

Wireless ECG Monitor User Manual



**Submitted as a requirement
for the course ICOM5047: Section 030**

*Design Course for B.S. in Computer Engineering Department
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Table of contents

Table of contents	2
Table of Figures	3
Starting the Cell Phone Application	4
Starting the Cell Phone Application	4
Initialization of the Application	5
Main Menu	10
Settings Menu	11
Emergency Contacts	12
Testing the emergency alert	12
Bluetooth Settings	13
Baseline Parameters	16
ECG Data	17
Help menu	18
Exit option	19
Alert Message	20
The Wireless ECGMonitor	21
Electrodes	22
Connection Indicator LED	22
Batteries	22
How to use the Wireless ECGMonitor	23

Table of Figures

Figure 1: The ECGMonitor application.....	4
Figure 2: Screen where the user has to set the emergency contact number (in the text box) and carrier (from the drop down list Carrier).....	5
Figure 3: Screen with the text boxes for setting the baseline parameter boundaries.....	6
Figure 4: Asking permission to use the connectivity services of the cell phone.	7
Figure 5: Prompting the user to start a connection.	7
Figure 6: Screen showing the devices that are near. In this screenshot there is only WARM_ECG, the Wireless ECGMonitor.....	8
Figure 7: Screen showing the services offered in a particular device. In this diagram there is only the service Bluetooth Serial Port of the device WARM_ECG.	8
Figure 8: Screen showing information about the connection. It shows the friendly name and Bluetooth address of the device to be connected.	9
Figure 9: Main menu showing the four main options.....	10
Figure 10: The Settings menu showing the three main settings.	11
Figure 11: The screen to set the emergency contacts and how to save them.....	12
Figure 12: Screen showing the devices that are near. In this screenshot there is only WARM_ECG, the Wireless ECGMonitor.....	13
Figure 13: Screen showing the services offered in a particular device. In this diagram there is only the service Bluetooth Serial Port of the device WARM_ECG.	14
Figure 14: Screen showing information about the connection. It shows the friendly name and Bluetooth address of the device to be connected.	15
Figure 15: Screen with the text boxes for setting the baseline parameter boundaries.....	16
Figure 16: The table containing the five ECG parameters. In this diagram the table is empty.....	17
Figure 17: Help menu showing help topics.	18
Figure 18: Message that appears on the screen of the cell phone containing this application informing a possible emergency.	20
Figure 19: The Wireless ECGMonitor.....	21
Figure 20: Place to put the electrodes in your chest and abdomen. The drawing resembles a chest.....	23

Starting the Cell Phone Application

After the application is installed in the cell phone you will be able to use the ECGMonitor. First of all, disconnect the cell phone from any active Bluetooth connection. If there is no connection then there is no problem. Go to the applications folder of the cell phone and look for ECGMonitor in the list. From there select Launch.

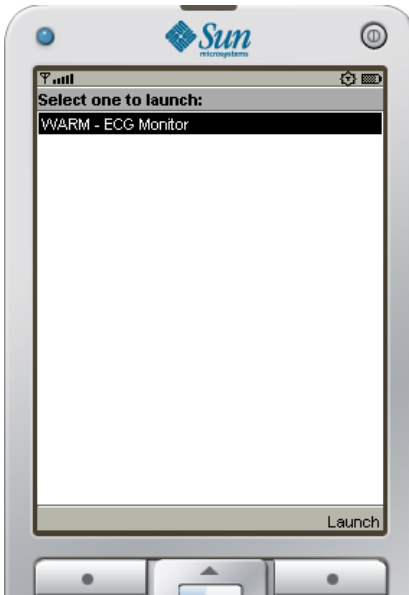


Figure 1: The ECGMonitor application

Initialization of the Application

The first time the application is launched it will ask to set at least one emergency contact. The application will not let enter the main menu until at least one emergency contact is set. The emergency contacts are the contacts that are going to receive the emergency message if the Wireless ECGMonitor detects an anomaly in the Electrocardiogram (ECG). To set an emergency contact you have to enter the cell phone number, or search for it in the contact list of the cell phone, of the person to be an emergency contact in the text box provided in the screen. Also, you have to select the carrier of the emergency contact from a list of carriers provided by the cell phone. This list includes:

- Virgin Mobile
- Verizon
- Suncom
- Nextel
- T-Mobile
- Sprint
- ATT

After setting an emergency contact you can continue setting the other two emergency contacts or continue through the initialization process until reaching the main menu. To continue with the initialization select Menu and then Save. The contacts will be saved in the memory of the cell phone.

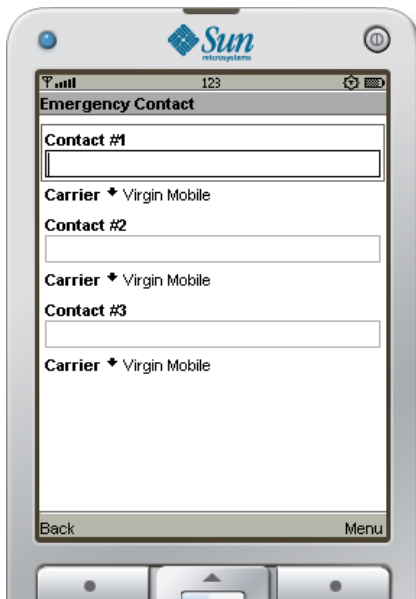


Figure 2: Screen where the user has to set the emergency contact number (in the text box) and carrier (from the drop down list Carrier).

After setting at least an emergency contact the application will ask to enter the baseline parameter boundaries of the ECG. This MUST be done by the doctor. If you are not with the doctor then skip this process and continue to the main menu. Important: if the baseline parameters are not set the Bluetooth connection can't be initialized so if you skip this part of the initialization then don't try to connect to the Wireless ECGMonitor. If the doctor is present then he will have to set each one of the baseline parameter boundary in the provided text box and select Menu and then Save Parameters. The parameters will be saved in the memory of the cell phone.



Figure 3: Screen with the text boxes for setting the baseline parameter boundaries.

If the baseline parameters are set then the application will continue to the initialization of the Bluetooth connection. The cell phone will ask permission to use the connectivity services of the cell phone. You must give the permission, otherwise the application will malfunction.

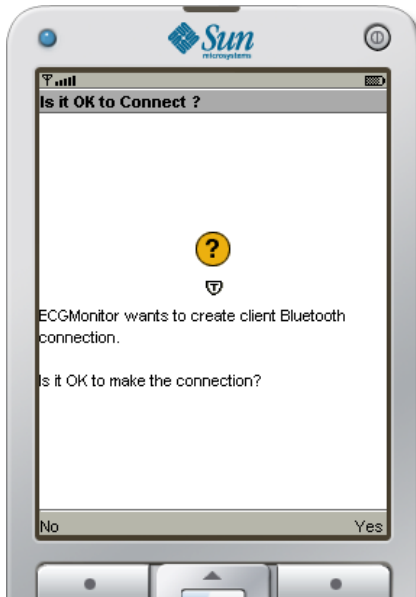


Figure 4: Asking permission to use the connectivity services of the cell phone.

If permission has been granted the application will ask if you want to start a connection.



Figure 5: Prompting the user to start a connection.

If you answer No then no connection is established and you will be redirected to the main menu. If you answer Yes then the application will start searching for near Bluetooth devices. The one we are interested is the Wireless ECGMonitor, it will appear in the list as WARM_ECG.

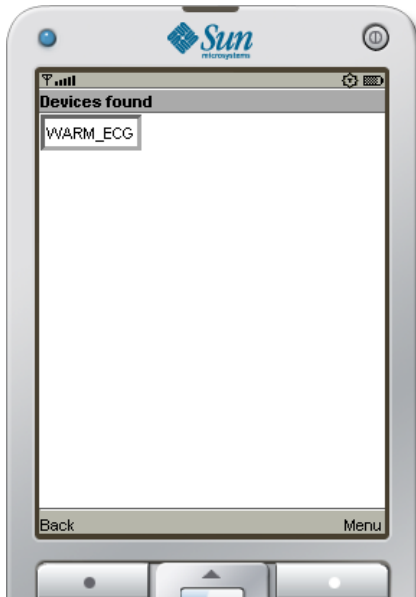


Figure 6: Screen showing the devices that are near. In this screenshot there is only WARM_ECG, the Wireless ECGMonitor.

To select the device select Menu and then Show. This will make the application to search the services that are being offered in that device. The service you are looking for is Bluetooth Serial Port of WARM_ECG.

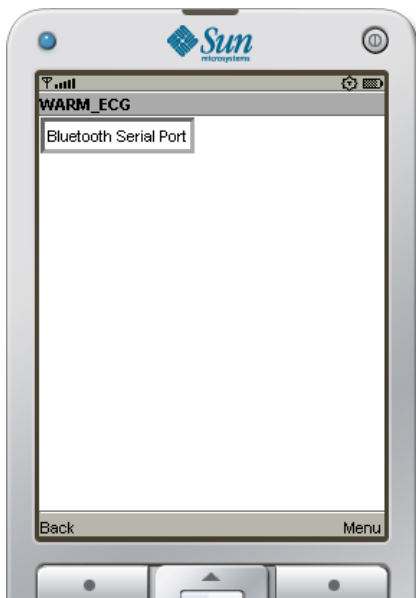


Figure 7: Screen showing the services offered in a particular device. In this diagram there is only the service Bluetooth Serial Port of the device WARM_ECG.

To connect to a service you have to select Menu and then Connect. A screen will appear showing information about the connecting process. If connection is successful the information of the device connected will be stored in the memory of the cell phone. After connecting you will enter the main menu.

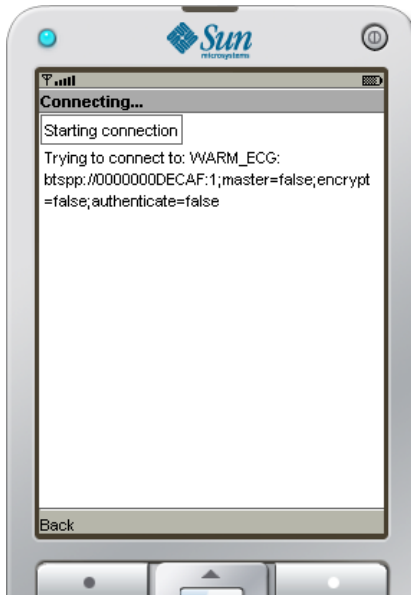


Figure 8: Screen showing information about the connection. It shows the friendly name and Bluetooth address of the device to be connected.

Main Menu

When you enter the main menu you will find 4 options:

- Settings
- ECG Data
- Help
- Exit

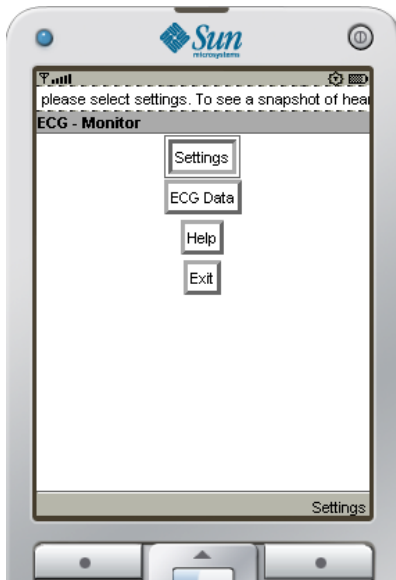


Figure 9: Main menu showing the four main options.

You can move through the menu using the up and down keys and you will access the desired option with the action key.

Settings Menu

In this menu you can modify every setting of the application. There are three major settings:

- Emergency Contacts
- Bluetooth Settings
- Baseline Parameters

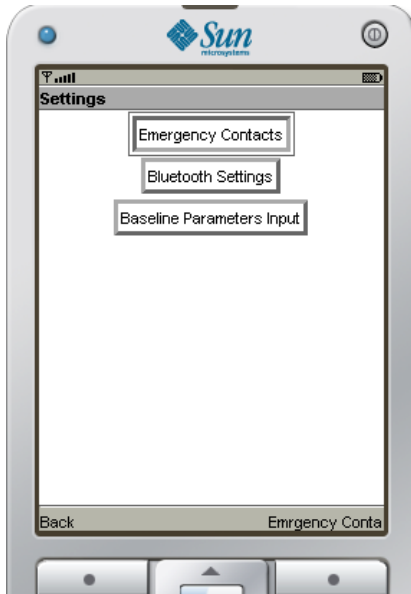


Figure 10: The Settings menu showing the three main settings.

You can move through the menu using the up and down keys and you will access the desired option with the action key. To return to the main menu press Back.

Emergency Contacts

In this screen you will set the emergency contacts. The emergency contacts are the contacts that are going to receive the emergency message if the Wireless ECGMonitor detects an anomaly in the ECG. To set an emergency contact you have to enter the cell phone number, or search for it in the contact list of the cell phone, of the person to be an emergency contact in the text box provided in the screen. Also, you have to select the carrier of the emergency contact from a list of carriers provided by the cell phone. This list includes:

- Virgin Mobile
- Verizon
- Suncom
- Nextel
- T-Mobile
- Sprint
- ATT

To save the emergency contacts select Menu and then Save. The contacts will be saved in the memory of the cell phone.

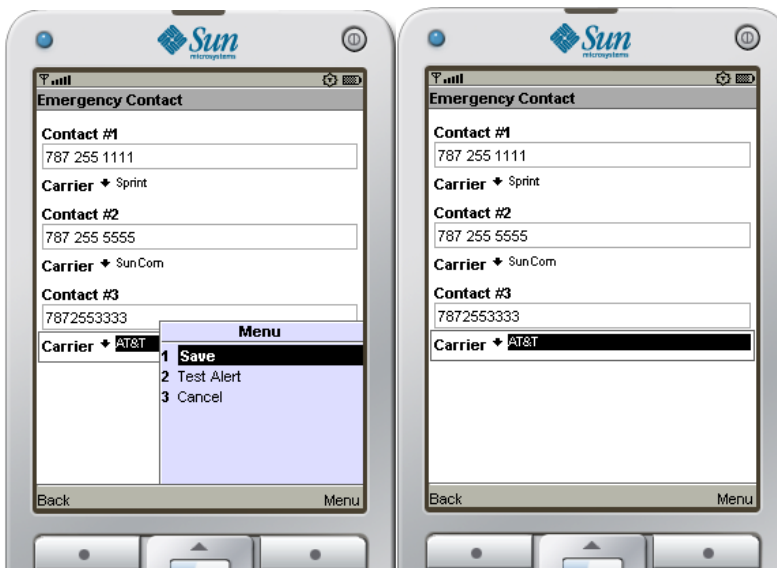


Figure 11: The screen to set the emergency contacts and how to save them.

If you press Back or Cancel you will return to the main menu.

Testing the emergency alert

From this screen you can test the emergency alert by sending one emergency alert to your emergency contacts. Just press Menu and then Test Alert.

Bluetooth Settings

When you enter to this menu the first thing that happens is that the application verifies if the baseline parameters are already set. If the parameters are not set then the application will redirect you to the Baseline Parameters Input screen, otherwise the application will continue normally. Then the application will start searching for near Bluetooth devices. The one we are interested is the Wireless ECGMonitor, it will appear in the list as WARM_ECG.

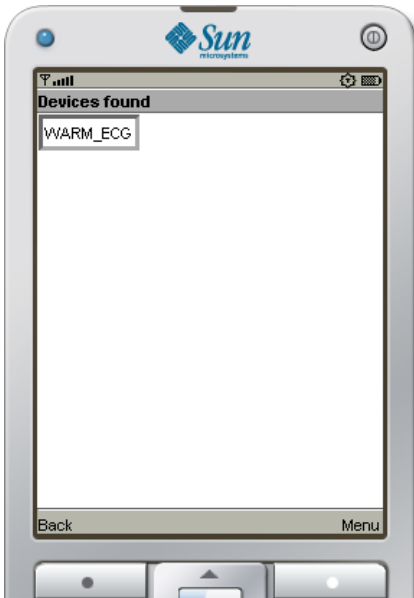


Figure 12: Screen showing the devices that are near. In this screenshot there is only WARM_ECG, the Wireless ECGMonitor.

In this screen you will have some options. To return to the Settings menu select Menu and then Back. To refresh the list of found devices select Menu and then Search Again. To clear from memory the information of the device connected select Menu and then Reset Connection. To select the device select Menu and then Show. This will make the application to search the services that are being offered in that device. The service you are looking for is Bluetooth Serial Port of WARM_ECG.

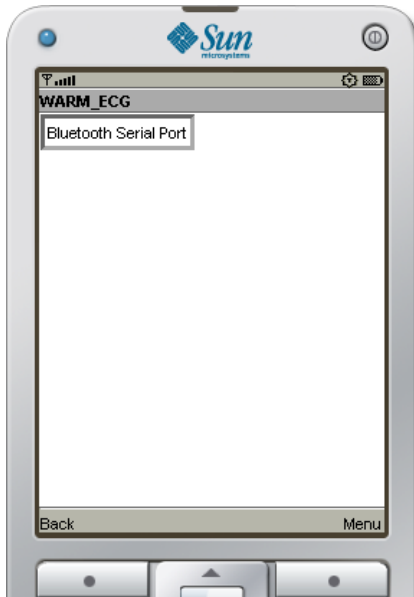


Figure 13: Screen showing the services offered in a particular device. In this diagram there is only the service Bluetooth Serial Port of the device WARM_ECG.

In this screen you will have some options. To return to the list of found devices select Menu and then Back. To refresh the list of found services select Menu and then Search Again. To connect to a service you have to select Menu and then Connect. If a Bluetooth connection is already established the application will ask if you want to close the previous connection and establish a new one. If you accept a new connection will be established, otherwise you will return to the list of found devices. If there is no connection currently established the application will try to connect to the desired service. A screen will appear showing information about the connecting process. If connection is successful the information of the connected will be stored in the memory of the cell phone. After connecting you will enter the main menu.

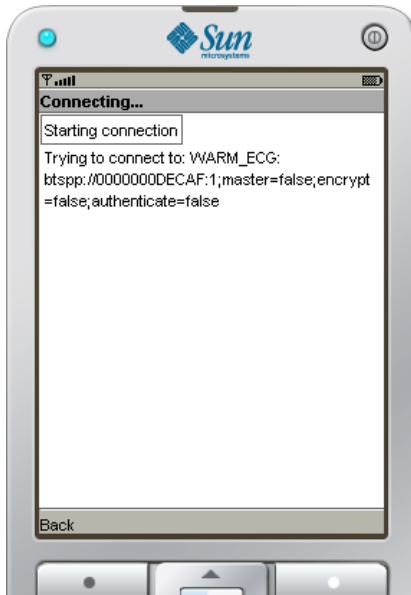


Figure 14: Screen showing information about the connection. It shows the friendly name and Bluetooth address of the device to be connected.

Baseline Parameters

In this screen the application will ask to enter the baseline parameter boundaries of the ECG. This MUST be done by the doctor. If you are not with the doctor then skip this process. Important: if the baseline parameters are not set the Bluetooth connection can't be initialized so if you skip this part of the initialization then don't try to connect to the Wireless ECGMonitor. If the doctor is present then he will have to set each one of the baseline parameter boundary in the provided text box and select Menu and then Save Parameters. The parameters will be saved in the memory of the cell phone.



Figure 15: Screen with the text boxes for setting the baseline parameter boundaries.

If you press Back or Menu and then Exit you will return to the Settings menu.

ECG Data

In this screen you will see a table containing the values of five ECG parameters read from the Wireless ECGMonitor, along with the values of the baseline parameter boundaries. The five ECG parameters are:

- Ventilation Rate
- PR Interval
- QRS Duration
- QT/QTc
- T mag

If there is no Bluetooth connection established the table will be empty, otherwise the application will send a message to the Wireless ECGMonitor requesting the current values of these ECG parameters. If you press Back you will return to the main menu.

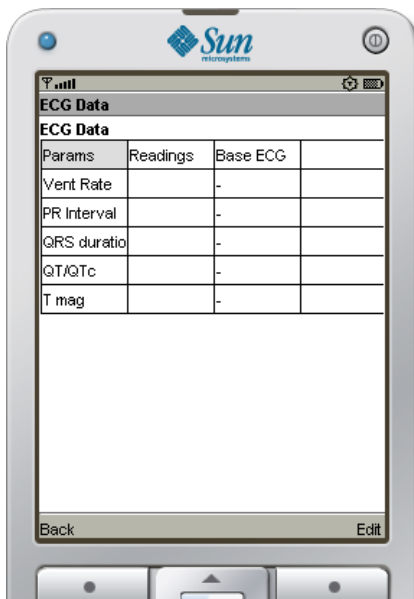


Figure 16: The table containing the five ECG parameters. In this diagram the table is empty.

Help menu

In this menu the user will find instructions of how to configure the application and help in other topics. The topics include: How to configure Bluetooth, How to configure Emergency Contacts, and How to contact the Development Team (us). If you press Back you will return to the main menu.

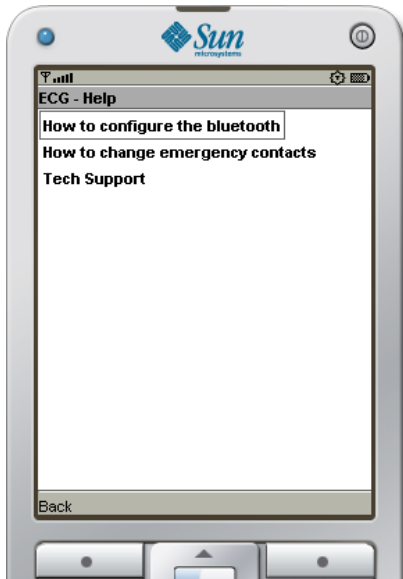


Figure 17: Help menu showing help topics.

Exit option

If you press the Exit button the application will be terminated. The Bluetooth connection will be closed as well as the streams of communication. Also, the next you open the application it will start from the initialization process but since there is information stored in the memory of the cell phone the initialization will be easier and faster.

Alert Message

If the Wireless ECGMonitor detects an anomaly in the ECG (by comparing the five ECG parameters with the baseline parameter boundaries) it will send an alert to the cell phone containing this application. It will show an alert message in the screen informing the situation and will also send the alert message to the emergency contacts indicating a possible emergency.

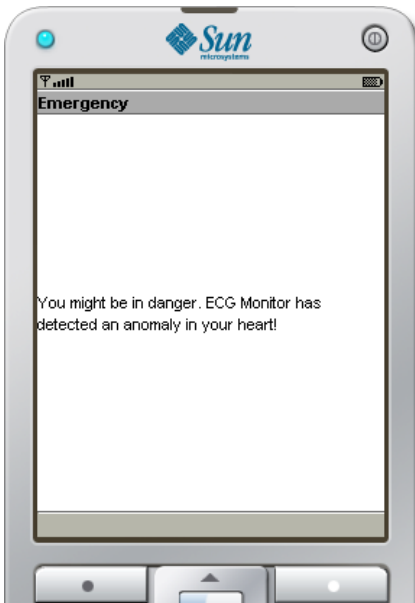


Figure 18: Message that appears on the screen of the cell phone containing this application informing a possible emergency.

The Wireless ECGMonitor

The Wireless ECGMonitor is the external device that you will connect to your body.

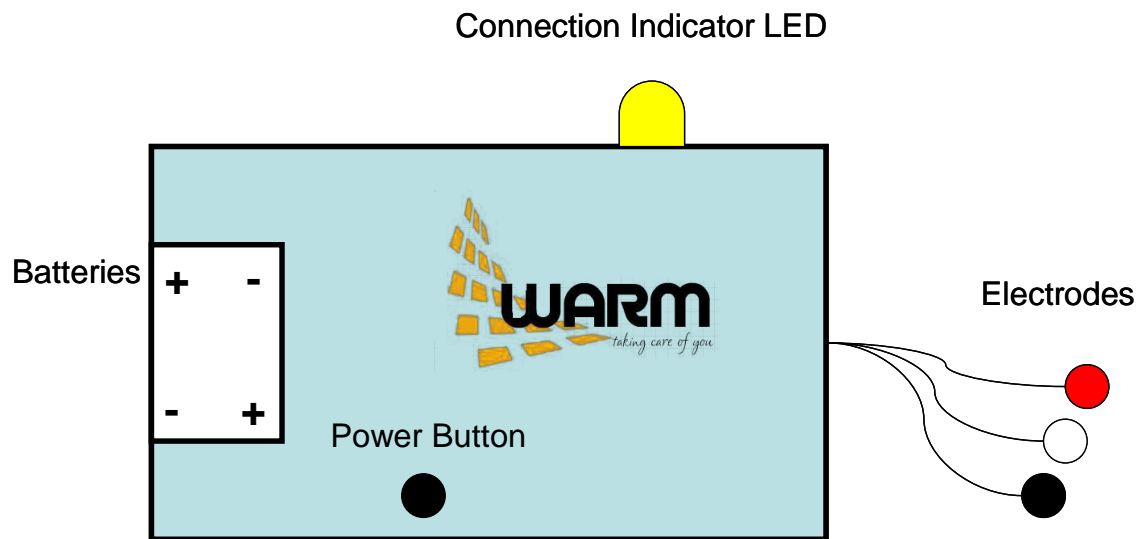


Figure 19: The Wireless ECGMonitor

Electrodes

The Wireless ECGMonitor contains three AgCl electrodes for connecting the device to your body. Each electrode is of different color:

- Red – the positive electrode, it is placed in the left side of the chest
- Black – the negative electrode, it is placed in the right side of the chest
- White – the ground electrode, it is placed in the lower right side of the abdomen

Connection Indicator LED

The Wireless ECGMonitor has a LED that indicates if there is a Bluetooth connection established. If the LED is on there is a connection established, otherwise it is not connected.

Batteries

The Wireless ECGMonitor uses two 9V batteries for supplying the power needed for the internal circuit to receive, read and process the ECG waveform coming in from the electrodes.

How to use the Wireless ECGMonitor

First insert the two 9V batteries (not included) in the Wireless ECGMonitor following the directions of + and – signs. Next, place the electrodes in your body using the next diagram. Important: place the electrodes in your body before turning on the Wireless ECGMonitor.

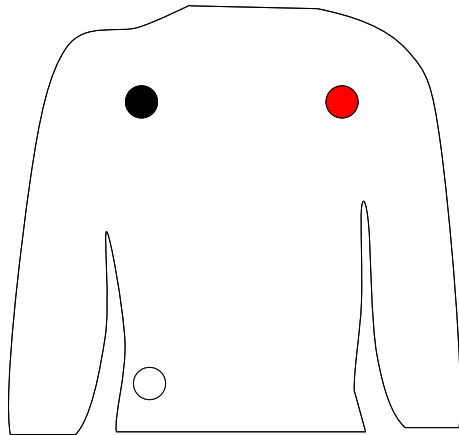


Figure 20: Place to put the electrodes in your chest and abdomen. The drawing resembles a chest.

After placing the electrodes in your body turn on the Wireless ECGMonitor by pressing the Power Button. The only thing that is left is to start the cell phone application, set the baseline parameters and establishing the connection (see above). The LED will be turned on if the connection is established. Once the Bluetooth connection is established you can be sure that your heart is being monitored continuously by the Wireless ECGMonitor.