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831



Advanced Sound Level Meter

for Architectural,
Environmental,
& Product
Noise Analysis



LARSON DAVIS
A PCB PIEZOTRONICS DIV.

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Model 831 Sound Level Meter

Applications:

- Class 1 sound measurements to the latest international standards
- Environmental noise assessment and monitoring
- Reverberation time measurement and building acoustics
- Tonality
- Occupational noise evaluation
- HPD selection
- Noise reduction validation
- Product quality control
- NVH correlation
- In-Situ sound power measurements
- Code enforcement

Features:

- IEC 61672-1:2013, ANSI S1.4-2014 Class 1 integrating sound level meter
- Real-time frequency analysis in 1/1 and 1/3 octave bands, compliant with IEC 61260:2001 and ANSI S1.11-2004 Class 1
- Large, high-resolution screen, easily readable in bright sunlight
- Robust battery life (24 hours on 4 X AA Lithium batteries)
- Simplified system and measurement set-up through a "mobile phone like" interface
- Lightweight, ergonomic design
- Soft keypad for 1-handed operation
- Standard USB interface
- Dynamic range in excess of 120 dB
- Logging of broadband and spectral data to obtain time, measurement and event histories on the instrument
- Sound recording in .wav format for event, manual or time-based trigger
- Utility software included for set-up, archiving, export and reporting
- Supplied with heavy-duty Pelican® carrying case

The Pelican trademark is a registered trademark of Pelican Products, Inc.



Fig. 1

Model 831 Layout

Display Navigation

Dual Purpose Start/Stop

Reset/Clear Memory

Recessed On/Off Button

USB Host (Thumb Drive Storage, GPS Receiver)

Master Power Toggle

Standard 1/2 inch Free Field or Random Incidence Microphone

Integrated Preamplifier Collar to Eliminate Reflections

Large High Resolution Display

One-button Access to Measurement Set-up

Run/Pause Control

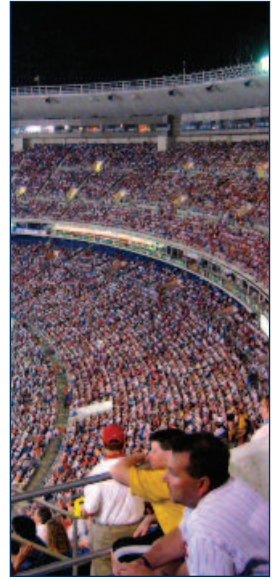
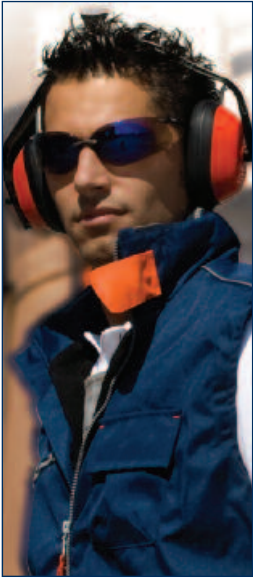
Back-lit Navigational Keypad

System Set-up Access

Headphone Jack/Noise Source Control

USB Power

Multi-function Connector (External Power, Weather Sensor Input)



Introduction

The Larson Davis Model 831 Class 1 Sound Level Meter, with its high definition display, is extremely versatile, performing the functions of several instruments. It puts the combined features of a precision Class 1 sound level meter, environmental noise analyzer, personal noise dosimeter, and a real-time frequency analyzer in the palm of your hand. The Model 831 is a fifth generation Larson Davis sound level meter, designed for simple, single-handed operation, yet is fully featured, smart and versatile with an ever expanding firmware platform. The design of the Model 831 was based on countless inputs from customers. It expands upon the Larson Davis tradition of delivering value, innovation and function in a rugged, single-handed, expandable package and is backed by a 2-year factory warranty, 24-hour application support and accredited factory service/calibration.

The Model 831 Standard Features:

- IEC 61672-1:2013, ANSI S1.4-2014 Class 1 integrating sound level meter
- Voice Annotation
- ANY LEVEL Display
- User-programmable run modes
- Six user-selectable statistics (Ln)
- Threshold exceedance data
- Community noise calculations (Lden, CNEL)
- GPS support
- Back erase functionality
- Normalized spectrum
- User-selectable screen layout and lockable set-up protection
- Remote access and field upgradable
- Wide variety of non-proprietary powering options including – 4XAA internal batteries, AC, USB and external batteries

Model 831 Firmware Options:

Code	Description
831-OB3	1/1 and 1/3, Class 1, octave band spectral analysis
831-IH	Industrial Hygiene or personal noise dosimetry
831-LOG	Time history logging at periods from 20 ms to 24 hrs
831-FST	Fast time history logging at 2.5, 5 or 10 ms periods
831-ELA	Automatic event detection, event history, and measurement history (1 min to 99 hour intervals) combine with 831-LOG for event time history and 831-SR for event sound recording
831-SR	Sound Recording to .wav files at 8, 16, 24 or 48 kHz
831-RT	Reverberation time measurement, computation and display
831-FFT	Fast Fourier Transform up to 6400 lines
831-COMM	Advanced digital communications via cellular modem
831-MSR	Measurement History and Sound Recording

Supported PC Software:

- SLM Utility-G4 – PC software supplied with the Model 831 that supports full sound level meter control, in the field firmware and option upgrades, data export to Excel®, and includes an integrated “Screen Grabber” to display the SLM screen live on a PC
- DNA – the analysis, post-processing and reporting tool for sound and vibration measurements. DNA delivers enhanced analysis capability, sound playback and graphical reporting. Graphs can be annotated and shared amongst multiple users using DNA reader software.
- Software Development Kit (SDK) – toolkit for developing custom applications in MS Windows® or Linux for the Model 831
- 3rd Party – the Model 831 has been integrated into various 3rd party software packages including software for airport noise management

The Model 831 offers a complete solution for noise measurement. Whether in the office or in the field, the Model 831 can handle your sound measurement needs.

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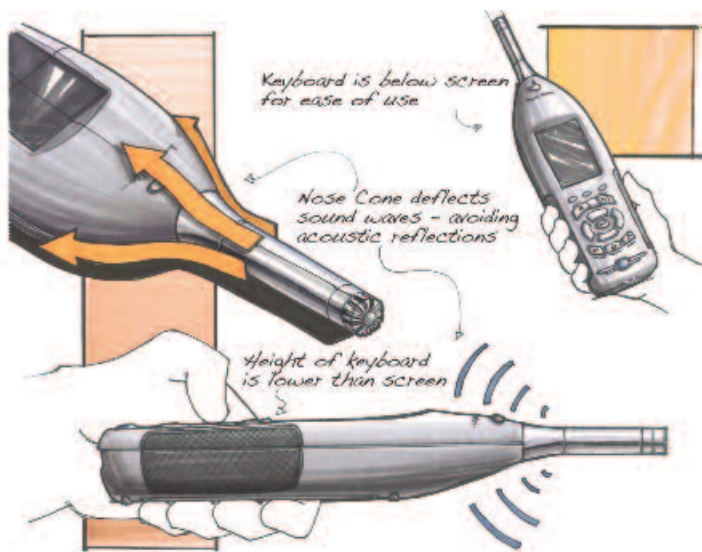
DID YOU KNOW...

...We Carefully Considered Every Design Element



Keyboard Features:

Much care was taken when designing the Model 831 keyboard. To reduce extraneous noise, the keys are manufactured of silicone to eliminate audible "clicks". In addition, the ON/OFF button is slightly recessed to avoid accidental power off. Together with the backlit display, the illuminated keyboard permits nightly operation indoors as well as outdoors. Finally, a raised thumbrest allows for careful positioning during measurements.



Avoid Acoustic Reflections:

To reduce noise reflections further, a noise cone was added between the preamplifier and the sound level meter body. The keypad is situated below the screen for ease of use and is slightly lower in height which positions the user's hand lower on the body allowing a free flow of acoustic waves. The preamplifier connection, the bulkier head, and the lowered keypad all contribute to the Model 831 Class 1 designation.



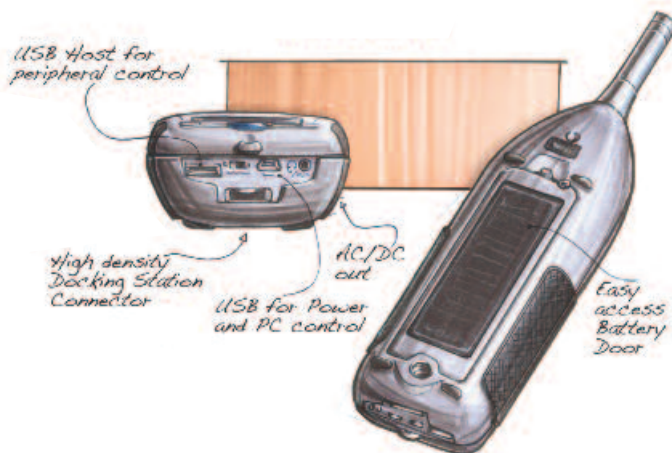
Material Features:

When selecting manufacturing materials, the day-to-day operation for users was taken into account. Advanced sound level meters like Model 831 are often used outside. The display with high readability in all lighting conditions is protected by a scratch resistant cover. A high impact plastic housing supports and safeguards the instrument for normal use.



Access Features:

The large battery access panel allows for easy exchange of batteries. Extra connections are grouped at the bottom of the instrument with PC control and power supply combined via a single cable.



Single-handed Operation:

To reduce acoustic reflections during measurement, Model 831 was designed with single-handed operation in mind. The soft grips combined with the overall inverted cone shape allow the meter to easily fit in the hand, without permanent finger pressure or user attention. For extra security a lanyard is provided as a standard accessory.





LARSON DAVIS
A PCB PIEZOTRONICS DIV.

NOISE MONITORING SYSTEM

Model EPS031

Fiberglass NMS enclosure (AC power)

Standard Features

When performing noise surveys, it is important to have a fully capable sound level meter at your fingertips to capture all of the essential data. How many times have you brought along additional equipment to log information such as GPS location, temperature, wind speed, and other environmental parameters? Then, how much time did you spend after the test merging that non-acoustic data into a report? Have you ever lost your measurement notes, or worse, forgot to log the information properly and then had to either go back and reacquire the data altogether or simply not report it? At Larson Davis, we recognize the value of measuring non-acoustic parameters in parallel with the acoustic data. The Model 831 firmware allows you to connect a variety of external sensors to log these non-acoustic parameters.

Extended Power Operation

A variety of powering options allows for flexibility when out in the field. There is no need to worry about proprietary batteries, cables, etc. since most power options are "off-the-shelf items". Great care was taken during the design of the Model 831 to ensure low power consumption, further extending measurement time. With (4) Lithium AA batteries, up to 24 hours of 1 second LAeq with 1/3 octave data can be measured.

Options include:

- AA batteries: Alkaline, NiMH rechargeable or 1.5V Lithium
- USB power from a universal AC power supply (PSA027), a PC or a powered USB hub
- 12 VDC from a DC power adaptor, 12 VDC battery, or car power connector

When using 12 VDC, the Model 831 can sense a low voltage condition and shut itself down automatically then restart automatically upon power restoration to protect external batteries from damage due to over-discharge.



ANY LEVEL

The Larson Davis Model 831 provides an ANY LEVEL feature to preview and review acquired sound field measurements utilizing multiple time weightings (Slow, Fast & Impulsive) and frequency weightings (A, C & Z). This feature allows the operator to easily view and acquire measurement data with the desired settings and ensures the correct values are measured. With the 831-LOG option all of the various measurement parameters are available and can simply be selected for storage and download. Pre-selected detector and frequency weighting are used to determine the metric sampled for statistical and event data.

Six Different Run Modes

The Model 831 has six (6) measurement control modes to accommodate a variety of field situations.

- **MANUAL** – typically used for walk-around surveys. Ideally used with the Measurement History (MH) to give a quick overview of the averages, the min-max values, and store multiple measurements into a single file.
- **TIMED STOP** – operates for a specified period of time
- **CONTINUOUS** – typically used for longer term monitoring, it allows storage of data files daily or even multiple times during the day. In this mode the Model 831 will start automatically upon powering. This is required for instances of power failure in remote locations.
- **STOP WHEN STABLE** – typically used to assess workplace noise exposure, it stops when the LAeq is stabilized in a narrow range
- **SINGLE BLOCK** – a start and stop timer controls the sound data acquisition
- **MULTI-BLOCK** – three separate time periods, of which one can cross the dateline

Available Broadband Metrics

Live	A	C	Z
L _{EQ,1s}	✓	✓	✓
L _{wS}	✓	✓	✓
L _{wF}	✓	✓	✓
L _{wI}	✓	✓	✓
L _{PEAK}	✓	✓	✓

Overall	A	C	Z
L _{EQ}	✓	✓	✓
L _{wS,Max}	✓	✓	✓
L _{wF,Max}	✓	✓	✓
L _{wI,Max}	✓	✓	✓
L _{wS,Min}	✓	✓	✓
L _{wF,Min}	✓	✓	✓
L _{wI,Min}	✓	✓	✓
L _{wS}	✓	✓	✓
L _{wF}	✓	✓	✓
L _{wI}	✓	✓	✓
L _{PEAK}	✓	✓	✓

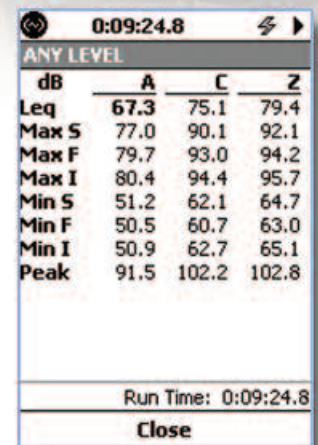


Fig. 1

ANY LEVEL allows the display of all acoustic parameters simultaneously



NoiseTutor Environmental Noise Monitoring System

Fig. 2
Live Display of Triggers
During Measurement



Normalized Spectrum

831-OB3 Frequency Analysis firmware allows the user to compare the frequency content of various measurements using the Normalized Spectrum function. Inverse A and C weighting filters can be applied, as well as user defined curves to current measurements and graph them relative to each other. For example, when comparing the noise signatures of various machines, a reference measurement can be saved such that subsequent measurements can easily be compared.

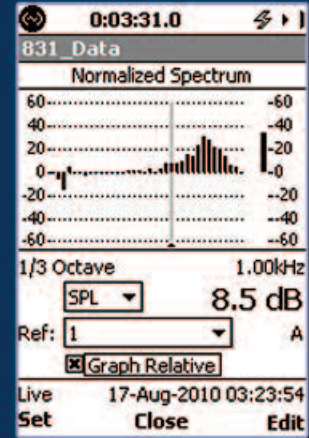


Fig. 3
Normalized Spectrum Display

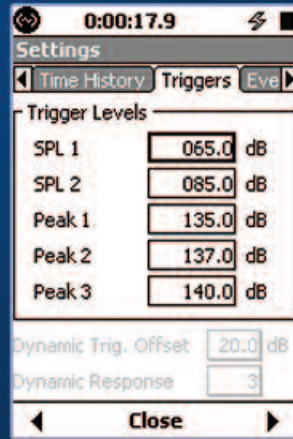


Fig. 4
Trigger Levels

Two RMS and Three Peak Threshold Triggers

Another standard feature of the Model 831 is the ability to define up to two (2) RMS and three (3) Peak threshold levels. During operation, Model 831 will count the number of threshold exceedances as well as the cumulative time of exceedance. This information is available real-time on the instrument display as well as included on any measurement files transferred to software. This is an ideal way to keep track of limit and action values according to EU Directive 2003/10/EC.

Back Erase

Simple transient noises such as an ambulance siren or dog bark can erroneously contribute to an outdoor measurement. The Model 831 includes a Back Erase feature allowing for the removal of the last 5 or 10 seconds of a measurement and recalculate the measurement parameters automatically. To ensure proper bookkeeping, the data is annotated so it can easily be identified post test.

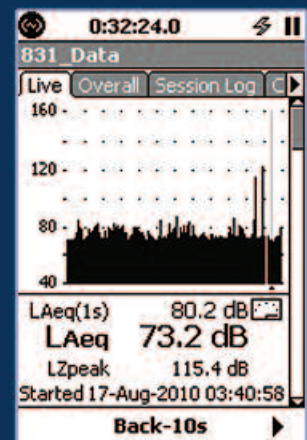


Fig. 5
Back Erase Display

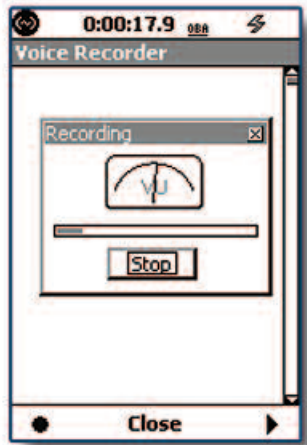


Fig. 6
Voice Recorder

Voice Recorder

The Model 831 allows for annotative noise measurements with a voice memo via a headset plugged into the AC/DC output jack or directly through the condenser microphone. Information can be played back through a headset directly connected to the instrument or by downloading the data file to a PC.

Ten Annotation Markers

To further annotate data in the field, the Model 831 allows the user to enter up to ten (10) user-defined Markers which are easily accessed through the main measurement screen. For example, during a traffic noise measurement, markers such as "Truck" or "Motorcycle" can be queued such that they are quickly ready to identify certain events. Time history data is then tagged with this Marker for ease of reporting. When equipped with the optional 831-SR Sound Recording firmware, the Model 831 will also automatically take a .wav file sound recording when a Marker is engaged.

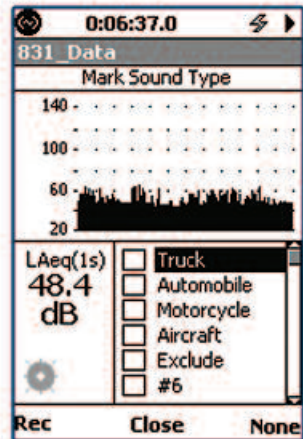


Fig. 7
Model 831 with optional 831-SR Sound Recording Firmware. One screen access to manual sound recordings and exceedance markers.

User-selectable Screen Layout

The powerful Model 831 user interface can be tailored for a wide-variety of end users. While the acoustical consultant may like to see all data parameters, a code enforcement officer may simply like to read the Leq or Peak dB level. In addition, the sound level meter may be utilized by untrained personnel who are unfamiliar with the set-up of the instrument. In this situation, the Model 831 provides a lock feature so that set-up parameters cannot be modified without entering a security code. Modifying the user interface of the Model 831 is easily done via the keypad or SLM Utility G4 Software. Various set-ups and configurations can be created within G4 and transferred to the sound level meter such that they are easily accessible.

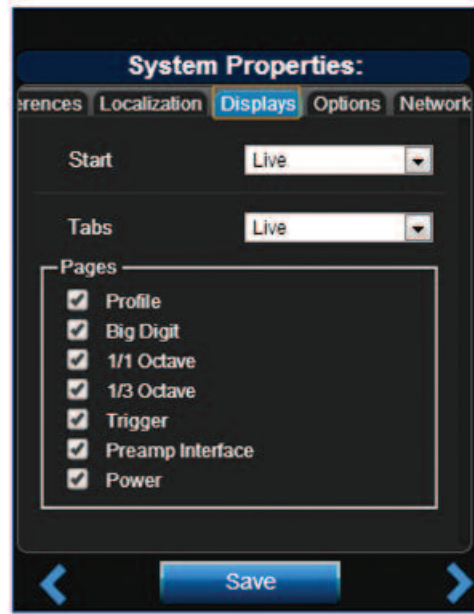


Fig. 8
Customizing Model 831 Instrument Displays utilizing SLM Utility-G4 Software



Weather Measurements

The Model 831 can be configured to log weather parameter data in the Time History along with all of the normal acoustic parameters at rates up to 1 sps (sample per second). A wide range of meteorological parameters are available including wind speed, wind direction, temperature, humidity and rain fall.

Combined Meteorological Unit (SEN031 Vaisala WXT520)

Measurement Method	Digitized sensors with ultrasonic wind sensors over serial port to USB
Connectivity	USB to Model 831 or 831-INT (-ET)
Measured Parameters	Wind speed and direction, temperature, relative humidity, barometric pressure, rain fall and hail

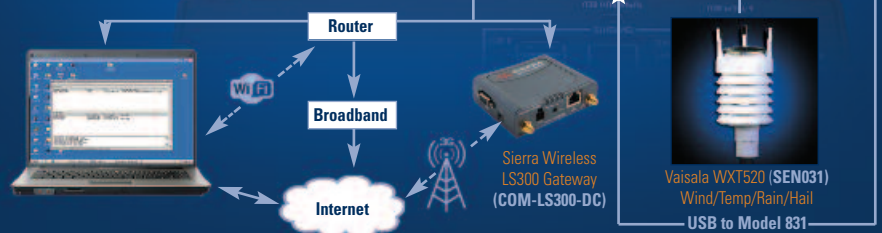
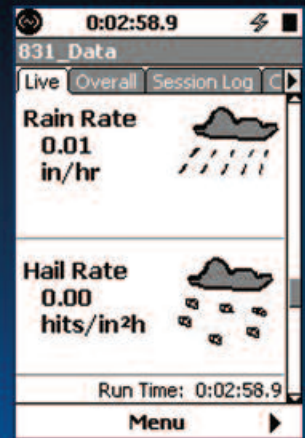
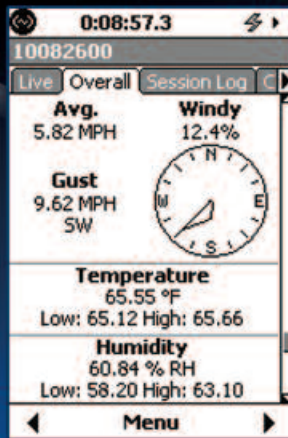


Fig. 9
Model 831-INT Docking Station – Configuration



Fig. 10
Noise map created using web-based GPS mapping

Global Positioning System (GPS)

Commonly, users want the ability to use GPS to log the location for each measurement, which is very beneficial when performing environmental noise surveys that require multiple points around large buildings or when mapping noise along a roadway. To meet this need, every Model 831 Sound Level Meter is equipped with firmware to decode and log GPS position information from an optional external GPS antenna (GPS001). When enabled, the GPS will log in position automatically at the beginning of each measurement run (831-ELA). In addition, the GPS signal also includes a highly accurate clock that the Model 831 can use to automatically update its internal clock as needed. Once the data is downloaded to a PC, the location information can be easily imported into mapping software to create, in seconds, a very powerful report showing exactly where noise measurements were made.



Model GPS001

Location and Timestamp with GPS001

Time Synchronization	Automatically performed with daily auto-store
Location	Latitude, longitude and altitude with measurement history

Shanghai Convention Center GPS [Compatibility Mode] - Microsoft Excel

Record #	Latitude	Longitude	Altitude	Date	Time	Duration	Run Time	Pause	LAeq	LAE	LAFmin	Time	LAFmax	Time	LZpeak (max)	Time
1	31°14'44"	121°29'47"	31.2 ft	2008/10/27	16:07:02	00:00:10.5	00:00:10.5	00:00:00.0	55.8	66.0	54.5	16:07:02	58.9	16:07:04	90.4	16:07:05
2	31°14'49"	121°29'48"	15.4 ft	2008/10/27	16:08:18	00:00:11.1	00:00:11.1	00:00:00.0	57.7	68.2	55.0	16:08:27	62.4	16:08:18	95.0	16:08:18
3	31°14'52"	121°29'52"	50.9 ft	2008/10/27	16:09:32	00:00:11.7	00:00:11.7	00:00:00.0	60.8	71.5	59.9	16:09:43	61.8	16:09:34	92.0	16:09:32
4	31°14'53"	121°29'56"	6.2 ft	2008/10/27	16:10:43	00:00:11.4	00:00:11.4	00:00:00.0	55.2	65.7	53.9	16:10:54	59.3	16:10:45	95.1	16:10:43
5	31°14'50"	121°29'61"	49.5 ft	2008/10/27	16:12:06	00:00:12.1	00:00:12.1	00:00:00.0	60.3	71.1	56.6	16:12:08	65.5	16:12:15	95.3	16:12:06
6	31°14'49"	121°29'59"	65.6 ft	2008/10/27	16:12:53	00:00:10.7	00:00:10.7	00:00:00.0	57.4	67.7	55.0	16:12:54	60.7	16:13:02	94.3	16:12:53
7	31°14'45"	121°29'59"	60.7 ft	2008/10/27	16:13:41	00:00:08.1	00:00:08.1	00:00:00.0	59.2	70.0	53.6	16:13:53	67.1	16:13:43	95.8	16:13:42

Fig. 11
Export the "Measurement History" tab directly into a web-based GPS mapping software (shown above). This tool will retrieve the appropriate map and add the acoustic parameters to the map automatically.

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Model 831 Options: Octave Band Analysis (831-OB3)

In many applications, it is important to acquire both the broadband level and spectral content of noise data. With spectral information, the source and content of the measured overall level can be better understood. Constant percentage bandwidth filters (1/1 or 1/3 octave) best approximate human perception to sound. Option 831-OB3 firmware enables simultaneous real time measurement of 1/1 and 1/3 octave Leq, Lmax, Lmin along with all the ANY LEVEL broadband parameters. Option 831-OB3 is compliant with IEC 61260:2001 Class 1 and ANSI S1.11-2004 Class 1 standards and covers the entire frequency range of human hearing: 6.3 Hz to 20 kHz for 1/3 octave bands. When 831-OB3 is combined with Time History Logging (831-LOG) or Automatic Event Detection and Event History (831-ELA) it is possible to review the frequency content of logged data or specific events.

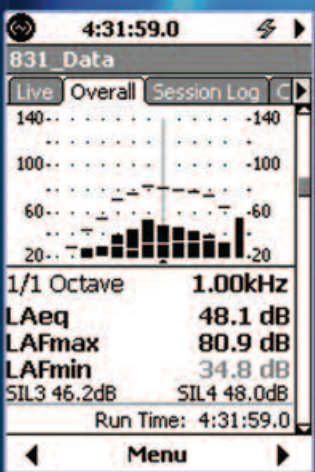


Fig. 12
1/1 Octave Display

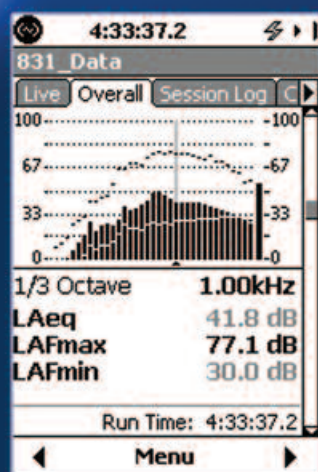


Fig. 13
1/3 Octave Display

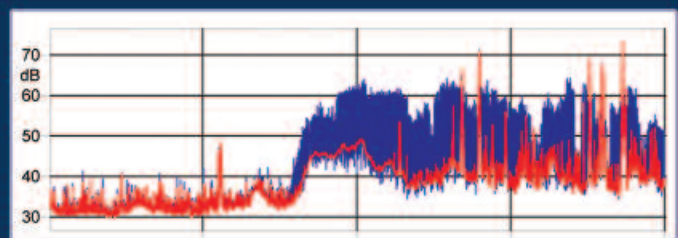
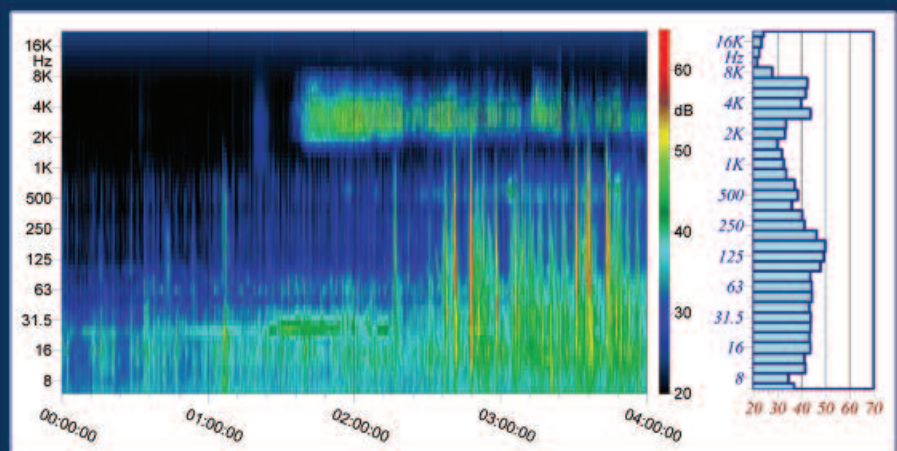


Fig. 14 Events Extracted from Noisy Data

Fig. 15
Spectrogram of
Events with High
Frequency Noise



Industrial Hygiene (831-IH)

The Model 831 is available with two (2) virtual noise dosimeters compliant with ANSI S1.25 and IEC 61252:2001, each with programmable threshold levels. This is very convenient when performing worker noise exposure assessment when coupled with the 1/1 octave band spectral analysis for hearing protection device selection. Typically, the characteristics of the hearing protectors are stored as one of the four reference curves on the Model 831 for easy on-site "what-if" measurements.

Logging (831-LOG) & Fast Logging (831-FST)

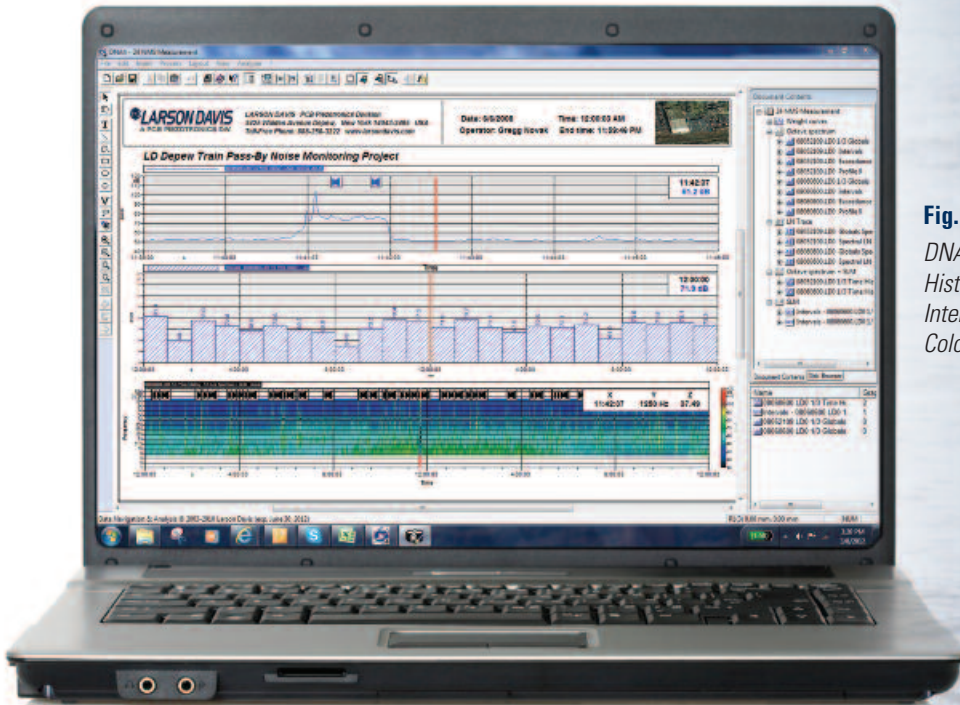


Fig. 16
DNA Software Time History and Hourly Interval Graph with Color Spectrogram

The Model 831 can be used to record the evolution of sound pressure level over time as a Time History (TH). The Time History is then used to profile the observation period, which can vary from a couple of seconds to continuous monitoring.

Larson Davis has enhanced the versatility of the Model 831 Sound Level Meter with the addition of Time History Logging Firmware (831-LOG). Users can pre-select from logging periods as small as 20 ms to a full 24 hrs. With time periods greater than or equal to 100 ms, up to 58 selectable parameters can be chosen. Selections consist of familiar acoustic metrics as well as non-acoustic metrics, such as battery condition, outdoor microphone performance and meteorological data (831-WTHR).

Special acquisition circumstances may require the user to acquire time-based data swifter than 20 ms. For these occasions, Larson Davis offers 831-FST firmware, which adds the additional sampling rate options of 2.5, 5, and 10 ms.

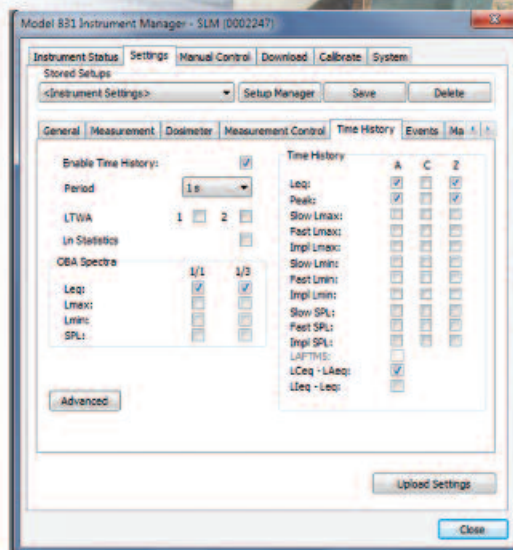


Fig. 17
Time History Parameter Selection in SLM Utility-G3



Measurement History (831-ELA)

While time histories are typically logged at one sample per second, it is convenient to view longer term averages of measurement data to more easily ascertain trends, i.e. 10 minute or one hour averages of various noise parameters. The 831-ELA firmware enables Measurement History (MH) which logs parameters similar to the Time History (TH) yet looks at the average, minimum and maximum over the selected interval time. MH and TH can run in parallel or independently.

When the Model 831 is set to “Manual Run” mode, MH history can be used to construct a noise survey. Data for each measurement or location is saved individually and may include the Leq, Lmax, Lmin, SPL, and statistical distribution of the SPL (Ln).

MH records are available for easy review on the Model 831. The current measurement is visible on the “Current” display tab, while completed measurements can be browsed in the “Measurements” tab. When combined with 831-LOG, the time history detail of each measurement can be viewed quickly using keypad shortcuts. Finally, an automated sound recording at the beginning of each measurement can be achieved with 831-SR firmware.

MH records are time-based when run mode = continuous, but in other run modes like manual, they are not. One of the benefits of MH history is the ability to make a series of smaller measurements. MH records and combines measurements automatically into a single composite measurement and puts everything into one file.

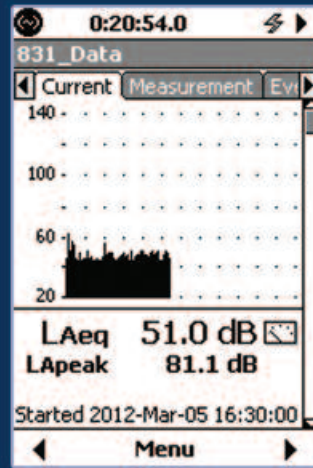


Fig. 18 Current Measurement Display

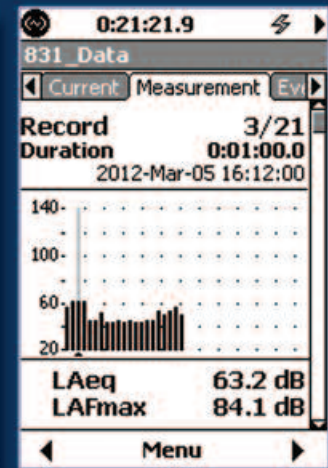


Fig. 19 Measurement History Summary Display

Automatic Event Detection and Event History (831-ELA)

In the Model 831 events are defined as either:

- Exceedance of a fixed threshold level for a minimum duration
- Exceedance of a dynamic threshold level for a minimum duration
- External trigger set by the digital input signal

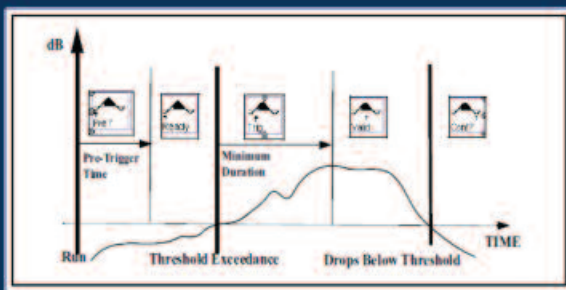


Fig. 20 Event Definition on the Model 831

The Model 831 includes basic exceedance logging functionality (see “Threshold Triggers” on page 8). However, only the number of exceedances and cumulative time above threshold values is provided. With 831-ELA firmware, you are able to define the attributes of an event including threshold level, duration and hysteresis. An event is considered “Valid” when it meets these criteria and ends when the SPL drops below the threshold level for a specific period of time (Continuation Period). The user is provided triggering status updates via triggering icon graphics, helping to identify event progression and qualification (see graph above).

The “Event” tab contains detailed information on each event including:

- Time and duration of Event
- Leq, Lmin, Lmax and Peak SPL
- Frequency analysis of event (with 831-OB3)
- Sound recording in .wav format for source characterization (with 831-SR)
- Event time history (with 831-LOG). Time history period can be different than that used in overall TH measurement.

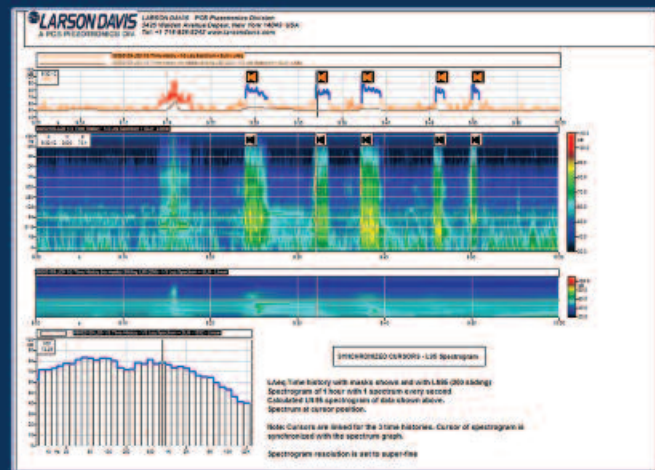


Fig. 21 DNA Software – TH with embedded .wav files on event, color spectrogram, L95 and 1/3 octave frequency analysis

A “Dynamic” trigger method can also be selected in the Model 831. The dynamic trigger is set to trigger when L85, L90 or L95 is exceeded by a predetermined number of decibels. A rise time can also be specified to determine how quickly the meter responds to changes in the background noise level. By utilizing the dynamic trigger, the number of false triggers is reduced and events (significant noise above background level) are better determined.



Fig. 22 Event Detection Display on the Model 831



Hear the Sound Being Measured (831-SR)

Measuring sound levels is a well-accepted way to objectively quantify the noise radiated by a product in an environmental survey. But a sound pressure level or octave data only provides part of the overall acoustic picture. How many times were you asked “are you sure that the spike in the data is actually the noise of the product or the actual environmental event of interest?” Rather than rely simply on the ‘objective’ data why not record a sample of the sound to truly determine if that elevated noise level was a police car driving past with its sirens on or a noisy dog barking at the letter carrier.

When recording raw time samples for playback, users can add the 831-SR firmware option. This option allows for high fidelity recordings up to 48 kHz sampling with the Model 831 either manually or automatically, based on an array of triggering options.

Option 831-SR Features:

User-initiated Recordings:

- **Manual Sound Recording** - User-controlled recording duration, acquired during operation, up to 48 kHz
- **Marker-based Sound Recording** - User-initiated with user-defined duration, acquired during operation, up to 48 kHz

Automatic Recording Mode:

When the 831-SR option is combined with other advanced logging functionality in the Model 831, it is possible to start and stop recordings based on a number of advanced measurement events. This allows the user to only record sounds associated with specific noises as they occur rather than recording many hours of data and having to ‘find’ these events after the fact in post processing software.

Option 831-ELA Recordings:

- **Event History Sound Recordings** - Acquired upon events meeting preset conditions with fixed or dynamic triggering available
- **Measurement History Sound Recordings** - Automated sound recording at the beginning of each Measurement History

Note: Event & Measurement Sound Recordings can be enabled at the same time.

These recordings can then be downloaded to a PC and stored as .wav files using the included SLM Utility-G4 software or the DNA advanced post processing and reporting tool.

Typical Model 831 Sound Level Meter Ranges

(when using a microphone with 50 mV/Pa sensitivity)

	Instrument Gain			
	0 dB		20 dB	
Range	High	Low	High	Low
Peak Overload Level	143 dB	110 dB	123 dB	90 dB
Lower Level of A/D Range	50 dB	17 dB	30 dB	-7 dB
Instrument Noise Floor	23 dB	23 dB	21 dB	21 dB
Sound Recording Range	50 - 143 dB	23 - 110 dB	30 - 123 dB	21 - 90 dB

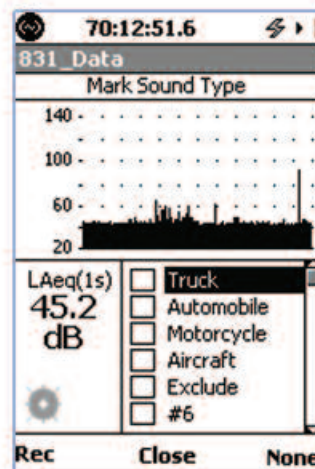
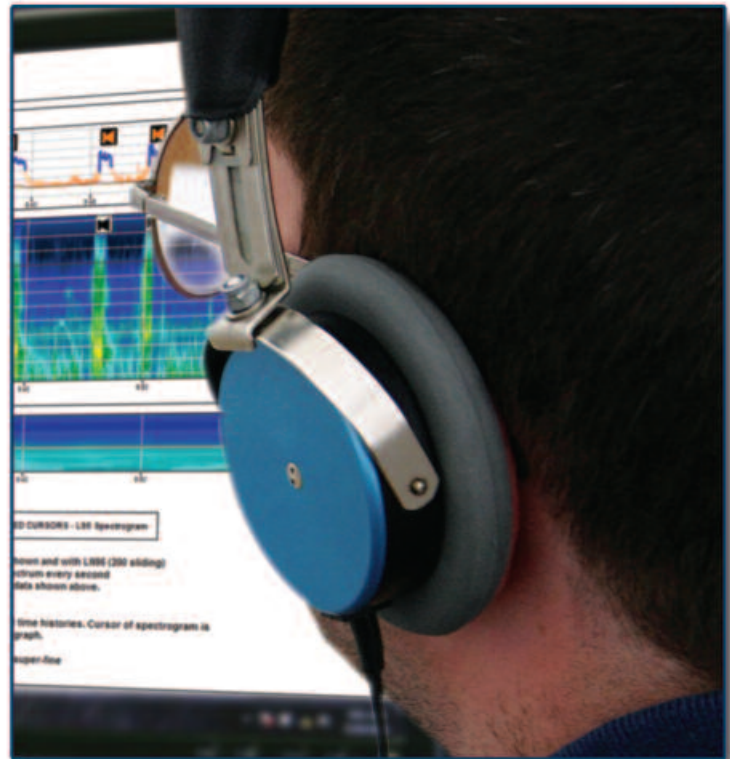


Fig. 23

A recording icon will appear on the Model 831 display when recordings are being made.

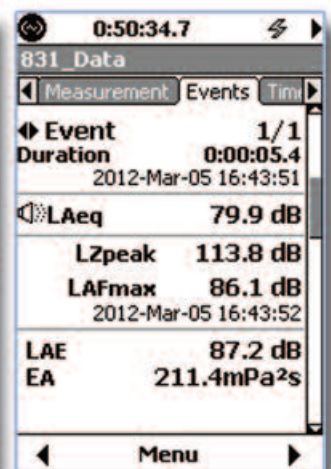


Fig. 24

Event Indication Display on the Model 831

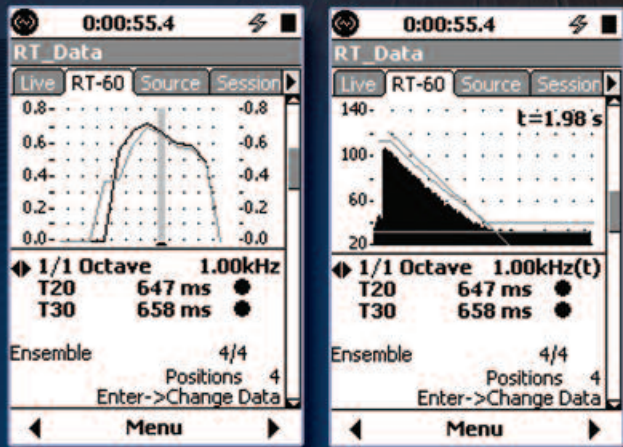


Fig. 25
RT Displays of Decay Curves

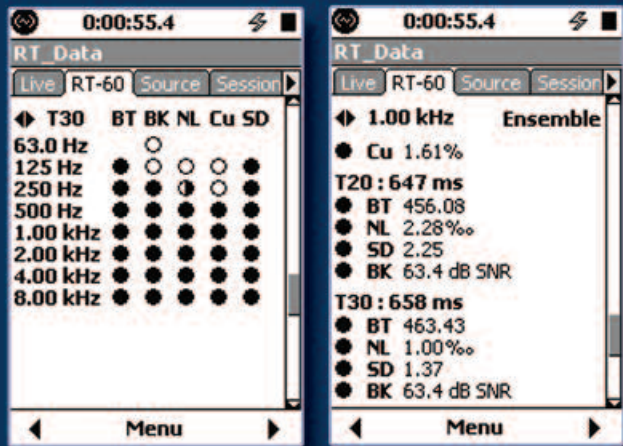


Fig. 26
Quality and Measurement Grade Indicators

Reverberation Time (831-RT)

Reverberation times are used in multiple architectural acoustics applications ranging from simple experimental reverberation time determination for room performance, to calculating absorption coefficients for material performance. Most of the time, these measurements are dictated by various international standards.

Model 831 measures the decays and then computes the reverberation time according to ISO 3382-2 or ASTM 2235-04 standards. When using the Interrupted Noise method, the Model 831 not only triggers the data acquisition, but its built-in Noise Generator can be used to drive the omni-directional sound source. Recent trends show that the Integrated Impulse method is gaining popularity and Model 831 handles the acquisition of the decays and the subsequent T20 or T30 calculations completely and with ease.

While the use of 1/3 octave bands is the most common method on the Model 831, the user can elect to work either with 1/3 octaves or full octave bands.

Helping the user in the field assess his measurement results the Model 831 computes the decay times automatically, shows the T20 and T30 spectra superimposed, computes seven (7) quality indicators per frequency as well as grades the measurement data. All these indicators are immediately available saving considerable time.

Easy-to-read screen and keyboard indicators help guide the user through the measurement. For example, a flashing red LED on the Model 831 indicates to the user when they need to create the impulsive noise, for example, with a starter pistol or a balloon.

The resulting data and decays can be exported to the SLM Utility-G4 or can be processed further in DNA for reverberation time, absorption coefficients or sound insulation calculations. Using DNA software, a full array of building acoustic measurements are possible as defined in ISO 10140, 140, 717 and ASTM standards.

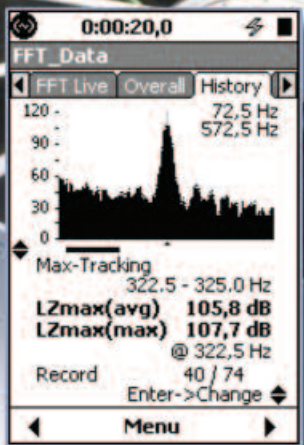


Fig. 27
 FFT Max-tracking on Model 831

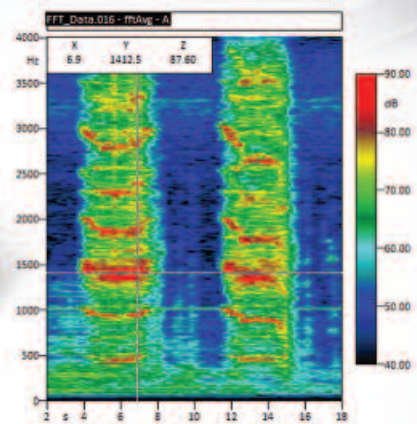


Fig. 28
 DNA Software FFT-spectrogram of Stone-cutting Operation

Fast Fourier Transform Analysis (831-FFT)

When a frequency resolution greater than 1/3 octave band spectral analysis is needed, the Model 831-FFT frequency analysis is the ideal solution. The Fast Fourier Transform (FFT) algorithm is implemented in the Model 831 for precision spectral analysis of acoustic signals. By utilizing a variety of frequency span and resolution settings, FFT acquisition settings can be adjusted to tune into specific acoustic and vibration phenomena.

The Model 831-FFT has three (3) operational modes serving different applications. The "Count" mode accumulates the average spectrum and maximum for a fixed number of FFT spectra. The "Timed" mode repeats the count mode for a given period of time and accumulates the spectra in a history. The "Timed" mode is best suited for transient signals, while the "Manual" mode is typically used for steady state measurements. In Manual mode, the number of averages is open and each Start-Stop sequence adds an entry to the history table.

Up to 6400 lines of resolution are available with the Model 831-FFT, allowing for detailed measurement analysis.

The FFT option has been further enhanced with the onboard computation of tonality as described in ISO 1996-2 Annex C. Tone level, masking noise level, audibility and quality indicators are all automatically computed and displayed in a simple to use interface that makes object measurement of tones in the field easy.

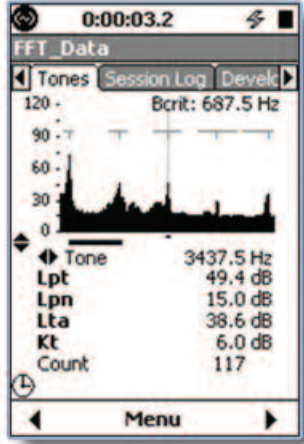


Fig. 29
 Model 831 Tonality Calculation



Data Navigation and Analysis Software (SWW-DNA)

Data Navigation and Analysis Software (SWW-DNA) is designed to analyze and report environmental noise, worker exposure and architectural acoustic measurements with an interactive graphical interface.

DNA and the Model 831 can be used in two ways: DNA retrieves files from the Model 831 or DNA uses the Model 831 as a data acquisition front-end.

Features:

- Remote access over modem or network
- Interactive graphs with data: zoom, evaluate processing for events, masking automated placement of speaker icon on time history and running cursor with sound replay on TH linked cursors over several graphs
- Template based operation with customizable templates

A major differentiating concept of DNA is the principle of separation of data and graphical concept. This allows for drag-and-drop functionality of new data in the same layout. With many environmental studies being similar in nature, this feature allows for quick, professional looking reports.

Software Development Kit (831-SDK)

The Software Development Kit for the Model 831 interfaces smoothly and directly with Microsoft or Linux programming environments supporting Excel®, VBA, Visual C++ or C# programming languages.

The SDK provides functionality to establish connection and fully control the Model 831 over USB, network or modem connections. File download is supported and the SDK includes documentation and software for extracting data from files.

Because of a reliance upon JSON, the SDK makes it easy to create modern, web based applications with minimal effort.



Software Solutions

The Model 831 has numerous on-board capabilities, yet often further processing, visualization or reporting needs exist. For this purpose the Model 831 can be used as a portable instrument and retrieve the data, work as a data acquisition front-end, or in combination.

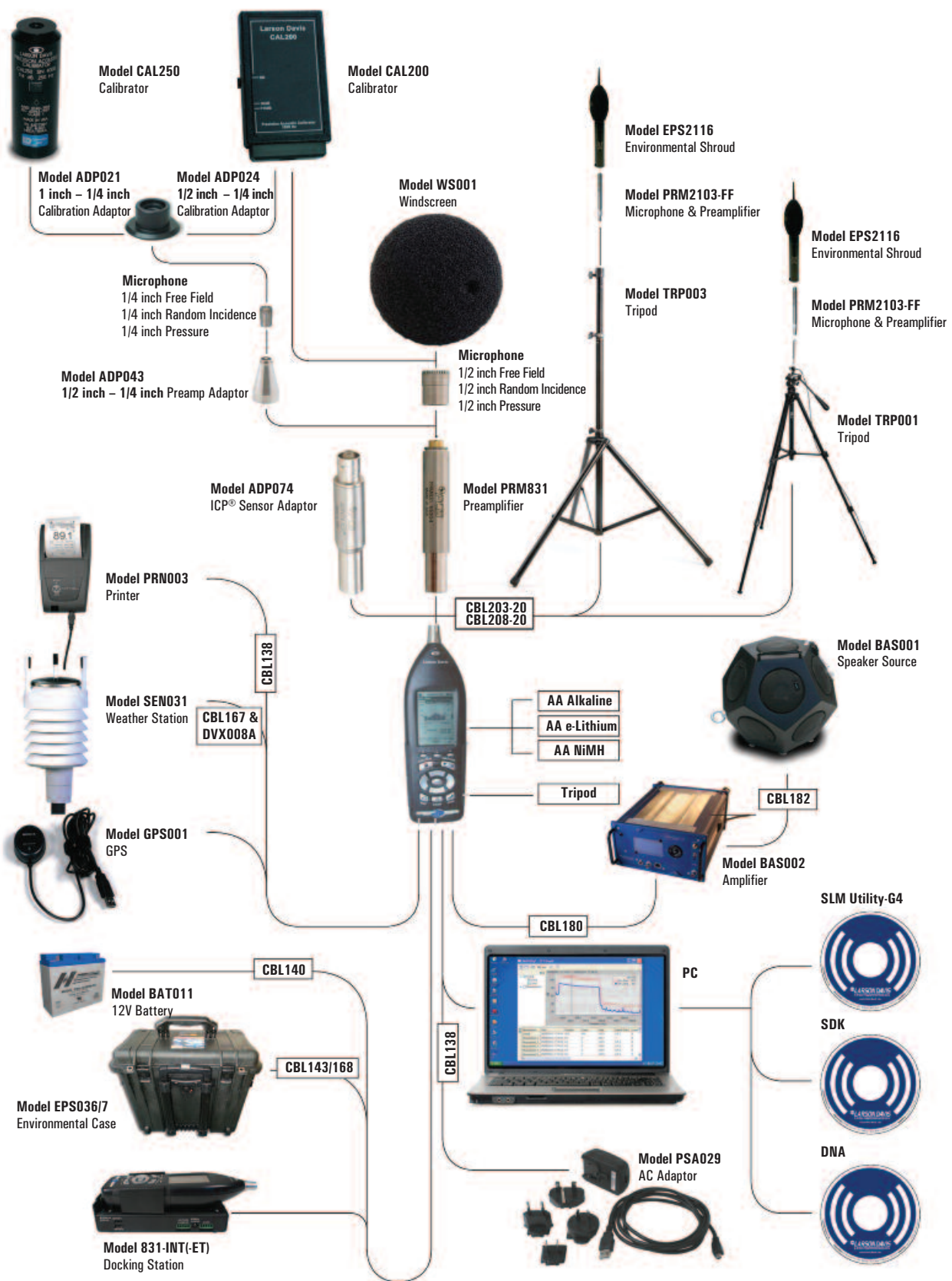
SLM Utility-G4

The SLM Utility-G4 program is an easy-to-use Windows® software for the Model 831 providing configuration set-up, data download and remote access. The Screengrabber feature emulates the SLM screen on your PC, convenient for presenting data stored on the Model 831 or for teaching classes. Measurement set-ups can be stored on the PC and exchanged with one or more Model 831 sound level meters. Data can be downloaded into a PC and easily exported to Excel® for further analysis. SLM Utility-G4 can simultaneously access multiple 831-based noise monitoring stations via USB, modem or Ethernet, which makes managing multiple noise monitors simple and convenient.

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System-at-a-glance



Model 831 Standards, Features & Specifications

Standards Met by Model 831

The Model 831 meets the specifications of the following standards:

Sound Level Meter Standards

IEC61672-1 Ed. 2.0 (2013-09) Class 1, Group X
 IEC60651 Ed 1.2 (2001) plus Amendment 1 (1993-02) and Amendment 2 (2000-10) Type 1, Group X
 IEC60804 (2000-10) Type 1, Group X
 ANSI S1.4-2014 Type 1

Octave Filter Standards (Option 831-OB3)

IEC61260 Ed. 1.0 (1995-08) plus Amendment 1 (2001-09), 1/1 and 1/3 octave bands, Class 1, Group X, all filters
 ANSI S1.11-2004 Class 1

Personal Noise Dosimeter Standards (Option 831-IH)

IEC61252 Ed. 1.1 (2002-03) Type 1
 ANSI S1.25-1991 Class 1

Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use

2006/95/EC Low Voltage Safety Directive
 IEC 61010-1 Ed. 3.0 (2010-06)

EMC Immunity and Emission

2004/08/EC EMC Directive
 IEC 61326-1 Ed. 2.0 (2012-07)
 IEC 61672-1 Ed. 2.0 (2013-09)
 FCC Title 47 CFR Part 15, Class B

Model 831 General Features and Characteristics

Class 1 Precision Integrating Sound Level Meter with real-time 1/1 and 1/3 octave filters
 Non-Volatile Memory
 High contrast 1/8th VGA LCD display with white LED backlight; sunlight readable
 Icon-driven graphic user interface
 Soft rubber backlit keys
 Large dynamic range
 Time weightings: Slow, Fast, Impulse, Integration and Peak simultaneously (AnyData)
 Frequency weightings: A, C, Z simultaneously (AnyData)
 1/1 and 1/3 octave frequency analysis available
 Voice message annotation and sound recording
 Ln statistics (L0.01 through L99.9 available)
 SLM Utility-G3 software available for set-up, control and high speed data download with export to Excel®
 Multi-tasking processor allows measuring while viewing data or transferring data
 Data Secure feature saves data to permanent memory every minute
 AC/DC outputs to recorder
 Long battery life; > 16 hours continuous measurement
 Multiple language support: English, German, Italian, Spanish, Portuguese, Swedish, French & Turkish
 Field-upgradable firmware: keeps instrument current with the latest measurement features
 Two-year limited warranty

Sound Level Meter Specifications

Averaging (Integration method)	Linear or Exponential
RMS Time Weighting	Slow, Fast or Impulse
Frequency Weightings	A, C or Z
Peak Detector Frequency Weighting	A, C or Z
Gain	0 dB or +20 dB
Exchange Rates	3, 4, 5, or 6 dB with optional 831-IH
Sample Rate	51,200 Hz
Peak Rise Time	30 µs

Physical Characteristics

Length with Microphone and Pre-amplifier	11.35 in	29.0 cm
Length, Instrument Body Only	8.8 in	22.4 cm
Width	2.8 in	7.1 cm
Depth	1.6 in	4.1 cm
Weight with Batteries, No Pre-amplifier or Microphone	13.6 oz	390 g
Weight with Batteries, Pre-amplifier and Microphone	1.2 lb	550 g

General Specifications

Reference level	114.0 dB re. 20 µPa
Reference level range	Single large range for SLM Normal for OBA option, Gain 0 dB
Reference frequency	1000 Hz
Reference direction	0° is perpendicular to the microphone diaphragm
Temperature	± 0.5 dB error between +14 to +122 °F (-10 to 50 °C)
Storage temperature	-4 to 158 °F (-20 to 70 °C)
Humidity	± 0.5 dB error from 30% to 90% relative humidity at 104 °F (40 °C)
Equivalent Microphone Impedance	12 pF for Larson Davis 1/2 in microphone
Range Level Error (OBA option)	± 0.1 dB relative to the reference range
Digital Display Update Rate	Four times per second (0.25 sec between updates). First display indication is available 0.25 seconds after initiation of a measurement.
Effect of an Extension Cable	None (up to 200 ft or 61 m with EXCxxx cable)
Electrostatic Discharges	The instrument is not adversely affected by electrostatic discharges
Extended Weather Options	-40 to +158 °F (-40 to +70 °C) operation with CER-831-E

Resolution Specifications

Levels	0.1 dB
Dose	0.1%
Elapsed time	0.1 second
Real time clock	1 second
Calendar	Through 31 Dec 2100

Integration Time

Time Averaged Levels and Sound Exposure Levels (s)	
Minimum	0.1 second
Maximum with Daily Autostore Enabled	Unlimited
Maximum with Daily Autostore Disabled	> 23 days with error < 0.5 dB
Dosimeter Metrics: TWA, Dose (s)	
Minimum	0.1 second
Maximum	Unlimited

Ln Statistics

Number of selectable parameters	6 in xx.xx% format, visible on the Model 831
Storage of Complete Table	0.1 dB Steps
Spectral Statistics	Requires Octave Analysis option (831-OB3)

Markers

Number of Markers	10
Pre-named Markers	5: Truck, Automobile, Motorcycle, Aircraft, Exclude
Link Marker to Automatic Sound Recording	Yes, requires Sound Recording option (831-SR)

Back Erase

Back Erase Time	5 or 10 seconds
Supported Modes	Manual

Measurement Control Modes

Available Modes	Manual Stop, Timed Stop, Stop when Stable, Continuous, Single Block Timer, Daily Block Timer
Timed Stop	Time in hh:mm:ss
Stop When Stable	Delta level in xx.x dB and time in hh:mm:ss
Continuous with Daily Auto-Store	1, 2, 4, 6, 12, 24, 48, 96 or 144 files per day, automated file numbering "yymmddnn.LD0"
Continuous Restart on Power Failure	Automatic if powered by 12VDC
Single Block Timer	Start date and time to End date and time
Daily Block Timer	Up to 3 blocks with each start and end date, blocks can cross date line

Clock Stability

< 1 sec in 24 hours, at 75 °F (+24 °C)
 < 10 sec in 30 days, at -40 to +158 °F (-40 to +70 °C)

Digital Voice Annotation

Annotate Recordings	Use headset (ACC003) or measurement microphone
Recording Sample Rate	8 kps
Listening Options	On the Model 831 or using processing software for .wav files

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AC/DC Output, Power Supply, Memory Retention, Broadband Noise Level & Preamplifiers



PRM831
Preamplifier

377B02
Microphone

Model 831 Preamplifier Specification (PRM831)

Frequency response with respect to the response at 1 kHz with 1 Vrms input and 12 pF equivalent microphone.	
8 Hz to 16 Hz	+0.1, -0.2 dB
16 Hz to 100 kHz	+0.1, -0.1 dB
Lower -3 dB limit	< 1.5 Hz
Attenuation	0.1 dB (typical)
Input Impedance	10 G Ω / 0.16 pF
Output Impedance	50 Ω
Maximum Output	28 Vpp 143 dB peak for microphones with 50 mV/Pa sensitivity
Maximum Output Current	12 mA peak
Harmonic Distortion	< -70 dBC with 8 Vrms output at 1 kHz
Output Slew Rate	2 V per μ s (typical)
Electronic Noise With 12 pF Equivalent Microphone	1.8 μ V typical A-weighted (2.4 μ V max) 4.3 μ V typical Flat 20 Hz to 20 kHz (5.0 μ V max)
Power Supply Voltage	15 to 36 V
DC Output Level	\approx 1/2 power supply voltage
Power Supply Current	1.9 mA (typical)
Temperature Sensitivity	< \pm 0.05 dB from +14 to +176 $^{\circ}$ F (-40 to +80 $^{\circ}$ C)
Humidity Sensitivity	< \pm 0.05 dB from 0 to 90% RH, non-condensing at +122 $^{\circ}$ F (+50 $^{\circ}$ C)
Dimensions (D x L)	0.50 x 2.88 in (12.7 x 73 mm)
Microphone Thread	11.7 mm - 60 UNS (0.4606 in - 60 UNS)
Cable Driving Capability	The Model 831 SLM (10 Vrms output signal) to 20 kHz with 200 ft (61 m) cable
Test Conditions	All values are at 73 $^{\circ}$ F (23 $^{\circ}$ C), 50% RH, 35 V supply, 10 ft (3 m) cable and equivalent microphone of 12 pF unless otherwise stated
Output Connector	Switchcraft TA5M (5-pin male)
Compatibility (to IEC61094-4)	Use with 1/2 in microphone, typical 50 mV/Pa sensitivity

General Specifications (Continued)

AC/DC Output					
Jack	2.5 mm (3/32 in), see CBL139 cable				
AC Output Voltage Range	\pm 2.3 Vpeak maximum output, 0.5 mV to 1.6 Vrms sine				
AC Output Recommended Load	Headset with \geq 16 Ω speaker impedance				
DC Output Voltage Scale	10 mV per dB, 0 V for 0 dB, 1 V for 100 dB				
DC Output Frequency & Time Weighting	Follows SLM Settings: A, C or Z and S, F or I				
Tee-off Preamplifier Signal Alternative	Use ADP015 and EXC006				
Power Supply					
Batteries	4-AA (LR6) NiMH, 1.5 V Lithium or Alkaline cells (supplied with 2500 mAh NiMH)				
External Power (5 V from USB)	USB Mini-B connector to * USB interface from computer * PSA029 AC to DC power adaptor * USB Hub * PSA031 12 VDC to USB adaptor				
External Power	Power through I/O connector: 10 to 15.5 VDC Use cable CBL140, CBL154 or Model 831-INT Interface Unit				
Operating Time on 1.5 V Lithium	> 24 hours with power save options, 1 sec Leq logging				
Power Consumption with PRM831	1.1 W (backlight off, running)				
Memory Retention					
Data Memory	Non-volatile flash memory, backup performed every minute				
Real-time Clock	\geq 10 minutes with batteries removed				
Broadband Noise Levels					
Self-generated Electrical Noise					
Weighting	0 dB Gain		20 dB Gain		
	Typical (dB)	Max (dB)	Typical (dB)	Max (dB)	
A	13	15	6	10	
C	15	22	12	16	
Z	22	25	19	26	
Self-generated Total Noise					
Weighting	0 dB Gain		20 dB Gain		
	Typical (dB)	Max (dB)	Typical (dB)	Max (dB)	
A	18	19	17	17	
C	18	23	17	19	
Z	23	26	21	26	

Note: Combination of the electronic noise and the thermal noise of the 377B02 microphone at 68 $^{\circ}$ F (20 $^{\circ}$ C) measured in a sealed cavity and vibration isolated with an averaging time of 60 seconds. Electronic noise of the instrument with an ADP090 (12 pF) in place of the microphone highest anticipated self-generated noise.

Model 831 with PRM831 and 377B02 Microphone

		0 dB Gain	20 dB Gain
Dynamic Range	A	18 - 140 dB	17 - 120 dB
	C	18 - 140 dB	17 - 120 dB
	Z	23 - 140 dB	21 - 120 dB
Measurement Range [1]	A	28 - 140 dB	26 - 120 dB
	C	29 - 140 dB	27 - 120 dB
	Z	35 - 140 dB	34 - 120 dB
Linearity Range [2]	A	\geq 115 dB 24 to 140 dB	\geq 101 dB 19 to 120 dB
	C	\geq 114 dB 25 to 140 dB	\geq 96 dB 23 to 120 dB
	Z	\geq 106 dB 32 to 140 dB	\geq 86 dB 32 to 120 dB
Peak Range	A	66 - 143 dB	46 - 123 dB
	C	66 - 143 dB	46 - 123 dB
	Z	77 - 143 dB	59 - 123 dB
Max Level	SPL	140 dB	120 dB
	PEAK	143 dB	123 dB

Notes
[1] As defined in IEC 61672-1. Microphone and electrical self-noise included. [2] As defined in ANSI S1.4-1983. Electrical Measurements.

Permanent Outdoor Preamplifiers and Microphones

Model 426A12
Model PRM2103

Model 831 Options-at-a-glance



BAS003
Directional Speaker

Fast Fourier Transform (831-FFT)	
FFT lines	400, 800, 1600, 3200 or 6400
Frequency Span	100, 200, 500, 1000, 2000, 5000, 10000 or 20000 Hz
Window	Hanning, Flattop or Rectangular
Frequency Weighting	A, C, Z
Bandwidth, Z Weighting	3 Hz to 20 kHz
Cursors	Manual and Max Tracking with or without Harmonic cursors
Reverberation Time (831-RT)	
Methods	Impulse Excitation and Interrupted Noise
Filters	1/1 (63 Hz to 8 kHz) and 1/3 (50 Hz to 10 kHz)
Sample Time	2.5, 5, 10 or 20 ms
Measurements	T20, T30 and ISO 3382-2 quality indicators

Spectral Analysis with Octave Bands	
Octave Analysis (Option OB3)	
Frequency Range	
1/1 Octave Filters	8 Hz to 16 kHz
1/3 Octave Filters	6.3 Hz to 20 kHz
Octave filter self generation noise	at 1 kHz
1/1 Octave Filters	2.0 dB @ low range (0.2 dB in low range w/ 20 dB gain)
1/3 Octave Filters	-3.1 dB @ low range (-4.9 dB in low range w/ 20 dB gain)
Octave Analysis Parameters	
Filters	None, 1/1 octave, 1/3 octave, or 1/1 and 1/3 octaves
Frequency Weighting (independent of broadband)	A, C or Z
Maximum Spectrum	Maximum in each band or Spectrum at broadband Lmax
Spectral Statistics	6 percentiles per band
Octave Band Logging Capability	Time History (see 831-LOG) Measurement History (see 831-ELA) Event History (see 831-ELA)
Normalized Spectrum	
View Modes	SPL, Leq, Lmax or Lmin; absolute or relative
Predefined Filters	A, C, -A, -C
User Defined Filters	Four named for 1/1 octave and four for 1/3 octaves bands

Profiling with Time History Logging, Measurement History and Event History	
Time History "TH" Logging (831-LOG)	
Record Period	Selections from 20 ms to 24 h 2.5, 5 and 10 ms are available with option 831-FST
Logging Parameters	Any combination of available broadband and spectral AnyData plus non sound metrics
Measurement History "MH" Logging (831-ELA)	
Interval	1 min to 99 hr
Logging Parameters	Same as Overall Measurements Ln Statistics + Spectral Ln (if OB1 or OB3 enabled)
Sound Record Tagging	At start of each interval (required to enable SR)
Event History "EH" Logging (831-ELA)	
Logging Period	20 ms to 5 s (independent of TH or MH)
Logging Parameters	Leq, Lmax, Lpeak, Date and Time, Duration, Exposure in dB and Pa ² s, and available spectral Leq and maximum. Event time history is also available with broadband and spectral levels.
Sound Record Tagging	Required to enable SR at 8 or 16 ksps
SEL	Yes (L _{Ae})
Sound Recording (831-SR)	
Data Format	Mono wave file (.wav), lossless
Listening Options	On Model 831 using headset with Utility program, DNA or using standard wave file player
Sample Rate	8, 16, 24 or 48 ksps
Storage Requirement	1 MB/min at 8 ksps to 6 MB/min at 48 ksps
Sound Recording Modes	Manual, Coupled to Marker, at measurement interval begin, upon exceedance event
Pretrigger	Up to 9 s
Duration	Max 9999 s
Sound Streaming	Streaming to host requires USB communication line (831 V1.6 or later)

Dosimetry (831-IH)	
Dosimeters	Two in parallel
Pre-configured settings	OSHA-1, OSHA-2, ACGIH, NIOSH, IEC
Exchange Rate	3, 4, 5, or 6 dB (independently selectable per dosimeter)
Threshold	Selectable level
Criterion Duration and Time	Numeric input

Communication	
Analog modem and Serial Communication	
Analog Modem Support	Requires fax quality line (no VOIP-like data compression allowed) and an analog modem on host computer
Analog Modem Protocol	Z-Modem
Analog Modem Model	MDMUSB-A
Analog Modem Power Requirement	Powered USB Hub or 831-INT Docking Station
Analog Modem Control	Model 831 USB port as host controller
Analog Modem Data Rate	2 to 3 kB/s (typical)
Serial Communication Prerequisite	USB to serial bridge (DVX008A)
Serial Communication Protocol	Z-Modem
Serial Communication Control	Model 831 USB port as host controller

Wireless Modem (831-COMM) Over Internet	
Wireless Modem Support	GSM-GPRS Edge technology over internet Dynamic IP address support via server initiated call Static IP address support when allowed by ISP provider (does not require modem on server)
Wireless Modem Protocol	Z-Modem over TCP/IP
Wireless Modem Model	MDMUSB-E (Quad-band)
Wireless Modem Power Requirement	Powered USB Hub or 831-INT Docking Station
Wireless Modem Control	Model 831 USB port as host controller
Wireless Modem Data Rate	2 to 3 kB/s (typical)

USB Communication	
Standard Cables	Up to 16.4 ft (5 m), CBL138 is 6 ft (1.8 m)
Extended Cable	Devices are available that extend the connection up to 330 ft (100 m)

Weather (Meteorological Parameters)	
Combined Meteorological Unit (SEN031)	
Measurement Method	Digitized over serial port to USB
Sensor Model	SEN031 (requires CBL167, DVX008A and 831-WTHR)
Connectivity	Model 831-INT Docking station, or direct to Model 831 (external power source required) CBL170 break-out cable can be used with user provided anemometers and analog sensors
Measured Parameters	Wind speed and direction, temperature, relative humidity, rain and hail



Ordering Information

Model Number	Description
Sound Level Meter	
831	Model 831 Sound Level Meter for Environmental / Community Noise including AnyData and Voice Annotation, without microphone or preamplifier
831-FF	Model 831 Sound Level Meter with Class-1 free-field, pre-polarized precision condenser microphone (50 mV/pa), preamplifier (PRM831), accessory kit (831-ACC)
831-RI	Model 831 Sound Level Meter with Class-1 random-incidence pre-polarized condenser microphone (50 mV/pa), preamplifier (PRM831), accessory kit (831-ACC)
Sound Level Meter Options	
831-LOG	Upgrade Model 831 Sound Level Meter with logging of time histories with periods from 20 ms to 24 hr
831-ELA	Upgrade for Model 831 Sound Level Meter. Exceedance based logging analysis with event, interval and daily histories.
831-OB3	Upgrade Model 831 Sound Level Meter with Real-time 1/1 & 1/3 octave filter set
831-SR	Upgrade Model 831 Sound Level Meter with sound recording. Adds sound snapshot on demand, with Measurement History (831-ELA required) or on events.
831-FST	Upgrade Model 831 Sound Level Meter to logging of time histories with periods from 2.5 ms to 24 hr (requires 831-LOG & 831-OB3)
831-IH	Upgrade Model 831 Sound Level Meter, Industrial Hygiene feature
831-COMM	Upgrade Model 831 Sound Level Meter, Advanced Communication Option controls the EDGE modem (MDMUSB-E)
831-RT	Upgrade Model 831 Sound Level Meter with Reverberation Time Analysis
831-FFT	Upgrade Model 831 Sound Level Meter with FFT Analysis
831-MSR	Upgrade Model 831 Sound Level Meter with Measurement History and Sound Recording
Handheld Accessories	
WS001	3 1/2 inch diameter windscreen for 1/2 inch microphone
831-ACC	Accessory kit for Model 831 Sound Level Meter, which includes case (831-CCS), battery (4-AA), power supply w/ USB cable (PSA029) and windscreen (WS001)
831-CCS	Hard shell case for Model 831 Sound Level Meter
ACC003	Headset with microphone boom, 0.09 inch (2.5 mm) sub-miniature plug
ADP074	ICP® cable adaptor for Model 831 Sound Level Meter
CBL138	Cable USB A to Mini-B 6 ft (1.8 m)
CBL139	Cable 0.09 inch (2.5 mm) sub-miniature plug AC/DC out to BNC or RCA
CCS032	Soft pouch for Model 831 and SoundTrack LxT®
PSA027	90 to 264V to 12V switching power supply for 824 and 831 sound level meter and HVM100
PSA029	AC Power supply for Model 831 and SoundTrack LxT® (100-240 VAC to 5 V USB w/mini-B cable, CBL138)
PSA031	12 VDC to USB Converter for SoundTrack LxT® and Model 831
CBL140	DC power cable for Model 831 Sound Level Meter, 8 – 30 VDC includes lead-acid battery clamps and 12 V car plug
Microphones and Preamplifiers	
PRM831	Model 831 Sound Level Meter preamplifier for 1/2 inch free-field or random incidence prepolarized microphones
377B02	1/2 inch free-field, prepolarized condenser microphone, typical sensitivity = 50 mV/Pa, 3.15 Hz to 20 kHz (±2 dB)
377C20	1/2 inch random incidence, prepolarized condenser microphone 50 mV/Pa, 3.15 Hz to 16 kHz (±2 dB)
377C10	1/4 inch pressure, prepolarized condenser microphone typical sensitivity = 1.6 mV/Pa, 4 Hz to 70 kHz (±2 dB)
ADP043	1/4 inch microphone to 1/2 inch preamplifier adaptor
426A12	Permanent outdoor preamplifier with electrostatic actuator, humidity reading, TEDS and supporting externally and pre-polarized microphone (microphone not included)
PRM2103	Permanent Outdoor Preamplifier for Model 831 with Remote Calibration Check, humidity reading and heater, for pre-polarized microphone (MIC and cables not included)

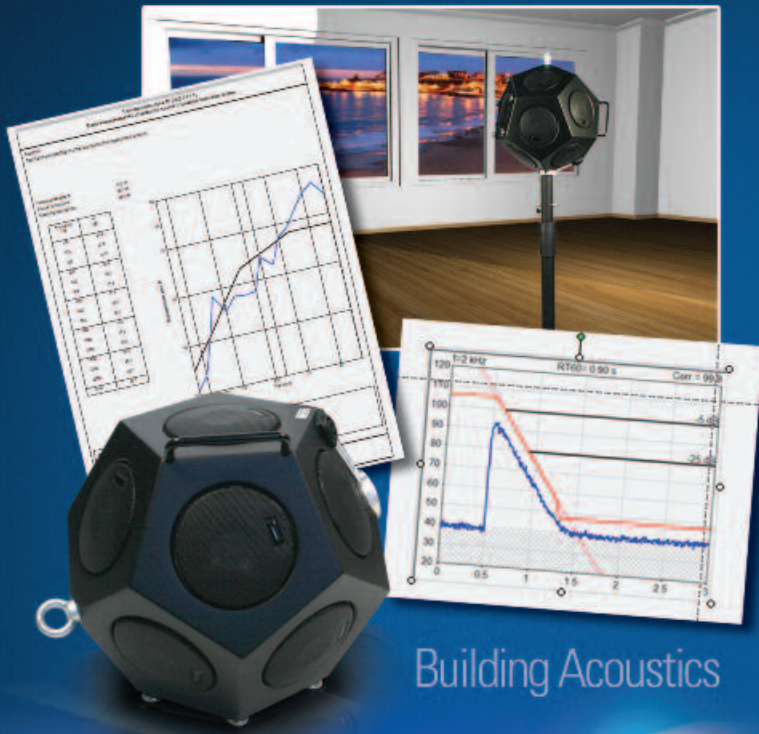
Noise Sources & Accessories



CAL200 1 kHz, 94 and 114 dB, Calibrator
BAS001 Omnidirectional Speaker
BAS002 Lightweight Power Amplifier

Model Number	Description
Software	
SWW-SLM-UTILG4	SLM Utility-G4 software for SoundTrack LxT® and Model 831 sound level meter: download, upgrade, translate, print text reports or export to spreadsheet. CD with Quick Start Guide
SWW-DNA	Basic software and dongle (USB) for evaluation and reporting of data downloaded from the Larson Davis instruments, requires an instrument driver
SWW-DNA-831	Instrument driver for instrument control, set-up, live display, data translation, and data download for Model 831 Sound Level Meter
SWW-DNA-EV	DNA option for events tracking: PNL and PNLt event time history and EPNL event
SWW-DNA-BA	DNA software Building Acoustics, allows calculation of transmission loss and sound insulation calculations
SWW-DNA-REMOTE	DNA software for monitoring a remote location when using 820, 824, 870, or 831 Models. Uses modem connection for communication and data download.
Calibrators	
CAL200	Class 1 acoustic calibrator with user selectable output of 94 or 114 dB at 1 kHz. 1/2 inch opening (no adaptor)
CAL250	Class 1 microphone calibrator, output 114 dB at 251.2 Hz. 1 inch opening with 1/2 inch (ADP019) adaptor. 3/8 inch (ADP020) and 1/4 inch (ADP021) adaptors available
Temporary Noise Monitoring System Components	
EPS029-831	Case for Model 831 including (2) 21Ah bat, charger (PSA032), internal preamplifier cable (CBL141), preamplifier cable (CBL142-006), power cable (CBL143), 3 ft mast
EPS030-831	Case for Model 831 Sound Level Meter including (1) 21Ah battery, charger (PSA032), internal preamplifier cable (CBL141), and power distribution cable (CBL151)
EPS2116	Environmental protection for 1/2 inch preamplifiers with windscreen, bird spikes, desiccants and universal mounting
TRP001	Instrumentation tripod w/ADP032 preamplifier to tripod interface
TRP003	Support tripod, maximum height 8 ft (2.4 m) used in portable NMS systems
ADP034	Adaptor connecting EPS2116 to TRP003 tripod
CBL174	Waterproof cable connecting EPS029-831/EPS030-831 to external PC, 2m USB A-to-B
Permanent Noise Monitoring Systems	
NMS016	Permanent NMS on tilt-down pole using main power. Includes 831 (LOG, ELA), 831-INT, TRP019, 426A12-FF, EPS031 (w/ 9Ah battery) and cables.
NMS019	Portable NMS on tripod using solar power. Includes 831 (LOG, ELA), 831-INT, TRP020-20, 426A12-FF, EPS032 (w/ solar charger) and cables (required PSA012 and battery).
NMS021	NoiseTutor complete system including 831-FF with 831-OB3, 831-ELA and 831-LOG firmware options and EPS2116. Also includes EPS041 that consists of weathertight case, 80 Wh battery, embedded PC, HDMI display, wireless keypad, SWW-DNA-NT software, and wireless gateway.
NMS022	NoiseTutor complete system including 831 with 831-OB3, 831-ELA and 831-LOG firmware options, PRM2103-FF and EPS2116. Also includes EPS041 that consists of weathertight case, 80 Wh battery, embedded PC, HDMI display, wireless keypad, SWW-DNA-NT software, and wireless gateway.
Noise Monitoring System Components	
831-INT	Model 831 docking station connecting weather sensors, batteries, charger and USB peripherals
831-INT-ET	Model 831 Docking Station with Ethernet (RJ45) connecting to power supply, weather sensors, batteries, charger and USB peripherals
ACC004	Surge suppressor for 110-240 VAC
CBL170	Cable connecting Model 831 to 9-pin D connector (wind speed, direction, logic I/O, 3 slow ADC) and coaxial DC connector (to PSA027), including breakout cable and I/F block
EPS037	Case on wheels (CCS035) with 100 Ah battery (BAT002) for permanent NMS, includes cable (CBL149) to enclosure (EPS031 or EPS032)
MDMUSB-A	Modem for Model 831 sound level meter with USB connection and dial-up
MDMUSB-E	EDGE Modem for Model 831 Sound Level Meter with USB connection
DVX008A	USB Adaptor to DB9 interface (used with Serial modem or SEN031)
SEN031	Combined weather sensor: wind speed and direction (no moving parts), temperature, humidity, pressure, rainfall (requires CBL167 cable + DVX008A)
Calibration	
CER-831	Calibration and certification of 831(SLM, preamplifier w/o microphone) and 831-RPT
CER-MIC	Calibration and certification for microphone
CER-831-E	Environmental certification Model 831 for [-40,+158] °F ([-40,+70] °C) range. Includes calibration of 831 and PRM831, 831-RPT, environmental test of microphone. Microphone calibration not included.
CER-PRM2103-E	Environmental Certification Model PRM2103 for [-40,+158] °F ([-40,+70] °C) range; (no microphone certification); environmental test of microphone
CER-426A12	Calibration and certification for 426A12 including environmental testing for temperature and humidity stability. Replaces windscreen, o-ring, and desiccant cartridges.
831-RPT	Model 831 Sound Level Meter certification test report. Certificate for SLM, preamplifier and microphone.

Model 831 Sound Level Meter Solutions



Building Acoustics



Environmental Noise Monitoring



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Larson Davis provides complete solutions for noise and vibration measurement and analysis. From stand-alone, simple-to-use instruments to complete systems including sensors, data acquisition, and software, Larson Davis has what you need.

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FFT Analysis

