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Quadra GUI quick-start guide.

Before installation, make sure that the device is not connected to USB port. Install the drivers by executing “QuadraUSBDriverInstaller_v1.1.EXE” in the “Windows Drivers” catalogue.

Description of the physical connectors and indicators.

SYNC IO can be used to sync external equipment to Quadra. The quadra outputs a square-wave signal that toggles its state when Quadra starts the measurement of a spectra. In default mode Quadra measures a spectrum of 1 kHz…349 kHz in 1 ms and the sync output signal is 500 Hz square-wave.

BAT LED (green/red) indicates the status of the battery:

Green	– charge complete / battery is full.
Red	– device is operating on battery supply.
Orange	– battery is charging.
Red blinking	– battery is low.

USB connector. Use good quality Mini USB Type A to Mini B cable to connect Quadra to PC USB port. USB port must be capable to deliver 500 mA current and USB voltage should not drop below 4.85 V.

BSY LED indicates active mode when LED is on and idle when LED is off.

ERR/ACK LED

Constant red indicates critical error during operation, DSP is halted.
Single 125 ms blink indicates acknowledgement of successfully received and executed command.
Double 125 ms blink indicates DSP USB controller TX buffer overflow (40ms of data is lost).
(ERR/ACK led also doubles as visual indicator for a mask violation error when the mask function is activated in the GUI)

RDY LED indicates that the DSP firmware has booted up.

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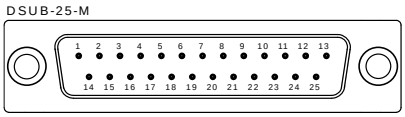
FRONT-END CONNECTOR



Front-end connector pinout.

1	Passive	**GND**
2	Analog Input	**U_P_SENSE**
3	Analog Input	**U_P_GUARD**
4	Analog Input	**U_N_GUARD**
5	Analog Input	**U_N_SENSE**
6	Passive	**GND**
7	Analog Input	**I_P_SENSE**
8	Analog Input	**I_P_GUARD**
9	Analog Input	**I_N_GUARD**
10	Analog Input	**I_N_SENSE**
11	Passive	**GND**
12	Analog Output	**Excitation Signal Positive**
13	Analog Output	**Excitation Signal Negative**
14	Passive	**GND**
15	Digital Output	**MUX SYNC**
16	Analog Supply	**-5 V, 100 mA**
17	Passive	**GND**
18	Analog Supply	**+5 V, 150 mA**
19	Digital IO (PU)	**User GPIO 0 (front-end detect)**
20	Digital IO	**User GPIO 1**
21	Digital Input Output	**User GPIO 2**
22	Passive	**GND**
23	Digital IO	**I2C Bus Serial Data IO SDA**
24	Digital IO	**I2C Bus Serial Clock IO SCL**
25	Digital Supply	**+3.3 V, 150 mA**

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SINGLE SHUNT FRONT-END

The pinout of the DUT connector is:

1		GND
2	E+	POSITIVE EXCITATION
3	S+	POSITIVE VOLTAGE SENSING
4	S-	NEGATIVE VOLTAGE SENSING
5	E-	NEGATIVE EXCITATION / CURRENT SINK
6		GND

The single shunt front-end can be connected to DUT with 2 wire or 4 wire method. Two wire method reduces the number of electrodes and wires but the resistances of the wires and electrodes are included in the measured values. To use 2 wire method, insert the two jumpers to the headers behind the DUT connector. Either E+ or S+ and S- or E- can be used to connect DUT to the front-end.

For four wire method remove two jumpers behind DUT connector. The positive excitation electrode connects to E+ etc.

The single ended / differential jumper selects if the DUT is excitated with a differential voltage or if the E- line is connected to GND. It is advised to use the single ended mode (default).

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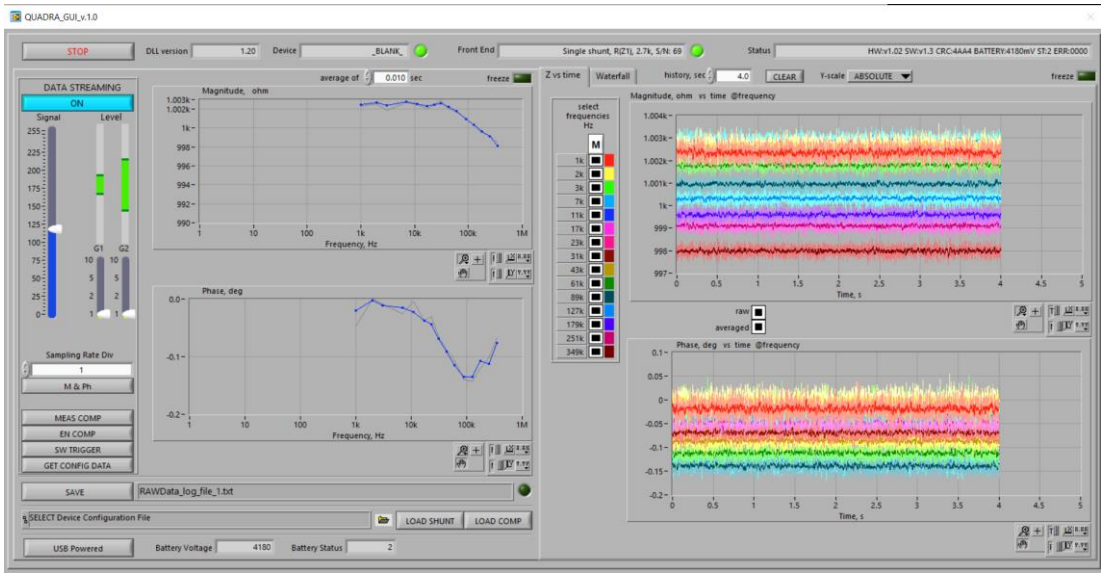
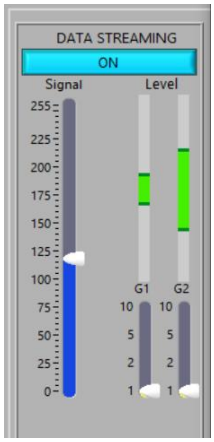
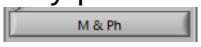
Attach single shunt front-end to Quadra. Connect the EBI demo board to the DUT connector of the single shunt front-end. An additional receptacle is provided with the Quadra demonstrator kit that can be screwed under the DUT connector terminals for quick and convenient replacement of the cables and test circuits.

Run the GUI executable “QUADRA_GUI_v.XX.exe”.
It will take some seconds while the Quadra is detected and initialized, after that the measured impedance spectra is displayed on the GUI.



The excitation level can be changed by “Signal” lever. The gains of the input amplifiers can be set to 1X, 2X, 5X or 10X by the G1 and G2 levers. The actual level at the ADC inputs are indicated on the level bars with green. When signal is too high then the ADC will be saturated and the measured values are not correct. The saturation is indicated by the ends of the level bar turning red.
It is advised to keep the signal levels above 10% of the full scale.



The current impedance spectra can be displayed either as magnitude and phase or real and imaginary parts in the left side graphs. The format can be changed using a button 

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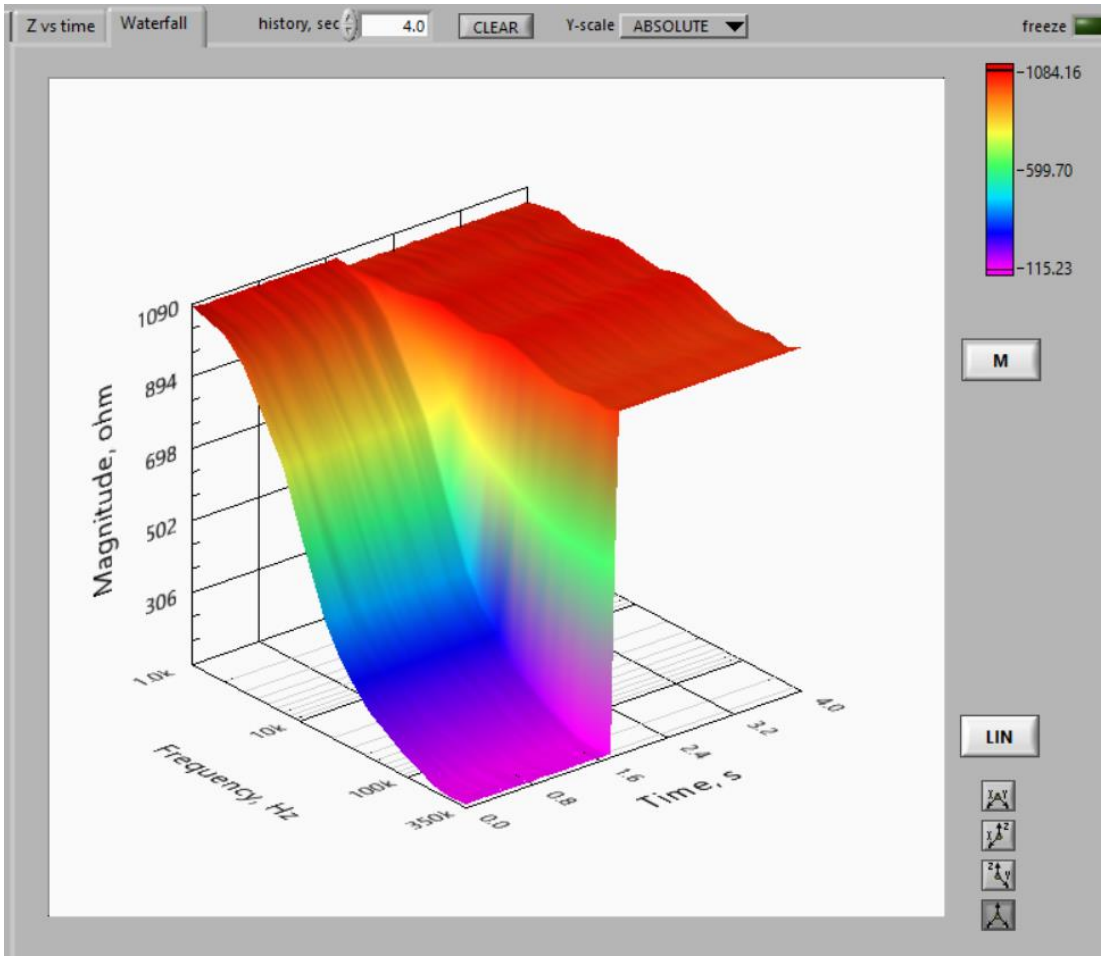
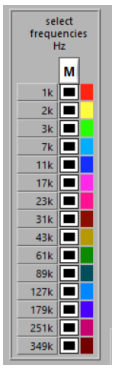
The graphs on the right side show the measurement history that can be displayed as separate frequency points vs time or as a waterfall chart.

The history length can be changed and cleared. User can change the mapping of Y scale from absolute value to trend to monitor simultaneously small changes in impedance at different frequencies.



In Z vs time tab, the displayed frequencies can be picked manually.



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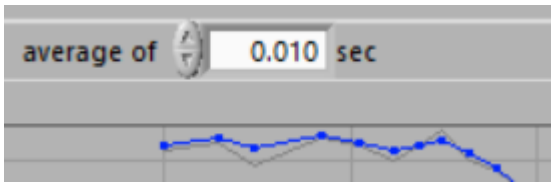
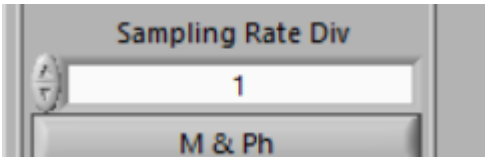
The displayed data can be displayed as raw data or filtered data. On the spectrum chart the averaged spectra is displayed with blue line and unfiltered data is displayed with gray by default. On the history charts the raw data is displayed in strong colors and the raw data is displayed with pastel colors. The averaging time can be set in:



The measured spectra is not limited to the range of 1 kHz … 349 kHz but can be scaled down to 500 mHz … 194 Hz by changing the sampling rate divider:



Quadra is optimized to be used in the range of 1 kHz … 349 kHz. When used in lower ranges then it is advised to use the data from the first 10 frequencies and discard the data from the higher frequencies since they will be erroneous.

Sometimes it is desired to isolate the measured object and the measurement device electrically from the surrounding grid and devices. This helps to suppress noise and reduce the stray currents and, in some cases, may greatly improve the quality of the measurement results.

The Quadra can be isolated from the host PC by clicking on the “USB Powered” button which then changes its label to “BATTERY powered”.

Quadra will then use the power from its internal battery until the user switches back to USB power or the battery will be depleted. When the battery level drops to critical threshold the Quadra switches back to USB supply automatically and starts charging the battery.

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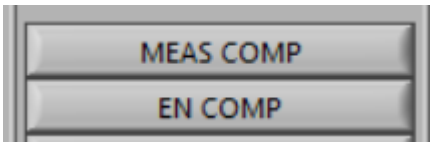
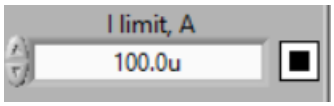
Open compensation function can be used by disconnecting wires from any DUT, connecting the E+ together with S+ and E- with S-. Then user must click on the “MEAS COMP” button twice to measure the compensation values. Then the compensation function can be activated by selecting “MEAS COMP” button.



The compensation values must be re-measured every time the sampling rate divider, G1 or G2 is changed! Signal level can be altered without the need for re-calibration.

There is a software current limiting feature that allows user to set maximum peak current limit when measuring delicate samples. When biologically safe front-end module is used then this software current limit is always turned on and the current limit can be set up to 100 µA.



When using multi-shunt frontend additional controls are revealed that allow to change the shunt value and detect the most appropriate shunt combination automatically.