SIERRA® Summit™ EMG/NCV/EP System Specifications

The Cadwell Sierra Summit system is a complete electromyography and evoked potential system with up to 12 channels of data acquisition.

The Sierra Summit system consists of:

- Base Unit
- Handheld StimTroller*Plus*™
- Amplifier (1-12 channel configurations available)

The Sierra Summit system supports/features:

- Base unit with dedicated keypad and knob controls
- Dual high-power speakers with software-controlled equalizer
- EMG with spontaneous, volitional, and interference pattern modes
  - Unlimited buffer storage (buffer length up to 10 minutes)
  - Replay with audio
  - Programmable muscle scoring
  - EMG snapshots within reports
  - Motor unit analysis (manual, suggested template, or automatic online or offline)
  - Interference pattern analysis (clouds)
  - Comparison to reference values
- EMG Guided Injection Protocol
- NCS (Motor, Sensory, Mixed, Inching, F Wave / H-Reflex)
- AnatomyVIEW™
- Side-to-Side Comparisons (NCV, F, H, EP)
- Blink Reflex
- RNS (1 or 2 channel acquisition
- SEP and SEP Interleave (upper, lower, dermatomes)
- Autonomic Studies
  - Heart Rate Variability (RR Interval)
  - Sympathetic Skin Response (SSR)
- Programmable Study Lists and Navigator
- Tabular Data Summary View
- QuickReport™ MS Word® based report generator
- Auto Findings Composer (automatic comparison to norms and creation of sentences for NCS, EMG, and EP findings)
- EP Analysis (add, subtract, average, grand average, invert)
- EMG to AVI Converter (convert EMG to video/audio files)
- DataLab™ (calculate user-defined relationships)
- ASCII Output Utility (all test protocols)
- CadLink™ Database (management patient files and user settings)
- Screen + video capture tools
- Internal Calibration Signals
- Hardware Diagnostics Suite (diagnostic routines for the amplifier, electrical stimulator and keypad)
- Electrode Continuity Check (built into amplifier)
- Comprehensive Application Help Topics
- Reader Software

Optional Software

- CadLink™ Server Software (centralized data storage and administration of user settings for all Summit acquisition and reader systems on the network)
- Single Fiber and Macro EMG
- Motor Unit Number Estimation (MUNE)
  - Assisted Incremental Technique
  - Multiple Point Stimulation Technique
- AEP (ABR, MLR, LLR, ERG, VEMP, ECochG)
- P300
- VEP – includes LCD calibration sensor
- HL7 Interface for EMR connectivity
- Data Interface Toolkit (API for developers)

Optional Hardware

- 2nd Electrical Stimulator
- Skin Temperature Probe
- Reflex Hammer
- Trigger Out/In Interface Cable (3.5 mm stereo to 2x RCA)
- Amp/Stim Switchbox (Injection Studies)
- LED Goggles
- Remote Input Box and cable (3-12 channel amplifier)
- Ring/Bar Switch Box
- VEP Monitor
- USB Footswitch
- Headphones
- Soft-sided Carrying Case

Amplifier Specifications

1-2 Channel

A/D Conversion	16-bit, 100 kHz per channel
Connections	1.5 mm touchproof or 5-pin DIN
Common Mode Impedance	> 1000 MΩ
Noise	< 0.6 μV_{RMS}
CMRR	> 115 dB at 50 or 60 Hz
Dimensions	1.2” H x 4.0” W x 5.2” L (3.0 x 10.1 x 13.2 cm)
Weight	0.6 lbs (0.3 kg)

3-12 Channel

A/D Conversion	16-bit Non-switched channels: 100 kHz /channel Switched channels: 25 kHz /channel
Connections	1.5-mm touchproof connector or 5-pin DIN connector
Common Mode Impedance	> 1000 MΩ
Noise	< 0.6 μV_{RMS}
CMRR	> 115 dB at 50 or 60 Hz
Dimensions	2.0” H x 6.3” W x 9.0” L (5.1 x 15.9 x 22.9 cm)
Weight	2.1 lbs (0.95 kg)

Additional Specifications

Sensitivity	2,5,10,20,50,100,200,300,500 µV/div 1, 2, 5 10 mV/div (additional values of 0.05, 0.1, 0.2, 0.5, 1.0 µV/div in NCV protocol)
Sweep Speeds	0.1 to 1000 ms/div in 23 steps
Highcut Filters	2-pole (12 dB/octave) Selectable at 30, 50, 100, 200, 300, 500 Hz; 1, 1.5, 2 3 5 10, 15, 20 kHz
Lowcut Filters	1-pole (6 dB/octave) Selectable at 0.04, 0.32, 1, 2, 3, 5, 10, 20, 30, 100, 150, 500 Hz Additional 1, 2, 3, 5 kHz filter values in EMG and SFEMG protocols
Notch Filter	50 or 60 Hz (additional 3 programmable notch filters)
Temperature Probe Input	21°C to 40°C ± 0.5°C (70°F to 104°F ± 0.9°F)
Impedance Measurement	Active, reference ground inputs 20 Hz signal 100 Ω to 100 kΩ
Additional Features	• Electrode check circuit built-in • Power button on front panel
Calibration	50, 100, 1000, and 10,000 µV square-wave at 100 or 1000 Hz

Base Unit Specifications

Computer Interface	High-speed USB connection (480 Mb/sec)
Trigger Inputs/Outputs	4 TTL compatible inputs; rising and falling edge 4 TTL compatible ouputs; multiple pulse durations, positive or negative polarity
Input Power	100-240 Vac, 50-60 Hz, 180 VA
Additional Connections	• Auditory stimulator (optional) • Electrical stimulator (1 standard, 2nd optional) • 4-port USB hub
Other Features	• Field upgradeable firmware • Single pedal, USB footswitch • Durable, color-coded connectors with protected pins • Equipotential ground • Automatic recovery after connection/power is restored • Built-in, front-facing, dual, high power speakers with software equalizer
Dimensions	2.5” H x 15.0” W x 14.8” L (6.4 x 38.1 x 37.6 cm)
Weight	7.4 lbs (3.4 kg) 14.5 lbs (6.6 kg) – with Laptop

Averager Specifications

Number per Channel	1 to 10,000 averages
Modes	Normal or Odd/Even
Sensitivity	0.01 µV/div to 10 mV/div in 42 steps
Artifact Rejection	Rejects signals from 30 – 95% of full scale On or off for all channels

Electrical Stimulator Specifications

Pulse Duration	50 to 1000 µs (adjustable in 50 µs increments)
Pulse Shape	Monophasic or biphasic
Pulse Types	Single, Pair, Train, Dual, Dual Train, or Triple
Repetition Rates	0.1 to 200 pps (depending on stimulus type and sweep speed)
Probes	2 removable stainless-steel probes 1.5 or 2.5 cm center-to-center spacing
Probe Position	+45 to -90 degrees (adjustable without removing probe tips)
Electrical Range	0 to 100 mA (400 V maximum)
Resolution	0.03 mA
Safety Features	Over current fault detection High impedance detection
Other Features	Stimulus intensity dial Single, repetitive, store, polarity, and three user programmable buttons on handle Includes high flex-life cable

Auditory Stimulator Specifications

Transducer	Sennheiser HDA 280 headphones (37 Ω) Insert earphones (10 Ω) Bone transducer (10 Ω)
Presentation	Left, right, or bilateral
Intensity Units	nHL/SPL
Intensity Increments	1, 2, 5, or 10 dB
Stimulus Types	Click, Tone Burst, Tone Pip 202, Tone Pip 212
Stimulus Polarity	Rarefaction, condensation, or alternating polarity
Repetition Rates	0.1 to 90 pps (depending on stimulus type and sweep speed)
Clicks	50, 100, 200, 500, or 1000 µs square wave
Tone Frequencies	250, 500, 750, 1k, 2k, 3k, 4k, 6k,8k Hz
Tone Burst	4 to 100 ms rise/fall, 4 to 2000 ms plateau
Tone Pip	1 to 40 cycles rise/fall, 0 to 500 cycles plateau
Tone Envelope	None, Linear, Gaussian, Hanning, Blackman
Decibel Range	-10 to 107 dB nHL (140 pSPL) (depending on stimulus type, frequency, and transducer)
Noise Masking	Contralateral white noise masking from 0 – 80 dB below stimulus

Visual Stimulator Specifications

LCD Monitor

Type	Black and white, pattern-reversal checkerboard stimulation
Square Sizes	1, 2, 4, 8, 16, 32, 64, or 128 checks
Connection Type	SVGA, HDMI, DVI, or Display Port from Laptop or Desktop PC
VEP Calibration Sensor	Included with VEP software
Other Features	Center fixation target Independent quadrant and half-field stimulation

Combination of Sierra Summit and monitor must meet requirements of EN60601-1-1.

LED Goggles

Type	Red flash
Duration	5 ms
Presentation	Left, Right, or Bilateral

System Operating Limits

- Temperature: 10°C (50°F) to 40° C (104°F)
- Humidity: 30% to 95%, non-condensing
- Pressure: 700 to 1060 hPa

Transport and Storage Limits

- Temperature: -20°C (-4°F) to 65°C (149°F)
- Humidity: 10% to 95%, non-condensing
- Pressure: 500 to 1060 hPa

Computer / Isolation Transformer Requirements

- Refer to Cadwell document 308014-000 for the latest minimum computer requirements based on current software requirements.
- Refer to Cadwell document 309002-000 to determine if an isolation transformer is required.

Regulatory

Classification Information

- United States: Class II
- Canada: Class II
- European Community (CE Mark): Class IIA

Type of Protection Against Electric Shock

- Class I Equipment (with Safety Ground)

Classification of Patient Connections

- Type BF Equipment (Floating Inputs)

Mode of Operation

- Continuous

System International Safety Standard Compliance

Sierra Summit meets the following internationally recognized safety standards for Medical Electrical Equipment:

- UL 60601-1 : General Requirement for Safety
- CSA 601-1 : General Requirement for Safety
- IEC 60601-1 : General Requirement for Safety
- IEC 60601-1-1 / EN60601-1-1 : Collateral Standard – Safety requirements for medical electrical systems
- IEC 60601-1-2 / EN60601-1-2 : Collateral Standard – Electromagnetic compatibility
- IEC 60601-1-4 : Collateral Standard – Programmable electrical medical systems
- IEC 60601-2-40 : Particular requirements for the safety of electromyographs and evoked response equipment

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