USER MANUAL

Eickemeyer PC-ECG

Content

Introduction, Purpose, Options

The importance of electrocardiograph examination in veterinary medicine is increasing and the method is considered one of the specialized diagnostic investigations of the patient's cardiovascular system. The fundamental condition of the use in clinical practice is profound knowledge of the method of examination, proficiency in interpreting the scanned curves and values of measurement. The limits of diagnostics should also be appreciated. It is recommended that relevant literature should be studied to be acquainted with the method of diagnostics. It is very important to realise in this context that perfect curves to be further interpreted and measured are attributed not only to the technical features of the equipment. Due focus has to be put on preparation of the lead spots, interconnection of the patient and placating the patient. It is crucial that a perfect signal is obtained with a minimum proportion of artefacts and interference.

Description

EKG 2000 is a multifunction electrocardiograph module connectable to a PC/AT computer via a series interface controlled by a software run in WINDOWS operation system. Installation of hardware and software is very simple. The software provides a possibility of simple intuitive operation. The standard equipment also provides for heart action monitoring on a long-term basis, for example during a surgery. In addition, an acoustic signal of the heart action is available. HW design meets the requirement of a classic 12-lead electrocardiograph machine. The basic model includes a 4-core patient's cable and a software providing for scanning of 3 extremity and 3 unipolar leads. The extended model available includes a patient's cable with up to 10 leads and a software for 12 leads. A model including a special patient's cable and a program for ECG examination of horses is also available.

Other features of the presented electrocardiograph machine include fast and quality printing of various formats, finding included, efficient digital filter to suppress interference from the mains and muscular tremor, QRS complexes averaging, time interval measurement, amplitudes, the heart axis inclination calculation, register containing the files of curves, measure values and findings. Examinations may be retrieved and viewed repeatedly any time, new examinations may be added, compared against each other and print out on regular office paper.

Technical Data

Number of channels	Standard model – 3-extremity Extended model up to 6 chest
Lead type	Standard model I, II, III, aVR, aVL, aVF, CX Extended V1 to V6 in addition
Number of leads displayed	6 or 3
Number of leads in printout	Various formats, 6, 12 leads, averaged complexes Measured values
Sensitivity	5, 10, 20, 40 mm/mV
Advance rate	10, 12.5, 25, 50, 100 mm/s
User's filters	Mains, muscle-tremble effect, averaging
Safety class	BF (ČSN 36 4800), IEC 601
Insulation voltage	4 000V
Supply	5V, max. 1W from PC keyboard
Dimensions:	210 x 112 x 30 mm
Weight:	0.4 kg
PC/AT interconnection:	RS 232C

Safety, Interference and Failures

Before commencing an ECG examination, read the text below carefully and remember the contents at using your ECG 2000 for scanning an electrocardiogram or monitoring. These are principles and data related specifically to the use of the equipment we have supplied but generally applicable provisions for using any electron diagnostic equipment. Provided that the conditions stated further are observed, you need not worry about using the equipment. ECG 2000 system has got an inlet t interconnect a type CF patient meaning that if the patient's cable we have supplied and the power supply adapter are used, the patient's inlet is perfectly galvanic-isolated from the mains.

It is important to arrange that the computer equipment is at a minimum distance of 1.5 m apart from the patient being examined/the place of examination. Further, in the course of scanning and recording the electrocardiogram, the patient and the live parts of electrodes on the patient's cable (alligator clips) shall not be in contact with other conductive objects not even when the objects are grounded. The observance of the condition of a minimum distance of 1.5 m will also provide for meeting the principle that the operator should not touch the patient and the computer during an examination.

Special precautions have to be taken when using the equipment for purposes of high frequency surgery. A minimum distance of 15 cm has to be maintained between the ECG electrodes and the high-frequency surgery electrodes. Wherever possible, the patient's cable should be disconnected upon staring the high-frequency surgery. For this purpose of monitoring in the course of HF surgery, a special monitoring cable is recommended for use (the other cores will not get in the way, easy placement, special high-frequency protection).

ECG 2000 is not designed for work in explosion-hazardous environment that may develop where the flammable anaesthetics are used.

In order to diminish the static electricity effect and the mains interference, the place of examination has to be selected and prepared in an appropriate manner (patient on a non-conductive pad washed and wetted with water just before the examination, the are of examination – a table – outside the are of strong source of mains interference (and supply conductors) and the examining persons – the staff – not wearing/using any fabrics of strong electrostatic effect.

Cleaning and Maintenance

The patient's cable and individual parts of it should not be exposed to excessive mechanical strain. When handled, the conductors to the alligator-clip electrodes should not be pulled. The patient's cable is cleaned with a cloth wetted in suds or a detergent solution (water with detergent). Use a disinfectant to disinfect the cable.

It is very important with the patient's cable that the contact gel and fluid are removed from the alligator-clips immediately after the ECG is completed, washing the clips in lukewarm water and using a brush. The gel left in the clips would get dry and produce the effect of insulation at a following scan. It is not actually possible to take ECG with dirty electrodes and dry gel in the clips.

The patient's cable shall not be cleaned unless all the instruments are switched off. ECG module should be cleaned only by wiping the dirt off with a wet cloth, with the module and the computer being off.

Installation and Putting into Operation

The standard delivery includes

- electrocardiographic module ECG 2000
- 5-conductor patient's cable with crocodile clips
- connecting cable to PC/AT
- software on CD for scanning of limb leads
- contact solution or contact gel
- operating instructions on CD

Hardware requirements

We manufacture two versions of device differing in a connector for connecting to the computer. The first version is equipped with the connector RS 232 for connecting via the serial port COM and the second version utilizes a USB connector for connecting via the USB port.

For version RS 232 -serial port
Pentium processor (or compatible)
SVGA monitor 800x600 dpi
Printer
CD-ROM
Windows 95 and higher
Min. 32 MB RAM

For USB version
Pentium processor (or compatible)
SVGA monitor 800x600 dpi
Printer
CD-ROM
Windows 98, ME, 2000 or XP
Min. 64 MB RAM
USB bus

Installation of your device connected via the serial COM port

1.   Switch off your computer and connect ECG to computer at COM2 (or other port according to your requirements) by means of connecting cable with the 9-pin connector RS 232.
2.   Connect the power supply part of the cable between the keyboard and computer.
3.   Switch on your computer.

Installation of ECG Basic program

1.   Start the computer and activate WINDOWS
2.   Insert the installation CD into the CD drive
3.   Installation will be started automatically, enter the installation code and press the **"Install"** button
4.   Wait for the completion of installation and following the notice of successful installation press **"OK"**

Note: If installation is not started automatically proceed as follows!

*Click the **"This computer"** icon, select **"CD-ROM drive"** and start installation by clicking the **install.exe** file*

Installation of your device connected via the USB port

First, you need to install the necessary program **ECG Basic** (refer to the previous chapter **„Installation of ECG Basic program"**). Continue according to the manual provided with your operating system.

Installation of ECG 2000 under Windows 2000 and Windows XP

1. Switch on your computer and connect ECG to USB port of your computer by means of connecting cable provided with a USB connector.
2. The dialog **„New hardware wizard"** will appear. Select **„Next"**.
3. Select **„Find a suitable controller for a particular device"** and press **„ Next"**.
4. Select **„CD-ROM drive"** and press **„Next"**.
5. Press **„Next"**.
6. Press **„Finish"**. In this way, the first part of installation of ECG 2000 will be completed. The second part of installation will install the USB Serial Port. This installation will be started automatically following the completion of the first part.
7. The dialog **„New hardware wizard"** will appear again. Select **„Next"**.
8. Select **„Find a suitable controller for a particular device"** and press **„Next"**.
9. Select **„CD-ROM drive"** and press **„Next"**.
10. Press **„Next"**.
11. Press **„ Finish"**. In this way, the entire installation of ECG 2000 will be completed.

Installation of ECG 2000 under Windows 98 and ME
1. Switch on your computer and connect ECG to USB port of your computer by means of connecting cable provided with a USB connector.
2. The dialog **„New hardware wizard"** will appear. Select **„Next"**.
3. Select **„Find a suitable controller for a particular device"** and press **„Next"**.
4. Select **„CD-ROM drive"** and press **„Next"**.
5. Press **„Next"**.
6. Press **„ Finish"**. In this way, the installation of ECG 2000 will be completed.

Preparation of the Patient, Attachment of Electrodes

The preparation of lead points is the most important action.

Red electrode	**Right chest limb, to cilia above elbow**
Yellow electrode	**Left chest limb, to cilia above elbow**
Green electrode	**Left pelvic limb, to antecubital cilia**
Black electrode	**Right pelvic limb, To antecubital cilia**
White electrode	**Chest**

ECG Basic Program

Information on the Program and its Initialisation

The program can be initialised under Windows 95 or higher. It is used as a card file for well-arranged archivation of patients, measured data, and setting of ECG communication with your computer. The program is started by double-clicking the icon located on a working area.

Note: If this icon is not present on the working area proceed as follows!

1. *Click the right button of the mouse on the working area*

2. *In the menu displayed select **"New -> Representative ->** and type the following to the line displayed **C:\SITOSPRG\BASIC_V.EXE -> Next -> Finish"***

Main Window of the Program

Ones the program has been started, the introductory window (Figure 1) will appear on your monitor. This window is divided into several basic parts and includes accelerating buttons for easier operation of the program. It is intended as the file for archivation of patients and scanned data, setup of communication of the device with your computer, and setup of program parameters.
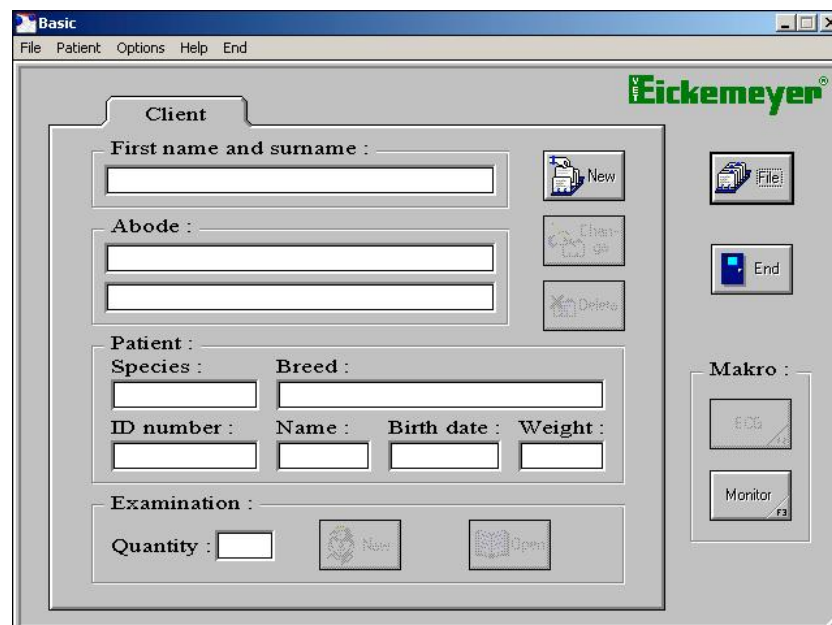

Figure 1   Main window of the ECG Basic program

It is intended for the insertion of a new patient to the file.

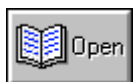It is intended for the change of patient's data already inserted in the file.

It is intended for the complete removal of the patient from the file.

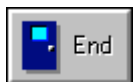It is intended for opening the file window for selection of the patient.

It is intended for starting the window for new scanning of ECG recording.

It is intended for the selection of examination from examinations stored for a selected patient.

It is intended for the proper connection of the unit with your computer.

It is intended for the termination of the program.

File Menu

By means of this dialog (Figure 2a) you can quickly find the patient in the file. To do so, you have to use two types of patient sorting to the file: according to the last name or tattoo number (hereinafter referred to as the T. No.). Resorting is carried out by buttons at the upper part of the dialog box.

Last names of patients (T. No.) may be searched for in two ways:

1) By mouse
In the list you can browse by means of the so-called scrollbar at the right part of the list (refer to the WINDOWS Help for more detailed description).

2) By keyboard
The program enables to find patients according to part of the last name (T. No.). Characters being pressed are displayed in the Edit window at the right upper corner. In finding the last name, the system starts with finding once the first character has been typed. By typing other

characters the finding is more precise. The same is valid for insertion of T. No. Ones the part of the last name (T. No.) has been found, the patient may be found by arrows or mouse.

The patient may be recorded to the file by means of the New button. This button activates the patient's insertion dialog in which you have to complete the patient related data and the patient will automatically be filed to the file.

Edit

(**File** button) - it is intended for editing and selection of the patient from the file. Following the menu selection or after pressing the acceleration button the following dialog (Figure 2a) will appear on your monitor.
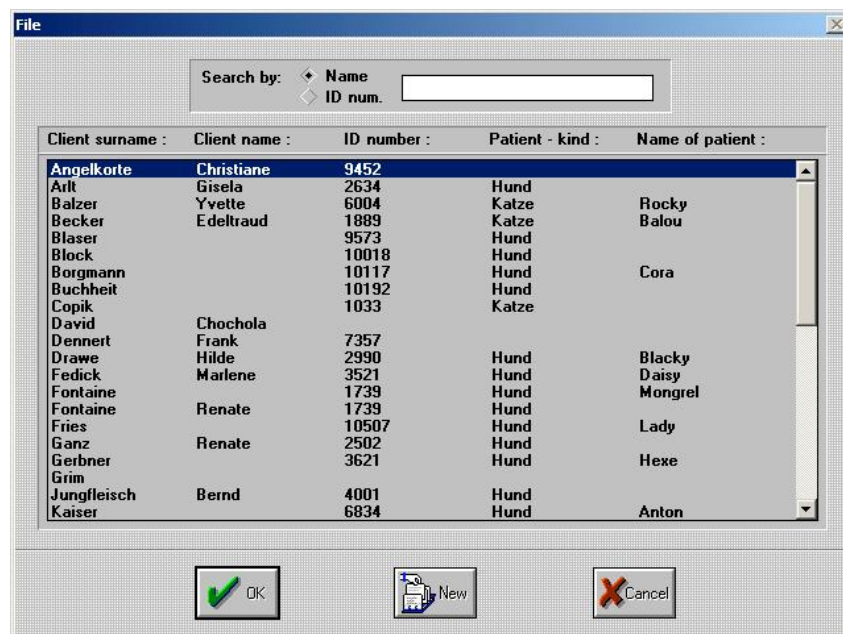

Figure 2a)   File dialog

Change

It is intended for changing the existing file (Figure 2b). Select a particular path to the file containing the file data (basic_v.dat). In this way you will record all the file data to another file. This function does not work if the patient has already been selected from the file.

Import

It is intended for importing the data from another file. Select a particular path to the file containing the file data (basic_v.dat). In this way you will import new data to your existing file. Your existing data in the file will remain unchanged, only new data will be added.
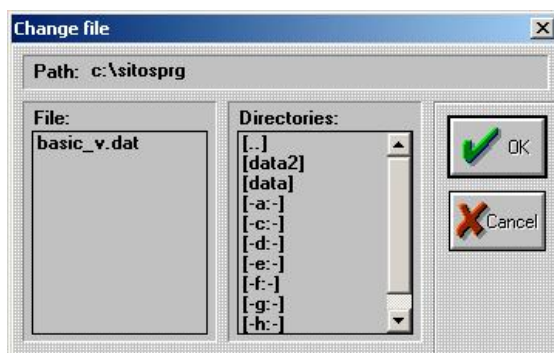
Figure 2b)   Card file change dialog

Patient Menu

New Examination
(**New** button) - it is intended for the method selection for a particular measurement (Figure 3) and subsequent initiation of the window for measurement.
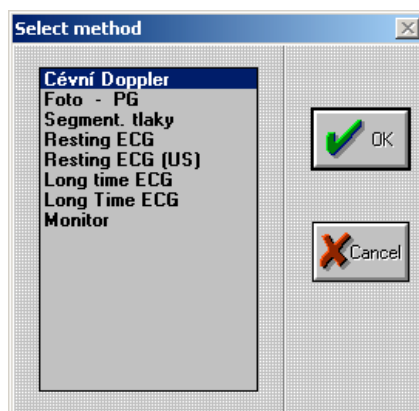

Figure 3   Dialog for measurement method selection

Open Examination
(**Open** button) - it is intended for the selection of examination which the patient has already undergone (Figure 4). This dialog is intended for the selection of an examination date which you want to further process (these examinations can be browsed or printed out).
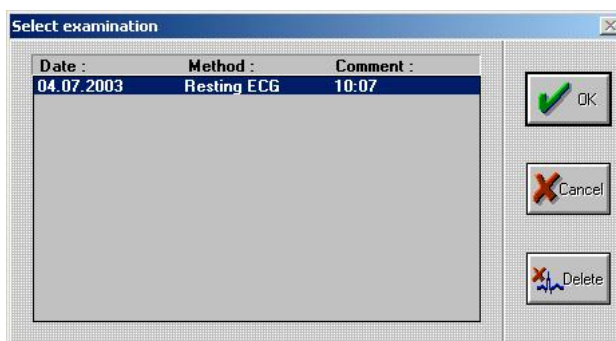

Figure 4   Dialog for selection from stored examinations

New Patient

(**New** button) - it is intended for the insertion of a new patient to the file (Figure 5).

> *Note: The patient's last name specification is the necessary and sufficient condition for correct entering the patient, other data are optional and they serve only as information for the doctor!*
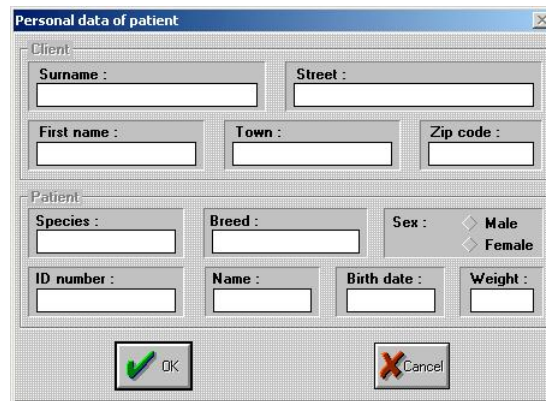

Figure 5   Dialog of patient's personal data

Change Personal Data

(**Change** button) - it is intended for the change of the patient's data already registered in the file (Figure 6).
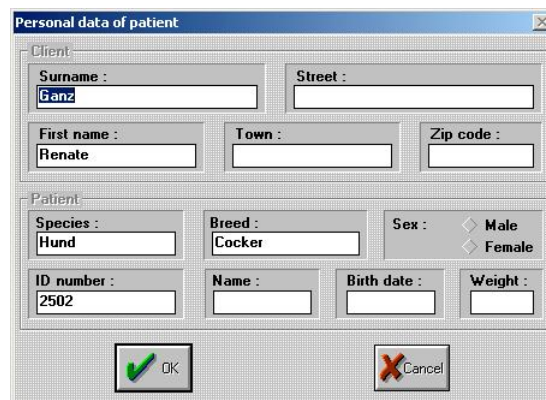

Figure 6   Dialog for change of patient's personal data

Delete Patient

(**Delete** button) - it is intended for the complete removal of the patient from the file. After pressing the delete button, the following dialog of patient's removal will appear (Figure 7).
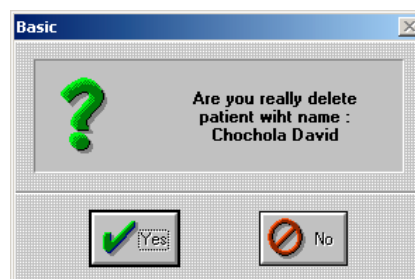

Figure 7   Dialog for patient removal from the file

Options Menu

Communication

The dialog communication (Figure 8) is intended for setting the connection of the ECG device and NIBP pressure gauge to the computer port. Each unit has its own setting. Following the program installation these ports are automatically set to **None.** By pressing the **Find** button the program will find out and automatically set the port to which the ECG device is connected. If you want to choose the port, use the arrow for selection and select the port to which the ECG device is connected. By using the **Test** button you will test the proper connection of a particular unit to the port. If no unit is connected, or if you do not want to use it, select **None**. If the unit is correctly connected, the program will show the version of the unit being connected (Figure 9). On the contrary, it will announce the failure to make connection (Figure 10).

> *Note: If **None** communication port in the **Setup** menu is set, the program **Resting ECG** cannot be started. The program will show the message **"No communication port connected!"**.*
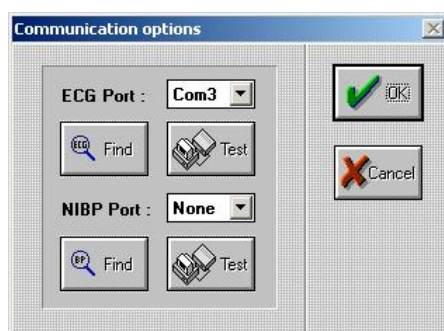

Figure 8   Dialog for setting the communication of ECG with your computer
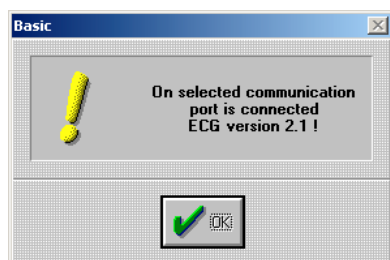

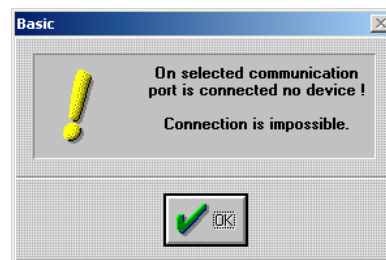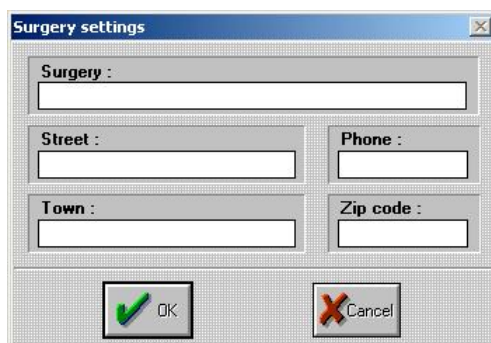*Figure 9 Dialog for proper connection of unit to port*

Figure 10   Dialog for improper connection of unit to port

Surgery

This dialog (Figure 11) is intended for entering the consulting room related basic data. These data are printed out to the bottom part of the page for each examination.
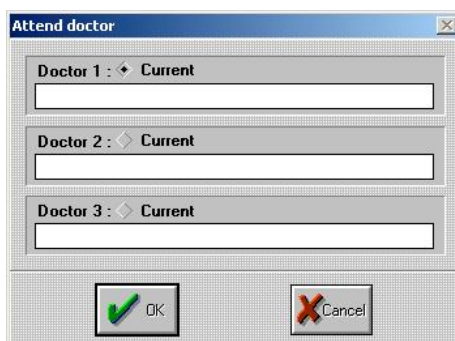
Figure 11   Dialog for setting the consulting room related data

Attend Doctor

This dialog (Figure 12) is intended for entering the name of the doctor(s) carrying out the examination. The doctor's name with the checked **Current** box will be printed at the bottom part of the examination form.
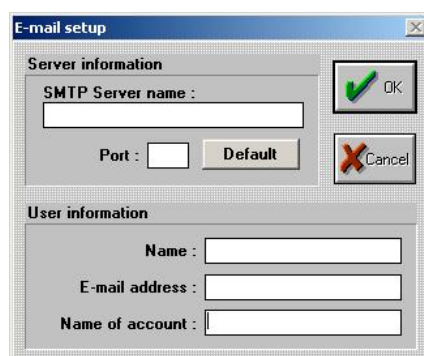
Figure 12   Dialog for entering the name of the doctor(s) carrying out the examination

E-mail

This dialog (Figure 13) is intended for setting the basic parameters (**SMTP Server, Name, E-mail address, Name of account**) to send the scanned values by e-mail. This setting can be found at your provider of Internet services or you can set it in your mail program (for example Outlook Express) in the same way as it is set for the server for outgoing mail.

Figure 13   Dialog for E-mail setting

Help Menu

It includes the manual for program parameter setting, program operation and troubleshooting. It includes the basic information on application (program version, copyrights).

End Menu

By clicking this menu your program will be immediately terminated. The same is valid also for the **End** acceleration button.

Resting ECG Program

Information on the Program and its Initialisation

This program is started by pressing the **ECG** button or pressing the **New** button and subsequent selection of **Resting ECG** method**.**

*Note: The program may be started only if the **"ECG Basic"** program has been started! If **No** communication port in the **Setup** menu is set, the **Resting ECG** program cannot be started. The program will show the message **"No communication port connected!"**.*

Main Window of the Program

The main window (Figure 14) is intended for the scanning and reviewing of ECG. This window is very important for your further actions because it is intended for the monitoring of ECG curves, both for the examination and long-term monitoring.

In addition, the program enables to store the ECG curve in memory and enables to set scanning parameters (speed, amplitude, number of leads, displayed leads, filters, printing, finding typing, switching on/off the QRS complex audible alarm, start of scanning, transfer to value measuring).
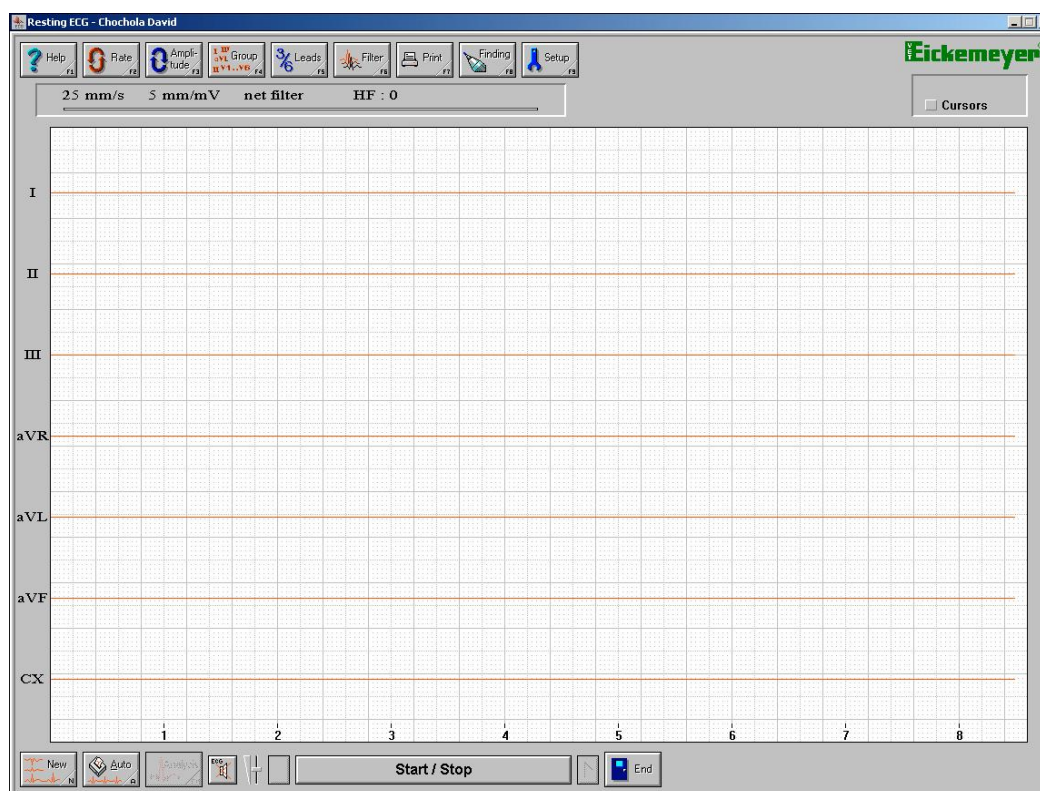

Figure 14   Program window for ECG curve scanning

Buttons in the main window of the program:

It is intended for the change of speed for curve displaying. The change is carried out cyclically. 100 mm/s => 50 mm/s => 25 mm/s=>12,5 mm/s => 10 mm/s => 100 mm/s, and the like. At higher speeds the whole recording is not displayed. Arrows on the keyboard or buttons on your monitor are intended for the selection of certain part displaying.

It is intended for the change of amplitude for curve displaying. The change is carried out cyclically. 5 mm/mV => 10 mm/mV => 20 mm/mV=> 40 mm/mV=> 5 mm/mV, and the like.

It is intended for the switching between Einthoven and Goldberger leads. Only at displaying of 3 leads.
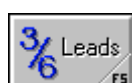
It is intended for the display of 3 or 6 leads on your monitor.

It is intended for the filter change; this change is carried out cyclically again. without filter => muscle filter => network filter => both filters => without filter, and the like.

It is intended for the setting of print parameters and subsequent printing of your document.

It is intended for the typing of a finding to particular examination. It includes the preprint function, i.e. you will write in advance the text which is then inserted.

It is intended for the setting of your printer and printing options, preprint setting for insertion to the finding, e-mail setting for sending the scanned values by e-mail.

It is intended for the start of new scanning of ECG curves. After pressing this button the program will ask you first if you want to save the current examination.

It is intended for the automatic scanning of recording and its subsequent printing according to setting.

It is intended for the transfer to the window for analysis of all averaged QRS complexes of given scanned ECG curves.

It is intended for the switch on/off of audible alarm of the ECG device.

It is intended for the volume setting of audible alarm of the ECG device. Only with ECG device of version 2.1.

It is intended for the movement of scanned ECG curves on your monitor (if high speed is set, whole curves are not displayed).

Start / Stop It is intended for the start of ECG curve scanning and stoppage of scanning. The **Space key** button also can be used. By pressing the button the curve scanning will be activated and by repeated pressing the scanning will be stopped.

It is intended for termination of the Resting ECG program. Following the pressing this button the program will ask you to save the current examination on your computer's hard disk.

It is intended for the adding or removal of a particular QRS complex to average of all marked QRS complexes. This function can be called by clicking the right button of the mouse above the particular complex.

Other important buttons:
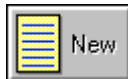
It is intended for the writing of a new preprint.

It is intended for the selection of a chosen preprint to the finding.

It is intended for the allocation or change of a preprint name.

It is intended for the immediate print of the finding or preprint.

It is intended for the setting of initial values of time intervals of the complex.

It is intended for the display of standard value dialog of ECG curves for dogs and cats.

It is intended to for the sending of current examination by e-mail in the form of **BMP** image.

⬍ Export	It is intended for the transfer of current scanned ECG curves to **BMP** image and its storage on the disk.

Operation of the Resting ECG Program

Scanning of ECG Curves

If your patient is prepared and all required conditions for perfect scanning of ECG curves (hereinafter referred to as the recording) are met (sea chapters „ **Safety, Interference and Failures"** and **„Preparation of the Patient, Electrode Attachment"**), you can start the scanning.

The scanning of recording is started by pressing the **Start/Stop** button or **Space** key. In the course of scanning it is important to meet the minimum time (i.e.. 8, 16 or 32 seconds). This is the time during which the recording is automatically stored in memory of your computer. If this time is not met, two recordings subsequently scanned will be overlapped in memory of your computer and result values for a subsequent analysis will be distorted.

The minimum recording time can be set by the **Setup** button and by selection of a particular recording length (sea chapter **„Setting the Important Parameters of the Resting ECG Program"**).

The minimum time for scanning of the recording is shown by the bar in the upper part of the window (see Figure 15). For the duration of the set lengths of recording (i.e. 8, 16 or 32 seconds) the bar is gradually fulfilled with red colour and after the elapse of this time it will go green. At his moment the recording may be stopped. Letters **R, L, F,** and **C** indicate whether the individual electrodes of ECG are connected or not. If the letter goes red a particular electrode is disconnected or it has bad contact (only at ECG device of version 2.1).
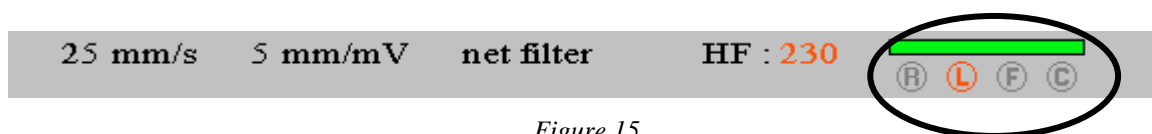
Figure 15

In the course of scanning, properties of recording may be changed according to your requirements.

The program enables the following modifications of the recording:

Rate
(**F2** button) changes the speed of the scanned recording. The change is carried out cyclically. 100 mm/s => 50 mm/s => 25 mm/s => 12,5 mm/s => 10 mm/s => 100 mm/s, and the like. At higher speeds the whole recording is not displayed. Arrows on the keyboard or buttons on the monitor are intended to display a certain part.

Amplitude
(**F3**) changes the amplitude of the recording. The change is carried out cyclically.
5 mm/mV => 10 mm/mV => 20 mm/mV => 40 mm/mV=> 5 mm/mV, and the like.

Leads
(**F4**) switches between the displays of bipolar or unipolar leads. Only if the display of 3 leads is switched on.

Leads
(**F5**) changes the display of 3 or 6 leads on your monitor. If 3 leads are selected, by pressing the **Leads** button it is possible to change the display of bipolar or unipolar leads.

Filter
(**F6**) for setting the filter to eliminate undesirable interference of the recording. There is available a muscle filter which is intended for the removal of signal interference caused by muscle shivering of the patient. In addition, there is a network filter which removes interference caused by network power supply. You also can use both filters simultaneously.

> *Note: We recommend to scan the signal with filters switched off and to use this function only during viewing and modification of this signal!*

Long-term Monitoring

The Resting ECG program may be utilized also for the long-term monitoring of heart functions, for example after surgical operation. By pressing the **ECG button with the loudspeaker symbol** you will activate the audible alarm of ECG device, which signalises the patient's heart function by beeping to every QRS complex. Turning on or turning off of the audible alarm is changed by every pressing this button.

Reviewing and Modification of ECG Curves

If the quality of the scanned recording is good and the minimum time for stoppage of the recording has elapsed press the **Start/Stop** button or **Space key** on the keyboard. The recording being scanned will be stopped (Figure 16) and you can review and modify the recording according to your requirements. The recording may be modified by using the following functions: **Rate, Amplitude, Leads, Leads, Filter** (sea chapter **„Scanning of ECG Curves"**).

Figure 16   Window of the Resting ECG program with the scanned recording

If you select higher speeds, the completely scanned recording will not be displayed on your monitor. Therefore, to move it, use the arrows in the bottom part of the window next to the Start/Stop button. The current displayed part of the recording on your monitor is shown in the form of the bar at the upper part of the window (see Figure 17).

Figure 17

Above this bar there are displayed the current values of recording speed setting values, amplitudes, used filter, and HF – heart rate.

At the right part of the window you can find the **Cursors** button (Figure 18a). This is used to measure a time section selected between cursors which will be displayed on your monitor after pressing the button (Figure 18c). Above the button there will be displayed the measured time value (Figure 18b). The cursors are moved by pressing the mouse button on a particular cursor and subsequent move through the required point.

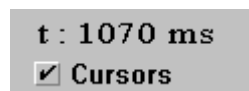*Figure 18a)   Before pressing the button*

Figure 18b)   After pressing the button

Figure 18c)   Cursors displayed for the measurement of recording time section

Saving the Examination on Hard Disk of Your Computer

If you work with the scanned recording this recording is temporarily stored in memory of your computer. For its permanent activation this must be saved on the hard disk of your computer. Saving is carried out by pressing the **Exit button** at the bottom part of the window. This action will open the dialogue for examination saving (Figure 19) and you can enter your own name (note) to the **Remark** item to identify your examination. Then the program will be terminated.
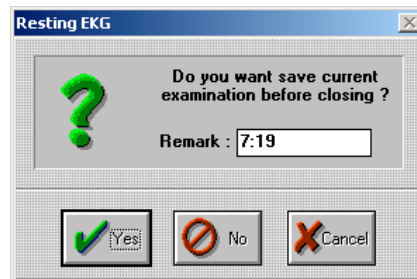

Figure 19   Dialog for examination saving

The recording can be saved on the hard disk also by pressing the **New** button at the bottom part of the window. This will open the dialogue for examination saving. After saving the examination on your hard disk the program will again be prepared for the scanning of a new recording. Use this option if you want to save the current examination and to scan subsequently other recording of the same patient.

Analysis of ECG Recording

The program enables to carry out two types of recording analysis. The first is the analysis of average marked QRS complex of recording and the other is the analysis of one particular QRS complex.
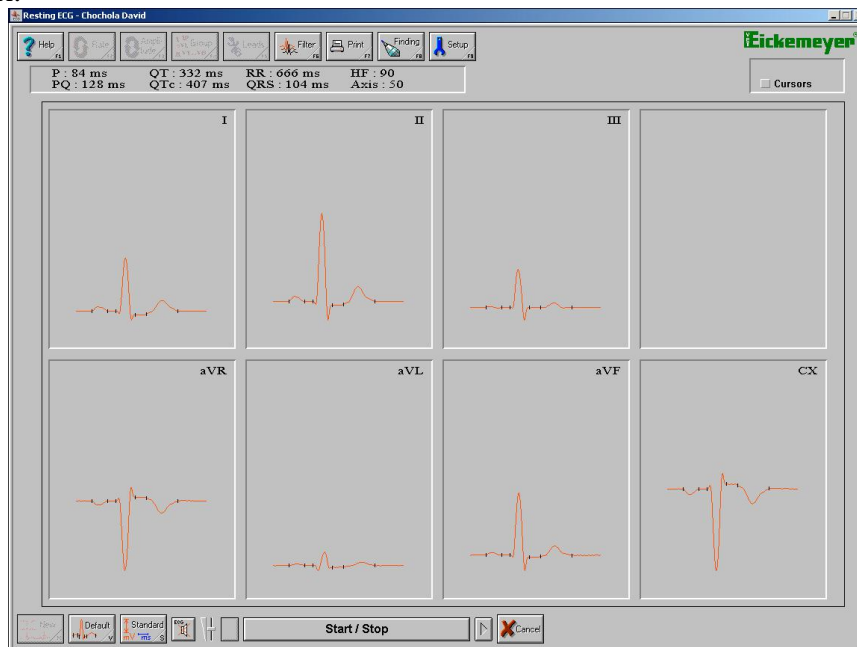

Figure 20   Basic window of the QRS complex analysis of all leads

Analysis of Average QRS Complexes

This analysis is created by averaging of all QRS complexes marked with a small arrow (Figure 23a). The complex can be added or removed by clicking the right button of the mouse above the particular complex and after the display of dialogue (Figure 23b) the **Change** button should be selected. The analysis itself will be initiated by clicking the **Analysis** button at the bottom part of the window. In this way the basic window for analysis (Figure 20) is activated and this window digestedly displays average QRS complexes of all leads of the recording. At the upper part of the window under the buttons there are displayed average values of time measurements of the complex.

The analysis of a particular averaged QRS complex can be activated by clicking the mouse on the window (Figure 20) where a particular complex is located. This will show the following window (Figure 21):
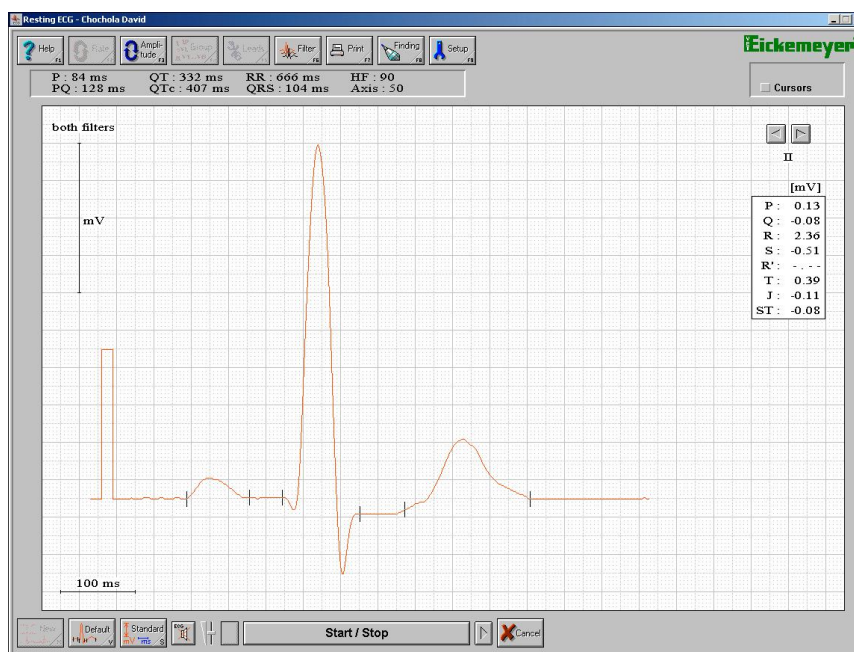

Figure 21   Window for analysis of a particular QRS complex

Now you can modify the QRS complex according to your requirements. Because the measurement of this complex is carried out automatically by the program it need not to fully comply with your requirements. Therefore, you can carry out the measurement of QRS complex as follows:

Click the mouse on a required stop sign and drag the mouse to a required position. In the course of this movement the values of time (at the upper part of the window under the buttons) and amplitude (at the upper part of the window in table) measurement of complex will be changed.

By means of **Amplitude** and **Filter** buttons you can change the appearance of the complex. In addition, by the **Default** button you can set original values of complex measurement. By the **Standard** button you can display the dialogue of standard values of complex measurement for dogs and cats (Figure 22). You can enter your own notes to two white fields beyond the values. In the **Type** item you can select whether you want to display standard values for dogs or cats. **Arrows** at the right upper part of the window are used to switch between QRS complexes of individual leads. Under the arrows there is the name of an actually displayed lead.
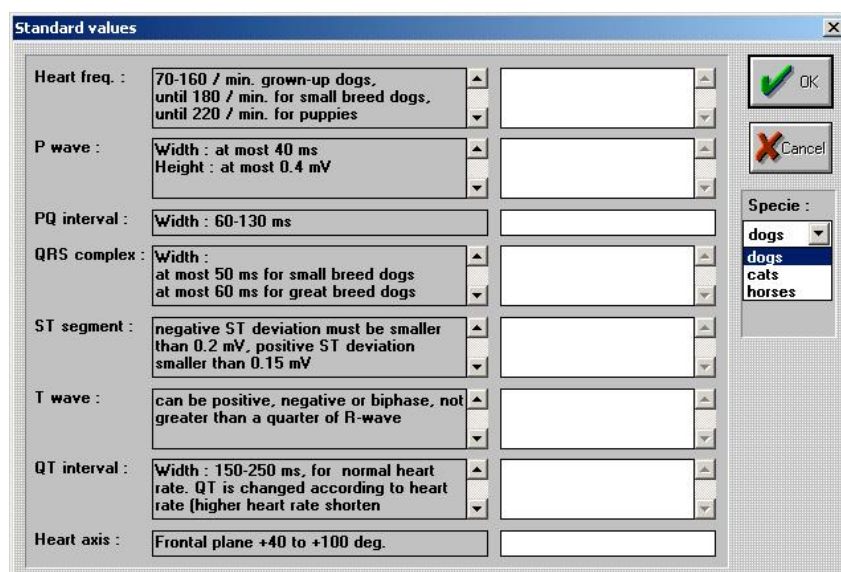
Figure 22 Window of standard values

Analysis of One Concrete QRS Complex

This analysis will be initiated by clicking the right button of the mouse on the arrow above the QRS complex (Figure 23a) where you want to carry out the analysis. In this way the dialogue (Figure 23b) is displayed and by clicking the **Analysis** button you will open the basic window of analysis of a particular complex for all scanned leads (operation is the same

Figure 23a), b)

as in the previous section called: „**Analysis of Averaged Marked QRS Complexes"**). If, after clicking the right button of the mouse, you select the **Change** item, the arrow above the complex will disappear and this QRS complex will not to be included to the averaged value of QRS complexes.
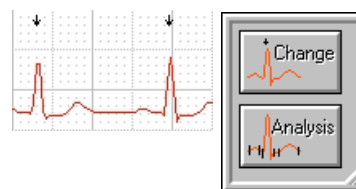
Print of ECG Curves and its Functions

The basic dialogue for printing (Figure 24) can be initiated by pressing the **Print** button or **F7**. In this dialogue properties of recording for printing are set (speed, amplitude, filter), printing mode (continual, averages, table), length of printing and number of copies. In addition, the dialogue is used to send the recording in the form of BMP image by e-mail and to export the recording to the BMP image.

Rate - (10, 12.5, 25, 50, 100 mm/s) selecting the recording speed for printing. At speeds of 50 and 100 mm/s the recording will exceeds the paper format therefore, in the **Length of printout** it is necessary to set the required number of pages for printing.

Amplitude - (5, 10, 20, 40 mm/mV) will set the amplitude of recording for printing.

Filter - is used to set the filter that will be used during the printing of recording.

Print type

It is used to set the way of recording printing.

Continual will print the entire recording of all leads of ECG curves according a particular setting.

Averages will print all leads of ECG curves with averaged QRS complexes of these leads and average time values of QRS complexes according to a particular setting.

Table will print bipolar (standard) leads of ECG curves including chest lead with average QRS complexes of these leads and average time values of QRS complexes and also the time value table of individual QRS complexes.

Length of printout

It will set the number of printed pages. This function must be used to print the entire recording at continual type of printing and print speeds of 50, 100 mm/s.

Figure 24   Print dialog

Number of copies

It is used to set the number of print copies.

Send

This dialogue (Figure 25) is used to send the actual examination by e-mail in the form of BMP image to a particular e-mail address that must be completed in the **To** column. The subject of your e-mail must be written to the **Subject** column and text you want to send together with examination must be written to the **Remarks** column. In the **Size** column you can set the size of a saved image. You can choose from the following options: 75, 100, 150 and 200 dpi.

Table of image file size and time of sending this file by modem with the speed of 28 kb/s:

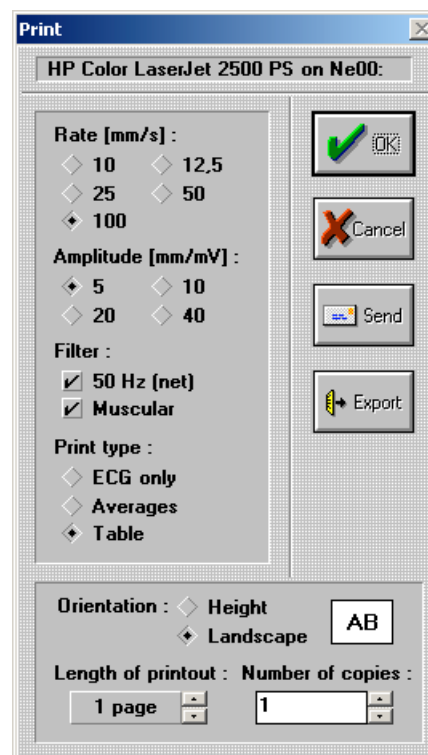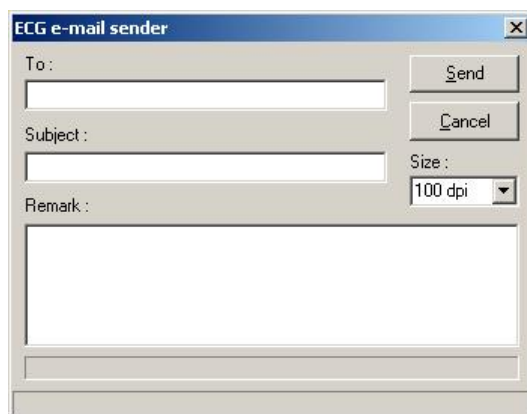| Selected dpi	File size (kb)	Time of sending with the speed of 28 kb/s
75	52	20 s
100	90	35 s
150	200	1 min 15 s
200	360	2 min 10 s

Figure 25   Dialogue for ECG sending by e-mail

Export

This dialogue (Figure 26) is used to save a particular recording in the form of a BMP image. Type the name of the image to the **File name** column. **Directory** and **Drive** will enable to set the place on your disk where the image will be saved. **Size** is used to set the image size (the following options are available: 75, 100, 150 and 200 dpi).
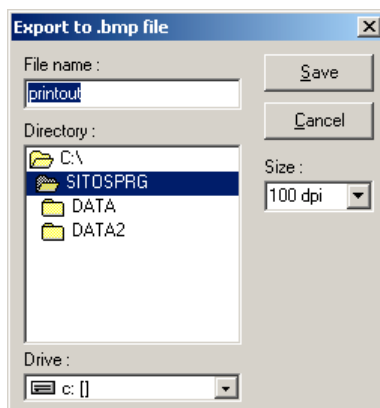

Figure 26   Dialog for export of recording to BMP file

Finding and its Functions

The finding dialogue (Figure 27) is initiated by clicking the **Finding** button or by pressing the **F8** key. This dialogue is used to write the finding to a particular examination and its immediate printing by clicking the **Print** button. The text prepared in advance may be attached to the finding by means of the **Preprint** button (see chapter „**Setup**" for the creation of a new preprint). The preprint will then be inserted to the end of the finding.

Figure 27 Finding dialogue

Setting of Important Parameters of the Resting ECG Program

The setting dialogue (Figure 28) is initiated by clicking the **Setup** button or by pressing the **F9** key. It is used to set the basic parameters and properties of the program (print mode, automatic setting, printer, e-mail, preprint).

Print
It is used to set the print mode of recording.

Current will print the recording with just set properties of the program (amplitude, speed, filter, print mode).

Last will print the recording with parameters set during the last printing regardless of the current setting (amplitude, speed, filter, print mode).

Figure 28   Setting dialogue

Length of record
It is used to set the length of scanned recording. If a particular recording is scanned to the end of a preset length (the bar and the upper part of the window is green, see Figure 15), this length cannot be changed. If the recording is not scanned to the end (the bar at the upper part of the window gets gradually red) and if you change the recording length, the unscanned recording will be deleted.

Auto setting
It is used to set printing for automatic scanning of ECG recording. In automatic scanning of recording this will be scanned in a preset length and after stopping, this recording will be automatically printed according to this auto setting.
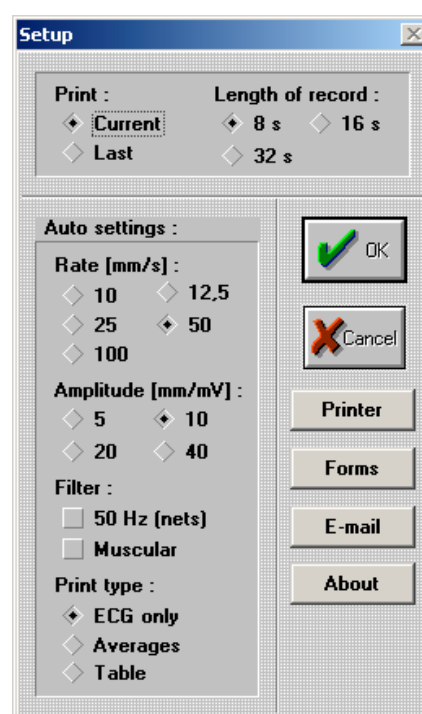
Printer

It is used to select and set the current setting of a printer where recordings will be printed. The program enables to select all printers that are installed in Windows. In the dialogue for printer selection (Figure 29) you will choose the required printer by means of a scrollbar and by pressing the **Setup** button you will activate the window for printer setting (this window is preset by the manufacturer of the printer for setting the printer properties).
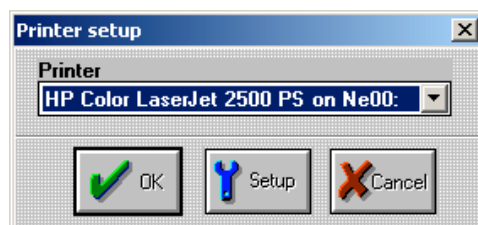

Figure 29   Dialog for printer selection and setting

Preprint

It is used to type the preprint which can be easily and quickly inserted to the patient's finding or it can be printed separately. In the dialogue for preprint selection (Figure 30a) there is a window with the list of all available preprints and by clicking the required preprint you will open the dialogue for preprint editing. If there is no preprint available in the window or if you want to write a new one, click the **New** button. On the contrary, if you want to delete any preprint from the program click the **Delete** button. After pressing the **New** button, the dialogue of preprint editing will be initiated (Figure 30b) and in this dialogue you have to prewrite your own preprint text and by clicking the **Name** button you will save this preprint. The dialogue for preprint name entry (Figure 30c) will appear and you have to enter the required name under which the program will be saved. By pressing the **Print** button the preprint text will be printed.
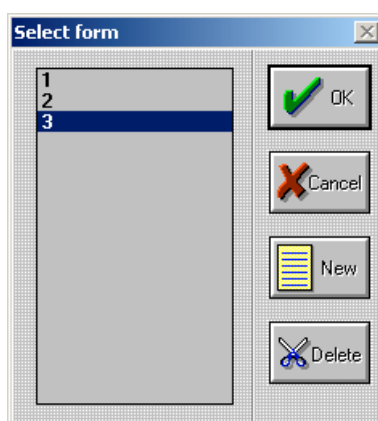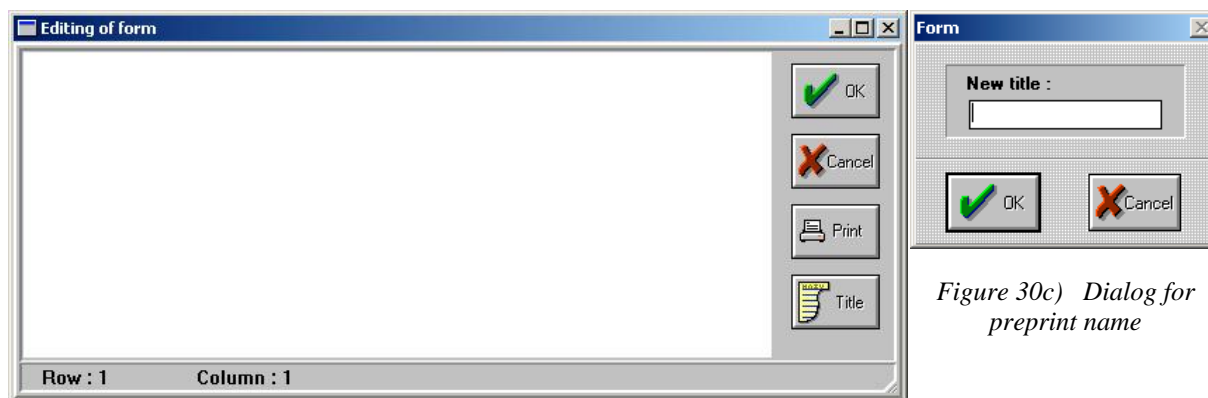

Figure 30a)   Dialog for preprint selection
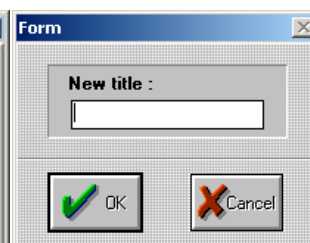
Figure 30c) Dialog for preprint name

Figure 30b) Dialog for preprint editing

E-mail

This dialog (Figure 31) is used to set the basic parameters (**SMTP Server, Name, E-mail address, Name of account**) for the sending of scanned values by e-mail. This setting can be found at your provider of Internet services or set it in the same way as it is made doe the server for outgoing mail in your mail program (for example Outlook Express).
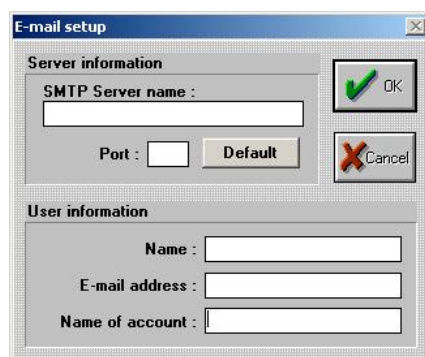

Figure 31   Dialog for e-mail setting

Function of Automatic Scanning of ECG Recording

This function is initiated by clicking the **Auto** button at the bottom part of the window of the main program. This function is used to scan the ECG recording in a selected length of recording and automatic cleaning after its stopping. The final appearance of printing, which you want to use for the auto function, can be set in the **Setup** menu (see chapter „**Setting of Important Parameters of Resting ECG Program -> Auto setting**").

Resting ECG Long program

This program is intended for a long-term scanning of heart activity (the maximum time of scanning is 1 hour). The program is started from the **ECG Basic** program by pressing the **New** button and subsequent selection of the **Resting ECG long** method**.** Principal functions are based on the **Resting ECG** program; therefore we will describe only the functions that are new in this application.

Main window of the program

The program has two basic settings of windows. The first setting is divided into three parts (Figure 1). The HF trend window (the upper window) shows trend values of the heart rate. The window of entire scanned signal course of a particular lead (the middle window) shows the scanned signal in lines over-under with the speed of 5 mm/s. And finally, the window of one ECG lead showing the signal with a selected speed. The **Group** button serves for setting the ECG lead to be displayed. The basic setting of windows can be changed by the arrow located left from the middle window. By pressing this arrow the main window of the program will be divided into two parts (Figure 2). The HF trend window (the upper window) and window displaying all (or three selected) leads similarly as at the Resting ECG program.

Scanning may also be completed by an audible alarm. To switch on/switch off this audible click the **ECG** button with a loudspeaker symbol. The volume of audible alarm can be controlled (only at ECG device, version 2.1). The volume is controlled by the slide button located right from the **ECG** button. The volume has three positions.
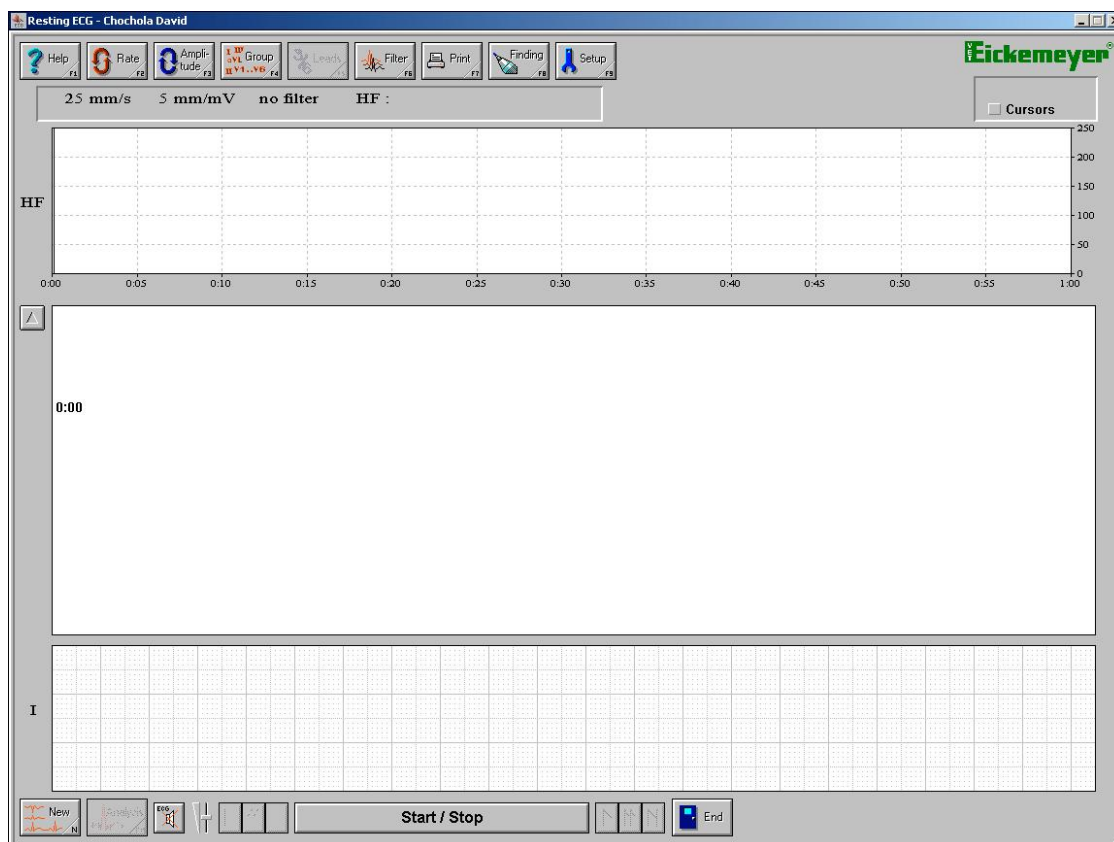

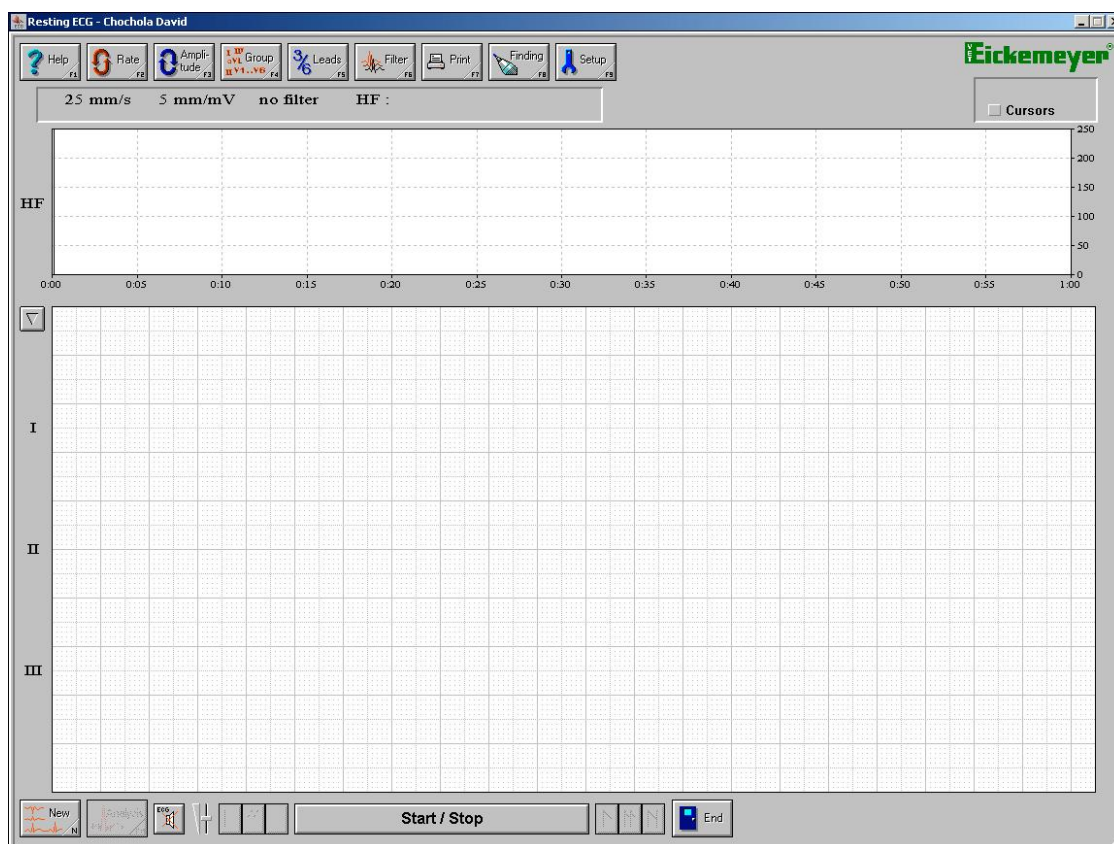*Figure 1   Main window of the ECG long program with three windows*

Figure 2   Main window of the ECG long program with two windows

Trend window – (Figure 3) displays the heart rate trend value of the scanned ECG recording. The maximum length of scanning is one hour.
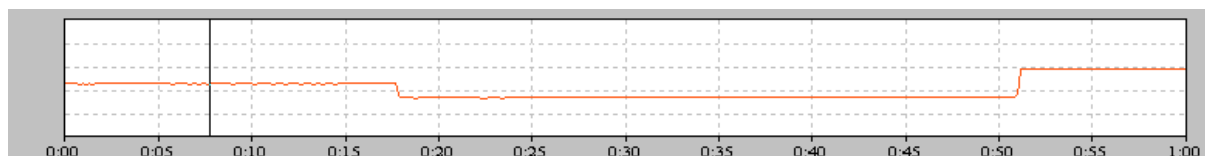

Figure 3   Monitoring window Trend

In the course of scanning, current measured values of heart rate **HF** (Figure 3a) are displayed at the upper part of the main program window in the status panel under the buttons. The elapsed time of measurement is displayed to the right of the heart rate value. Letters R, L, F, and C indicate whether individual ECG electrodes are connected (only at ECG device, version 2.1). If the letter light comes red, a particular electrode is disconnected or it has a bad contact.
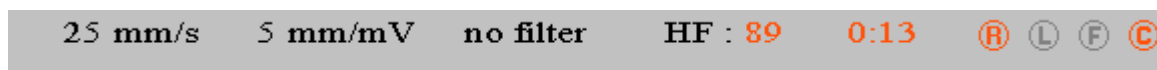

Figure 3a)   Status panel

Once the scanning has been stopped, by clicking the mouse you can display the heart rate values for a time selected by you. Other windows will show then an ECG signal curve at the time you have selected.

Window of entire scanned signal course – (Figure 4) shows the entire course of a scanned signal in reduced form at the speed of 5 mm/s in lines over-under. The current time is displayed at the beginning of each line. The blue marked area of the scanned ECG signal determines the area displayed at the bottom window of the program. By clicking the mouse to a given selected time you can browse through the scanned signal and display this particular section.
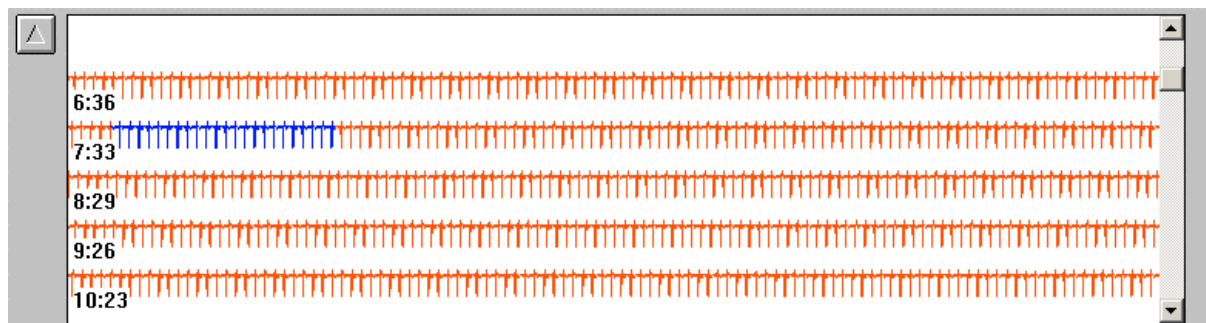

Figure 4) Window of entire scanned signal course

ECG curve window – (Figure 5) shows an ECG curve of one scanned channel. At this scanned signal you can cyclically change the curve amplitude by pressing the button **Amplitude** (5 mm/mV, 10 mm/mV, 20 mm/mV, 40 mm/mV) and signal scanning speed by pressing the button **Rate** (100 mm/s, 50 mm/s, 25 mm/s, 12,5 mm/s, 10 mm/s). By pressing the **Group** button you can set the type of the ECG lead to be displayed. The marking of a current lead is shown to the left of the window
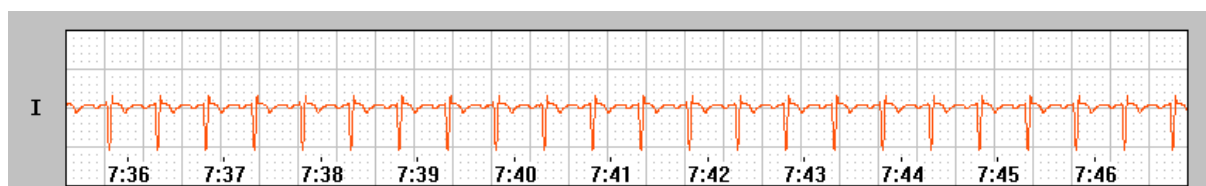

Figure 5) Window of the ECG curve of selected lead

Buttons in the main window of the program:

This is intended for the transfer to the Resting ECG program where it is possible to carry out the analysis of QRS complexes for a selected 32-second portion of the ECG recording.

This is intended for the movement of the ECG curve at the bottom window by 2/3 of a displayed section.

Fast movement of the ECG curve (triple in comparison with the previous case)

Movement to the beginning of the ECG curve

Movement to the end of the ECG curve

Setting of important parameters of the ECG _V long program

The setting dialog (Figure 6) is initiated by clicking the **Setup** button or by pressing **F9** key. It is intended for setting of program basic parameters and properties (print mode, setting the number of leads, printer, e-mail, preprint).

Print
See setting in part describing the Resting ECG program.

Number of leads
This is intended for activation/deactivation of scanning of the chest lead marked CX. By checking this option the

chest lead is activated. This option may be changed only prior to new signal scanning. This selection also influences the length of a stored file and data reading and storage times.
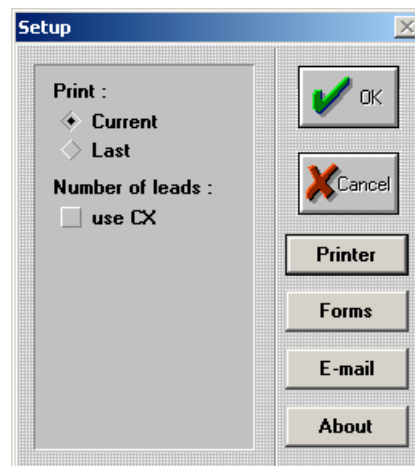

Figure 6) Setting dialog

Print of ECG curves and ECG functions

The basic dialog for printing (Figure 7) will be started by pressing the **Print** button or **F7** key. In his dialog you can set properties of recording for its printing (speed, amplitude, filter), print mode (continual, averages, table), length of printing a number of copies.

Leads
This is intended for setting of leads for printing. By checking the **All** box**,** all leads of the scanned ECG signal will be printed out. If you want to print out only one selected lead, check the **Lead** box and by using a small arrow at the scrollbar menu select a particular lead you want to print out.

Length of printout
According to the length of the scanned ECG recording you can set the number of pages you want to print out. In addition, the length and area of printing may be set by specifying the time period **From To** when the print should be done. This selection chooses the time in minutes and seconds.
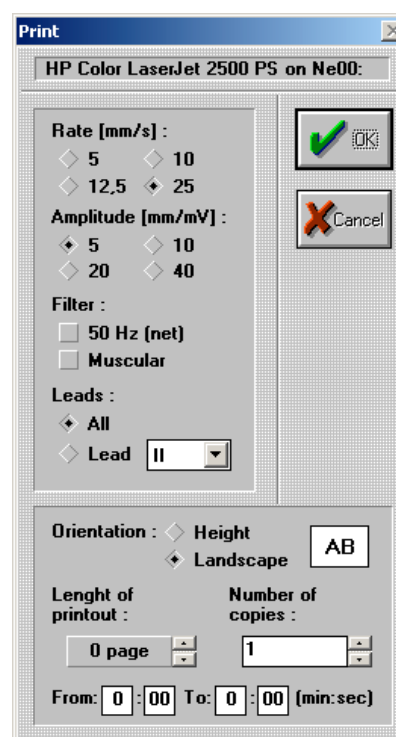

Figure 7) Printing dialog

Addendum – Annex
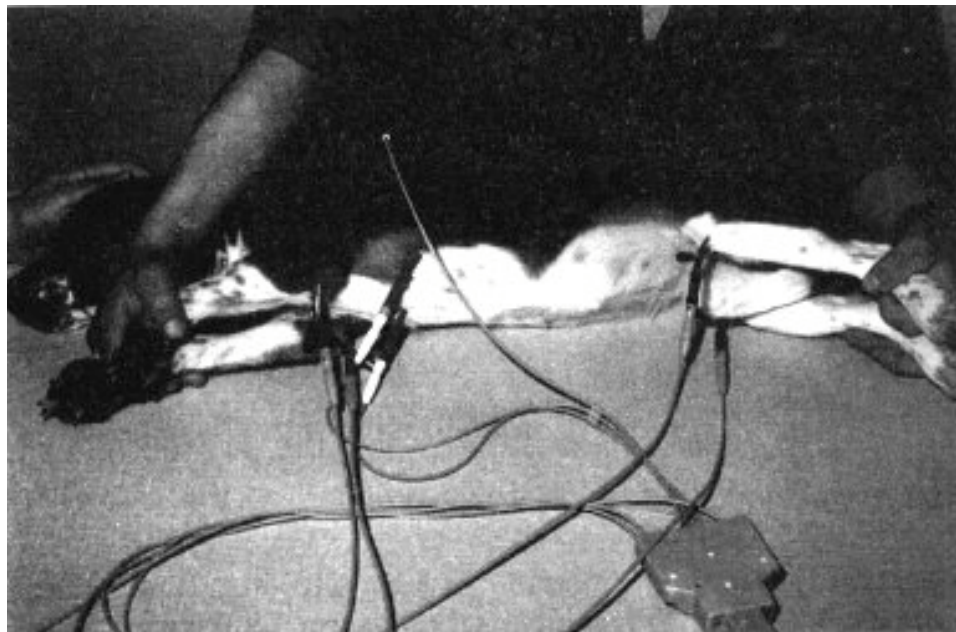
Position and Fixation of the dog

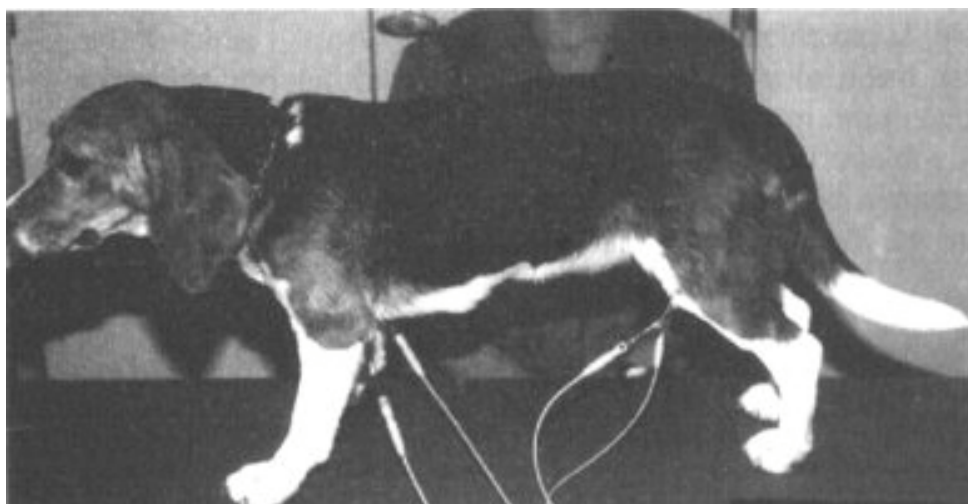*Figure 32 Fixation of the dog in standard position*

Figure 33 Implementation of ECG record in stand position

Figure 34 Implementation of ECG record in sit position

Figure 35 Implementation of ECG record in pectoral position