FMS

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SIGGI II Operation Manual

Power Supply

4* batteries or accumulators, size Mignon(AA).
Please insert the batteries into the black battery drawer and ensure correct polarity.
Remove empty batteries. Remove batteries when SIGGI II will not be used for a longer period!
Leaking batteries should be removed at once, respectively not inserted at all!
Usually new accumulators do not reach their full capacity from the start; several charging and discharging cycles are necessary to reach full capacity.

Switching SIGGI II On

Press the white button named *Enter/Esc* on the jog-shuttle.
After a short message the *Main Menue* will appear on the LCD-display.
SIGGI II starts with the settings stored last within the *Setup Menue.*

Operating SIGGI II

SIGGI II is handled by means of the black jog-shuttle with the white *Enter/Esc* button on top.
By turning the jog-shuttle you will move within the menue or change a parameter. Selected menue items or parameters show up on dark background on the LCD-display.
By pressing the *Enter/Esc* button the selected menue item will be executed. After having selected a parameter, a switchback to the previous menue takes place.

Switching SIGGI II Off

Select *Power off* from the *Main Menue* and press *Enter/Esc*.
SIGGI II will switch off automatically, if no operating takes place for several minutes.
As long as valid values are measured during impedance measurement, no automatic switch-off will take place.
Automatic switch-off will also be suppressed during recording of electrode potentials within the function *Electrode Tester*.

Impedance Meter

To measure impedance three electrodes are required.

Single-Ch-In [1]

[1&2] Customized adaptors to connect into *Single-Ch-In* or *Multi-Channel-In* are available from FMS.

Plug a Ground-Electrode into “N”
Plug a Reference-Electrode into “-“
Plug the to-be-measured electrode into “+”

Multi-Channel-In [2]
Here up to 32 electrodes plus Gnd plus Ref can be connected at the same time.

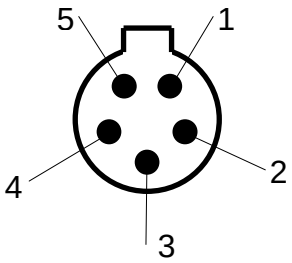
Select *Impedance Meter* from the Main Menue and press *Enter/Esc.*

The menue *Impedance Measurement* appears. The electrode impedances of the to-be-measured electrode, the reference- and the ground-electrode are displayed simultaneously. Impedance is shown as bar graph and as numeric value as well. The range of the bar graph can be adjusted in the *Setup* menue. The Impedance measurement frequency can be selected in the *Setup* menue too.
The electrode potential of the to-be-measured electrode compared to the reference electrode is shown beneath the selected input channel. In case of identical electrode materials high electrode potentials indicate faulty electrodes. In case of different electrode materials some amplifiers may be unable to process the signal if there are very high electrode potentials.
To select the channel for impedance measurement select *CH menue* and press *Enter/Esc.* By turning the jog-shuttle *Single-Ch-In* with its three safety sockets or one of 32 channels of *Multi-Channel-In* is selected. *Single-Ch-In* is depicted by *III*, whereas *Multi-Channel-In* is shown by the channel numbers 1–32. To quit channel selection press *Enter/Esc.*
To quit *Impedance Measurement* select ↰ and press *Enter/Esc.*

Signal Generator

The *Signal Generator* function is permanently active, regardless which other functions are performed. After connecting the *Signal-Out* cable no further handling is necessary, unless different settings are required.

Pinout of 5-pin socket *Signal-Out*

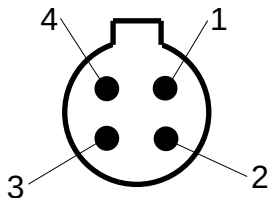


Pin 1 Signal B-
Pin 2 Signal A+
Pin 3 Ground
Pin 4 Signal A-
Pin 5 Signal B+

Signal outputs A are used to output signals into single amplifier channels. They are precise enough for calibrating, and should be used especially when calibrating with DC voltages.
Signal outputs B are used to output signals into several parallel amplifier-channels. They are less precise, but output the same signal into up to 32 channels.

Pin 3 *Ground* is connected to Ground of the amplifier. It also serves as an input of CMR-Signals.

Pinout of 4-pin-socket *Trigger out*



Pin 1 +3.3V Out
Pin 2 GND
Pin 3 Trigger +
Pin 4 Trigger -

Select *Signal Generator* in the Main Menue and press *Enter/ESC.*
The menue *Signal Generator* appears. Here different Waveforms, Amplitudes, Frequencies and Noise signals can be selected.
Overlayed Noise signals help to judge, how an amplifier copes with certain artifacts:
High Common Mode Rejection (CMR) is important to suppress 50/60 Hz noise. High DC-tolerance is important to compensate different electrode potentials.
Not all settings are available for every waveform. The parameters not available are displayed as hyphens (-----).

In menue item *Waveform* different signal shapes can be selected.

Sine	a sine wave signal is emmitted.
Square	a square wave signal is emmitted.
+ DC	generates a positive DC potential at output.
- DC	generates a negative DC potential at output.
Ampl.	If at *Single-Ch-In* or *Multi-Channel-In* a signal is registered (see function *Amplifier*) this signal is emmitted as output signal in real-time.
Record	A signal, recorded beforehand (see function *Amplifier),* is re-emmitted as an endless loop at output.
ECG	an artificial ECG-like signal is emmitted.

In menue item *Amplit.* the amplitude of the signal is selected
(0-20mVpp; at DC 0-10mV).
In menue item *Frequ.* the frequency of the signal is selected
(0.1-1000Hz; at ECG 10-300bpm).
In menue item *CMR Amplit.* the amplitude of the common mode noise signal is selected (0-5Vpp).
In menue item *CMR Frequ.* the noise frequency is selected (50/60 Hz). The setting of 3 Hz is meant for technicians use.
In menue item *DC Pot.* the amplitude of a simulated electrode potential is selected
(+-300mV).
To leave *Signal Generator* select ↵ and press *Enter/Esc.*

Amplifier

Select *Amplifier* in the Main Menue and press *Enter/Esc.*
The menue *Amplifier* appears. Here signals entering SIGGI 2 via *Single-Ch-In* or *Multi-Channel-In* can be amplified, displayed and saved.

In menue item *CH* select III *(Single-Ch-In)*or one of channels 1-32 of *Multi-Channel-In.*
In menue item *Mode* select a DC-amplifier or an AC-amplifier (Tau (= time constant) 0.3s). The AC-amplifier is less sensible against external artifact sources and should therefore be used for e.g. calibration. The DC-amplifier is needed for Bio-signals slower than 1 Hz or for artificial signals (square, triangle, etc.).
In menue item *Ra* the input sensitivity is selected (10uV-500mV).
In menue item *Time* the speed of waveform display is selected.
With menue item *Record* recording of the input signal is started. Input will be recorded for 13 seconds and then saved. Pressing *Enter/Esc* earlier will stop and save a shorter interval. The recorded signal can be replayed as an endless loop by *Signal Generator.* Every loop is marked by a trigger signal.
Selecting *AutoZero* will center the current signal at zero.
To leave *Amplifier* select ↰ and press *"Enter/Esc"*.

Electrode Tester

Each electrode has an electrode potential. Electrode potentials from different materials will differ in any case. In electrodes from the same materials electrode potentials can differ too, but usually less. In AC recordings with high-pass filters slightly different electrode potentials don't matter, but if they are too large (e.g. 300 mV) the amplifier will run into saturation. With SIGGI 2 the electrode potential can be measured, e.g. to select electrodes of similar potentials (important for DC EEG) or to identify defective electrodes.

Select *Electrode Tester* in the Main Menue and press *„Enter/Esc"*.
The Electrode Tester display appears. Here electrodes may be tested and judged for a longer period of time (about 5 hours).

Backgroundinformation:
Electrodes generate voltages by themself even if they are not faulty. These voltages may falsify measurements. High quality electrodes (e.g. sintered Ag/AgCl-electrodes) generate voltages, that amount to 1 mV after a period of accustoming to the electrolyte in use. Electrodes of minor quality may generate voltages of more than 100 mV. More decisive than the absolute rate of voltage are changes in voltages. Electrodes with high voltages usually generate higher changes of voltage. Faulty electrodes may generate considerable jumps of voltage. For instance high-level noise disturbance may arise from electrolyte contact to the lead wire, caused by leakage.
To detect problems like this the Electrode Tester is used.
(Note: The Electrode Tester visualizes electrode-characteristics over long periods of time. To check the short-term conduct of electrodes, please refer to the function "Amplifier – Record".)

Testing directive:
Insert fully charged accumulators into SIGGI II.
All electrodes, that is Ground, Reference and n electrodes-to-be-measured are submerged into electrolyte or isotonic saline solution.
Connect SIGGI II to the electrodes.
Select *Electrode Tester* in the Main menue and press *„Enter/Esc"*.
Press *„New" to delete possible older recordings.*
Now the connected electrodes can be selected within menue *CH* and will be displayed in the left half of the display.
They should display a steady line within the measuring range.
In menue *Ra* the measuring range may be adjusted.
Select *Record* to start actual measurement.

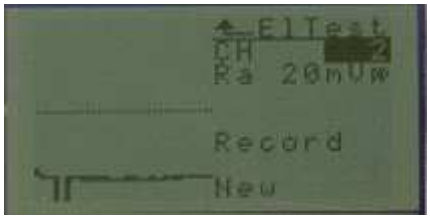
In order to save electricity, the lighting of the LCD-Display is switched off. Only full batteries or accumulators should be used. To avoid loss of data by premature empty batteries, data recorded so long are saved as soon as the BatLo sign shows up and the test is stopped.

After Record has been selected SIGGI II initially measures impedance to determine how many electrodes are connected.
Then electrode potentials of all electrodes are measured and maximum and minimum values are saved and displayed as vertical line in the left half of the display. The sequence of channels is from left to right.

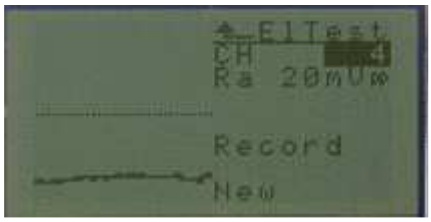
Note: After these initial max-min values nothing else is displayed during electrode testing. The result is shown only after recording is finished.

By selecting *Rec Stop* recording may be stopped. Otherwise the process runs itself automatically (about 5 hours).
After recording is finished all results measured are saved and may be assessed by selecting each channel individually. In case of automatic switch-off the results may be assessed after re-starting SIGGI II the next time.
To leave *Electrode Tester* select ↰ and press *„Enter/Esc“*.

Examples of Electrode Tests (X-axis always 5 hours)



Faulty Ag/AgCl electrode; should be replaced.



Relatively bad Ag/AgCl electrode.

Ag/AgCl electrode with high initial drift, but nevertheless to be judged as fine. Possibly another electrolyte had been used or the electrode had not been used for quite some time.

Ag/AgCl electrode in very fine state.