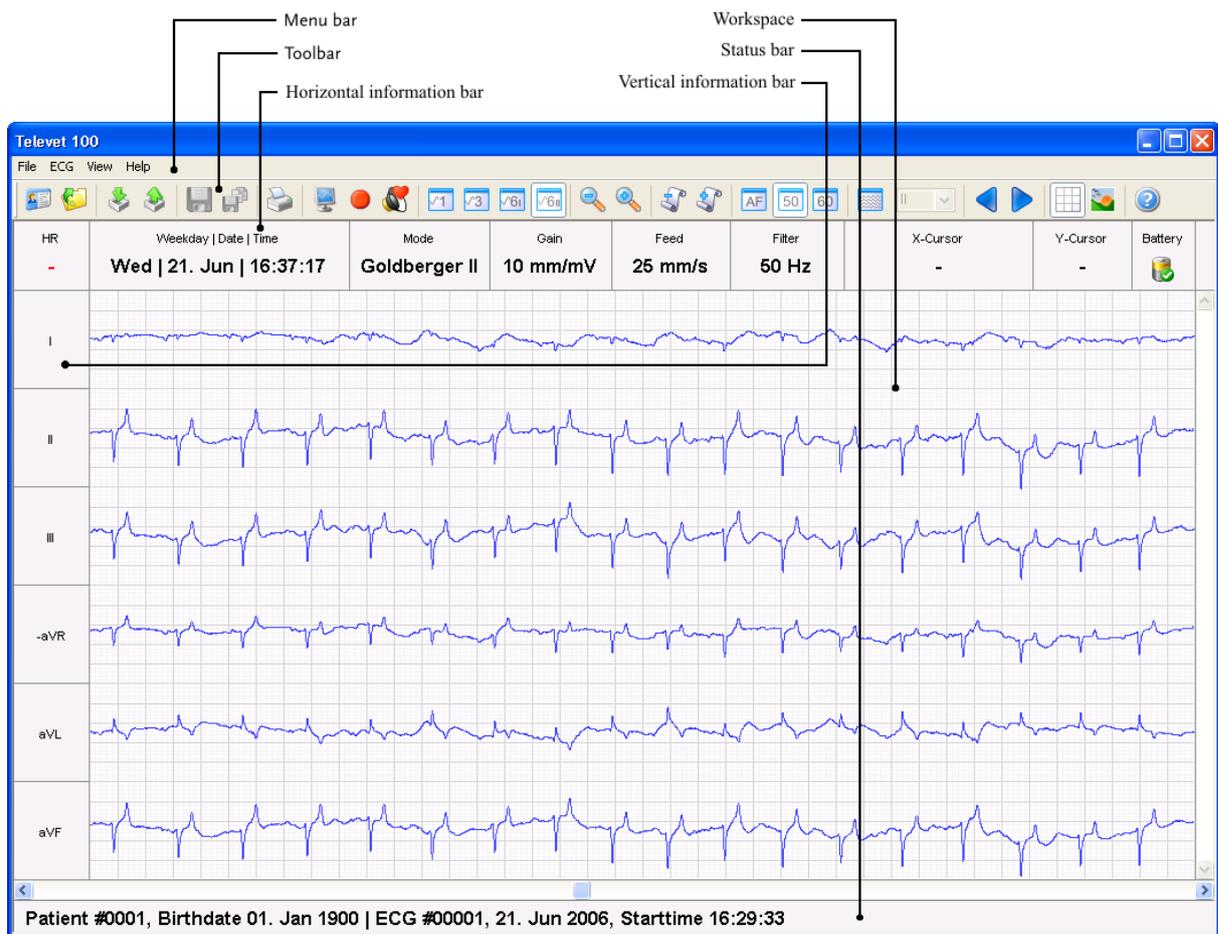
Figure 7: ECG workspace

The Toolbar contains buttons that give you easy access to the most common tasks.

Icon	Description
	Open the patient management
	Open and manage ECG recordings
	Import/Export an ECG recording
	[Disabled at the current software version]
	Copy & Save (a part of an ECG recording)
	Print the current screen
	Monitor mode
	Record mode
	Sound on (acoustic heart beat)
	Display Single Lead, Einthoven, Goldberger I, Goldberger II
	Decrease Gain, Increase Gain, Decrease Paper Feed, Increase Paper Feed
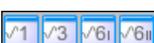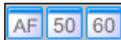
	Enable Artefact Filter, Power Supply Filter 50 Hz or Power Supply Filter 60 Hz
	Overview mode
	ECG Playback (backward, forward)
	Display grid
	Color scheme (outdoor mode)
	ECG Software information
	Micro SD card
	locking Televet device

3.1.3 Horizontal and vertical information bar

The information bars show all recorded dates and enabled tasks.

Weekday | Date | Time	Point of recording in playback mode
Recording Time	Time span of recording in monitor and record mode
Mode	Used mode (Single Lead, Einthoven, Goldberger)
Gain	Current gain
Feed	Current paper feed
Filter	Display all enabled filters (Artefact and Power Supply)
X-Cursor	Time span and the related heart rate of two vertical markings (left mouse click)
Y-Cursor	Signal amplitude (mV) of two horizontal markings (right mouse click)
Battery	Battery power is low, replace batteries
HR	Heart rate in monitor and record mode
II	Single Lead chart
I, II, III	Einthover charts
aVL, I, -aVR, II, aVF, III	Goldberger I charts
I, II, III, -aVR, aVL, aVF	Goldberger II charts

3.1.4 Workspace

The workspace displays the ECG graphs in the monitor, record and playback mode.

Click in the toolbar to display a (sub-)grid (the major grid equals 10mm) or to change the background color.

Set two markings with the left mouse button in an ECG to display the heart rate. Markings with the right mouse buttons generate the signal amplitude.

3.1.5 Status bar

The status bar shows the patient name and the birthday. With enabled playback mode the ECG number, the date and the start time of the recording is displayed additionally.

3.2 Patient Management

After start up the software the last active patient will be displayed. Push the [icon] button to open the patient management.
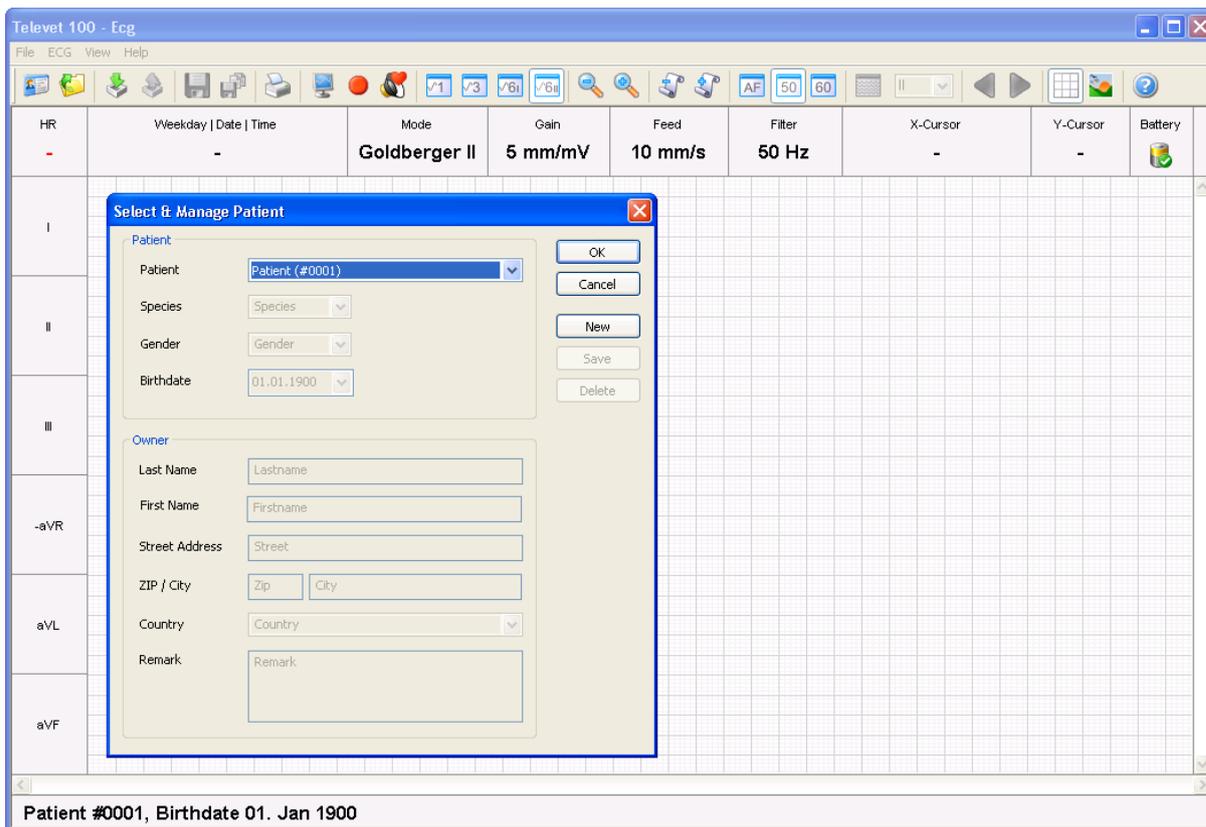
Figure 8: Patient management

The first patient is "Patient #0001". This entry cannot be edited or deleted.

To enter a new patient click the **New** button and enter the patient and the owner data. After clicking **Save** the new patient get a patient number. Click **OK** to close the patient management and return to the main window.

The patient is now defined to be the active patient and monitoring or recording can be started. The resulting recordings will assigned to the active patient.

Deletion of a patient is only possible if there are no ECG files assigned to the patient (see chapter 3.7).

3.3 ECG Monitoring

By pressing the button monitoring will start immediately, Goldberger I will be displayed by default. Monitoring can be stopped by pressing this button again.
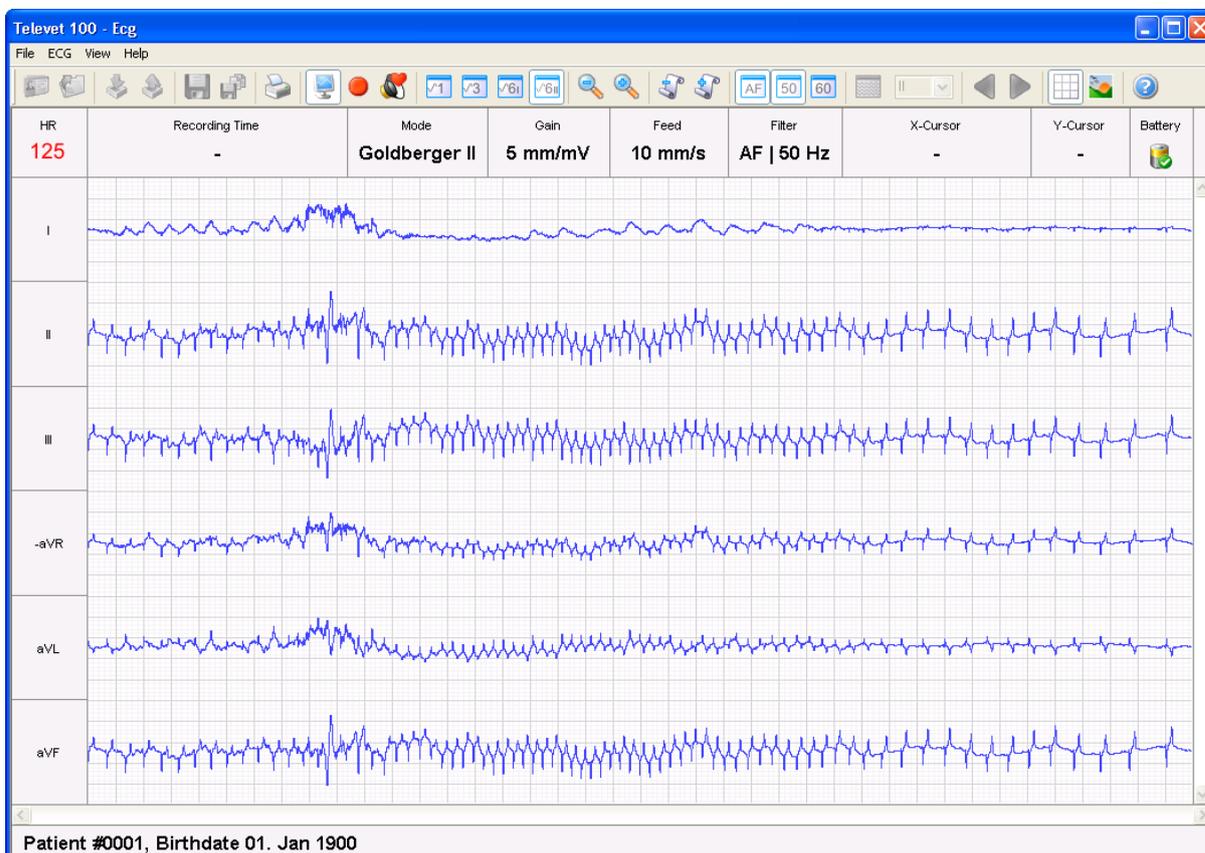
Figure 9: Monitoring

Single Lead, Einthoven or Goldberger will displayed in the workspace by pushing the buttons .

The heart rate is displayed in the information bar (**HR**).

Clicking on the button will activate the 35 Hz artefact filter. The signal bandwidth will be limited to 35Hz suppressing high frequency artefacts. The filter can be deactivated by clicking the button again.

NOTE: Do not use this filter on small animal !!! It will take away significant parts of the ecg frequency spectrum and therefore distort th small animal ecg significantly !!!

The buttons ⬚50⬚60 activate a 50/60 Hz filter.

NOTE: Avoid using this filter on small animal !!! It will take away significant parts of the ecg frequency spectrum and therefore distort th small animal ecg significantly !!! On small animal this filter may have impact to amplitudes and shape of ST-segment.

For outside use click the button 🖼 to change the background color.

🛈 Monitoring will not record to disk. Therefore, it will only allow real time investigation of the ECG.

By pressing the button 🐚 a heart beat signal is generated on each detected R peak of Lead II.

3.4 ECG Recording

To create a recording the button 🔴 needs to be pressed. If monitoring was started before, the monitoring status will remain active and the system will create a file with an automatically created filename. The file will be assigned to the active patient.

The information bar displays the elapsed recording time.

By clicking the record button again, the recording will be stopped. Monitoring however will proceed. Everytime this button is used to start a recording, a new file with a new name is created and assigned to the active patient. The new created files are displayed in the "Open & Manage ECG" window. These files can be reviewed later (see chapter 3.7).

🛈 As soon as monitoring is stopped, recording will be stopped as well.

3.5 Displaying Large Heart Rate Fonts

The menu item "**View-Large Hear Rate**" allows displaying an enlarged font for the heart rate during monitoring or recording.
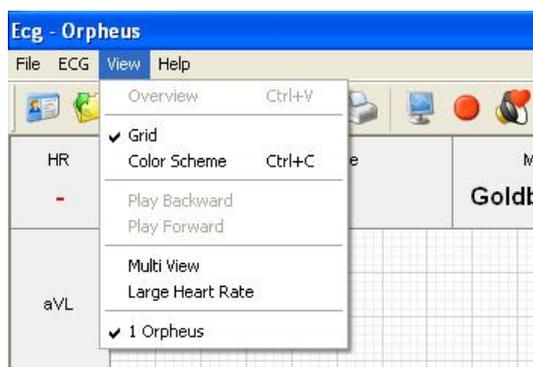
Figure 10: Menu item Large Heart Rate

Figure 11 shows an example of an enlarged heart rate font.

Figure 11: Enlarged Heart Rate Font example

3.6 Detection of data integrity Errors

The software of the Televet uses algorithms to detect data integrity problems. Data integrity can be violated i.e. when an animal is temporarily getting out of transmission range. To protect against mis-interpretation of data in case of a data integrity problem, the Televet software will report the error by drawing a red crossbar at the affected location of the ecg trace. Red crossbars may also be present in an ecg recording which was previously imported from the SD Card. Frequently occurring red crossbars are indicating that the SD Cards either is to slow to be used with the Televet or the SD Card is not correctly formatted or it is fragmented. If a SD Card is too fragmented it should be formatted. However, it is normal that a few red crossbars may occur in a holter recording on the SD Card because of reorganisation issues on the card.

Figure 12: Data integrity Errors

3.7 ECG Review

Click on the button to open the "Open & Manage ECG" window.
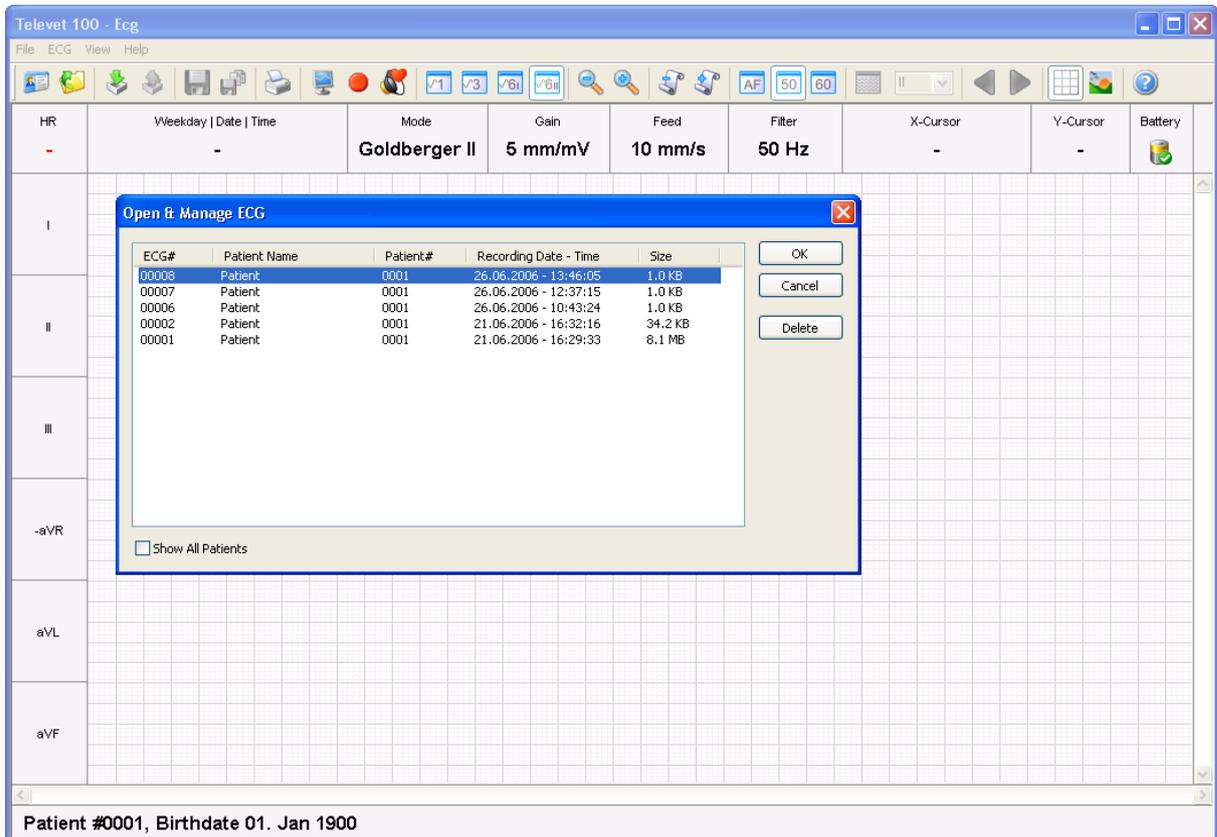
Figure 13: Open & Manage ECG

The window contains all ECGs of the active patient. By clicking "Show All Patients" the ECGs of all patients will be displayed. After an entry is selected and the **OK** button is clicked, the ECG will be displayed in the main window.

The patient name, the birthday, the ECG name and the start time of the recording are displayed in the status bar.
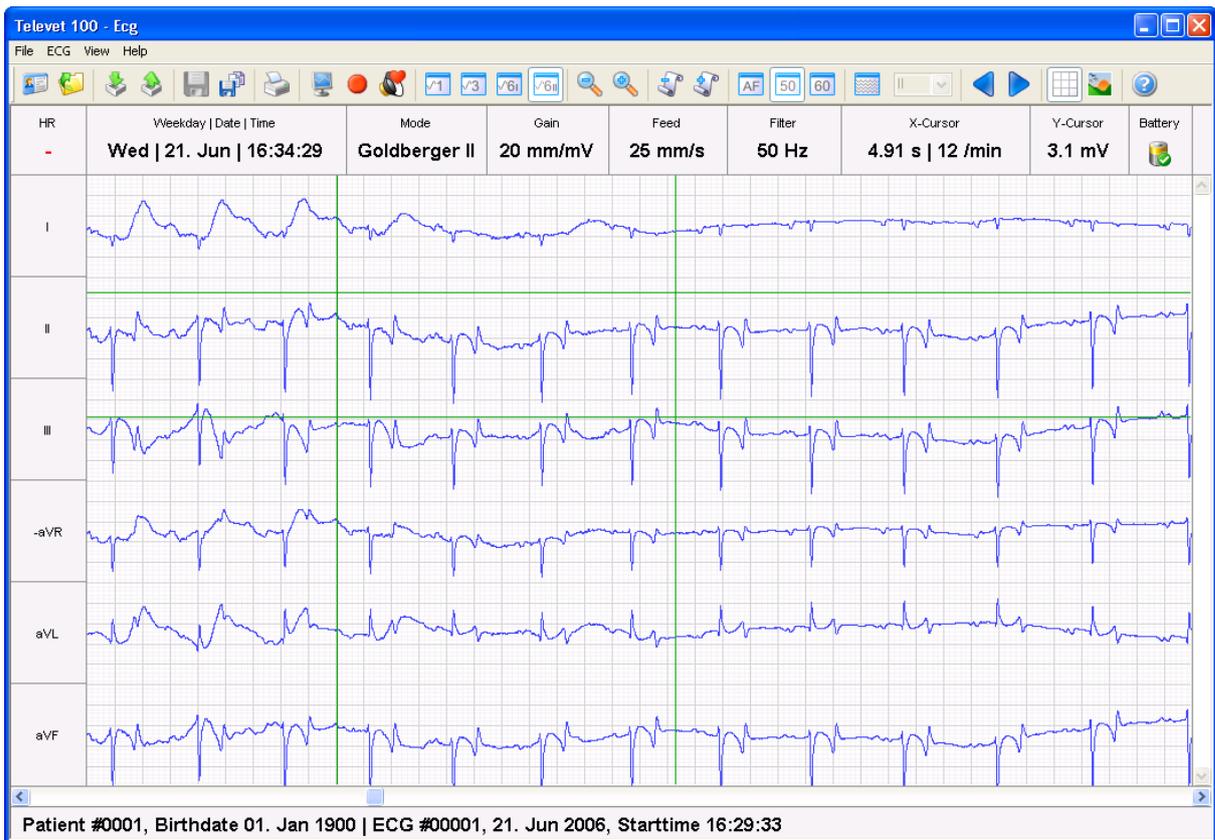
Figure 14: Review

Use the [⏴⏵] buttons for ECG playback.

Click the buttons [🔍🔍✏️✏️] to decrease the gain, increase the gain, decrease the paper feed or increase the paper feed.

By clicking within the workspace (ECG graph) a cut out area can be marked (green lines).

Left mouse click: The cut out is indicated by vertical bars.

The X-Cursor field in the information bar displays the time span and the related heart rate.

Click on the button [💾] to copy and save the cut out as a new ECG.

Right mouse click: The cut out is indicated by horizontal bars.

The Y-Cursor field in the information bar displays the signal amplitude (mV).

The button activates the overview mode. Choose the display mode in the select box next to the overview button (Single Lead, Einthoven, Goldberger).
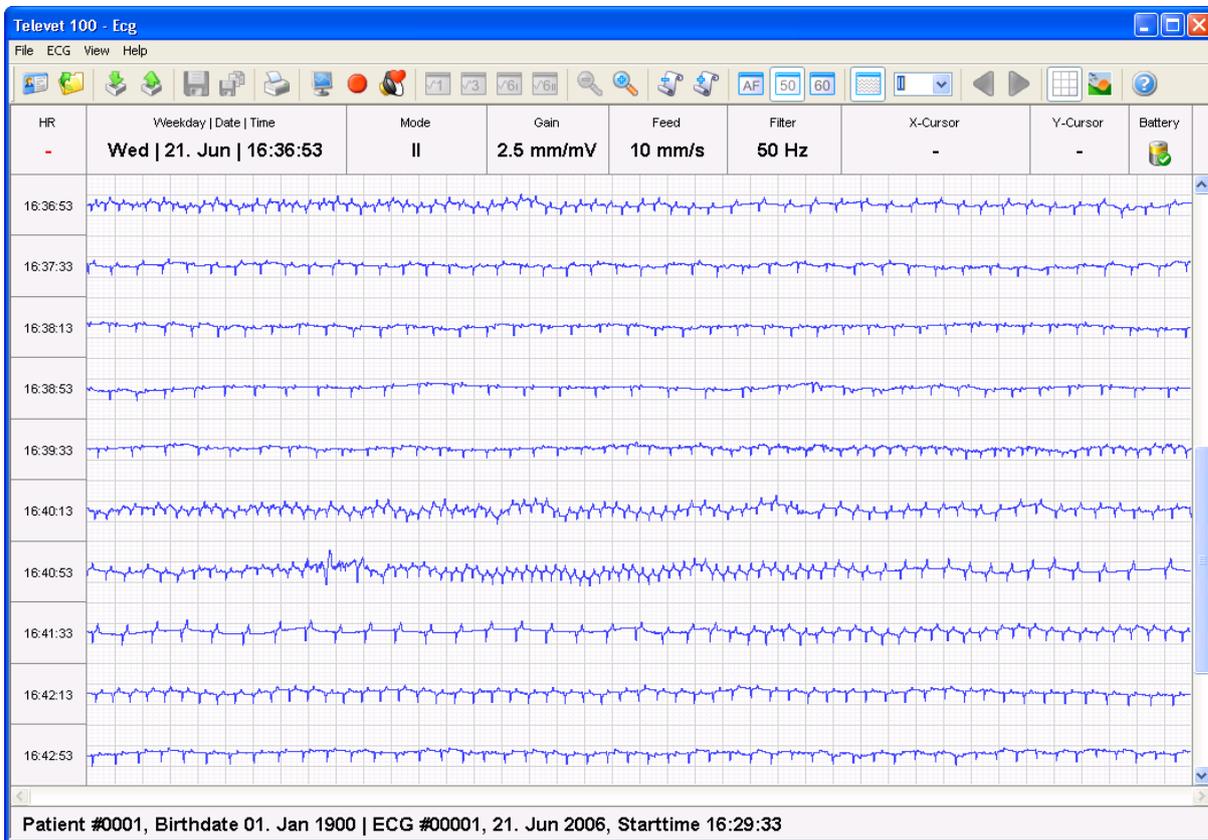
Figure 15: Overview

A double click within the workspace disables the overview mode and display the selected part of the ECG graph in the standard view.

3.7.1 Automatic analysis

The software provides rhythm analysis of Lead II of an ECG. An analysis run can be invoked by selecting the menu item **ECG** – **ECG Analysis…** . The algorithm creates an annotation to the ECG trace which includes R peak markings and RR interval size information. The R peak detections is carried out by a rule based R wave detector. Once this information is generated, it is possible to export RR intervals to an ASCII file. This ASCII file can be imported in Heart Rate Variability analysis programs.

If the menu item **ECG** – **Show Analysis Marks** is selected, R peaks are marked by a black dotted line. Irregular R peaks are marked by a red line. A R peak is considered to be irregular, if the recent RR interval deviates more than a value of the configured „Maximum Deviation" percentage from the preceding one.
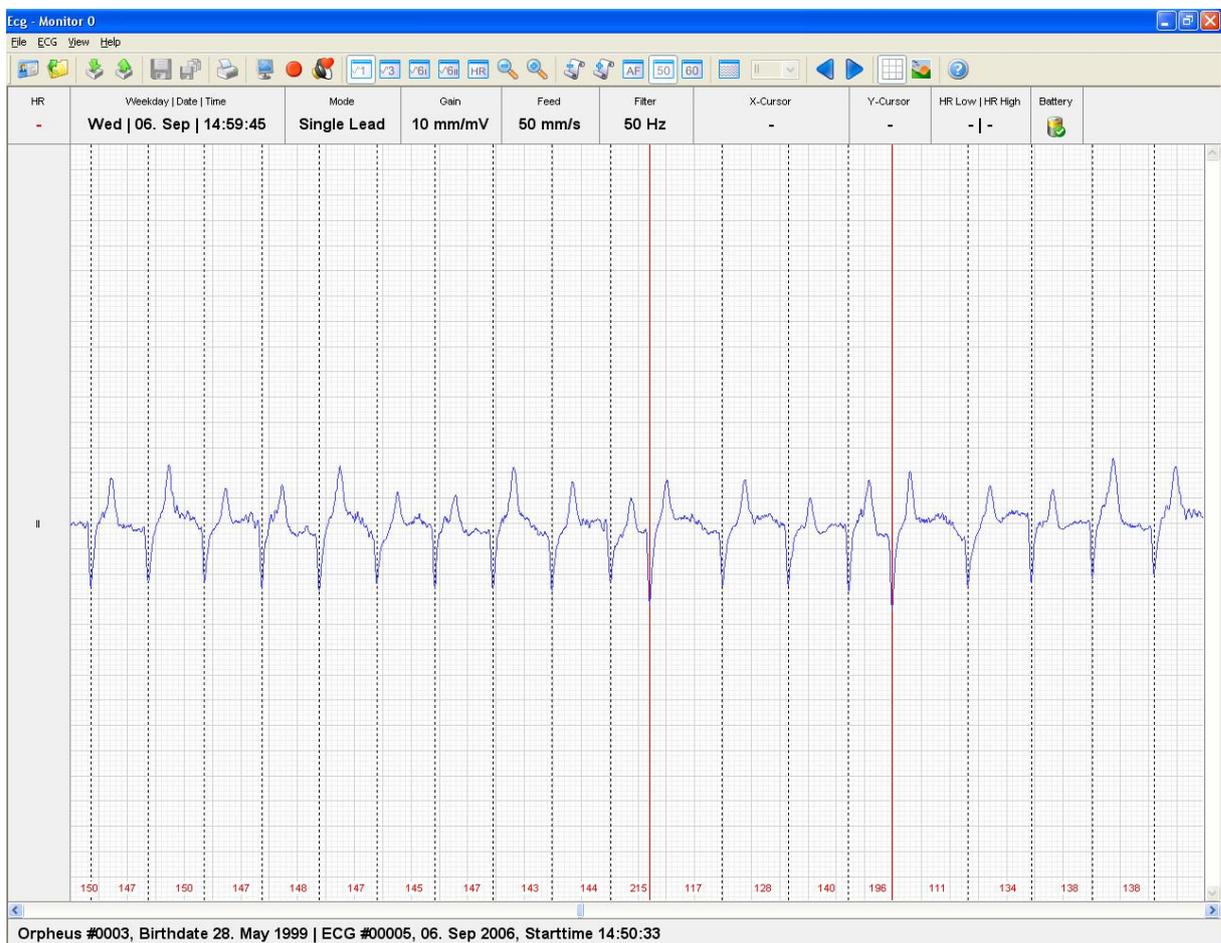
Figure 16: Markings of regular and premature R-complexes

The semantic of the [buttons icon] buttons is changed when **Show Analysis Marks** is selected. In this case it is possible to jump from irregular beat to irregular beat while browsing through the trace.

In overview mode red bars are indicating rhythm irregularities at a glance. By double clicking on a red bar the particular area of a trace can be inspected in the normal view mode. This enables the user to decide whether there is an artefact or an irregular beat.
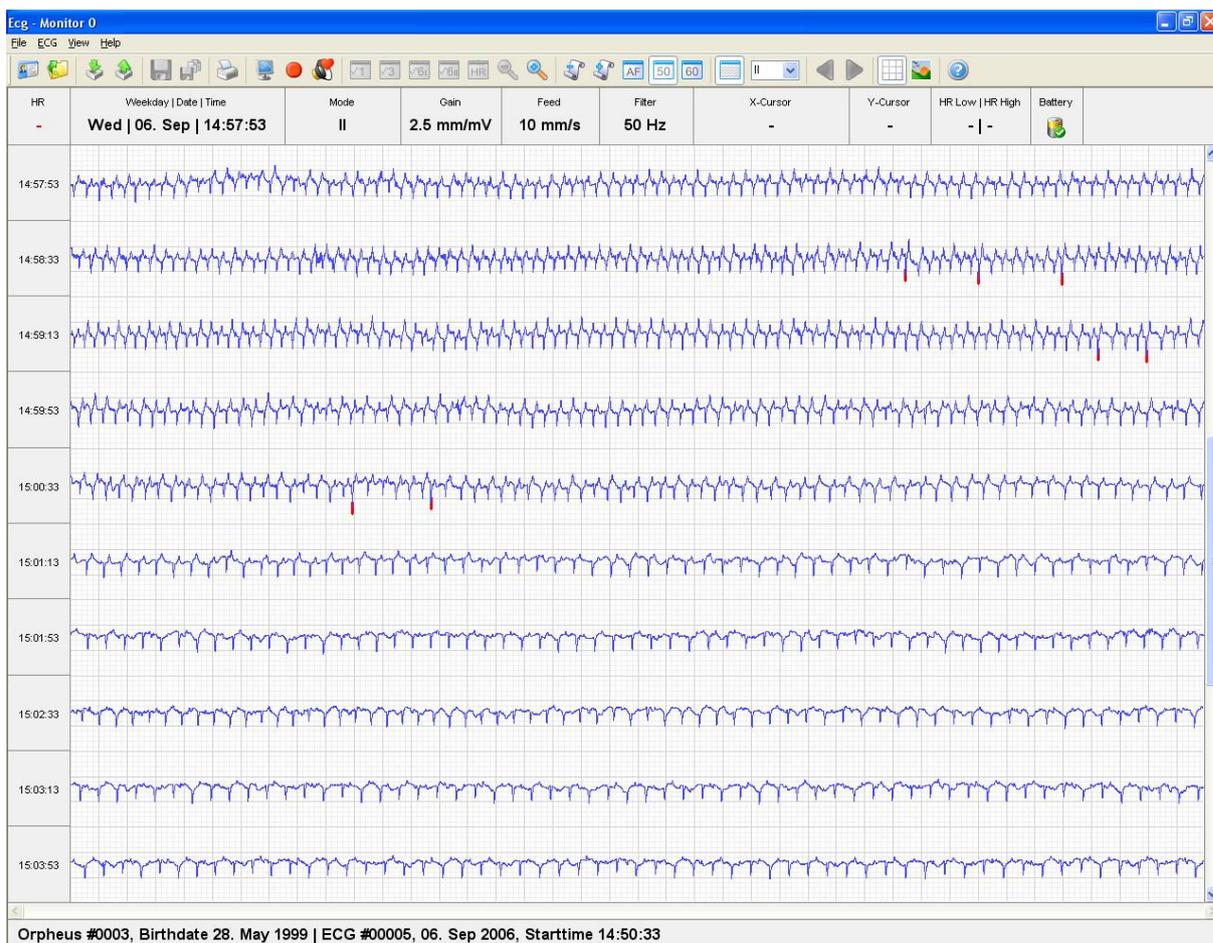
Figure 17: Markings of of irregular R-peaks in Overview mode

3.7.1.1 Rate view

After running an RR-intervall analysis the heart rate graph can be displayed. By selecting the menu item **ECG** – **Heart Rate View** the graph will be visible as in Figure 18.
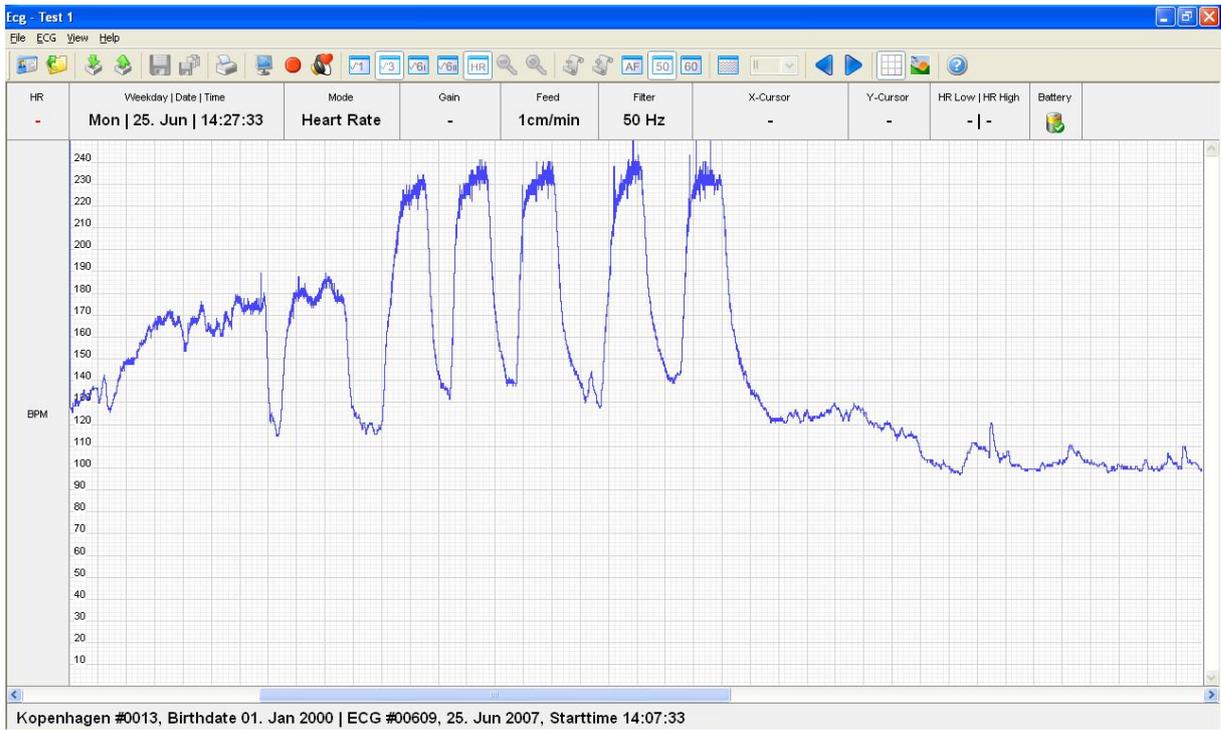
Figure 18: Heart rate view

By doubleclicking on a particular position in the heart rate graph the corresponding location of the ecg recording will be displayed.

3.8 ECG Printing

Select the menu **File** – **Print Screen**, or click the button for a quick print of the current screen to the default printer.

The menu task **File** – **Print** allows to select printing parameters. A printer and the pages to be printed can be selected.
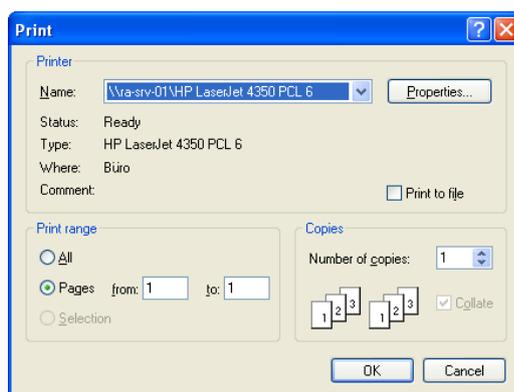
Figure 19: Print

If Microsoft Office 2003 is installed on the computer, it is possible to print to a virtual printer. This is done by selecting "Microsoft Office Document Image Writer" in the printer selection box. "The Microsoft Office Document Image Writer" will create a file containing the formatted ECG trace.

Execute the menu **File** – **Print Preview** to see a print preview of the ECG.

3.9 ECG Transfer

3.9.1 Import

Press the button to open the import window. Select "dat", "ecg" or "csv" as extension. Now all importable ECG files in the current folder will be displayed and the desired file can be selected.

Accept the recommended date or enter a date with the start time of the ECG recording. If the software doesn't find any date in the file, the current date is displayed.
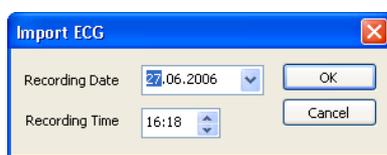
Figure 20: Recording date

The ECG will be assigned to the active patient.

If the file extension is "ecg" an additional window opens (Figure 21). Select the (active) patient for the imported file or add a new patient.
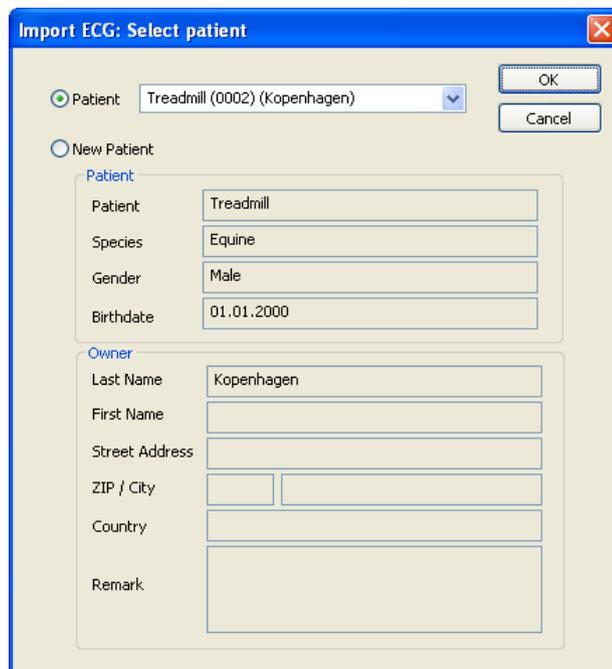
Figure 21: Select patient

3.9.2 Export

Open an ECG ("Open & Manage ECG window") and press the button to export an ECG. Press save after the target folder on your local system is selected.

3.9.3 Change assignment of recordings to a patient

Assume that a recording was made without the selection of the correct patient. In this case, the correct assignment needs to be done afterwards. The following steps can be used to transfer a recording:

Step 1: Export the relevant ECG (see chapter 3.9.2).

Step 2: Delete this ECG in the "Open & Manage ECG window" (see chapter 3.7).

Step 3: Open the patient management and select the target patient (see chapter 3.2).

Step 4: Import the ECG (of Step 1).

3.10 System Settings

The menu item **Settings** – **System Settings opens a dialog** as in Figure 22.

Figure 22: Dialog System Settings

The default setting for the communication is: **„Serial Communication"**. This setting must be used for Bluetooth communication between the PC and one or more Televet units.

3.10.1 Power Frequency

The „Power Frequency" setting will be used as the default setting for importing SD-card data files.

3.11 System Options

Select the menu **Settings** – **ECG Options…** to open the System Options window.
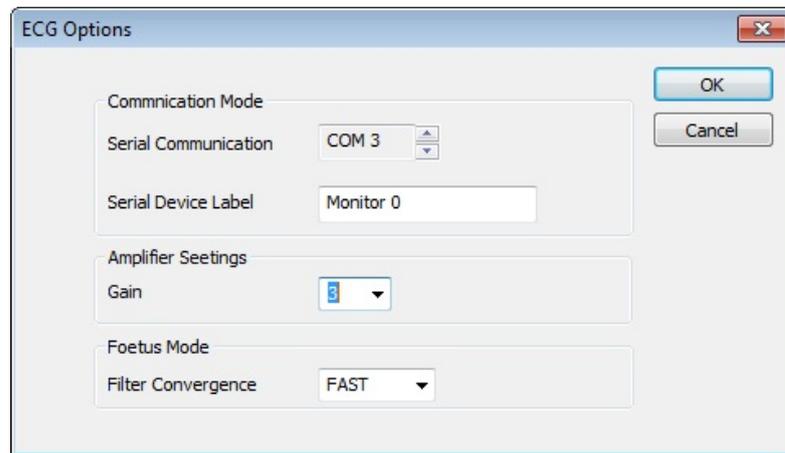
Figure 23: Configuration

3.11.1 Serial Communication

The field „Serial Communication" holds the „COM Port" number reported by windows after Blue-
tooth pairing was completed (s. chapter 2.2).

3.11.2 Serial Device Label

The field „Serial Device Label" holds a text string which is used in the „Multiview Modus". It simplifies
to distinguish the different associations of the Televet units and the location of the display on the
Monitor.

3.11.3 Amplifier Settings

The physical gain of the ecg amplifier can be modified to adapt the R-amplitude of very small animal
up to very large animal. By default a gain setting of 3 is configured. In most cases there will be no
need to modify this setting. The higher the gain setting index, the higher the amplification will be.

3.11.4 Filter Convergence

This field is used for equine foetus ecg recordings only. A description of how to obtain a foetus ecg is provided in the document: "**Obtaining foetus ecg recordings of pregnant mares**". The document is available in the customer portal of the Televet web site (http://www.televet.co.uk and http://www.televet.de).

4 Browsing Patient Datafiles

The patient database of the Televet software is stored on the hard disk of the computer system. The default location of the database is:

C:\Users\Public\Documents\Televet\Data on Windows 7, 8, 10

5 Automatic Measurement QRS Parameters

The Televet software allows to measure QRS parameters automatically. Therefore a QRS complex needs to be selected by using the left mouse button. Only one caliper should be set to enable automatic measurement.

Figure 24: Setting a QRS complex

By pushing the "QRS-Calipers" button of toolbar the result will be displayed:
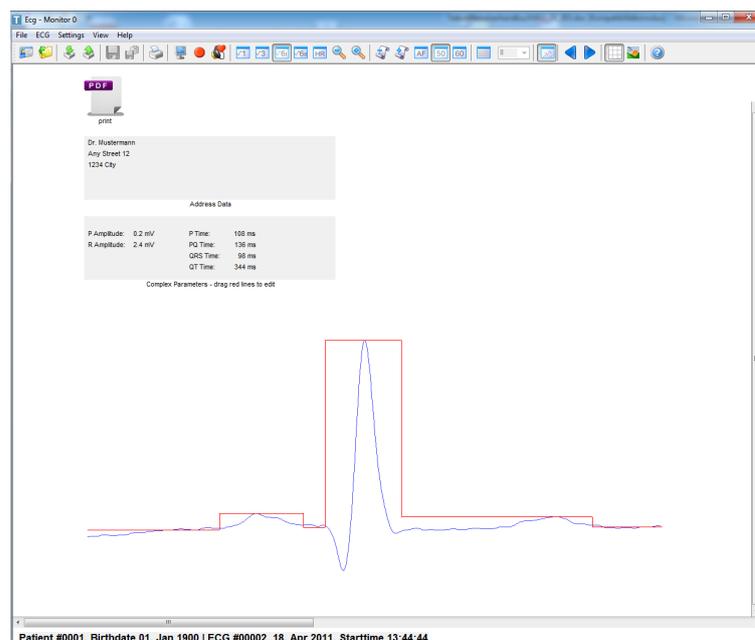
Figure 25: QRS-calipers

The detection of the various segments and intervals of the QRS complex can be modified by the user by dragging the red lines to their correct position if required.

A doubleclick at the pdf icon will generate a pdf document containing the measurement results.

The address data of the practice or clinic can be entered by selecting the menu option "Settings/Address Data". This address data is used in the pdf summary of the QRS-measurement data.
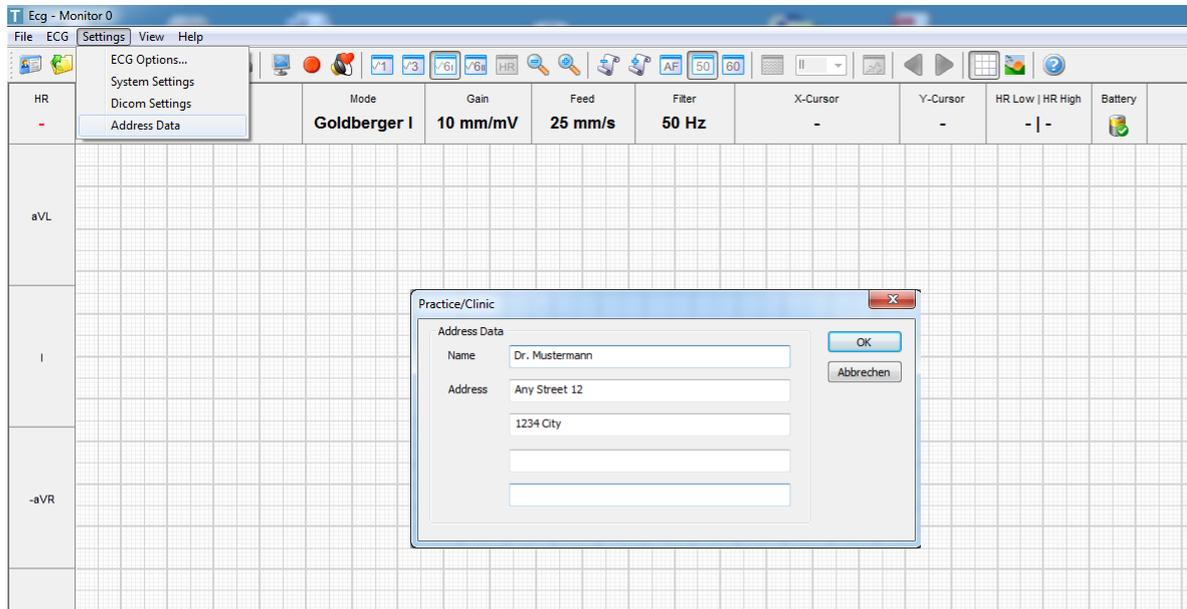
Figure 26: Entering address data of practice or clinic

6 Holter Analysis Module

The "Holter Analysis" module is intended for use on ecg recordings of dogs and cats. This module is not suitable for equine ecg recordings.

An activation key is required to enable the „Holter Analysis" functionality oft he Televet software.
To get the license management window select "HelpI/ License Management…":
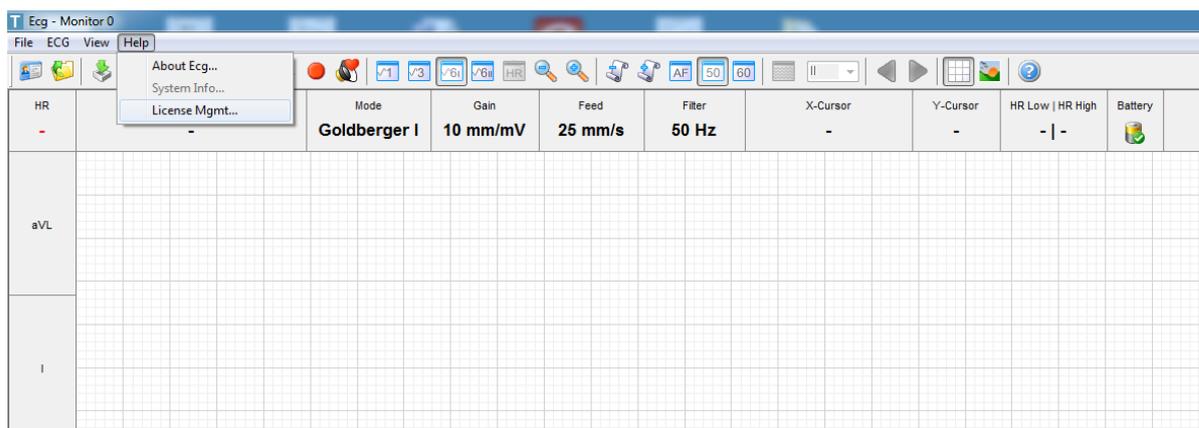
Figure 27: OpenLicense Managment

The following window will appear:
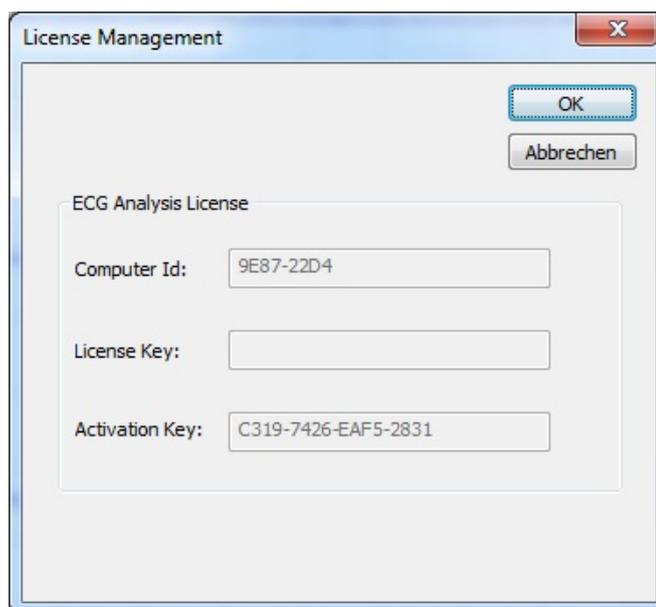
Figure 28: License Managment

Send the Computer Id by E-Mail to kengel@televet.de. In return you will receive an "Activation Key". Enter this Key into the Activation Key field and click ok. The License Key field should be ignored. Close the Televet Application and start it again. Open the license Management Window again and verify that the Activation Key file is now grey. If so the Key was accepted.
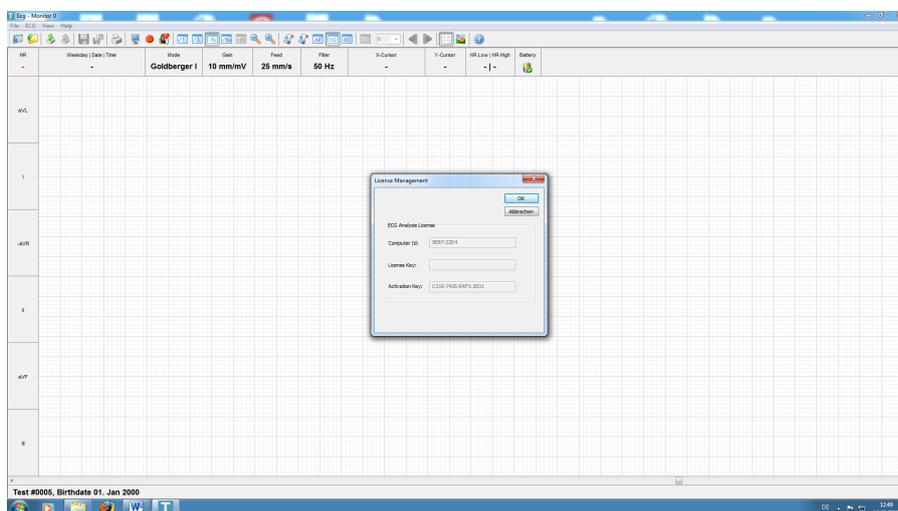
Figure 29: Example for successfully applied Holter License

6.1 Running Holter Analysis

Load the ecg file and run "ECG Analysis" with RR-analysis unchecked and Classification checked. Einthoven should be checked as well. Click ok to run the analysis.
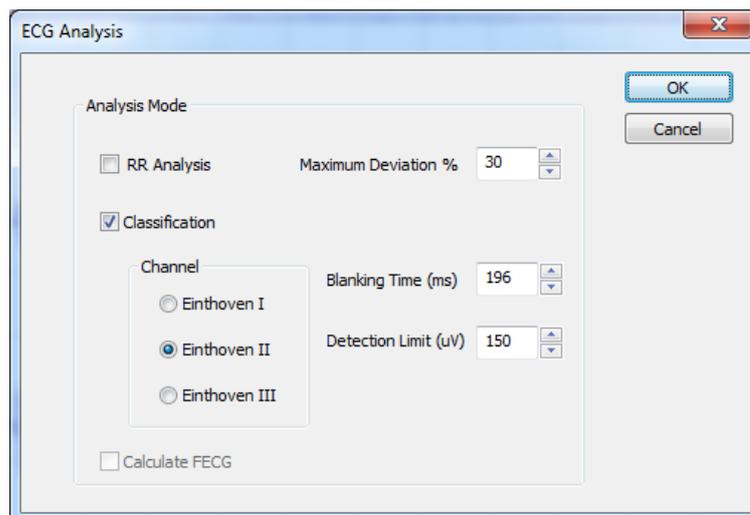
Figure 30: ECG Analysis

When the analysis run is finished, open View/Templates. The amplitude of the template beats can be adjusted using amplitude buttons.
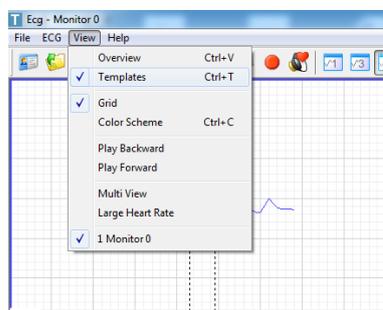
Figure 31: Selecting Templates View

The „Template View" will display beats with different morphology in each Template. The number of beats is also displayed for every template.
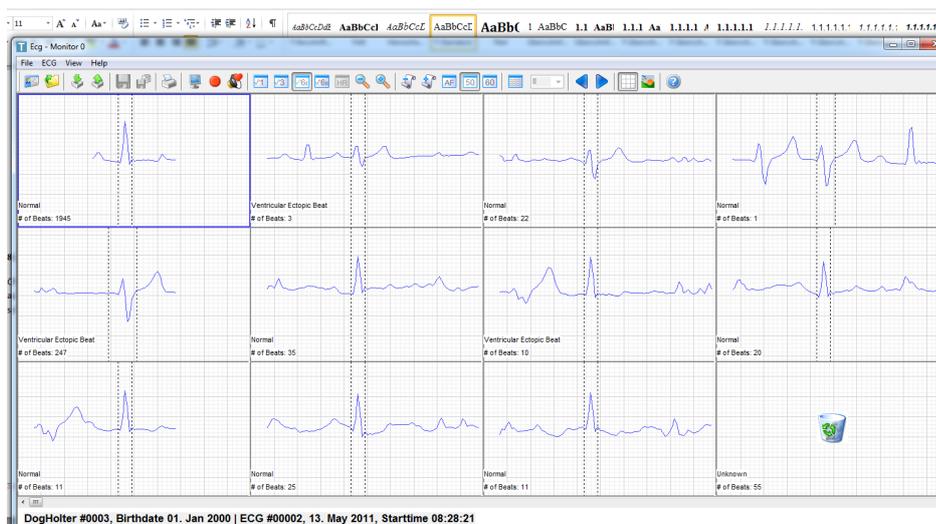
Figure 32: Templates View

Also the classification of a beat is displayed. However this classification can be overruled by selecting "Template Details" in the pop up menu. The pop up menu appears when the right mouse button is clicked. Changes in "Template Details" need to be saved to disc by pushing the save button.

⚠ the classification of the beats generated by the analysis module requires to be verified by the user. The classification proposed by the system should never be relied on. It is up to the specialist to confirm or overrule the classification.

The aim of the module is to decrease the amount of work required to analyse the Holter recording. Results created by the Analysis module, always needs to be verified by the user.

The individual beats in a Template are shown after selecting "Template Contents" in the context menu of the Template view.

Figure 33: Selecting Templates Contents

The individual beats of a Template are ordered by time.
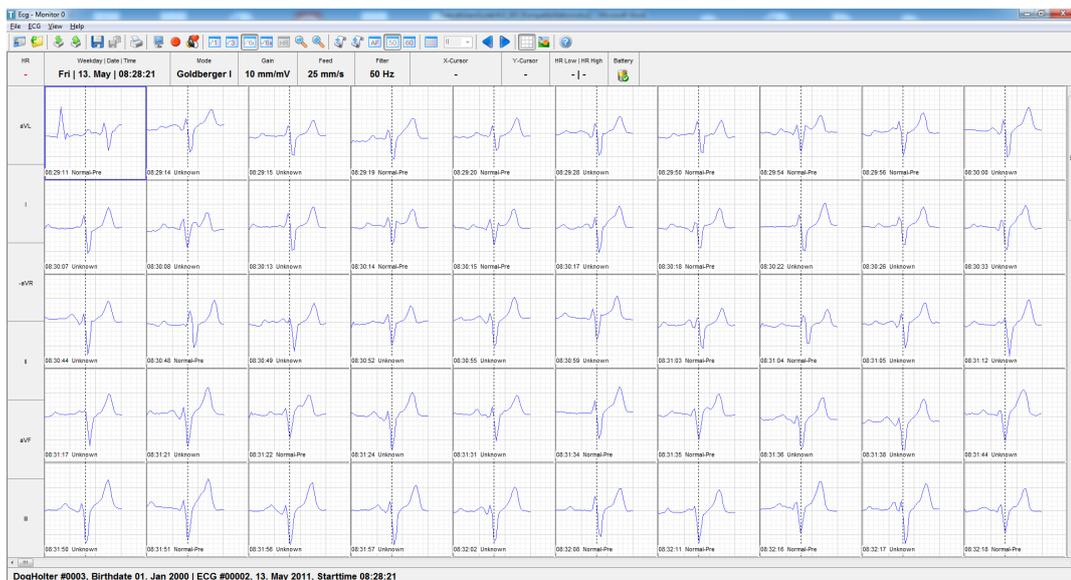
Figure 34: Individual beats in a Template

Selecting "Display Full ECG" in the context menu, displays the ecg recording on the left side of the screen and the beats inside the Template on the right side ordered by time. Selecting an individual beat on the right side will display the corresponding part of the ecg on the left.
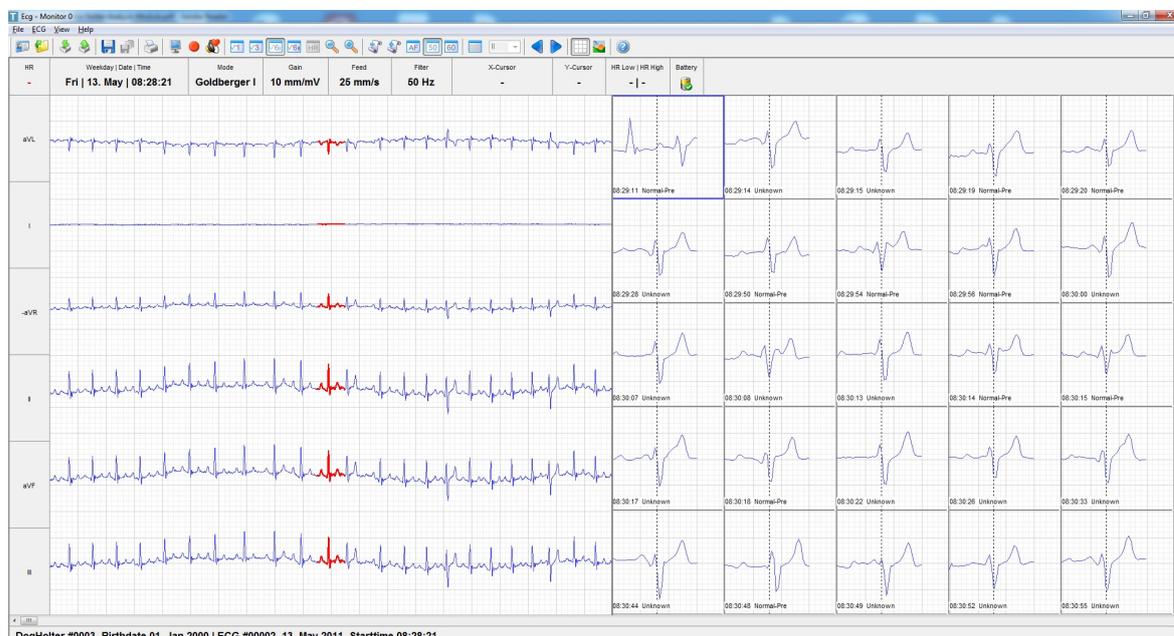
Figure 35: Individual beats in a Template and ECG

Using the up/down buttons or the vertical scrollbar allows to scroll quickly through the beats to verify the quality of the sortation. In cases where abnormal beats have a very similar shape as a normal beat, the quality of the sortation can get insufficient. In this case it is recommended to run a the analysis again on a different vector of the recording.

It is also possible to search for pauses and short RR-intervals within the entire recording. Therefore "Rhythm" should be selected in the context view of the "Templates" window.
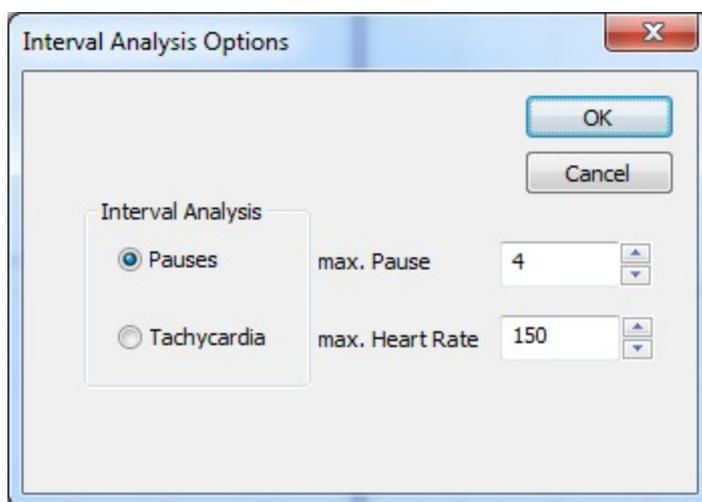
Figure 36: Interval Analysis Options

The minimum length of pauses to be detected can be configured in the "Interval Analysis Options" window. The unit "max. Pause" is seconds. The unit of Tachycardia is "beats per minute"

When pushing OK in the above example, the beats following an RR interval with pauses of 4 seconds or longer are displayed. The beats are sorted by interval length. The longest pause is displayed first.

7 Preparing access to the Televet Cloud

The Televet system allows to upload acquired ecg recordings to the Televet Cloud. For uploading Televet Light for iOS, MacOS, Android or Windows is used. The Televet Light software is specialized on acquiring ecg recordings on phones, tablets, laptops and desktop computers. Please refer to the Televet Light user manual from support.televet.de.

The Televet software for PC supports downloading ECG recordings from the cloud. Once downloaded an ECG is stored locally. The Televet Cloud therefore acts as a temporary storage for exchange of ecg data.

To configure access to the Televet Cloud open "Settings/System Settings". The dialog of Figure 37 will appear. Select "IP Network" and click "Ok".
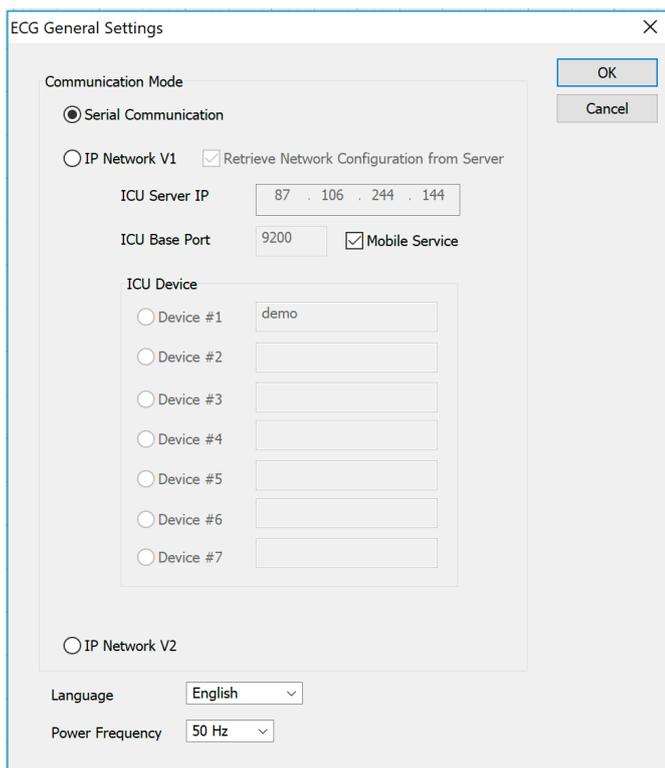
Figure 37: ECG General Settings

Then open "Settings/ECG Options" and enter your username and password.
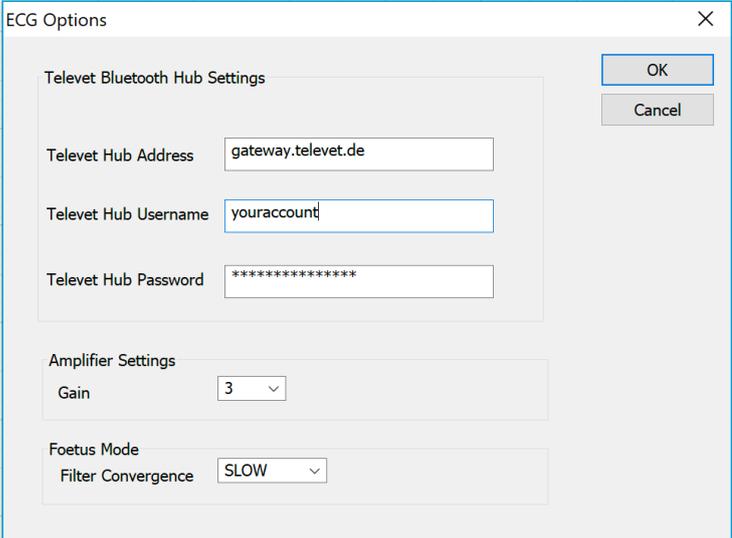
Figure 38: Televet Cloud account data

Confirm with "Ok" and open "Settings/System Settings" again. Select "Serial Communication" and click "Ok".

The Televet software is now able to download from the cloud.

8 Downloading ECG recordings from the Televet Cloud

ECG recordings can be uploaded by using the Televet Light software running i.e. on an iPad. For information about uploading, please refer to the Televet Light user manual.

Before downloading an ECG recording from the Televet Cloud the patient needs to be selected as described in chapter "Patient Management".
Then open "Open & Manage ECG". Select the "Show Cloud List" radio button. Then select an ECG from the list and click "Ok". The ECG will be downloaded and stored locally on the PC.
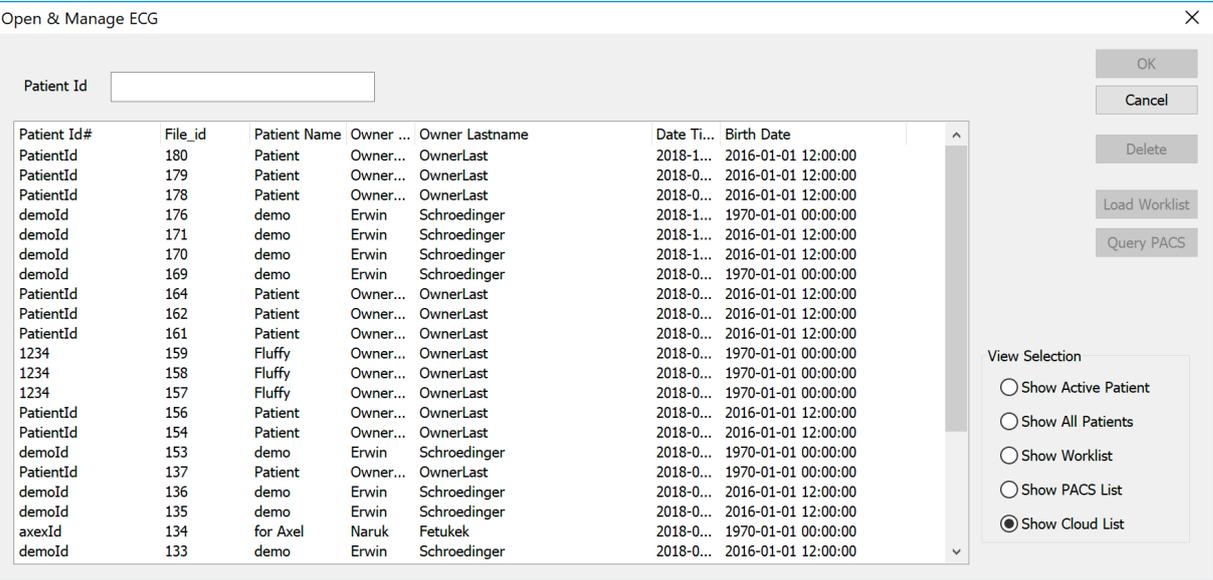
Patient Id#	File_id	Patient Name	Owner ...	Owner Lastname	Date Ti...	Birth Date
PatientId	180	Patient	Owner...	OwnerLast	2018-1...	2016-01-01 12:00:00
PatientId	179	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
PatientId	178	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
demoId	176	demo	Erwin	Schroedinger	2018-1...	1970-01-01 00:00:00
demoId	171	demo	Erwin	Schroedinger	2018-1...	2016-01-01 12:00:00
demoId	170	demo	Erwin	Schroedinger	2018-1...	2016-01-01 12:00:00
demoId	169	demo	Erwin	Schroedinger	2018-0...	1970-01-01 00:00:00
PatientId	164	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
PatientId	162	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
PatientId	161	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
1234	159	Fluffy	Owner...	OwnerLast	2018-0...	1970-01-01 00:00:00
1234	158	Fluffy	Owner...	OwnerLast	2018-0...	1970-01-01 00:00:00
1234	157	Fluffy	Owner...	OwnerLast	2018-0...	1970-01-01 00:00:00
PatientId	156	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
PatientId	154	Patient	Owner...	OwnerLast	2018-0...	2016-01-01 12:00:00
demoId	153	demo	Erwin	Schroedinger	2018-0...	1970-01-01 00:00:00
PatientId	137	Patient	Owner...	OwnerLast	2018-0...	1970-01-01 00:00:00
demoId	136	demo	Erwin	Schroedinger	2018-0...	2016-01-01 12:00:00
demoId	135	demo	Erwin	Schroedinger	2018-0...	2016-01-01 12:00:00
axexId	134	for Axel	Naruk	Fetukek	2018-0...	1970-01-01 00:00:00
demoId	133	demo	Erwin	Schroedinger	2018-0...	2016-01-01 12:00:00

Open & Manage ECG — Patient Id field. OK, Cancel, Delete, Load Worklist, Query PACS buttons. View Selection: Show Active Patient, Show All Patients, Show Worklist, Show PACS List, Show Cloud List (selected).

Figure 39: List of ECG recordings on the Televet Cloud

9 Using Televet on an animal

The front side of the device (where the power button and the led's are placed) is the antenna side. This side should be positioned away from the animal to ensure maximum range.

9.1 Exercise ECG of a Horse

An exercise ECG of a horse will always contain artefacts. These artefacts need to be minimized in order to get results of diagnostic value. Therefore the placement of the electrodes and the way they are fixed on the horse are important factors for a high quality recording. If KRUUSE ECG Electrodes (Cat. no. 291310 40/pk) are used, clipping of the horse will not be required in most cases.

9.2 Placement of the electrodes for an equine exercise ecg

The green electrode is placed on the sternum or better 2 or 3cm right from the sternum. The red electrode should be placed on the left side of the horse thorax about 30 cm below the top of the thorax (not in the area of spines). The black electrode is placed approximately 10 cm above the red electrode. The yellow electrode may be placed on the right side of the horse's thorax in a position similar to the red one on the left side. This can give additional information concerning questionable artefacts. All electrodes need to be positioned in a way so that they can be tightly fixed with the girth. The girth is pushing the electrodes against the hair coat of the horse. The jelly electrode liquid in the sponge of the adhesive electrode is able to penetrate the hair coat even if the horse is not clipped.

Figure 40 and Figure 41 are taken from horse prepared for an exercise ECG in a round pen.

Figure 40: Electrodes

Figure 41: Girth

For horses on a high speed treadmill, the same electrode placement can be used.

An alternative way of electrode placement is shown in Figure 42. This method is advantageous for exercise ecg recordings on ridden horses. In this case electrodes are not placed under the surcingle, because this would often lead to additional artefacts. Yellow and green are the lower electrodes. Black and red are the upper electrodes. Lead one and two would be identical in this case. So a redundant channel is available in case an electrode gets dislodged.

Figure 42: Electrode placement on a ridden horse

9.3 Recording an Holter ECG of a dog

9.3.1 Lead Configuration

The Televet system by default uses Lead cables with European Color Coding. North American Color Coding is available on request.

	European Code (Televet 100)	North American Code
left leg	**green**	**red**
right arm	**red**	**white**
left arm	**yellow**	**black**
neutral	**black**	**green**

Figure 43: Comparison between North American and European Color Coding

The table reflects the lead configuration for a defined Einthoven ecg recording. For a holter recording electrodes need to be placed on the chest of the animal in order to minimize movement artifacts.

9.4 Electrode placement example

Figure 44: Electrode placement on a dog

The Einthoven lead configuration is projected from the extremities to the chest. I.e. Black moves from the right leg to the right side of the chest and behind the dog's heart. Red moves from the right arm to the right side of the chest located in front of the dog's heart (Figure 2). The same principle applies to the green and yellow electrode on the left side of the dog's chest. As a result the electrodes frame the dog's heart where the electrode configuration is projected from the Einthoven configuration to the chest.

Figure 45: Left side of the dog with yellow and green electrode

Figure 3 shows the yellow and green electrode on the left side of the dog's chest.

Figure 46: Fixing electrodes and Televet unit

Figure 4 shows the preparation of the fixation of the Holter unit. The plug of the cable should point towards the tail of the dog.

For fixation itself a sticky flexible bandage like VetWrap® can be used. It is also common that a few windings of the VetWrap® bandage are also wrapped around the anterior side of the dog's chest. This avoids slipping of the bandage and the device when the dog moves.

Figure 47: Fixing electrodes and Televet unit

Care must be taken that the bandage does not constrict the dog's thorax in a way that breathing is affected.

10   Regulatory Information

Declaration of Conformity

$C \in$

We, the manufacturer: Engel Engineering Services GmbH
                                            63150 Heusenstamm
                                            Seligenstädter Grund 14
                                            Germany

declare that the product:

Televet

Intended purpose: **Veterinary Electrocardiograph**

to which this declaration relates, complies with the Radio Equipment Directive 2014/53/EU, the EMC Directive 2014/30/EU, the Low Voltage Directive 2014/35/EU and other relevant provisions. The product is manufactured in accordance with the regulations of Directive 2011/65/EU. We hereby confirm that the supplied batteries are in conformity with the European REACH regulation no. 1907/2006. Furthermore we confirm that the supplied primary batteries above fulfil the requirements of IEC 60086-1, IEC 60086-2 and IEC 60086-5.

The product is compliant with the following standards and normative documents:
EN 300 328 V2.1.1
EN 301 489-1 V1.9.2
EN 61326-1:2013

defective or used batteries must be collected separately and disposed in an environmentally correct manner

Oct. 20, 2018 Heusenstamm, Germany

Klaus Engel
Managing Director