Engineering App Requirements (Draft)

# Requirements

## General Requirements

* The system shall be a stand-alone Windows application
* The system shall be able to run alongside other Windows applications (not a Windows Store App)
* The system GUI shall be resizable
* The system shall support a single channel hardware configuration (old Spencer board)
  + One TCD Device
* The system shall support a dual channel hardware configuration (Lucid board)
  + One Power Microcontroller Device
  + Two TCD Devices

## Connectivity Requirements

* The system shall connect to one TCD board at a time.
* User shall command the system to connect to TCD board.
* User shall command the system to disconnect from TCD board.
* System shall list available TCD Devices.
  + Do we show “Channel Name” in GUI?
* User shall select a single TCD Device for use with system.
* How do we handle two devices connected at once? Build for one, tell user not to connect more than one? Do we need the system to respond intelligently or gracefully in this case? Is it sufficient for the system to quietly connect to the “first device”?

## Exam Screen

The exam screen shall present an interface similar to the Mercury application exam screen. This includes input controls, output parameters, and graphical displays of spectrogram and m-mode.

**Input Parameters**

* The exam screen shall provide input controls for the following TCD parameters:
  + Power
  + Depth
  + Filter
  + Sample Volume
  + Start Depth
  + Pulse Repetition Frequency (PRF)
* The exam screen shall allow the user to send a value to the hardware for the TCD parameters listed above.
* The exam screen shall display in a separate location the current value of the TCD parameters as read from the TCD data packet.

**Output Metrics**

* The exam screen shall display TCD output data for the following metrics:
  + Mean (To and Away)
  + Min (To and Away)
  + Max (To and Away)
  + Pulsatility Index (PI) (To and Away)
  + Thermal Cranial Index (TIC)

**Spectrogram**

* The exam screen shall display the spectrogram data.
* The spectrogram horizontal axis shall be time (s).
* The spectrogram display horizontal scale shall be 4 seconds.
* The spectrogram vertical axis shall be velocity (cm/s).
* The spectrogram shall display vertical scale.
* The spectrogram display shall represent intensity by color using a fixed intensity-color map.
* The spectrogram baseline may be adjusted by user.
* The spectrogram baseline adjustment shall update the envelope limits TCD parameter.
* The spectrogram shall display to and away envelopes.
* The user shall be able to toggle envelope display (ON/OFF, default ON).
* The user shall be able to toggle envelope limits (ON/OFF, default ON).

**M-Mode**

* The exam screen shall display the M-Mode data
* The M-Mode horizontal axis shall be time (s).
* The M-Mode display horizontal scale shall be 4 seconds.
* The M-Mode and spectrogram displays shall be horizontally aligned.
* The M-Mode vertical axis shall be depth (mm).
* The M-Mode shall display vertical scale.
* The M-Mode display shall represent intensity and direction by color using a fixed intensity-color map.
* The current depth shall be indicated by a horizontal line in the M-Mode display.

## Info Screen

**Board Info**

* The info screen shall support the following board information:
  + Part Number
  + Model Name
  + Hardware Revision
  + Serial Number
* The info screen shall read and display board information when commanded.
* The info screen shall write board information when commanded.
* TBD – Format, range, type, etc… for board info

**Channel Assignment**

* The info screen shall read and display channel number when commanded.
* The info screen shall write channel number when commanded.
* TBD – Format, range, type, etc… for channel number

**Probe Info**

* The info screen shall support the following probe information:
  + Part Number
  + Model Name
  + Serial Number
  + Physical ID
  + Format ID
  + Center Frequency
  + Diameter
  + Tank Focal Length
  + Insertion Loss
  + TIC
  + Fractional 3dB BW
  + Impedance
  + Phase Angle
* The info screen shall read and display probe information when commanded.
* The info screen shall write probe information when commanded.
* TBD – Format, range, type, etc… for probe info

## Calibration Screen

*TBD*

## Packet Screen

**Display Rate**

* The packet info screen shall display data for a single packet at a time.
* The packet info screen shall load and display the current packet.
* The packet info screen shall provide an automatic refresh rate
  + Refresh rate: None, ½ Second, 1 Second, 5 Second
* When refresh rate is set to None, the user shall select a “Refresh” button.

**HEX Display**

* The packet info screen shall display packet information in binary form in the HEX display.
* The HEX display shall show memory address of information
* The HEX display shall show packet data in Hexadecimal format.

**Structured Display**

* The packet info screen shall display packet information in structured human readable format.
* The structured display shall list data element names and values as given in *DC-00035 Interface Specification USB Communication TCD Driver, Table 8, EP2 Data Packet Structure*
* As an element is selected in the structured display, the matching binary data shall be highlighted in the HEX display.

## Message Output

* The system shall output application generated user messages to a text display.
* The user shall clear the user message display.
* The system shall output hardware error logs to a text display.
* The user shall clear the hardware error log display.

## FPGA Screen

*TBD*

## Software Loading Screen

* The software loading screen shall install a selected version of the TCD DSP and FPGA.
* The software loading screen shall display current versions of:
  + TCD Firmware
  + Boot Loader
  + Does FPGA have a version?