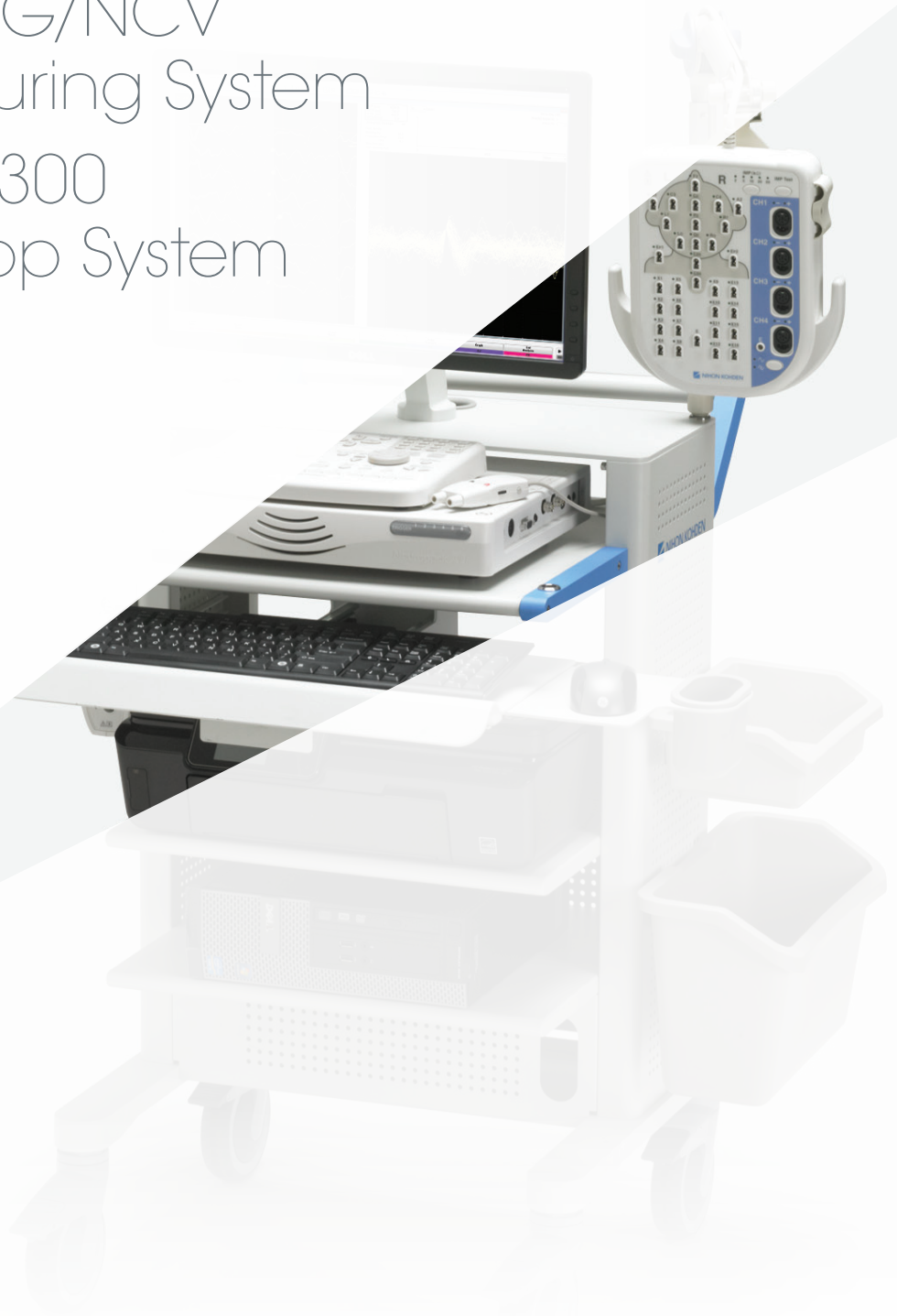


Neuropack X1

EP/EMG/NCV
Measuring System

MEB-2300
Desktop System



For more than 60 years, healthcare providers worldwide have relied on the quality and reliability of the Nihon Kohden line of comprehensive and innovative neuro-diagnostic and -monitoring instrumentation to aid in the diagnosis, information and treatment of their patients.

The MEB-2300 is the latest and most advanced EP/EMG system in the Nihon Kohden product portfolio. Available with either a six or twelve channel amplifier and up to two electrical stimulators, the MEB is designed with numerous time-saving features to maximize the user's workflow without compromising the integrity of data acquisition. Basic exam software including EMG, NCS, SEP, ABR and VEP protocols come standard with the MEB-2300.

The new examination list creates a seamless integration of protocols, patients and reports, increasing productivity and reducing test time.



Optional Software Packages:

- QP-219: Review Station Software
- QP-258: Trending Software
- QP-259: Autonomic Nervous System Testing (Microneurogram, R-R Interval, Sympathetic Skin Response)
- QP-260: Event Related Potential (P300, MRCP, CNV)

Mobile Control Panel



Operation Panel PV-230

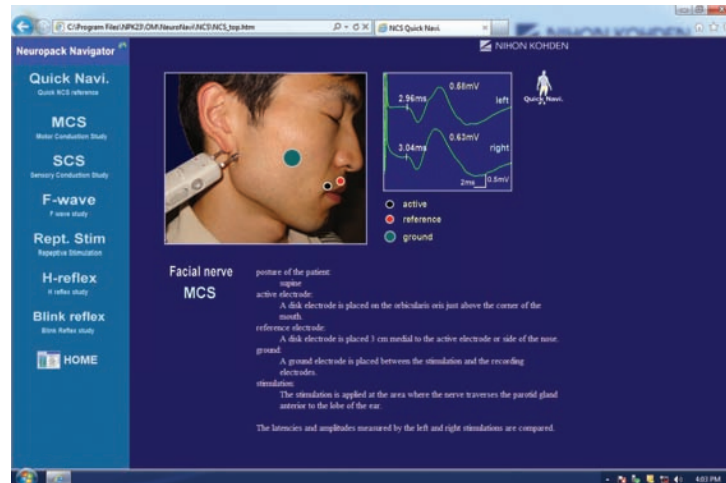
The mobile function keypad enables the user to complete an entire exam without the use of a keyboard or mouse. This simple control panel contains the main operation buttons seen in previous models, "monitor-stimulate-analysis-stop and store," with added key features such as function keys, a number pad and NeuroWorkbench® controls.

Low Noise Amplifier



Six Channel JB-206

The MEB-2300 uses a low noise amplifier with active electrodes to provide clean waveforms easily and quickly. An integrated impedance check can be activated with the touch of a button from the amplifier to ensure properly placed and seated electrodes.



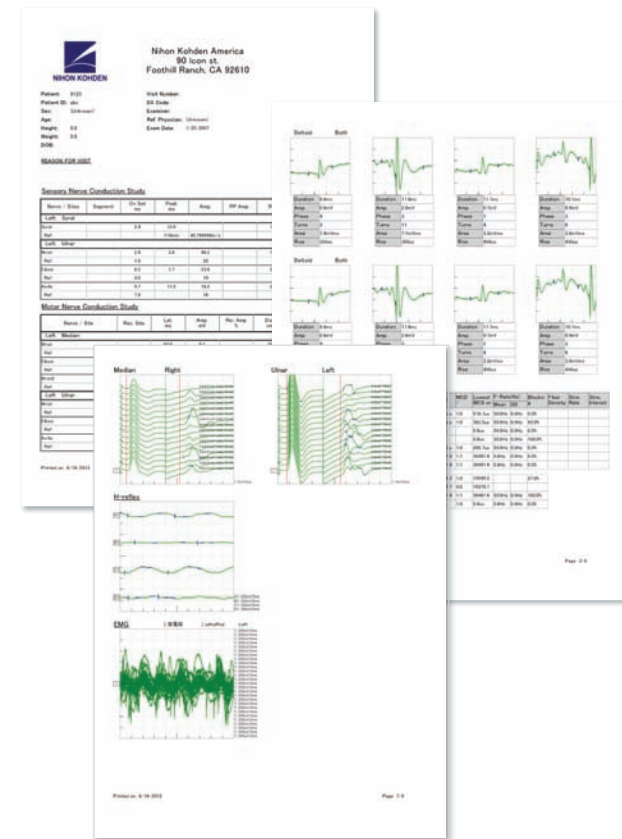
NeuroNavi

NeuroNavi™ shows examination information and electrode and stimulation positions for NCS and other exams. This guide can be referenced on the screen at any time.

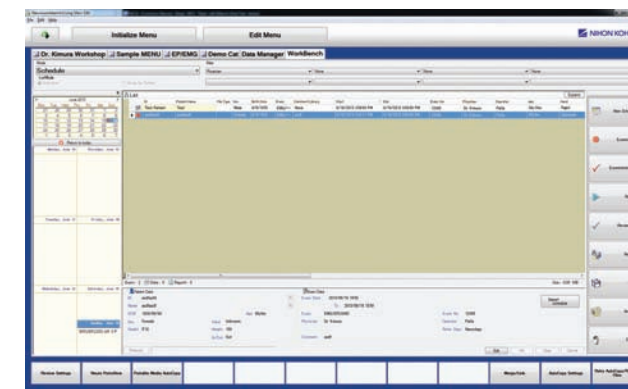
NeuroReport

A customized report can be generated with the click of a button using our proprietary NeuroReport™ software.

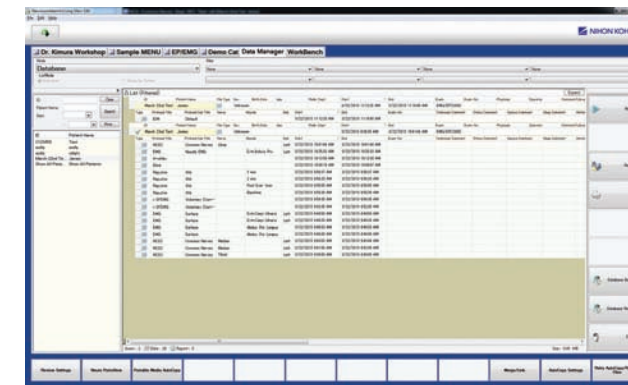
Included in NeuroReport are several selectable layouts which can display your facility's logo, test results with highlighted abnormalities, waveforms and a powerful auto-text summary. Saved within the database, the report can automatically be signed electronically and converted to a PDF, protecting the electronic record while keeping it universally viewable.



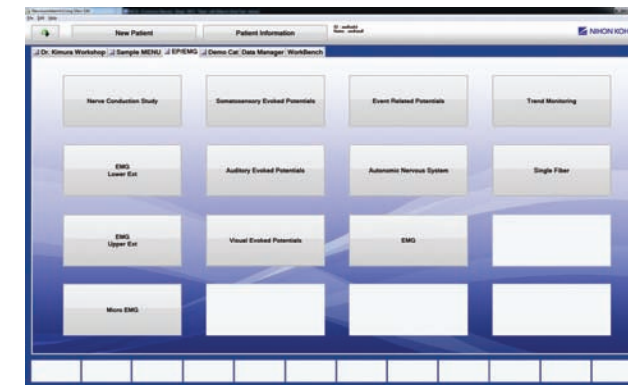
Flexible Software Innovation



NeuroWorkbench – Scheduler



NeuroWorkbench – Patient List



NeuroWorkbench – Protocol Tab

Workflow Solutions

NeuroWorkbench is the core integrator of the Nihon Kohden neurology product portfolio. This common interface allows for examination scheduling, protocol administration and data management that improve workflow. NeuroWorkbench provides HIPAA Compliant access to clinical data and records with passwords and three levels of administrative rights, as well as audit trails. A flexible NeuroWorkbench option includes an HL7 interface. The NeuroWorkbench SQL Database integrates all of the Nihon Kohden neurology devices to provide a complete database across all neuro- diagnostic and -monitoring modalities.

Menu Window for an MEB Examination

Open an MEB examination screen using the examination protocol menu.

Menu Tabs

Up to eight category tabs with 10 programs per tab for a total of 80 preset examination programs.

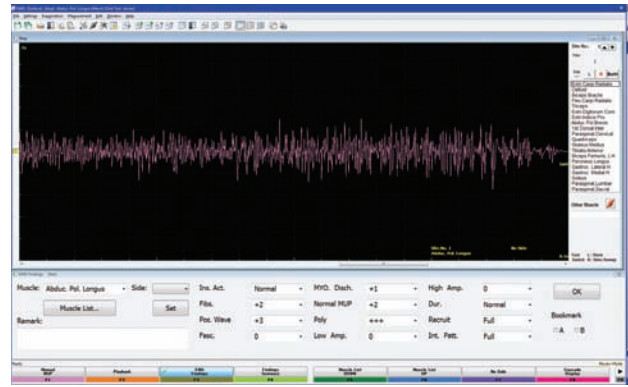
Data Manager Tab

- Database files
- Copy, move and delete file
- Patient database with search and query function

Workbench Tab

- Scheduler
- Remote access
- Review patient files

Standard Examination Programs



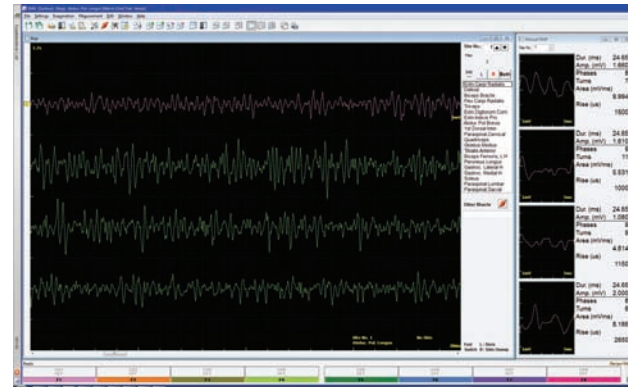
Routine EMG Program

The routine EMG program utilizes auto MUP detection and classification, and real time turns/amp analysis. A functional and sophisticated findings screen meets various needs in clinical use by easy and smooth operation.

Interference

Turns/amp measurement is automatically performed. The measurement result is displayed at every one second on the turns-interval histogram, turns/amp histogram and turns/amp graph.

The turns/amp normative data of several muscles are installed as default settings and its normative area is displayed in the turns/amp histogram. You can easily recognize whether or not the measuring waveforms are in the normative range.



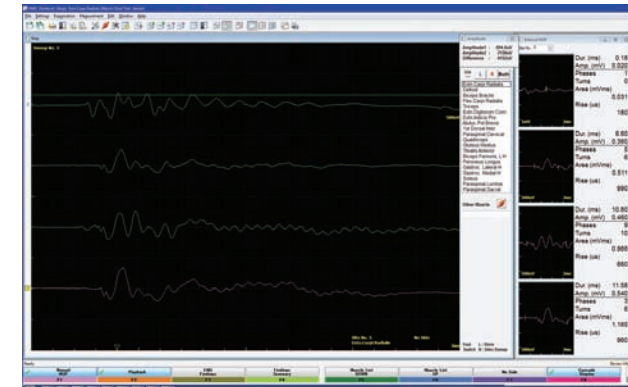
Quick Display

You can easily switch between four measurement modes that you can define freely—for example for insertion activity, motor unit detection or turn/amplitude analysis or interference—by pressing a button at the bottom of the screen or on the control panel.

MUP Analysis

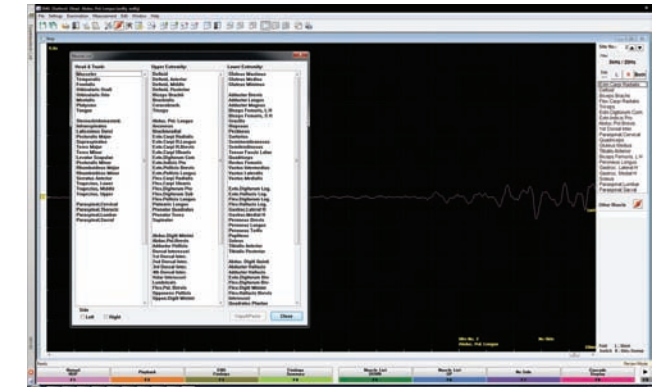
MUP waveforms are automatically detected and classified into groups of similar shaped MUPs. MUP measurement result (duration, amplitude, phase, turns and firing rate) are shown next to the waveforms or in a dedicated summary screen.

The averaged MUP of the same MUP groups are calculated and displayed with the numeric data.



Trigger EMG

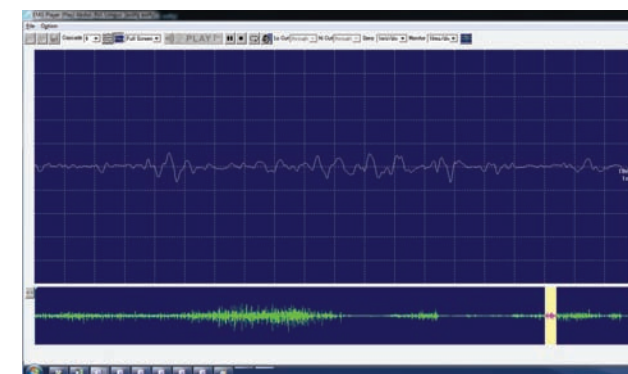
A cascading waveform window displays the waveforms which are triggered by either level trigger, window trigger or rise time trigger in chronological order. You can change the beginning and end point of the duration. Up to eight new sequential MUP waveforms are displayed on the MUP sweep window without scrolling.



Muscle Summary

Measurement results and saved waveforms can be displayed in the muscle summary window.

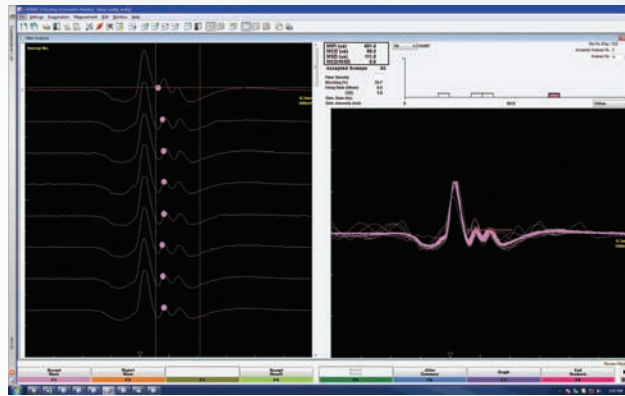
The summary window is the best place to start typing the EMG findings—next to the results of the examination. The latest EMG findings screen shows up to 26 traces of waveforms with annotations in the Monitor Waves window and up to 20 MUP waveforms in the MUP window on one screen for efficient and quick EMG findings.



EMG Playback/EMG Player

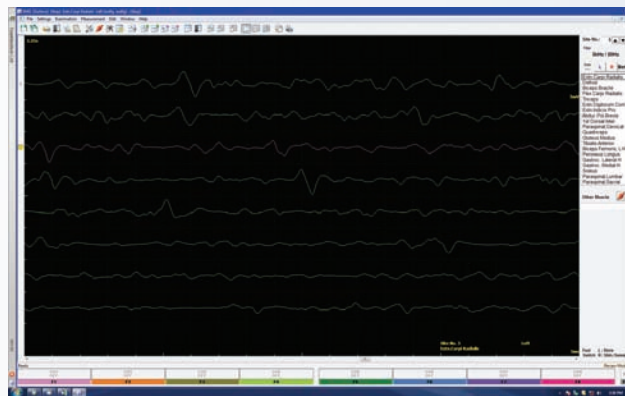
You can also easily review any acquired waveform with sound after measurement by clicking the EMG player button. This tool lets you play back EMG files with sound on a review station for presentations and lectures.

- Display up to 600 sec of EMG with sound
- Sweep speed, sensitivity, and filter settings can be changed afterwards; a great function for teaching purposes
- Compressed/cascaded waveform display



Single Fiber Jitter Analysis

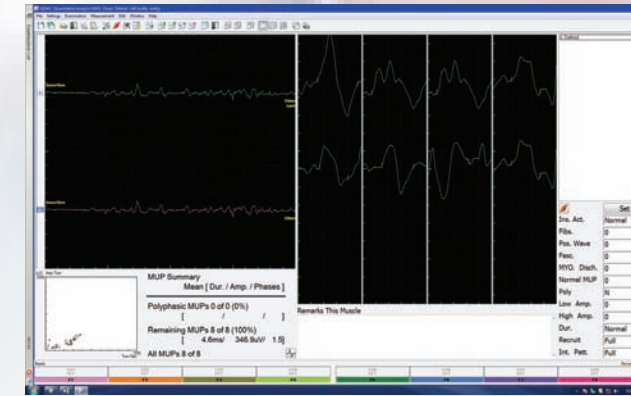
Perform jitter reanalysis at different trigger levels for all acquired waveforms. MCD, MSD, MIPI, firing rate and blocking can be automatically analyzed. Two single fiber modes are available: voluntary contraction and stimulated.



Eight Channels of Macro EMG

Simultaneous eight channel macro EMG recording is possible. Acquired waveforms can be reanalyzed. Triggered waveforms and averaging result can be simultaneously displayed.

Quantitative EMG



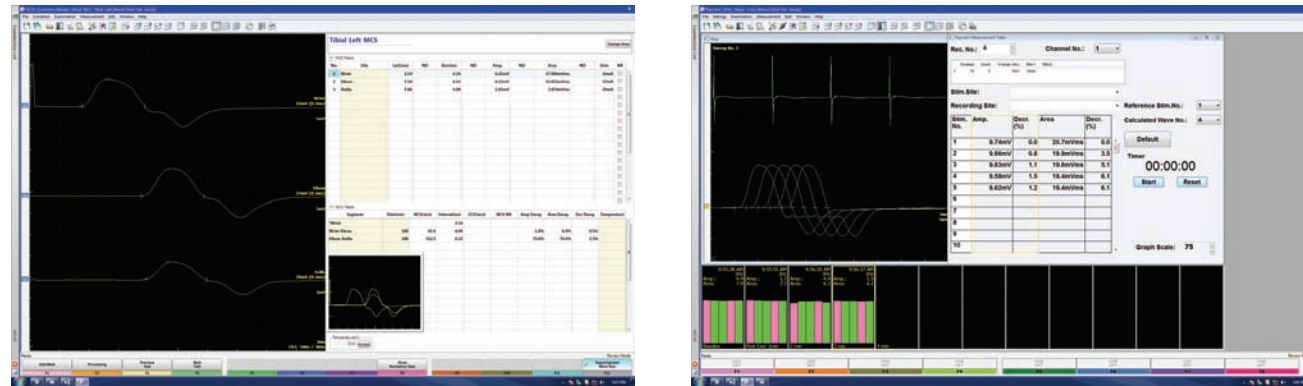
Real time MUP analysis

With the template matching method, MUP are automatically classified into several patterns and the amplitude, phase, turns, area, rise time and firing rate are quantitatively analyzed in real time. There are two methods of analysis: triggered and continuous. The analysis results can be statistically processed.

Real time interference pattern analysis

Interference patterns can be analyzed in two ways: turns/amp analysis and power spectrum analysis with FFT.

Nerve Conduction Study



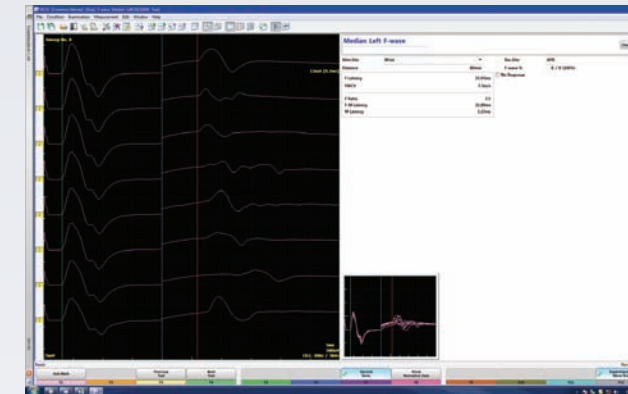
The NCS program lets you perform MCS, SCS and F-Wave in one program. Any number and combination of examinations can be created in your own custom routine protocol by selecting nerve, side and exam. You can change the examination by just clicking the item in the list box, or by clicking a button on the dedicated operation panel of the Neuropack.

Motor NCS/Sensory

- When measuring with the MEB there is no need to manually pick the stimulation site before starting the recording. The software does this automatically for you and, if necessary, it can be easily changed.
- Side comparisons and combined motor and sensory tests can be shown in one waveform screen and also have their own dedicated evaluation tables.
- Normative data are shown on the same screen.
- The superimposed waveform in real time is shown at the same time, so you can easily compare the amplitudes of all stimulation sites and thus judge the quality of your stimulation.

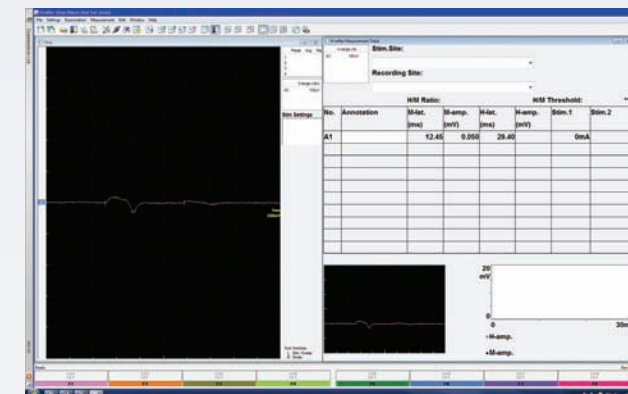
Repetitive Stim

- The amplitude of each sequence is displayed as a bar graph on the same screen. You can see the summary of the repetitive stimulation study at a glance. The waveform of each sequence can be displayed by clicking the corresponding bar graph.
- Up to 12 sequences of stimulation patterns can be set for one automatic measurement (automatic sequence function).
- Stimulation can be done with either high or low frequency or combined in the same protocol.



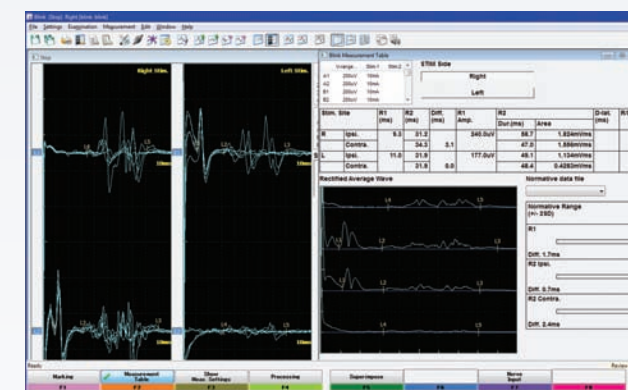
F-Wave

With the dual sensitivity function, both M- and F-wave are displayed with a proper amplification. F-Wave latency is displayed in the F-Wave histogram window.



H-Reflex

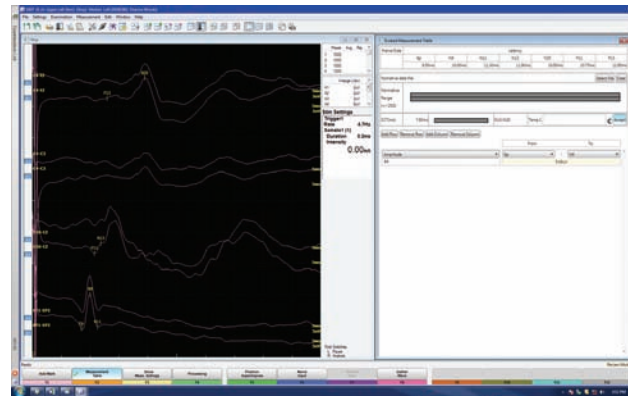
The intensity-amplitude graph and superimposed waveforms are displayed on the same window.



Blink-Reflex

The relation between the mark position and the normative range is easy to see on the blink measurement table window.

Evoked Potentials



Standard SEP examination protocols are:

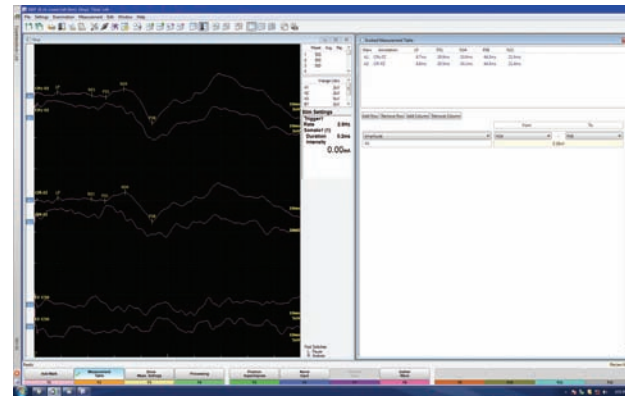
- SEP (somatosensory evoked potential)
- SSEP (short-latency SEP)
- ECG-SSEP (ECG-triggered SSEP)
- ESCP (evoked spinal cord potential)

ECG artifact-free SSEP

With ECG-SSEP protocol, stimulation and averaging is done during the flat period of the ECG waveform so artifact-free waveforms can be recorded.

Signal triggering and back averaging

Cortical potentials prior to muscle contraction can be recorded by using a rectified EMG signal trigger and back averaging.

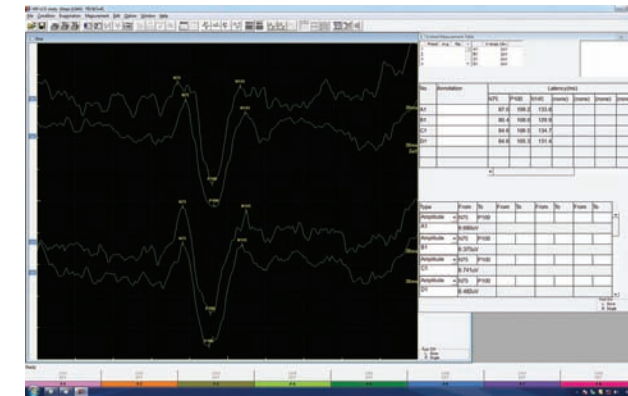


Simultaneous SSEP and SEP measurement

Upper and lower extremity measurements can be conducted at the same time on the same screen.

Side comparison

Split screen display allows for side comparisons at a glance.



Standard VEP examination protocols are:

- Pattern-VEP
- Goggle-VEP
- Flash-VEP
- ERG (electroretinogram)
- EOG (electrooculogram)

Flexible pattern stimulations

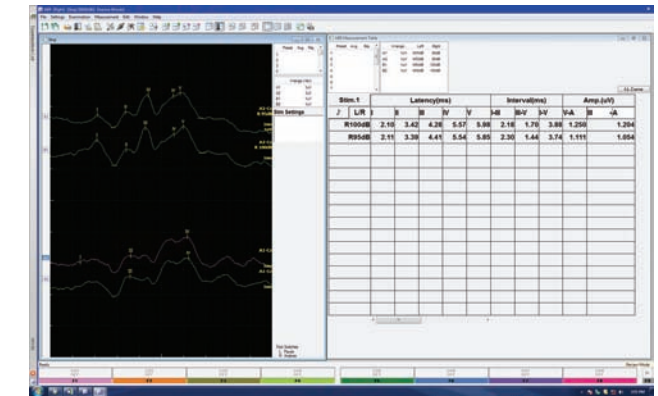
VEP protocol requires a VEP monitor. Pattern reversal stimulation can be selected from full, half, and quarter visual field. 4 to 128 horizontal divisions can be selected for patterns.

Variety of visual stimulations

A monitor for pattern reversal, LED goggles and flash stimulator options allow complete visual testing.

EOG velocity waveform display

With the integrated differential amplifier, the velocity waveform can be simultaneously displayed with the original EOG signal.



Standard AEP examination protocols are:

- ABR (auditory brainstem response)
- MLR (middle latency response)
- SVR (slow vertex response)
- EcochG (electrocochleogram)

Three types of auditory stimulation

Click, tone burst, and tone pip stimulation are available.

ABR auto marking

In the ABR protocol, automatic waveform marking allows time-saving measurement of latency, amplitude, and interval.

Automatic separation of AP and CM waveforms

In EcochG examination, AP and CM can be automatically separated from the original waveforms in real time. The original, AP and CM waveforms are simultaneously displayed on the screen.

Simultaneous ABR and MLR

ABR and MLR can be measured simultaneously on the same screen.

Specifications

Amplifier

Number of channels: JB-206B: 6, JB-212: 12

Input impedance: 200 M Ω \pm 20% (differential mode), 200 M Ω \pm 20% (when the active electrode cable is used, differential mode), \geq 1000 M Ω (common mode)

Noise: < 0.6 μ Vrms at 1 Hz to 10 kHz, < 1.1 μ Vrms at 1 Hz to 10 kHz (when the active electrode cable is used)

Common mode rejection ratio: \geq 106 dB (balanced mode), \geq 90 dB (balanced mode, when the active electrode cable is used), \geq 112 dB (isolation mode)

Sensitivity: 1, 2, 5, 10, 20, 50, 100, 200, 500 μ V/div, 1, 2, 5, 10 mV/div \pm 5%

Low-cut filter: 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 30, 50, 100, 200, 500 Hz, 1, 2, 3 kHz (\pm 20%)

High-cut filter

Channel 1 and 2: 10, 20, 50, 100, 200, 500 Hz, 1, 1.5, 2, 3, 5, 10, 20 kHz (\pm 20%)

Channel 3 to 5: Upper limit 10 kHz at -12 dB/oct (\pm 20%)

Channel 6 to 10: Upper limit 5 kHz at -12 dB/oct (\pm 20%)

Channel 11 and 12: Upper limit 3 kHz at -12 dB/oct (\pm 20%)

AC interference notch filter: 50 or 60 Hz (rejection ratio: < 1/20)

Reset: Available

Rectification: Off, half, full

Electrode impedance check: 2, 5, 10, 20, 50 k Ω indication

Amplitude calibration: 1, 10, 100 μ V, 1, 10 mV (within \pm 5%)

Acquisition

A/D converter: 18 bits

Time base modes: Individually selected for each channel (up to 12 channels)

Monitor time base: 5, 10, 20, 30, 50 ms/div, 0.1, 0.2, 0.5, 1 s/div (within \pm 5%)

Data points: 2048/20 div

Conversion speed: 5 μ s/1 ch, 10 μ s/2 ch, 20 μ s/3 and 4 ch, 50 μ s/5 to 10 ch, 100 μ s/11 and 12 ch

Analysis time base: 0.1, 0.2, 0.5, 1, 2, 3, 5, 10, 20, 30, 50 ms/div, 0.1, 0.2, 0.5, 1 s/div (within \pm 5%) or 0.1 to 0.9 ms in 0.1 ms steps (within \pm 5%)

1 to 99 ms in 1.0 ms steps (within \pm 5%)
100 to 1000 ms in 0.01 s steps (within \pm 5%)

Delay time: -10 to 10 div in 1 div steps or 0 to 500 ms in 0.1 ms steps

Number of averages: 1 to 9999

Artifact reject inhibit range: \pm 1 to \pm 5 div in 0.1 div steps, Off

Waveform storage capacity: Depends on the hard disk free space of the PC unit

Display

Number of examination windows: Up to 12

Waveform display mode: Monitor (free run), sweep (trigger), average

Cursor: Two vertical or horizontal lines for time or amplitude measurements, one vertical line for mark set

Scale: 5, 10, 15, 20 div

Grid: Line, dot, off
stimulator common functions

Triggers

Number of channels: 6

Trigger mode: Recurrent, random, foot switch, single stimulation, signal 1 to 5, somato 1, somato 3, external 1 to 6

Trigger wave mode: Single, double, train

Stimulation rate

With the list box: 0.1 to 0.9 Hz in 0.1 Hz steps, 1 to 10 in 1 Hz step, 13, 15, 17 Hz, 20 to 100 Hz in

10 Hz steps (within \pm 5% of the preset value \times 0.95)

With the keyboard: 0.1 to 100 Hz in 0.1 Hz steps (within \pm 5%)

Delay time

With the list box: 0 to 9 ms in 1 ms steps, 10 to 90 ms in 10 ms steps, 100 to 900 ms in 100 ms steps, 1 to 10 s

With the keyboard: 0 to 10 s in 0.01 ms steps

Electric stimulators

Number of channels: 2 (monophasic/biphasic stimulation, high current stimulation)

Output mode: Constant current

Output current: Monophasic/biphasic stimulation, 0 to 100 mA (load resistance: 1 k Ω , step can be selected from 0.05, 0.1, 0.2, 0.5, 1 mA)

High current stimulation: 0 to 200 mA (load resistance: 1 k Ω , step can be selected from 0.05, 0.1, 0.2, 0.5, 1 mA)

Stimulation pulse duration: 0.05-1.0ms +/- 10% 0.05ms when stimulus is greater than 2mA, +/- 20% 0.03ms when stimulus is less than 2mA

Number of outputs on the stimulation pod: 5 available

Biphasic stimulation mode: Positive, negative, bipolar, alternate

Temperature measurement: 0 to 45°C (32 to 113°F) \pm 0.1°C (0.18°F)

Auditory Stimulators

Examination side: Left, both, right

Stimulation waveform: Click, tone burst

Stimulation phase (polarity): Condensation (positive), rarefaction (negative), alternating stimulation

Intensity: 0 to 135 dB SPL (within \pm 2 dB) contralateral white noise masking: -10, -20, -30, -40, -50 dB or off (within \pm 5 dB)

Click pulse duration: 0.1, 0.2, 0.3, 0.5, 1 ms (within \pm 5%)

Tone burst frequency

With a list box: 125, 250, 500, 1 k, 1.5 k, 2 k, 3 k, 4 k, 6 k, 8 kHz (within \pm 5%)

With a keyboard: 50 Hz to 10 kHz (within \pm 5% plateau time of tone burst)

With a list box: 0, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 ms (within \pm 5%)

With a keyboard: 0 to 1,000 ms in 1 ms steps (within \pm 5%)

Rise/fall time of tone burst

With a list box: 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 10 ms (within \pm 5%)

With a keyboard: 0.1 to 3000 ms in 0.1 ms steps (within \pm 5%)

Visual Stimulators

Stimulation modes: Pattern reversal, LED goggles, external visual stimulation

Pattern reversal

Field format: Full, left, right, upper, lower, upper left, lower left, upper right and lower right field

Patterns: Checkerboard, horizontal bars, vertical bars

Number of horizontal divisions: 4, 8, 16, 32, 64, 128

Brightness: More than 80 cd/m²

LED Goggles

Side: Left, right, both

Printer

Printing mode: Hard copy, review

External Units

External input: 8 ch, 0.2, 1 V/div

External output: 8 ch 1 V/div (5 kHz at 1 ch, 200 Hz at 8 ch)

Line I/O: Available

Trigger input: 6 ch

Amplitude: more than 4 V (positive), less than 0.5 V (negative)

Available for pulse whose duration is more than 10 μ s, either positive and negative can be selectable

Trigger output: 6 ch

Amplitude: 5 V (positive), less than 0.5 V (negative)

Pulse duration: 1, 5, 10 ms

Either positive and negative can be selectable

Response switch: When closed, operates at low level

Digital input: When closed, operates at low level 6 ch

Amplitude: less than 0.5 V (negative)

Available for pulse whose duration is more than 1 ms

Dimensions and Weight

Main Unit: 390(W) x 55(H) x 304(D) mm, 3.2 kg

Electrode Junction Box: 180(W) x 56.5(H) x 234.5(D) mm, 1.5 kg

Constant current stimulator unit: 56.5(W) x 190(H) x 240(D) mm, 1.0 kg

Somato control box: 37(W) x 62(H) x 21(D) mm, 0.16 kg

Control panel unit: 253(W) x 100(H) x 300(D) mm, 1.0 kg

Multi interface box: 160(W) x 24(H) x 120(D) mm, 0.8 kg

Power Requirements

Line voltage and frequency

MEB-2300A (DC-230BA): 100-120 V \pm 10% 60Hz \pm 1% Power input

DC-230BA main unit: 75 VA

Operating Environment

Temperature: 10 to 35°C (50 to 95°F)

Humidity: 30 to 80% (non condensing)

Atmospheric pressure: 700 to 1060 hPa

Storage and Transport

Temperature: -20 to 65°C (-4 to 149°F)

Humidity: 10 to 95% (non condensing)

Atmospheric pressure: 700 to 1060 hPa

When performance counts, you can rely on Nihon Kohden to assist you in delivering the highest quality patient care as efficiently as possible. Nihon Kohden is committed to bringing trusted and innovative solutions to the changing demands of the neurodiagnostics field today and into the future.

