

Datex-Ohmeda

S/5™ EEG Module, M-EEG (rev. 01)
S/5™ EEG Headbox, N-EEG (rev. 01)

Technical Reference Manual Slot



All specifications are subject to change without notice.

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EEG Module, M-EEG and EEG Headbox, N-EEG

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INTRODUCTION

This Technical Reference Manual Slot provides information for the maintenance and service of the Datex-Ohmeda S/5 EEG Module, M-EEG and Datex-Ohmeda S/5 EEG Headbox, N-EEG. The EEG module is a single width plug-in module designed for use with the S/5 monitors. Later in this manual modules can be called w/o system name S/5.

Please see also related *Technical Reference Manual* for information related to system e.g. related documentation, conventions used, symbols on equipment, safety precautions, system description, system installation, interfacing, functional check and planned maintenance.

The EEG module and the EEG headbox together measure:

- electroencephalography (EEG)
- spontaneous facial muscular activity with frontal electromyography (FEMG)
- auditory evoked potentials (AEP)

The EEG Headbox, N-EEG, is responsible for EEG and FEMG signal amplification, filtering and digitalization and electrode impedance measurement. It is situated close to the patient's head. The Headbox has connectors for the EEG leads, either for a referential or a bipolar montage, and for the AEP stimulation earphones.

The EEG module M-EEG creates auditory stimulus pulses and takes care of AEP signal processing. It has one connector for the EEG headbox.

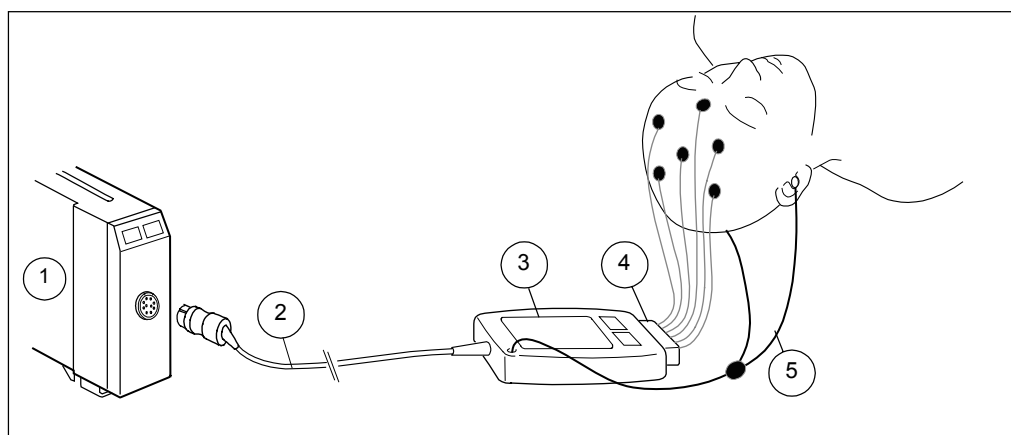


Figure 1 Measurement setup

- (1) EEG module measuring EEG and EP
- (2) Module-headbox cable
- (3) EEG Headbox
- (4) Organizer
- (5) Earphones (for AEP measurement only)

1 SPECIFICATIONS

1.1 General specifications

1.1.1 Headbox

Box size, W × D × H	96 × 170 × 34 mm/3.8 × 6.7 × 1.3 in
Box weight	0.5 kg/1.1 lbs
Power consumption	1.9 W

1.1.2 Module

Module size, W × D × H	37 × 180 × 112 mm/1.5 × 7.1 × 4.4 in
Module weight	0.37 kg/0.8 lbs
Power consumption	3.1 W

1.2 Technical specifications

1.2.1 EEG

Amplification	10 000
Resolution	60 nV
Max amplitude	800 μV_{pp}
Sampling frequency	100 Hz per channel
Range	$\pm 400 \mu\text{V}$
Frequency range	0.5...30 Hz
Input impedance	8 M Ω @ 10 Hz
Noise level	<0.5 μV rms from 0.5 Hz to 30 Hz
CMRR	>100 dB @ 50 Hz
Parameters from power spectrum	SEF, MF, relative power in frequency bands
Burst suppression	calculated burst-suppression ratio (BSR)
Defibrillation protection	5000V, 360 J
Allowable Input Offset	$\pm 300 \text{ mV}$

1.2.2 AEP

Amplification	10 000
Resolution	60 nV
Max amplitude	1000 μV_{pp}
Stimulation	
Click (condensating)	duration 100 μs
Frequency	1.1...9.1 Hz (1 Hz steps) @ 10 ms measurement 1.1...8.1 Hz (1 Hz steps) @ 100 ms measurement
Intensity	10...90 dB nHL, 10 dB steps
Measurement	
Sampling frequency	2400 Hz for MLAEP/ 4800 for BAEP
Frequency range	0.5...1000 Hz
Highpass filter	off/10/30/50/75/100/150 Hz
Single average:	
Averaged responses	100...2000 stimuli
Moving average:	
Gross average	100...2000 stimuli
Update interval	after every 100 stimuli (200, when gross average is 2000)

1.2.3 EMG

Amplification	50 000
Resolution	100 nV
Max amplitude	100 μV_{pp}
Frequency range	60...300 Hz
Amplitude	Root Mean Square (RMS)

1.2.4 Impedance measurement

Measurement frequency	75 Hz
Current	10 μA
Range	0...30 k Ω
Resolution	100 Ω
Accuracy	$\pm 1\text{k}$ or $\pm 10\%$ whichever is greater
Measurement time, all leads	3 s
Start of measurement	manual/automatic
Leads off detection	>3 M Ω , continuous

2 FUNCTIONAL DESCRIPTION

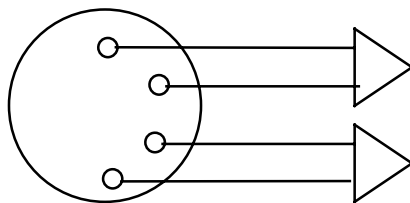
2.1 Measurement principle

2.1.1 EEG

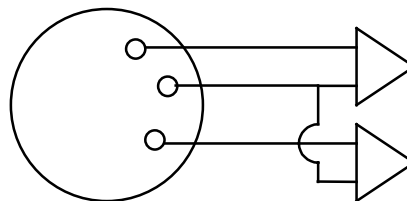
EEG is differential voltage signal measured from electrodes attached to the patient's skin. EEG measures the spontaneous electrical activity of the brain. This electrical activity reflects the state of the brain.

Electrode connections can be made with two different principles: bipolar or referential montage. In bipolar montage every channel has two electrodes and the signal is the potential difference between these two electrodes. In referential montage the referential electrode delivers its potential to every channel's minus-input. The signal is the potential difference between this common reference electrode and the electrode connected to plus input. Purpose of the ground electrode is to reduce common mode noise. It cannot be used as referential electrode.

Bipolar connection



Referential connection



The EEG signal is amplified, antialias filtered, digitised and software filtered. After that the EEG signal is shown on the screen and various characteristics are calculated out of it. These include spectrum, rms amplitude, spectral edge frequency, median frequency, burst-suppression ratio and percentage of total power in four different bands: theta (1...4 Hz), delta (5...9 Hz), alpha (9...13 Hz) and beta (>13 Hz).

2.1.2 FEMG

FEMG is electrical signal originating from facial muscles. In the headbox the signal of channel 1 is divided to two different amplification and filtering paths. One is the EEG path and the other is the FEMG path. FEMG signal has much broader spectrum than EEG and it overlaps with EEG at low frequencies. Because of this the rms amplitude of FEMG signal is calculated from band 60...300 Hz. Mains power frequency and its harmonics are digitally filtered away to reject interference noise from power lines.

2.1.3 AEP

AEP is an electrical response of the nervous system to external auditory stimulus. It is measured using same electrodes as in EEG measurement, but the sampling frequency and bandwidth are different. The electrical signal resulting from one stimulus is weaker than the spontaneous activity

of the brain. To overcome this the stimulus is repeated several times (100...2000), and average of all responses is calculated. Responses containing big artefacts are removed from the average to improve the signal to noise ratio.

2.1.4 Impedance measurement

The impedance measurement is done from one channel at a time and the EEG or EP measurement is stopped during the impedance measurement.

Differences in electrode impedance of the electrodes causes common mode noise coupling to measured signal. To minimise this the electrode impedance is measured and a warning of unsatisfactory impedance level is generated when necessary. The impedance of an electrode is measured by applying a known current through the electrode and measuring the voltage drop over the electrode. This way the impedance of a single electrode can be resolved instead of a sum impedance of an electrode pair.

2.2 Main components

2.2.1 Neuro board

The Neuro board consists of the following functional sections:

- audio stimulator
- microprocessor for stimulation and measurement control, and for counting the measurement results
- two serial communication drivers

The serial bus speed to monitor is 500 kbps and the bus itself is half duplex, i.e. data can be transferred to both directions but only one way at a time.

The serial bus speed to the headbox is 500 kbps and the bus is full duplex i.e. data can be transferred to both directions at the same time.

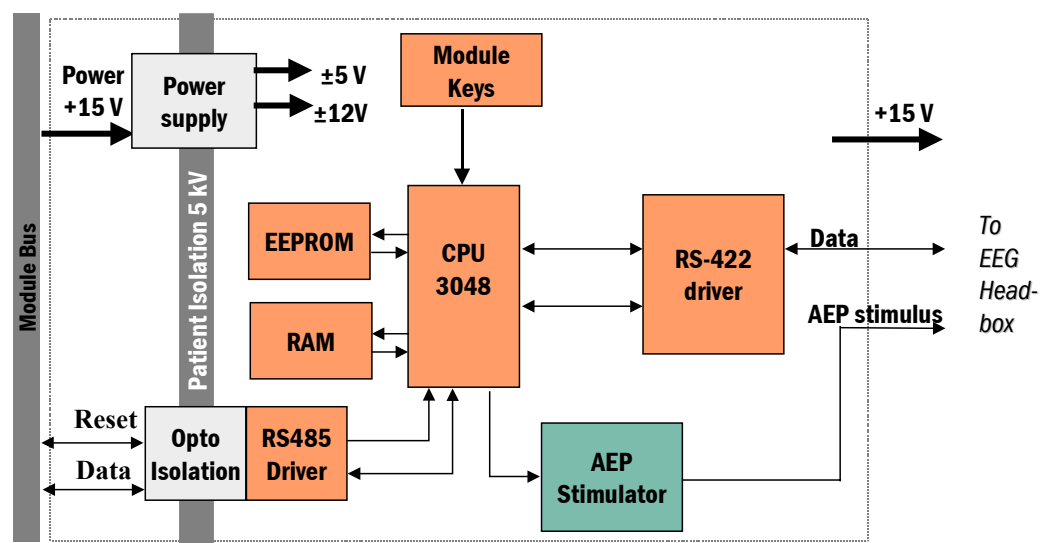


Figure 2 Neuro board block diagram

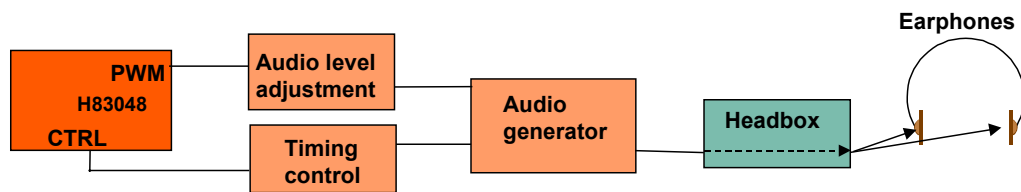


Figure 3 Audio stimulator circuitry

2.2.2 Headbox board

The Headbox board consists of the following functional sections:

- input protection
- EEG amplifiers and filters
- FEMG amplifier and filter
- current feeding circuitry and amplifiers for impedance measurement
- microprocessor
- serial communication

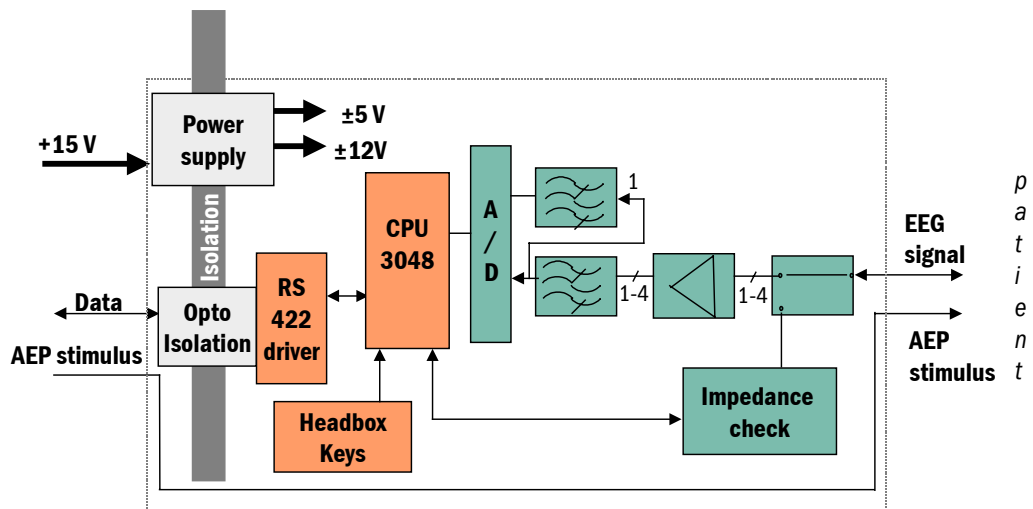


Figure 4 EEG headbox board block diagram

2.3 Connectors and signals

2.3.1 Module bus connector

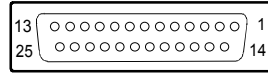
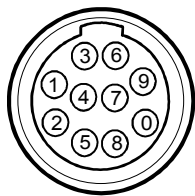


Table 1 **Module bus connector (X1) pin description**

Pin No.	I/O	Signal
1	I	RESET_RS485
2	I	-15 VDC
3	I	+15 VDIRTY
4	I	+15 VDC
5	I/O	-DATA_RS485
6	I/O	DATA_RS485
7	-	Ground & Shield
8	I	-RESET_RS485
9	I	CTSB
10	O	RTSB
11	I	RXDB
12	O	TXDB
13	-	Ground & Shield
14	I	+32 VDIRTY
15	I	GroundDIRTY
16	I	CTSC
17	O	RTSC
18	I	RXDC
19	O	TXDC
20	-	ON/STANDBY
21	-	PWM_ECG
22	-	RXDD_RS232
23	-	TXDD_RS232
24	I	+5 VDC
25	I	+5 VDC

2.3.2 Module front panel connectors

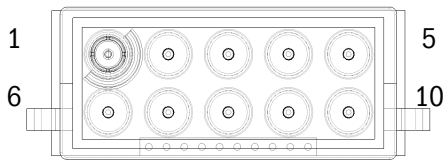
Table 2 Headbox connector



Pin No.	Signal
1	Ground
2	Ground
3	+15 V
4	TXD+
5	EP Audio
6	Power sync 43 kHz
7	RXD+
8	EP Sync
9	RXD-
0	TXD-

2.3.3 Headbox input connector

Table 3 Headbox input connector



Pin No.	Signal
1	Lead set id
2	1+
3	2+
4	3+
5	4+
6	Ground
7	1- / Ref
8	2-
9	3-
10	4-

3 SERVICE PROCEDURES

3.1 General service information

Field service of the M-EEG and N-EEG is limited to replacing faulty circuit boards or mechanical parts. Faulty circuit boards should be returned to Datex-Ohmeda for repair.

Datex-Ohmeda is always available for service advice. Please provide the unit serial number, full type designation, and a detailed description of the fault.

The Datex-Ohmeda EEG Simulator (order No. 90502) is recommended for functional checks.


CAUTION Only trained personnel with appropriate equipment should perform the tests and repairs outlined in this section. Unauthorized service may void warranty of the unit.

3.2 Service check

These instructions include complete procedures for a service check. The service check is recommended to be performed after any service repair. However, the service check procedures can also be used for determining possible failures.

The procedures should be performed in ascending order.

The instructions include a check form, [Appendix A](#), which should be filled in when performing the procedures.

The mark  in the instructions means that the check form should be signed after performing the procedure.

The procedures are designed for monitors with S/5 monitor software of revision 01. However, most of the procedures also apply to monitors, which contain some other monitor software type/revision.

3.2.1 Recommended tools

Tool	Order No.	Notes
EEG simulator	90502	
Screwdriver		
Earphones		

- Detach the module box by removing the two screws from the back of the module. Be careful with the loose latch and spring pin for locking.
- Detach also the cover of the EEG headbox by removing the four screws from the bottom of the box. Be careful with the two wired connectors in the circuit board attached to the cover.

1. Check internal parts of the module and the headbox:
 - screws are tightened properly
 - cables are connected properly
 - the EMC cover is attached properly in the module
 - there are no loose objects inside the module or the headbox



2. Check external parts of the module:
 - the front cover and the front panel sticker are intact
 - connectors are intact and are attached properly
 - the module box, latch and spring pin for locking are intact



3. Check external parts of the headbox
 - cover and the base of the headbox are intact
 - the headbox sticker is intact
 - connectors are intact and attached properly



- Reattach the module box and the cover of the EEG headbox.
- Turn the monitor on and wait until the normal monitoring screen appears.
- Configure the monitor screen so that information regarding the EEG measurement is shown:

Monitor Setup - Screen 1 Setup - Waveform Fields - Field 1 - EEG1

Monitor Setup - Screen 1 Setup - Waveform Fields - Field 2 - EEG2

Monitor Setup - Screen 1 Setup - Waveform Fields - Field 3 - EEG3

Monitor Setup - Screen 1 Setup - Waveform Fields - Field 4 - EEG4

Others - EEG - Montage - EEG Channels - 4

Others - EEG - Montage - Montage type - Bip

Others - EEG - EEG Setup - Numeric 1 - MF

Others - EEG - EEG Setup - Numeric 2 - Ampl.

4. Plug in the module. Check that it goes in smoothly and locks up properly



5. Check that the module is recognized, i.e. the EEG header with related information appears in the chosen waveform fields and 'Headbox off' message is shown on the four fields.



6. Connect the headbox to the module. Check that the headbox is recognized i.e. message 'EEG measurement off' is shown on the four waveform fields. If the EEG leads are connected 'EEG measurement off' message disappears after 15 seconds.



7. Enter the service menu:

Monitor Setup - Install/Service (password 16-4-34) - **Service** (password 26-23-8)

Record the information regarding the software of M-EEG and N-EEG by selecting SCROLL VERS and turning the ComWheel.



8. Enter the EEG module service menu:

Parameters - More... - EEG & EP

Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values in the module view are not increasing faster than by 50 per second. Check that the memories of the module have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all state OK.



9. Check that the 'HB Mod Timeouts', 'HB Mod Bad Checksum' and 'Mod HB Bad Checksum' values are not increasing faster than by 50 per second. Check that the memory of the headbox has passed the internal memory test, i.e. 'HB Rom Error' in the headbox view states 0.



10. Check the **EP Start/Stop** and **Imp. Check** membrane keys both of the module and the headbox. Go to module view and press each key for at least one second and check that the key being pressed is identified, i.e. the corresponding text is highlighted in the service menu. Repeat in headbox view with headbox keys.



11. Select 10 k Ω as impeded. pos. and impeded. neg. value on the simulator. Go to **EEG & EP** service menu and select **Check Electr.** From the headbox view check that the impedances in all four channels are 10 k $\Omega \pm 1$ k Ω .



12. Connect the EEG simulator to the headbox. Select 2 k Ω as impeded. pos. and impeded. neg. value on the simulator. Select 10 Hz 200 μ V sinewave on the simulator and check that all the four waveforms have same form. Check that the size of the waveforms is 200 μ V_{pp} ± 5 μ V. Check that the MF value is 10 ± 0.5 Hz. Check that the amp value is 71 μ V ± 3 μ V.



13. Select 75 Hz 50 μ V signal on the simulator. Check that the FEMG value is 16 ± 3 μ V.



- Preset the AEP measurement settings:

Others

EP - Cycle - Cont.

EP - AEP Setup - AEP Channels - 2

EP - AEP Setup - Responses - 100

EP - AEP Setup - Stim. Frequency - 1.1Hz

EP - AEP Setup - Stim. Intensity - 60 dB

EP - AEP Setup - Sweep length - 100 ms

14. Plug in the earphones to the headbox. Be careful with load stimulation from the earphones when starting AEP stimulation. Start AEP stimulation by pressing the **EP Start/Stop** button on the module. Check that the clicking sound comes from the earphones in 1.1 Hz frequency. Stop the stimulation by pressing again the **EP Start/Stop** button on the module. Check that the clicking stopped.



- Modify the AEP measurement settings:

Others

EP - AEP Setup - Stim. Frequency - 8.1Hz

EP - AEP Setup - Stim. Intensity - 90 dB

EP - EP Size - 1

15. Connect the AEP testing cable between the simulator and the headbox. Select 2 k Ω as impeded. pos. and impeded. neg. value on the simulator. Select 40 μ V amplitude in the EP waves menu on the simulator and start AEP measurement in the **Others - EP** menu. Wait until you get the response on the display. Check that the shape of the response is one period of a sine wave. Save EP and adjust the markers to minimum and maximum level of the response curve in both channels. Check that the amplitude is 40 μ V \pm 5 μ V.



16. Perform an electrical safety check and a leakage current test.



17. Check that the module functions normally after performing the electrical safety check.



18. Clean the module with suitable detergent.



- Fill in all necessary documents.

3.3 Disassembly and reassembly

3.3.1 M-EEG

Disassemble the M-EEG in the following way. See [Figure 7](#) [Exploded view of module box and EEG module](#)

1. Remove the two screws from the back of the module.
2. Pull the module box slowly rearward and detach it from main body. Be careful with the loose latch and spring locking pin.
3. Detach the Neuro board by removing the two screws located near the front panel frame, disconnect the cable and pull out the front panel frame.

To reassemble the module, reverse the order of the disassembly steps.

CAUTION When reassembling the module, make sure that the cables are reconnected properly.

3.3.2 N-EEG

Disassemble the N-EEG in the following way. See [Figure 8](#) [Exploded view of headbox.](#)

1. Remove the four screws from the bottom of the headbox.
2. Lift off the cover and disconnect the two cables connected to the EEG headbox board.
3. Disconnect the module-headbox cable and the headbox input unit connectors from the EEG headbox board.
4. Remove the four screws on the corners of the EEG headbox board and detach the EEG headbox board.

To reassemble the N-EEG, reverse the order of the disassembly steps.

CAUTION When reassembling the headbox, make sure that the cables are reconnected properly.

4 TROUBLESHOOTING

4.1 Troubleshooting chart

Trouble	Cause	Treatment
No EEG waveforms on screen.	EEG waveforms not selected on screen.	Press Monitor Setup key and select EEG waveforms on the screen.
No EEG waveforms on screen and 'EEG measurement off' message shown in the number field.	Electrodes not attached properly to skin or electrode cables not connected to headbox.	Check electrodes and electrode cables.
All EEG Waveforms not drawn on screen even if electrodes and cables are OK.	The number of channels chosen on montage setup is smaller than the number of channels connected to patient.	Check that the number of channels in menu Others -EEG - Montage is same as the number of channels connected to patient.
Number fields show '---' and message 'High EMG' is displayed.	Patient has high muscle activity in the head region or noise from some equipment is coupling to electrode cables.	Relax the patient or remove the noise source.
EEG signal looks noisy and artefact message is displayed in the number fields.	Electrodes are poorly connected or electrical interference is coupling to electrode cables.	Check the electrodes and electrode impedances. Remove noise sources if necessary.
Leads off message is shown on other channels than channel 1 in referential connection.	The montage chosen in monitor is not referential.	Change the montage to referential from monitor menu Others -EEG - Montage .
Electrode impedance measurement is not available on menus.	EEG measurement is off.	EEG measurement starts 15 seconds after first electrode pair is connected.
Electrode impedance measurement is not available on menus.	EP measurement is on.	Wait until EP measurement ends or stop EP measurement.
Electrode impedances show '---' and check ground electrode message is displayed on number fields after impedance measurement.	Ground electrode is poorly connected to patient or ground electrode cable is not connected to headbox.	Check the electrode and cable. If the electrode has too high impedance (>50k) the measurement fails even if the electrode is properly attached. Cure for this is to use better electrodes or prepare the skin better.
Electrode impedances show '---'	The electrode impedances are too high and out of measurement range.	Prepare the skin better or use better electrodes.
Start EP measurement not available on EP menu.	The EEG measurement is off.	Connect electrodes and wait 15 seconds and the measurement starts.
EP measurement parameters cannot be changed.	The EP measurement is on.	Stop EP measurement.
All or most of the EP epochs are rejected (Rej. counter on EP screen increases more rapidly than Ave. counter).	The signal has too much noise/artefacts in EP measurement band. Especially coupled 50/60 Hz is not shown on EEG waveform because of filtering, but may be present in EP signal.	Check that electrode impedances are below 5k and the impedances of the same channel are close to one another. If this does not help then try to remove noise sources.
EP wave is shown only on one channel even if two channels EP measurement is selected.	Leads are off in the channel where the EP wave is not shown.	Check the electrodes and electrode cables.
No clicks can be heard from earphones.	The earphones connector is not in place.	Check that the earphones plug is firmly pushed into the headbox's earphone connector.

4.2 Troubleshooting flowcharts

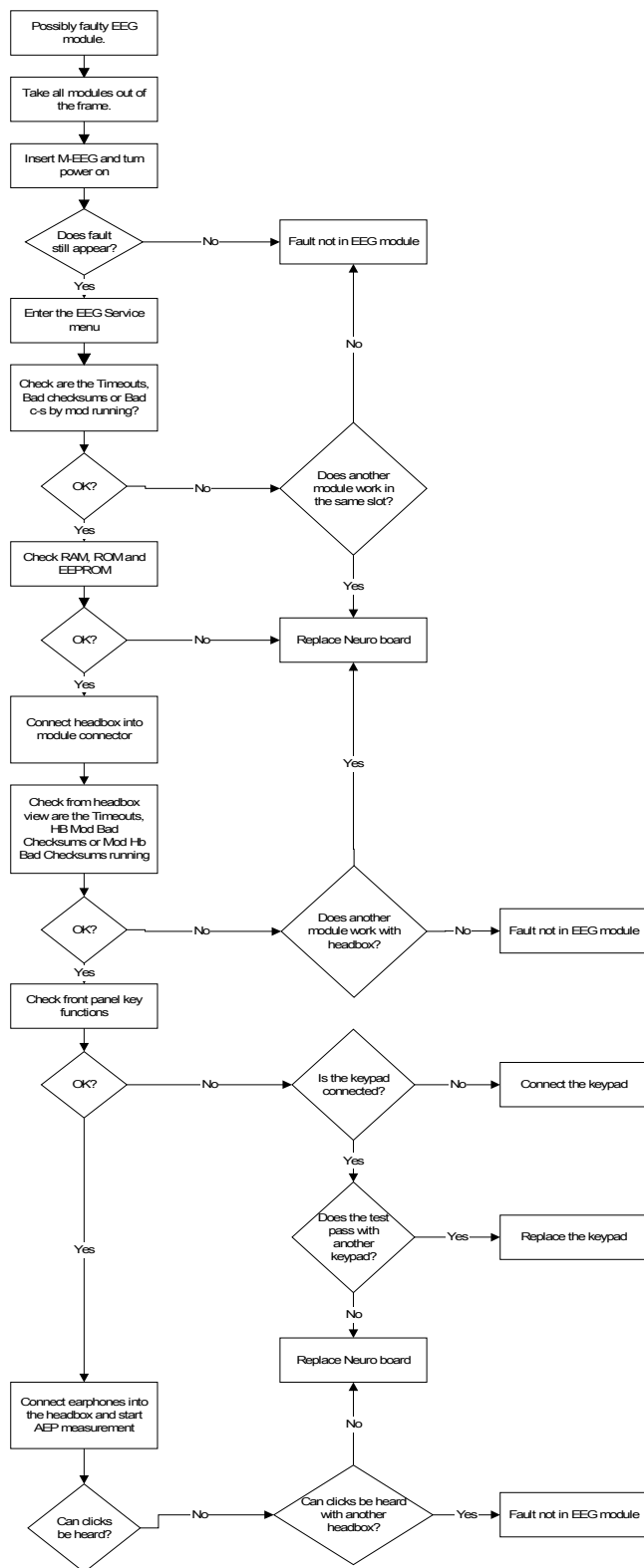


Figure 5 EEG module troubleshooting flowchart

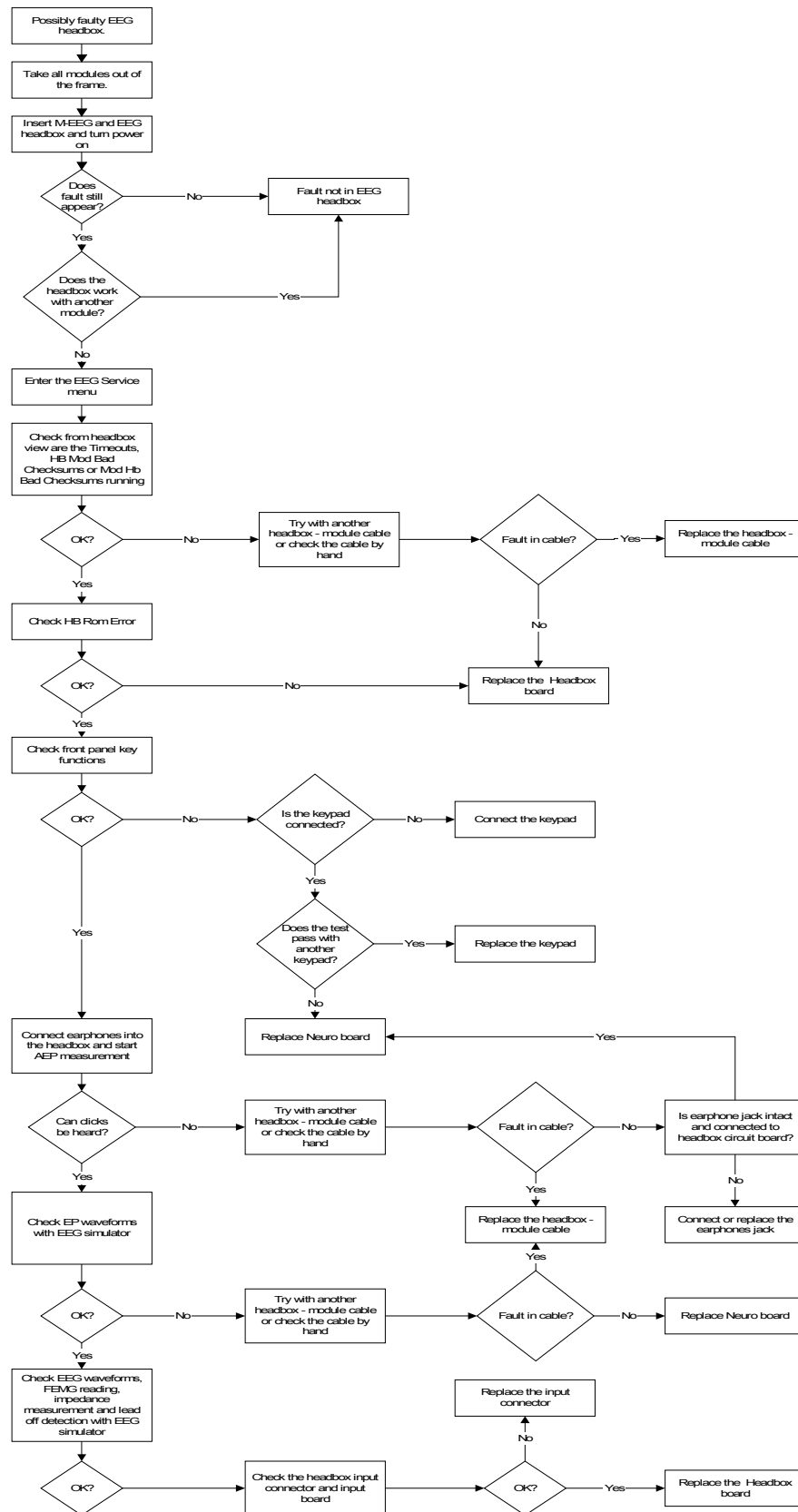
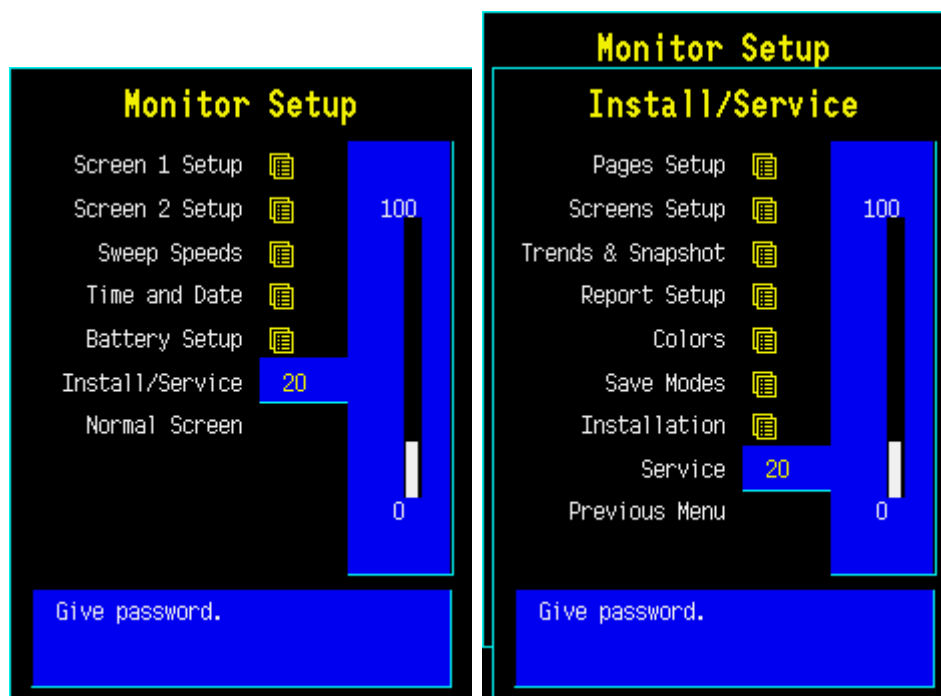


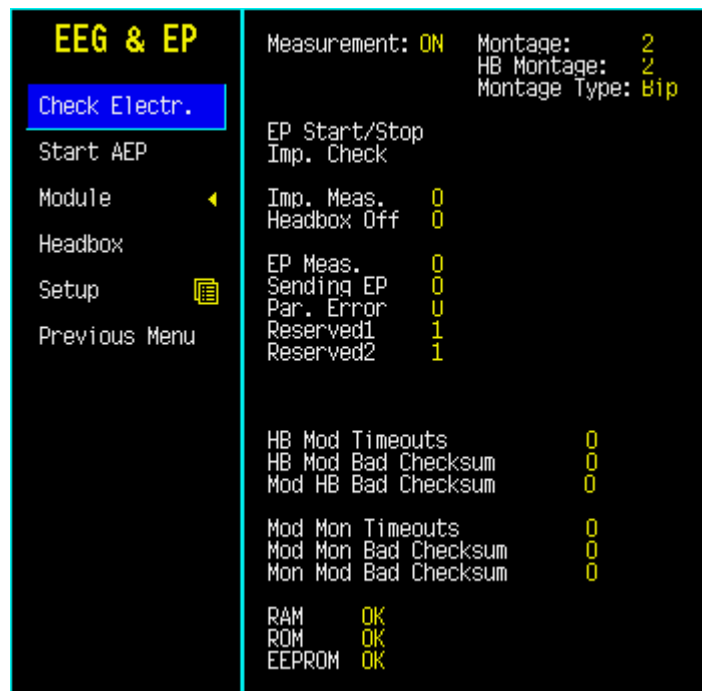
Figure 6 Headbox troubleshooting flowchart

5 SERVICE MENU



Press the **Monitor Setup** key - select **Install/Service** (password: 16-4-34) - select **Service** (password: 26-23-8) - select **Parameters - More... - EEG & EP**.

5.1 EEG & EP service menu



EEG & EP

Check Electr. Headbox measures impedance of electrodes. Works same way as from EEG menu or headbox/module button.

Start AEP AEP measurement is started with current AEP settings.

Module Service data is changed to module view (some of the data in this view is though from headbox).

Measurement shows whether the EEG measurement is ON or OFF. Measurement should start by itself when the leads have been on about 15 seconds.

Montage shows the active montage in monitor.

HB Montage shows the montage attached to headbox. 0 means no montage, 1 basic, 2 general, 3 AEP, 4 Mont4 etc. up to 8, which means Mont8.

Montage type shows whether the montage is bipolar or referenced.

EP Start/Stop is highlighted when the EP Start/Stop button is pressed in headbox or module.

Imp. Check is highlighted when the Imp. Check button is pressed in headbox or module.

Imp. Meas. shows 1 if the impedance measurement is on in the module.

Headbox Off shows 1 if the headbox cable is not connected to module.

EP Meas. shows 1 if the evoked potential measurement is active in module.

Sending EP shows 1 if the module has acquired 100/200 new epochs and is sending them to monitor.

Par. Error shows 1 if the evoked potential parameters active in module are conflicting with each other.

Reserved 1 is reserved for future use.

Reserved 2 is reserved for future use.

HB Mod Timeouts is a cumulative number that indicates how many times the headbox has not responded to module's inquiry.

HB Mod Bad Checksum is a cumulative number that indicates how many times there has been an error in the message from headbox to module.

Mod HB Bad Checksum is 1 if there has been errors in the messages from module to headbox.

Mod Mon Timeouts is a cumulative number that indicates how many times the module has not responded to monitor's inquiry.

Mod Mon Bad Checksum is a cumulative number that indicates how many times there has been an error in the message from module to monitor.

Mon Mod Bad Checksum is a cumulative number that indicates how many times there has been an error in the message from monitor to module.

RAM indicates the state of the RAM memory.

ROM indicates whether the checksum at the EPROM is accordance with the one the software has calculated.

EEPROM indicates if the values stored in permanent memory are valid.

The states in memory checks are **OK**, **Fail** or **?** (module not in place or a communication error).

Headbox

Service data is changed to headbox view.

EEG & EP		EP Start/Stop Imp. Check				
Check Electr.		1	2	3	4	
Start AEP		Active	1	1	1	1
Module		Lead off+	0	0	0	0
		Lead off-	0	0	0	0
Headbox	◀	Imped.+	1.8	1.9	1.9	1.9 kOhm
		Imped.-	2.2	2.2	2.2	2.2 kOhm
Setup	📄	BSR	2	2	2	2
Previous Menu		Artefact	0	0	0	0
		Noise	0	0	0	0
		EMG AD	534			
		Leadset AD	1016			
		Bipolar	1			
		60 Hz	0			
		Imp. Meas.	0			
		Imp. Check Failed	0			
		EP Meas.	0			
		High EP Sampl. Rate	U			
		EP Epoch Points	241			
		EP Channels	2			
		HB Rom Error	0			

EP Start/Stop is highlighted when the EP Start/Stop button is pressed in headbox or module.

Imp. Check is highlighted when the Imp. Check button is pressed in headbox or module.

Active shows 1 if the channel is active.

Lead off+ shows the lead off status of all plus electrodes. 0 means that the lead is on and 1 that the lead is off.

Lead off- shows the lead off status of all minus electrodes. 0 means that the lead is on and 1 that the lead is off.

Imped+ shows the impedance of plus electrodes of last impedance check in all channels.

Imped- shows the impedance of minus electrodes of last impedance check in all channels.

BSR shows the burst-suppression classification of EEG waveforms. 0 means artifact, 1 suppression, 2 burst and 3 invalid (the EEG is not classified).

Artefact shows the artefact status of all channels. 0 means that there are no artefacts on the signal and 1 means that there are artefacts.

Noise shows 1 if the activity of FEMG is too high for clean EEG signal and that EEG is not probably reliable.

EMG AD shows the latest AD conversion result of FEMG signal without any filtering or scaling.

Leadset AD shows the latest AD conversion result of lead set signal without any scaling.

Bipolar shows the montage type that is active in module and headbox. 1 means bipolar and 0 referenced.

60 Hz is 1 if the power frequency filter is set for 60 Hz power frequency.

Imp. Meas. shows 1 if the impedance measurement is on in the headbox.

Imp. Check Failed shows 1 if the impedance check has failed.

EP Meas. shows 1 if the evoked potential measurement is active in headbox.

High EP Sampl. Rate shows 1 if the headbox uses higher sampling rate for 10 ms EP measurement.

EP Epoch Points shows the number of samples collected for each epoch.

EP Channels shows the number of channels used in EP measurement.

Hb ROM Error is 1 if the checksum at the EPROM is not accordance with the one the software has calculated.

Setup



The items in setup menu are collection of items in normal EEG and EP menus. There are no special service settings in this menu.

Imp. Cycle Impedance measurement repetition time.

Select Montage Selection of headbox's electrode configuration.

EEG Channels	Number of active channels in EEG measurement.
Montage Type	Selection of bipolar (Bip)/referenced (Ref) montage.
Cycle	EP measurement repetition time.
Stim. Frequency	Ep measurement's stimulation frequency.
Stim. Intensity	Intensity of EP stimulus.

6 SPARE PARTS

6.1 Spare part list

NOTE: Accessories are listed in the *Patient monitor and supplies catalogue*.

6.1.1 M-EEG rev. 00

Item	Description	Order code	Item	Description	Order code
1	Module box (single width)	886167	5	Neuro board	898806
2	Latch	879181	6	Cross cylinder head screw, M3×12	628700
3	Spring pin	879182	9	EEG input board	896571
4	Cross recess screw M3×8 black	616215	10	Metal frame	879184
7	Front panel unit	896484	11	Cross cylinder head screw, M3×6	61721
8	Membrane keypad	880101	-	-	-

6.1.2 S/5 M-EEG rev. 01

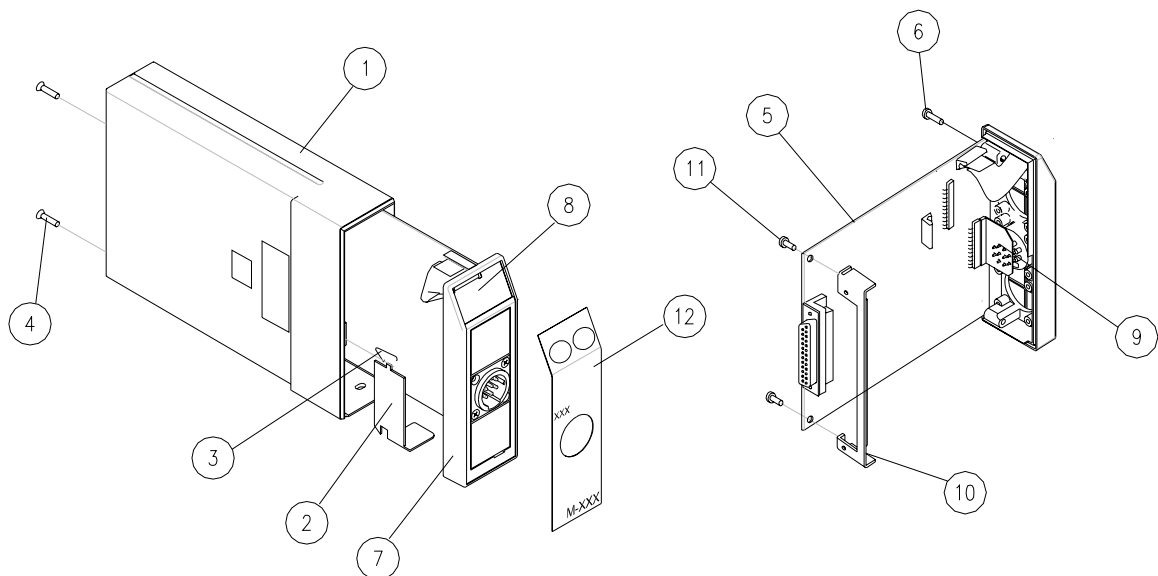


Figure 7 Exploded view of module box and EEG module

No new spare parts.

6.1.3 N-EEG rev. 00

Item	Description	Order code	Item	Description	Order code
1	Headbox board	898805	6	Membrane keypad	880101
2	Module-headbox cable	895610	7	Cover	896457
3	Headbox input unit	896558	8	Base	896557
4	AEP connector	896461	9	Cross cylinder head screw, M3x6	617210
5	EMC cover	898276	10	Screw, MRX-Z, M3x12 FZB DIN 8985	61736
-	Screw, to connect cable shield to EMC cover	61721	-	-	-
-	Nut, to connect cable shield to EMC cover	63116	-	-	-
-	Washer, to connect cable shield to EMC cover	63407	-	-	-

6.1.4 S/5 N-EEG rev. 01

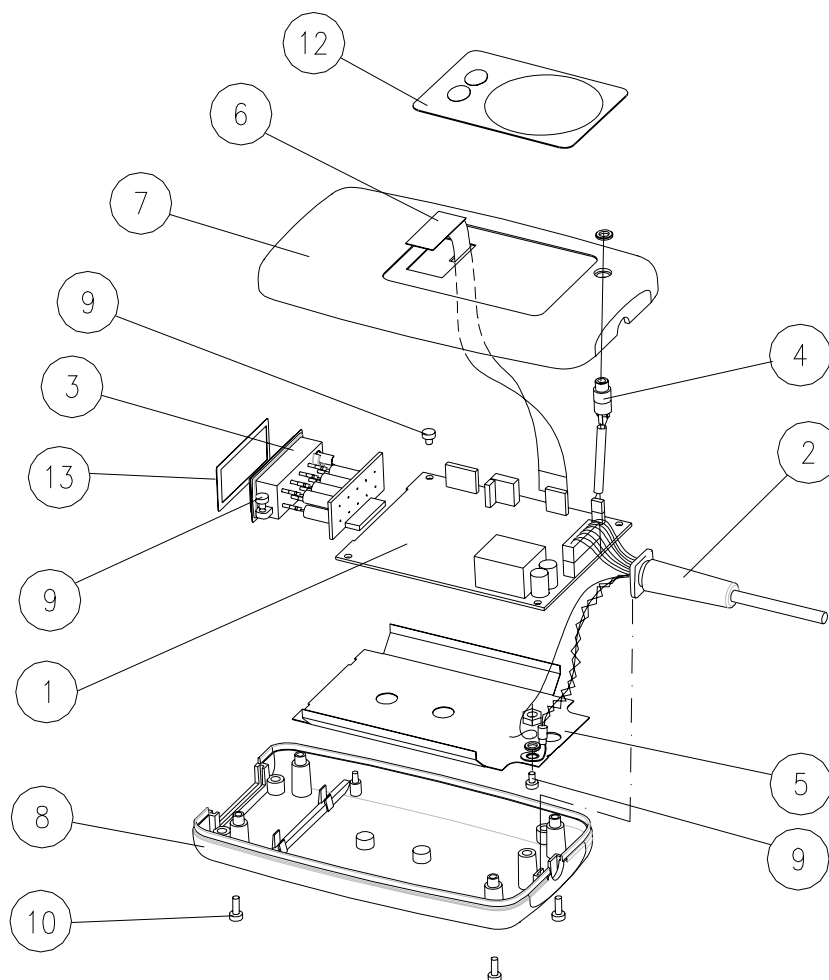


Figure 8 Exploded view of headbox

No new spare parts.

6.1.5 Front panel stickers

Adaptation	S/5 M-EEG (Rev. 01)	S/5 N-EEG (Rev. 01)	Electrode sticker
DA	898693	898708	898207
DE	898684	898699	897858
EN	898683	898698	897858
ES	898687	898702	898203
FI	898690	898705	897858
FR	898685	898700	898201
IT	898688	898703	898204
JA	8000381	8000382	8000393
NO	898692	898707	898208
NL	898686	898701	898202
PT	898689	898704	898205
SV	898691	898706	898206

7 EARLIER REVISIONS

Revision	Manual slot/main manual	Note
M-EEG rev. 00 and N-EEG rev. 00	896622-1/896624	

APPENDIX A

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SERVICE CHECK FORM

EEG Module, M-EEG and EEG Headbox, N-EEG

Customer			
Service	Module type	S/N	
Service engineer		Date	



OK = Test OK



N.A. = Test not applicable



Fail = Test Failed

	OK	N.A.	Fail		OK	N.A.	Fail
1. Internal parts	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	2. External parts of module	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>
3. External parts of headbox	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	4. Installation	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>
5. Recognition of module	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	6. Recognition of headbox	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>
7. Module software	M-EEG						
	N-EEG						
8. Communication and memories of module	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	9. Communication and memories of headbox	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>
10. Membrane keys	<input style="width: 30px; height: 20px; border: 1px solid green;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>	<input style="width: 30px; height: 20px; border: 1px solid red;" type="checkbox"/>				
11. Impedances				+	-		
Channel 1						9...11 kΩ	
Channel 2						9...11 kΩ	
Channel 3						9...11 kΩ	
Channel 4						9...11 kΩ	
12. Checks with simulator						Allowed range	
Waveforms						195...205 μV _{pp}	
MF						9.5...10.5 Hz	
Amp value						68...74 μV	
13. FEMG value							
FEMG						13...19 μV	

	OK	N.A.	Fail		OK	N.A.	Fail
14. AEP stimulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
15. AEP response							
Channel 1					35...45 μ V		
Channel 2					35...45 μ V		
16. Electrical safety check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17. Functioning after electrical safety check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Final cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Notes	
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Used Spare Parts	
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Signature	
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