Electrocardiogram Device and Application Requirements Document

Version 1.6

# Document Revision History

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| --- | --- | --- | --- | --- |
| **Version** | **Date** | **Author** | **Change summary** | **Reviewed By** |
| 1.0 | 7/10/2019 | Andrew Belcher | Formal write up of requirements defined in initial project requirements meeting | Jamie, Megan, Najma |
| 1.1 | 14/10/2019 | N/A | Making new changes suggested in Review Document. Data structure in section 1 end. Adding additional App requirements noted by Jamie |  |
| 1.2 | 15/10/2019 | Andrew  Belcher | Added a few requirements presented by Najma | Jamie, Megan,  Najma |
| 1.3 | 16/10/2019 | Andrew  Belcher | Merged changes from Jamie’s review 1.2 and added pre- requisites/priorities |  |
| 1.4 | 17/10/2019 | Andrew  Belcher | Adding my own changes that were made to 1.3 |  |
| 1.5 | 18/10/2019 |  | Merged with changes from both Megan and Najma’s review of 1.4 |  |
| 1.6 | 25/10/2019 | Megan Jones | Updated changes made during marking session |  |

# JAMN – ECG Requirements

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| Requirement Reference | Description | Priority | Pre-requisites |
| **SECTION 1.0: ONBOARD RECORDING AND DATA DISPLAY** | | | |
| ORD-1 | Device powers on without fault | 1 |  |
| ORD-2 | **LED0** is on if device is powered correctly | 3 | ORD-1 |
| ORD-3 | **Display** powers on without fault | 1 | ORD-1 |
| ORD-4 | **Display** shows splash screen on boot | 3 | ORD-3 |
| ORD-5 | Device checks if **Probes** are attached | 1 | ORD-1 |
| ORD-6 | Device displays warning if **probes** are not attached | 3 | ORD-3 |
| ORD-7 | **Display** shows an image to explain how to use the device after splash screen | 4 | ORD-3 |
| ORD-8 | Device detects **Button0** press to put into recording state | 1 | ORD-1,  ORD-5 |
| ORD-9 | **LED1** is on when recording | 2 | ORD-8,  ORD-5 |
| ORD-10 | **ADC** reads in analogue data from probes | 1 | ORD-1,  ORD-5 |
| ORD-11 | Data from probes gets stored in SRAM | 1 | ORD-1, ORD-5 |
| ORD-12 | Pulse Display handler averages sampled data from buffer | 1 | ORD-10 |
| ORD-13 | The heart rate is displayed in the top right corner of the screen |  | ORD-10 |
| ORD-14 | Pulse Display handler updates waveform on screen with sampled heart beat data from recorded pulse | 1 | ORD-10 |
| ORD-15 | Pulse Display waveform resets on new recorded pulse | 1 | ORD-10,  ORD-14 |
| ORD-16 | Device detects **Button0** press to stop the recording if it is in recording state | 1 | ORD-8 |
| ORD-17 | **LED1** flashes for a short period to signal recording has ended | 2 | ORD-16 |
| ORD-18 | Display will show “CONNECTION ERROR” If data from **ADC** reflects that the probes are not connected to a patient while in recording mode | 2 | ORD-5 |
| ORD-19 | **LED1** will flash in bursts if a connection error is detected. | 3 | ORD-5 |
| ORD-20 | Device can receive commands over **Serial** | 1 | ORD-1 |
| ORD-21 | Device can respond with acknowledgement to commands sent over **serial** | 1 | ORD-20 |
| ORD-22 | Device can activate “docked mode” when a “dock” command is sent over **serial** | 1 | ORD-21 |
| ORD-23 | Device sends version information in acknowledgement to the “dock” command over **serial** | 1 | ORD-21 |
| ORD-24 | Device can begin a recording when a “start recording” command is sent over **serial** while in docked mode | 1 | ORD-21 |
| ORD-25 | Device can stop a recording when a “stop recording” command is sent over **serial** while in docked mode | 1 | ORD-24 |
| ORD-26 | Device will reply with an error code instead of an acknowledgment within the data frame reply if there is an issue with communication | 2 | ORD-21 |
| ORD-27 | Device listens for 2 types or frames on **serial** command/data | 1 | ORD-21 |
| ORD-28 | Device will translate **serial** command/data frames | 1 | ORD-27 |
| ORD-29 | Device will go back into docked mode after **serial** connection issue is detected | 2 | ORD-22 |
| ORD-30 | **LED0** + **LED1** flash in sequence depending on if error is detected on boot (POST error code) | 3 | ORD-1,  ORD-2 |
| ORD-31 | Device has **serial** port configured for traffic to **PC** app | 3 | ORD-1 |
| ORD-32 | Device has **serial** port configured exclusively for debugging purposes (disabled in release build) | 3 | ORD-1 |
| ORD-33 | Device can switch Baud rate via the initial connection command from app depending on the setting sent with the baud set command. | 4 | ORD-21,  ORD-28 |
| ORD-34 | If Device is in recording mode via **serial**, it will send timing + pulse data in frames. | 2 | ORD-22 |
| ORD-35 | Device will send a checksum of pulse frames to prevent **serial** connection issues. | 3 | ORD-34 |
| ORD-36 | Device will send header information with ECG data sent over **serial**. | 2 | ORD-22 |
| ORD-37 | Device can write to **FRAM** correctly | 2 | ORD-1 |
| ORD-38 | Device can read from **FRAM** correctly | 2 | ORD-37 |
| ORD-39 | Device time can be resynched via command on **serial** from app. | 4 | ORD-22 |
| ORD-40 | Device will store settings data from Options screen in **FRAM** | 2 | ORD-28 |
| ORD-41 | Data packets contain a buffer of 50 ECG readings | 2 | ORD-34 |
| ORD-42 | Data packet has a size set in data frame | 2 | ORD-34 |
| ORD-43 | Verify voltage draw doesn’t go above ideal range during program execution |  | ORD-1 |
| ORD-44 | Device in docked mode can be powered by **PC** | 4 | ORD-28 |
| ORD-45 | Device can be charged in docked mode | 4 | ORD-44 |
| ORD-46 | Device can be powered by battery in undocked mode | 4 | ORD-1 |
| ORD-47 | Device can enter sleep mode to conserve battery power | 4 | ORD-1 |
| **SECTION 2.0: ONBOARD CONFIGURATION** | | | |
| OPT-1 | **Button1** press will change **Display** to show options screen | 2 | ORD-3 |
| OPT-2 | Options screen will show different settings | 2 | ORD-3 |
| OPT-3 | Options screen can be navigated with **Slider1** | 2 | OPT-1 |
| OPT-4 | Options screen settings can be adjusted with **Slider2** | 2 | OPT-1 |
| OPT-5 | Options screen will show setting for the display’s sleep mode when in docked mode. | 3 | OPT-1 |
| OPT-6 | Options screen will show setting for data/time | 3 | OPT-1 |
| OPT-7 | Options screen will show setting for display brightness | 3 | OPT-1 |
| OPT-8 | Options screen will show setting for toggling bpm box in corner of Pulse display on/off | 3 | OPT-1 |
| OPT-9 | Options screen will show option to exit menu back to Pulse Display | 2 | OPT-1 |
| OPT-10 | Options screen will show option to change sample rate for pulse capture. | 3 | OPT-1 |
| OPT-11 | Options Screen settings are all displayed in correct and readable formats. | 3 | OPT-1 |
| **SECTION 3.0: COMPANION APPLICATION** | | | |
| APP-1 | User can access **patient view** on application start-up | 1 |  |
| APP-2 | User can add a new patient **(patient view)** | 1 | APP-1 |
| APP-3 | User can set update/set a patient’s age, weight, height **(patient view)** | 2 | APP-1 |
| APP-4 | User can view a list of all patients **(patient view)** | 1 | APP-2 |
| APP-5 | Application can send **serial** commands to the ECG device | 1 | ORD-20 |
| APP-6 | Application displays a connect button (**patient view)** | 1 | APP-5 |
| APP-7 | Application sends a “docking mode” command to the ECG device when connect button is pressed | 1 | APP-5 |
| APP-8 | If “docking mode” command fails when attempting to dock, an error is displayed (**patient view**) | 1 | APP-5,  ORD-25 |
| APP-9 | If ECG device successfully docks, user is redirected to **recording view** | 1 | APP-7 |
| APP-10 | User can set the target patient from a dropdown list (**recording view**) | 1 | APP-2 |
| APP-11 | User can set the recording type from a dropdown list (resting, stress) **(recording view)** | 3 | APP-10 |
| APP-12 | User can press “begin recording” button to start an ECG recording on ECG device (**recording view**) | 1 | APP-7 |
| APP-13 | User can press “stop recording” button to end an ECG recording on ECG device (**recording view**) | 1 | APP-12 |
| APP-14 | “begin recording” button is inactive until the user has defined a target patient and recording type (**recording view**) | 1 | APP-10 |
| APP-15 | Application will have **serial** connections setting tab/window | 3 | APP-7,  ORD-31,  ORD-44 |
| APP-16 | Application will support changing baud rate from selected rates during connection configuration | 3 | APP-15 |
| APP-17 | Application will send command to set baud after initial handshake with device | 2 | APP-7 |
| APP-18 | Application will resync device data/time after set baud and before start recording command can be sent. | 3 | APP-17 |
| APP-19 | Application will listen for **serial** ECG data headers when a recording has started | 1 | APP-7,  APP-12 |
| APP-20 | Application decodes and stores ECG data samples from **serial** packets into memory | 1 | APP-19,  ORD-32 |
| APP-21 | Application live updates a graph as **serial** packets are decoded (**recording view**) | 2 | APP-20 |
| APP-22 | User can press “save recording” to generate an ECG recording file out of data stored from **serial** packets (**recording view**) | 1 | APP-20 |
| APP-23 | ECG recording file contains header information on the date/time of the recording | 2 | APP-20 |
| APP-24 | ECG recording file contains header information on the patients name, age, weight and height at time of recording | 3 | APP-3 |
| APP-25 | ECG recording file contains header information on the type of recording (resting, stress) | 3 | APP-11 |
| APP-26 | User is redirected to **patient view** after an ECG recording file is saved (**recording view**) | 2 | APP-22 |
| APP-27 | User can press back button to return to **patient view** (**recording view**) | 1 | APP-21 |
| APP-28 | User can select a patient to view a list of their previously saved ECG recordings (**patient view**) | 2 | APP-4 |
| APP-29 | User can select a patient ECG recording to generate a PDF report | 1 | APP-28 |
| APP-30 | Patient ECG PDF report contains graph of heartrate data | 1 | APP-29 |
| APP-31 | Patient ECG PDF report contains patient information at time of recording | 2 | APP-29 |
| APP-32 | Patient ECG PDF report contains date/time of recording | 2 | APP-29 |
| APP-33 | User can generate a Patient Overview PDF report from any patient | 3 | APP-29 |
| APP-34 | Patient Overview PDF report shows graph of average resting heartrate over time | 2 | APP-29 |
| APP-35 | Patient Overview PDF report shows graph of average stress heartrate over time | 2 | APP-29 |

## Priority Key

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| --- | --- |
| 1 | Very high |
| 2 | High |
| 3 | Medium |
| 4 | Low |