ECG 1410
CALIBRATION UNIT

SPECIAL PURPOSE
15-lead ELECTROCARDIOGRAPH

OPERATING MANUAL

(Preliminary)

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CONTENTS:

1. INTRODUCTION

ECG 1410 Calibration Unit is device for recording electrocardiogram (ECG) based on up-to-date trends in electronics and informatics. This device is a part of the ***ECGMobile*** System that is used in the urgent telemedicine, and which includes also ***ECGMobile*** Pocket Device and ***ECGMobile*** Centre.

ECG 1410 Calibration Unit can function in two modes: conventional and calibration. In the conventional mode of operation, the unit records conventional 12- leads ECG. In the calibration mode, which is used in the procedure for introducing patient in the ***ECGMobile*** system, the unit records 15 (12 conventional and 3 special) ECG leads. Device is powered from a rechargeable battery, which removes all possibilities of exposing patient to undesired electrical shock. Acquisition and display of recorded ECG signals is done using a personal computer (PC) with appropriate software, while the printout can be performed using a printer connected to PC. Keeping in mind autonomous powering, ***ECG 1410*** Calibration Unit can be made mobile if a portable computer (e.g. lap-top) and printer are provided.

2. DEVICE DESCRIPTION

Device is produced using modern microprocessor technology. Complete configuration for recording, showing and printing of the ECG signals includes the following parts:

1. ***ECG1410*** Calibration Unit.
2. Standard cable for 12-leads ECG.
3. 3-channel ECG module
3. AC/DC adaptor 220V, 50 Hz, to 5V/1A.
4. PC with printer.
5. USB communication cable for PC connection.
6. PC Software.
7. Operating manual.

Fig. 1. Front side view of the ***ECG 1410*** Calibration Unit.

Fig. 2. Rear side view of the ***ECG1410*** Calibration Unit.

Front and rear side views of the ***ECG 1410*** Calibration Unit are given in the Fig. 1 and Fig. 2.

On the front panel following elements are visible:

1. Button for powering the device On and Off.
2. Indication that device is switched on and battery state indication.
3. Connector for conventional 12-lead ECG cable.
4. Connector for ***ECG*** pocket apparatus.

On the rear plate following elements are visible:

1. Mini-USB connector for the connection with the PC, with indication (blue LED).
2. Mini-USB connector for battery charging, with indication (red LED).

3. BASIC TECHNICAL DATA

Battery charging	220V□10% using supplied AC/DC adapter 5V/1A
Battery capacity	Li-Ion 4.2V, 1100mAh
Battery charging current	max 450mA
Protection class	DIN 40050: IP 20
Electrical protection	Protection class I /unit has its own battery power supply
Dimensions	length 135mm, width 91mm, height 33mm.
Weight	175g
Working mode 1	Battery charging, when device is not used for ECG recording
Working mode 2	ECG recording using internal battery power supply
Working environment temperature	-10ºC do +35ºC
Max working environmental humidity	95%
Storage temperature	-25ºC do +55ºC
Storage environmental humidity	10% do 95%, non-condensing

4. SWITCHING ON AND PUTTING INTO SERVICE

4.1. Non-working condition (charging)

In non-working (silent) mode ***ECG 1410*** Calibration Unit is connected to power grid 220VAC, 50Hz, via AC/DC adaptor 5V/1A. In that condition recharging of internal battery installed in the device is performed. Red indication is on. For battery to be fully charged it takes about 90 minutes.

4.2. Switching on the device

- Device can not be used for ECG signals recording while its battery is charging. To turn device on briefly press ⏻ button, after that LED by ⏻ sign will turn on.

- If battery is fully charged LED will emit green light. If LED is flashing red, device should be put to charging.
- Connect USB cable used for the connection with PC computer (⇢). After doing so blue LED will be lit on.
- Turn on the PC and start ECG application. Manual for application is in section 5 of this document.
- Connect ECG cables to appropriate sockets on the device (ECG3 and ECG12).
- Electrodes are placed on the patient (see Fig. 3).
- Device with the PC program is now ready for ECG acquisition and measurement, which is indicated by appearance of the ECG signal on the monitor of the PC.

4.3. Switching off the device

To turn off the device hold pressed ⏻ button, until LED next to it changes its color to white. When LED changes color to white, release the button and device will then turn off.

If leads are not attached to the patient, device will automatically turn off after 10 minutes. This function is integrated so device would not use up all of the battery if user forgot to turn it off (*stand-by* function).

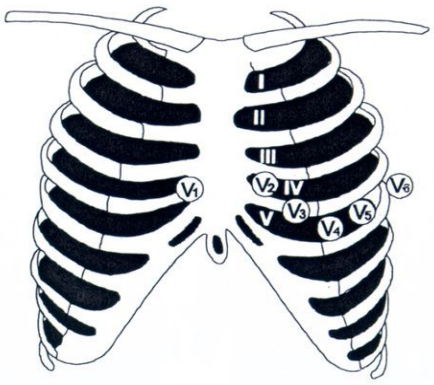


Fig.3. Conventional positions for attaching ECG electrodes.

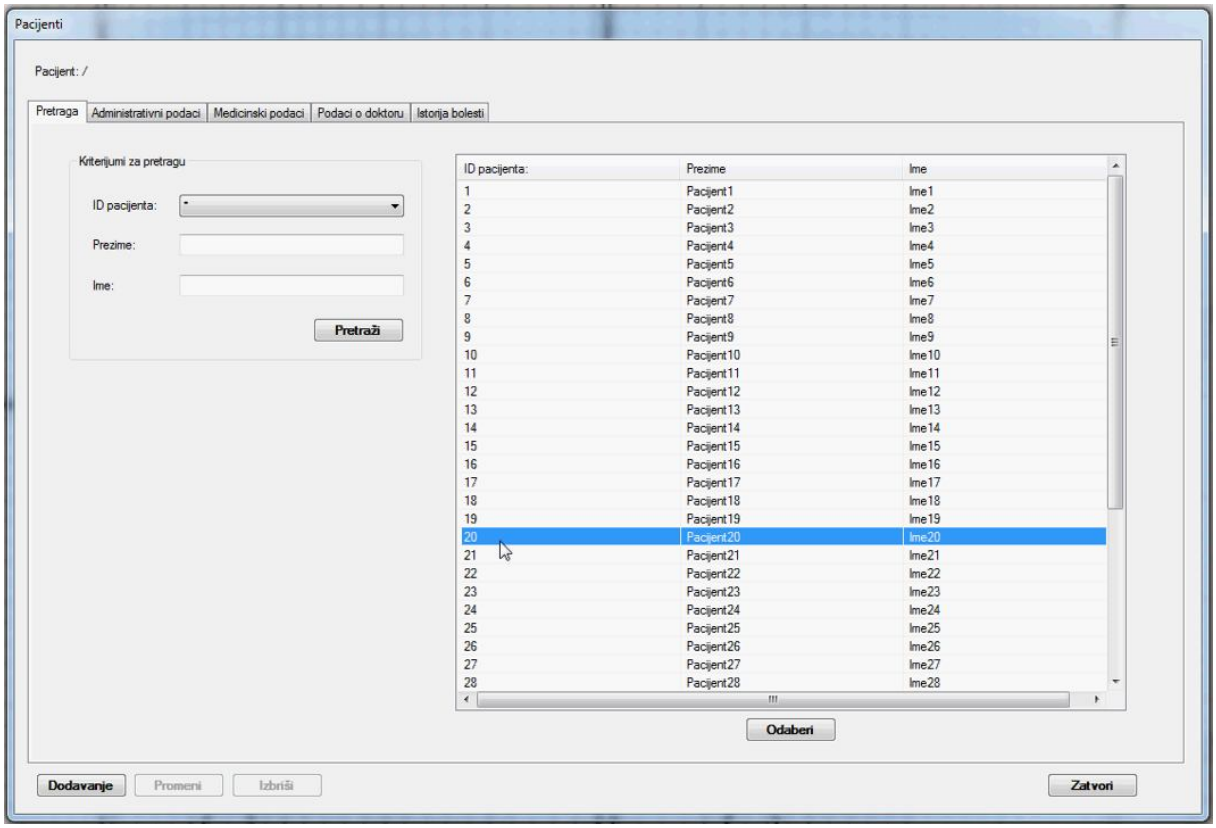
5. COMPUTER PROGRAM

Computer program to be used with the ***ECG 1410*** Calibration Unit is written on the CD disc and has to be installed on the personal computer under Windows 7 Pro or newer operating system. Program performs acquisition of the measured ECG data, their processing, displaying on the screen and printing. Beside this, the program creates a database of treated patients with their basic identification data, established diagnoses and corresponding ECG records.

Operator's access is controlled with user name and password.

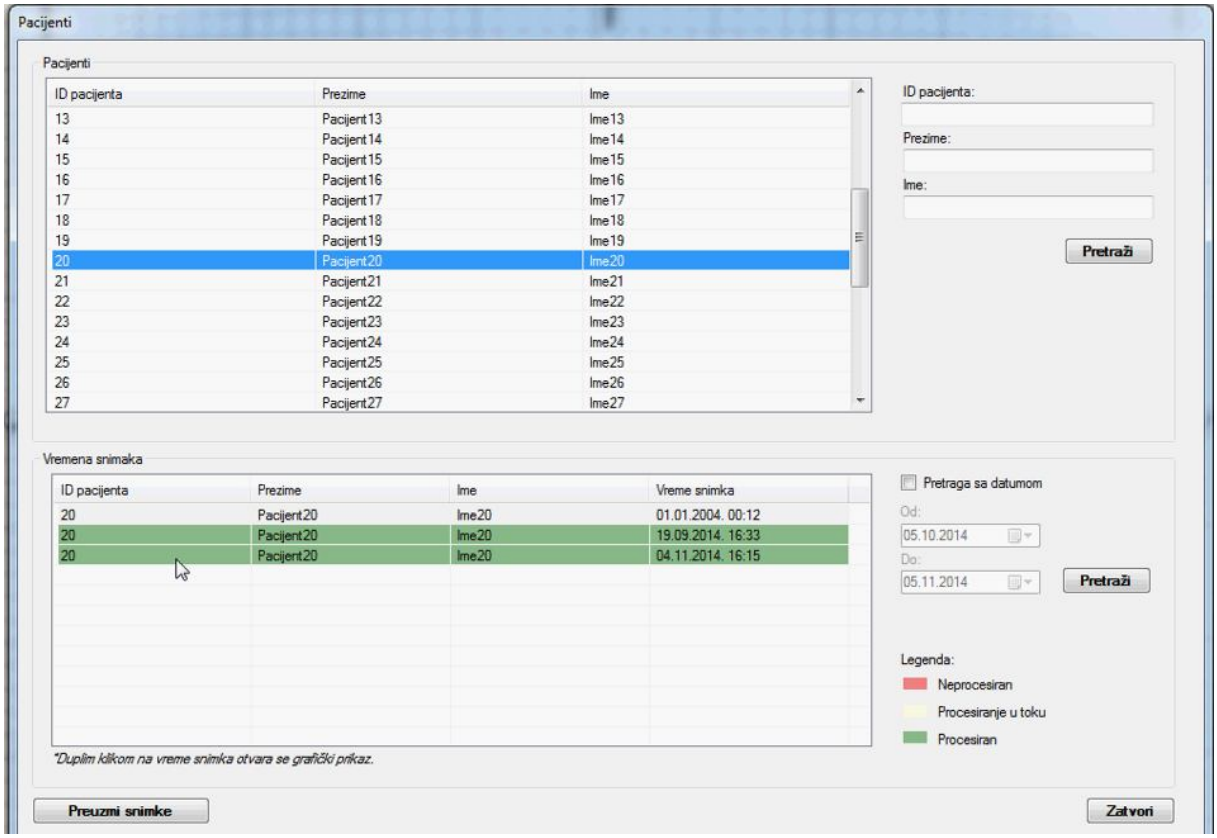
5.1 Patient's data base

In programme menu choose „Pacijenti/Administracija“ (Patients/Administration), after that the following window will be displayed.



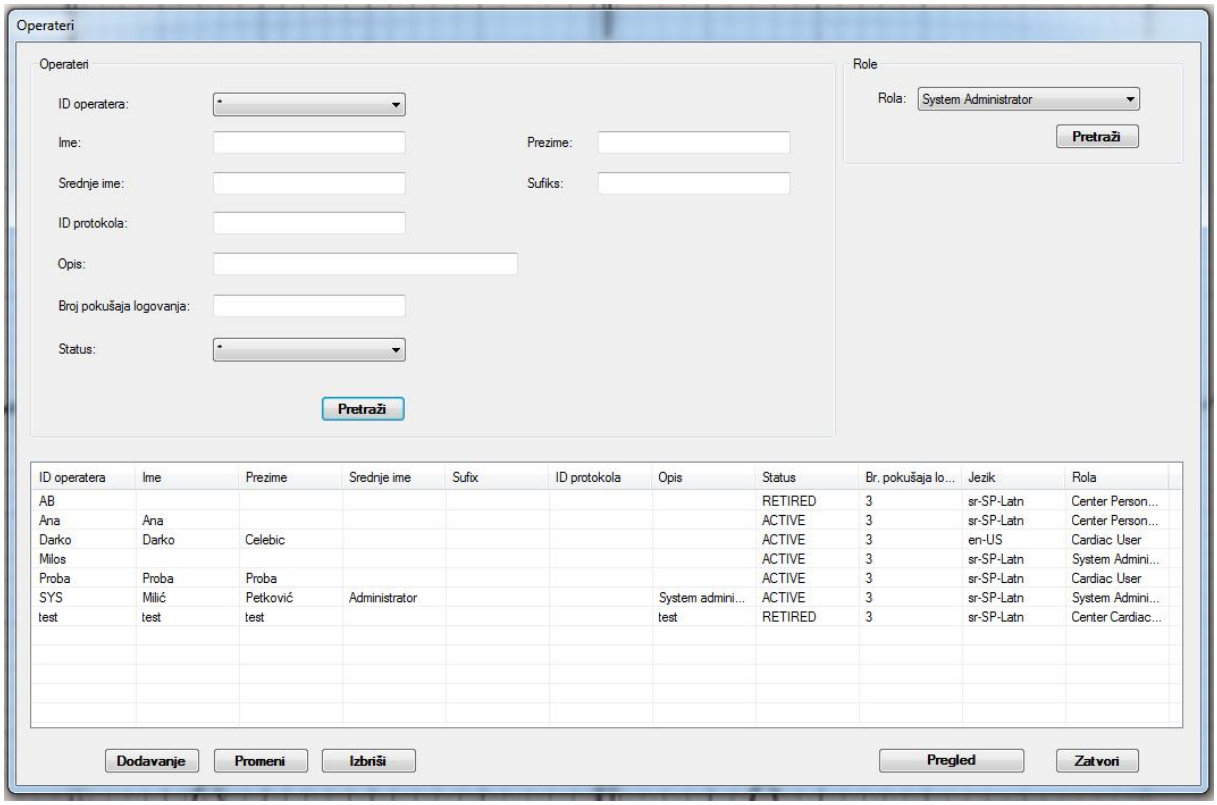
By selecting specific patient, his/her data can be inspected or changed, such as administration, medical, doctor's data or case history. Clicking on „Dodavanje“ (Add), new patient will be inserted into data base, after that all relevant data of the patient should be inserted.

After selecting „Pacijenti/Pozivi“ (Patients/Calls) review of all ECG records can be done (see Fig below).



By selecting specific patient, than clicking on „Preuzmi snimke“ (Get records) newest ECG record will be downloaded from FTP server. Records can be searched by date and time of arrival to the FTP server.

After selecting „Sistem/Operateri“ (System/Operators) window shown on next figure will be openned.



Information of operators can be added or changed in this window. Search according to various criteria is possible as well as easy change of existing data or adding new data.

5.2 Calibration

In program menu select ”Pacijenti/Kalibracija“ (Patients/Calibration). Choose specific patient in right upper corner. If the Calibration unit is connected to personal computer he operater must check if it was recognized on COM port (COM22 in the shown example). After the electrodes are attached to a patient ECG sighnal recording will start by click on „Start“. Recorded ECG signals will be displayed (a, b, c, I, II, III, V1-V6). Section „Podesavanje“ (Settings) is used for set up ratio between namuber of milivolts of ECG signal and 1 cm of graphic on display.

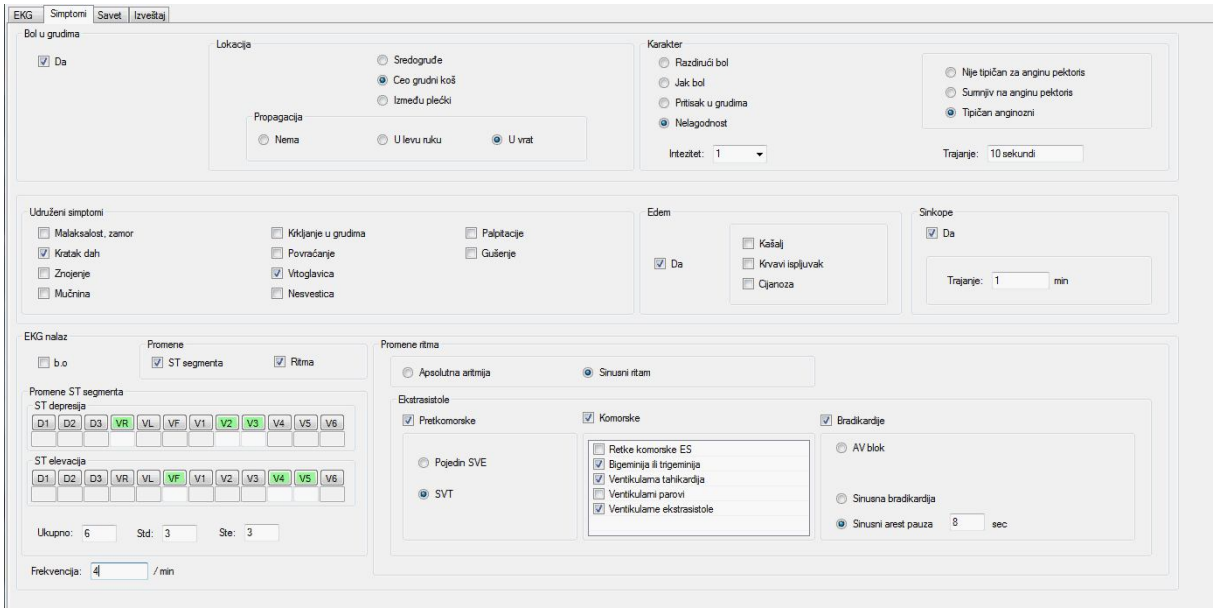
Existance of noise, as slow signal fading, is not a problem as it will filtered out in next steps of using the programme. When all signals approximately fit into windows, recording should be stopped by clicking on „Stop“. After that click on „Self“ and „Sacuvaj“ (Save), what will be followed by message that file has been successfully saved. That's the end of calibration process.

5.3 ECG signal reconstruction

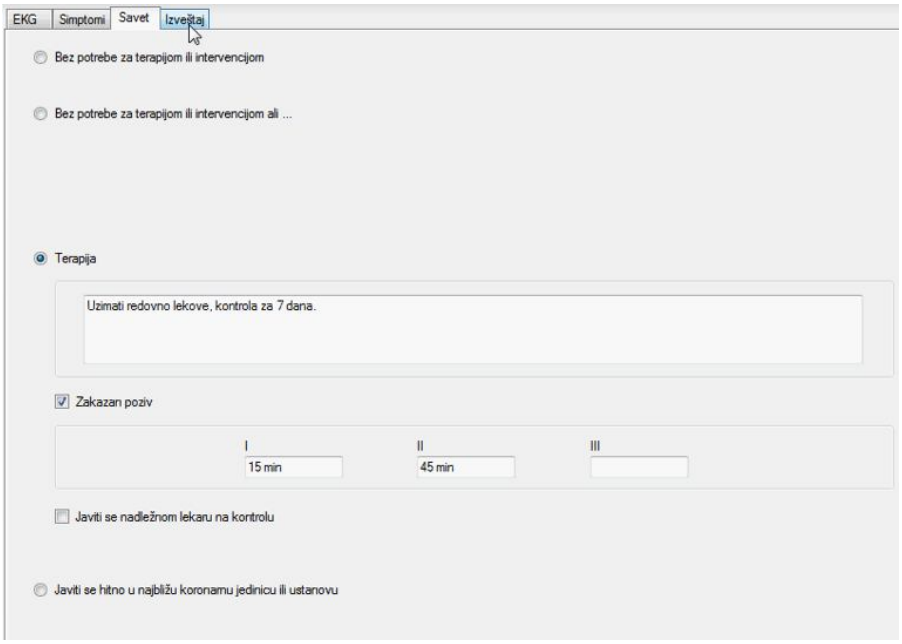
In programme menu select „Sistem/Podešavanje/Files“ (System/Settings/Files). Select file from Mobile unit (extension .raw) and file from Calibration unit (extension .e24). Click on „Grafički prikaz“ (Graphical display) will open windows shown on the following figure.

Graph in red is reconstructed ECG signal from file sent by Mobile unit, while graph in blue represents original ECG signal from Calibration unit. In section „Pregled“ (View) one can choose enlarged view of some groups of signals (for instance, only I, II, III). It's highly advised to apply signal filtering. In section „Filter“ by clicking on „Baseline“ fading effect will be eliminated. „Mains“ filters out noise caused by 50Hz mains. Filter „Tremor“ filters out noise caused by patient's muscules tremor. Click on „Clear“ will reset effects of filtering.

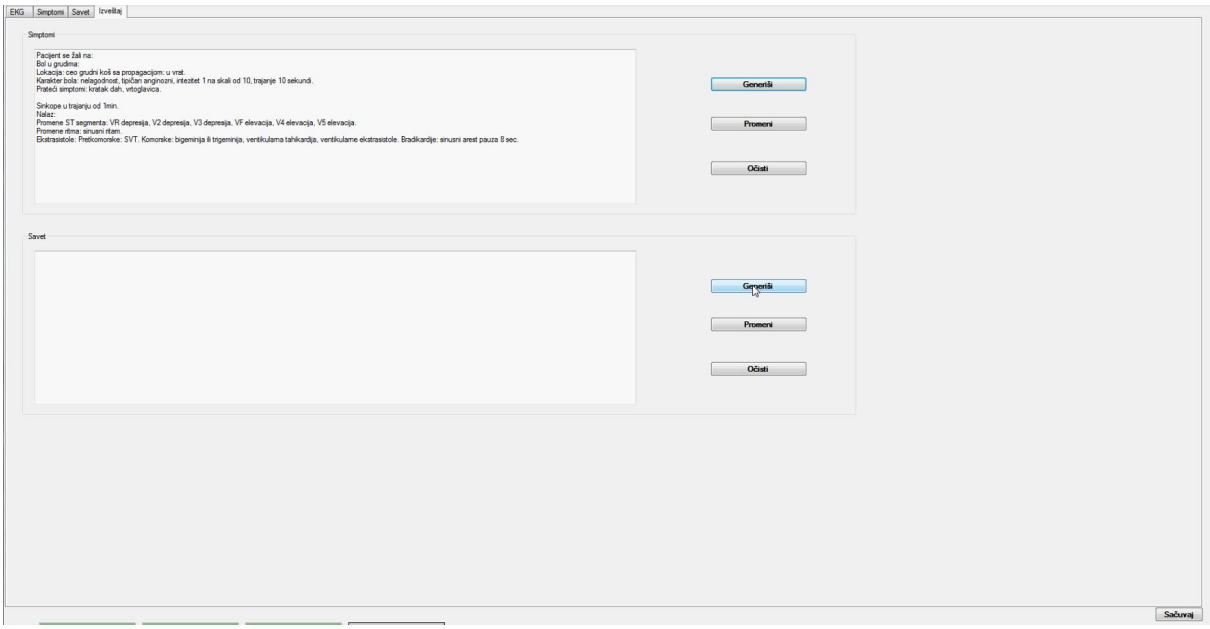
Simptoms can be entered after click on „Simptomi“ (Simptoms) on top of window (see next Figure).



After click on „Savet“ (Advise) data about prescribed therapy can be entered. An exmaple s shown on the next Figure.



Click on „Izvestaj“ (Report) opens window shown on the next Figure.



Click on „Generisi“ (Generate) will provide report about simptoms and doctor's advices. After click on „Sacuvaj“ (Save), message “Poziv je procesiran” (Call has been processed) will be displayed.