Televet 100
Veterinary telemetric ECG system
Documentation

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4.5 Detection of data integrity Errors................................................................. 22

4.6 ECG Review ................................................................................................. 23
  4.6.1 Automatic analysis .................................................................................. 26

4.7 ECG Printing ............................................................................................... 27

4.8 ECG Transfer ............................................................................................... 28
  4.8.1 Import ...................................................................................................... 28
  4.8.2 Export ..................................................................................................... 29
  4.8.3 Change assignment of recordings to a patient ........................................ 29

4.9 Configuration ............................................................................................... 30
  4.9.1 Serial Interface ....................................................................................... 30
  4.9.2 Gain ........................................................................................................ 30
  4.9.3 Power Frequency .................................................................................... 30

5 Regulatory Information .................................................................................... 31
1 General Matters

1.1 System Requirements

Minimum requirements for the PC equipment:

- PC or Notebook with min. 800 MHz clock frequency
- Windows XP SP2
- USB Ver. 1.1 or newer

1.2 Technical Data

Sampling rate: 500Hz each Channel

Signal frequency range: 0.05Hz – 100 Hz (35Hz with artefact filter)*

Filter type: digital IIR

Channels: 2 according to 3 or 6 vectors

Operating range: approx. 100m (clear range)

* The frequency range refers to the ECG device. The resulting frequency range depends on the specific filters implemented in the PC software.

1.3 Requirements to the SD Card

The Televet 100 device requires a fast SD-Card for correct recording of ECG data. The minimum requirement is a transfer rate of 80x. The 256 MB SD-Card of Transcend (www.transcend.de) TS256MSD80 for example complies to this requirement.
1.4 Safety Issues

- Televet 100 is for veterinary use only.
- Do not expose Televet 100 to any liquid.
- Never use Televet 100 during electrical defibrillation to avoid uncontrollable decrease of defibrillation energy and skin burns.
- Televet 100 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 100 must not be used along with HF (high frequency) surgery devices.
- It has to be guaranteed that no part of Televet 100 is in contact with hot parts or earth potential.
- Only use non-rechargeable alkaline batteries (type Mignon AA) with Televet 100. 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 100 is not used over a longer period of time the batteries should be removed.
- For cleaning take a cloths moistened with isopropyl alcohol.
- At 24 h 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.

1.5 Registration


We will keep you informed for updates!
2 Installation

This description is based on the operating system Windows XP with SP2. Please install the Televet software first. Configuration of the Bluetooth connection should be done subsequently.

For installation of a new version of the Televet software please uninstall the existing version first (see chapter 2.2).

2.1 Installation of the Televet software

Step 1: Insert the Televet CD and double click on the icon of the self extracting installation file (.exe). The installation assistant will start up.

![Installation Assistant](image)

Figure 1: Installation assistant

Step 2: Press the Next button and select the installation path of the software in the following window.
Step 3: Click Next and select an existing folder if the installer should not create a new folder (Televet 100) to the Start menu. Click Install to start the installation.

Step 4: Complete the installation by pressing the Finish button.
2.2 Uninstallation of the Televet software

**Step 1:** To uninstall the Televet software execute the uninstaller link in the start menu (Figure 5).

Alternatively the Televet 100 software can be uninstalled, using the “Add or Remove Programmes” option in the Windows Control Panel (Start menu – [Settings] – Control Panel).

**Step 2:** Click yes to start the uninstallation.

**Step 3:** Close the uninstaller when all components are removed.
The patient database and the ECG files will not be deleted when uninstalling the software. The location of these files is c:\Documents and Settings\All Users\Application Data\Televet\Data\.

* The folder “Application Data” is hidden (default settings). Display hidden folders: Tools – Folder Options... – View – Show hidden files and folders.

If a new version of the Televet software is installed these files will not be overwritten.
2.3 Configuration of the Bluetooth connection

⚠️ Do not install the drivers of the USB stick CD!

**Step 1:** Plug the USB stick into a free USB port of your computer. Windows XP SP2 will install the drivers automatically. A Bluetooth icon will appear in the info area of the tool bar on your desktop.

![Figure 9: Found new hardware](image)

**Step 2:** Double click on the Bluetooth icon 📈. A window will open.

![Figure 10: Bluetooth Devices](image)

**Step 3:** By clicking the button **Add** (a device), the assistant will start up.
Step 4: Click **Next** to start the device search.

Step 5: Having selected the newly found Bluetooth device ("ESD...") and having pressed the **Next** button, the next page will ask for the pairing code.
Step 6: The valid passkey is: **ecg3001**. Having pressed the Next button the procedure can be finished.

Step 7: Please note the “Outgoing COM port” for subsequent settings in **Step 8** before pressing the **Finish** button!

**Step 8:** The „Outgoing COM port“ (in this example COM3) needs to be configured in the System Options of the **Televet Software (ECG – ECG Options... – Serial Interface)**; see chapter 4 and 4.9.1). The Televet software is now ready to connect to the ECG device.
3 Using the Televet 100 ECG Device

The back side of the device (where the CE label is) is the antenna side. This side should be positioned away from the animal to ensure maximum range.

When the device is used without being connected to a PC it defaults to single channel operation and the default gain setting is on position 3. The defaults may be changed by simply connecting the PC to the device. In this case the gain settings and channel settings of the PC-software are used as soon as the connection is established (see chapter 4.9.2).

Changing gain or channel settings may produce an artefact!

There is an alternative way to change gain and number of channels without establishing a connection between PC and device. Therefore, a file called ecg.ini needs to be copied to the SD Card. An example copy of the ecg.ini file is available on the installation disk. The content of this example file defines a gain setting of 3 (which is advisable in most cases) and two channel operation. When the PC connects to the device the PC-Software settings are used. In order to avoid switching artefacts the PC should be configured to have the same settings as the ecg.ini file.

When the electrode (yellow) of the second channel is not attached to the animal, the second channel should be switched off. Any enabled channel with open input will increase current consumption of the device and decrease battery lifetime. This is because of the input protection circuits.

The device is switched-on when the cable is connected.
Remove the cable to switch-off the device!

3.1 SD Card

The card must be inserted with the diagonal edge on the top right.

Figure 15: SD Card
To format the SD Card the format option of the PC can be used. However, it is important to use the FAT option (not FAT32). The FAT option is actually a FAT16 option which is the only one which works with the SD Card.

When no SD Card is inserted the LED is static green when the device is switched on. The LED flashes when an SD Card is successfully initialized. A file with the name "ECG1.dat" will be created on the card. ECG data will continuously be written to this file. When the Televet 100 is switched-off and restarted again, a new file with the name "ECG2.dat" will be created.

The SD Card must be inserted prior to switching the device on and it should only be ejected when the device has been switched off.

### 3.2 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. When using other electrodes, best results are achieved when the horse has been clipped and the electrodes are tightly fixed with a girth. The green electrode is placed on the sternum or better 2 or 3 cm 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 16 and Figure 17 are taken from horse prepared for an exercise ECG in a round pen.
For horses on a high speed treadmill, the same electrode placement can be used.

An alternative way of electrode placement is shown in Figure 18. 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.
4 Using the Televet software

To start the ECG Software, double click the \( \text{Televet} \) 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.

4.1 Getting started

![Televet system window](image)

**Figure 19: Televet system window**

### 4.1.1 Menu bar

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.
4.1.2 Toolbar

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

- 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

4.1.3 Horizontal and vertical information bar

The information bars show all recorded dates and enabled tasks.

<table>
<thead>
<tr>
<th>Weekday</th>
<th>Date</th>
<th>Time</th>
<th>Point of recording in playback mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording Time</td>
<td>Time span of recording in monitor and record mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>Used mode (Single Lead, Einthoven, Goldberger)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td>Current gain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed</td>
<td>Current paper feed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filter</td>
<td>Display all enabled filters (Artefact and Power Supply)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-Cursor</td>
<td>Time span and the related heart rate of two vertical markings (left mouse click)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Y-Cursor: Signal amplitude (mV) of two horizontal markings (right mouse click)

Battery: Battery power is ok

Battery: Battery power is low, replace batteries

HR: Heart rate in monitor and record mode

II: Single Lead chart

I, II, III: Einthoven charts

aVL, I, -aVR, II, aVF, III: Goldberger I charts

I, II, III, -aVR, aVL, aVF: Goldberger II charts

4.1.4 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.

4.1.5 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.
4.2 Patient Management

After start up the software the last active patient will be displayed. Push the button to open the patient management.

![Patient management](image)

*Figure 20: 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 4.6).
4.3 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.

![Monitoring](image)

*Figure 21: 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.

The buttons activate a 50/60 Hz filter.

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.

4.4 ECG Recording

To create a recording the button must be pressed. If monitoring was started before, the monitoring status will remain active and the system will create a file with an automatically created file name. 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 4.6).

As soon as monitoring is stopped, recording will be stopped as well.
4.5 Detection of data integrity Errors

The software of the Televet 100 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 misinterpretation of data in case of a data integrity problem, the Televet 100 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 100 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 24h recording on the SD Card because of reorganisation issues on the card.

![Figure 22: Data integrity Errors](image)
4.6 ECG Review

Click on the button 📝 to open the “Open & Manage ECG” window.

![Figure 23: Open & Manage ECG](image)

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.
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 \textbf{button} activates the overview mode. Choose the display mode in the select box next to the overview button (Single Lead, Einthoven, Goldberger).

![Figure 25: Overview](image)

A double click within the workspace disables the overview mode and display the selected part of the ECG graph in the standard view.
4.6.1 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 green 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. The semantic of the \[ \text{\includegraphics[width=0.05\textwidth]{button}} \] 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.
4.7 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.

![Print dialog box](image)

*Figure 26: 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.
4.8 ECG Transfer

4.8.1 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 27: Recording date](image)

If the file extension is “dat” (SD Card file) the following window appears. Select the Power Supply Filter. The recommended filter is taken from the Televet software settings (see chapter 4.9.3).

![Figure 28: Import filter](image)

The ECG will be assigned to the active patient.

If the file extension is “ecg” an additional window opens (Figure 29). Select the (active) patient for the imported file or add a new patient.
4.8.2 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.

4.8.3 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 4.8.2).

**Step 2:** Delete this ECG in the “Open & Manage ECG window” (see chapter 4.6).

**Step 3:** Open the patient management and select the target patient (see chapter 4.2).

**Step 4:** Import the ECG (of Step 1).
4.9 Configuration

Select the menu **ECG – ECG Options...** to open the System Options window.

![System Options window](image)

*Figure 30: Configuration*

4.9.1 Serial Interface

The field “Serial Interface” must contain the outgoing comport. The port number is reported by the “Add Bluetooth Device” wizard after installation (see chapter 2.3).

Alternatively the outgoing comport can be found in the Microsoft Windows Start menu: **Start menu – [Settings] – Control Panel – Bluetooth Devices – COM Ports** (ECG system must be connected).

4.9.2 Gain

There are four different gain settings for the analog amplifiers of the ECG device available. This is for optimizing utilisation of the available dynamic range also with low amplitude or high amplitude ECG signals.

The default setting is gain three which is an appropriate setting for most cases. In case of a low voltage ECG signal, a gain setting might be appropriate. If high amplitude signals are over modulating the system, a gain setting of one or two might be appropriate.

4.9.3 Power Frequency

Default mains frequency used during import of an SD Card file.
5 Regulatory Information

This product is designed for the 2.4 GHz ISM-Band throughout the EC region and Switzerland, with restrictions in France.

For USA:

Contains FFC ID: QOCPROMI-ESD01

Declaration of Conformity

The company: Rösch & Associates
Information Engineering GmbH
Mörfelder Landstraße 117
60598 Frankfurt am Main, Germany

Declares that the product: Televet 100

Intended purpose: Veterinary Diagnostics

Complies with the appropriate essential requirements of the FTEG (Article 3 of R&TTE) and other relevant provisions

Standards:

EN 300 328-2 V1.2.1 (2001-12)
EN 301 489-1 V1.3.1 (2001-09)
EN 301 489-17 V1.1.1 (2000-09)
EN 60601-2-47 (2003-05-01)

01/12/2005 Frankfurt am Main, Germany

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