ADVANCED SOUND LEVEL METER
MODEL 831
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

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
- Lightweight, ergonometic 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 carrying case
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 sound level meter
- Voice Annotation
- ANY LEVEL Display
- User-programmable run modes
- Six user-selectable statistics (Ln)
- 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

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>831-OB3</td>
<td>1/1 and 1/3, Class 1, octave band spectral analysis</td>
</tr>
<tr>
<td>831-IH</td>
<td>Industrial Hygiene or personal noise dosimetry</td>
</tr>
<tr>
<td>831-LOG</td>
<td>Time history logging at periods from 20 ms to 24 hrs</td>
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<tr>
<td>831-FST</td>
<td>Fast time history logging at 2.5, 5 or 10 ms periods</td>
</tr>
<tr>
<td>831-ELA</td>
<td>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</td>
</tr>
<tr>
<td>831-SR</td>
<td>Sound Recording to .wav files at 8, 16, 24 or 48 kHz</td>
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<tr>
<td>831-RT</td>
<td>Reverberation time measurement, computation and display</td>
</tr>
<tr>
<td>831-FFT</td>
<td>Fast Fourier Transform up to 6400 lines</td>
</tr>
<tr>
<td>831-MSR</td>
<td>Measurement History and Sound Recording</td>
</tr>
</tbody>
</table>

SUPPORTED PC SOFTWARE

- G4 LD Utility – 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.
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 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.
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 & Impulse) 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

<table>
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<tr>
<th>LIVE</th>
<th>A</th>
<th>C</th>
<th>Z</th>
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<table>
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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.

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.
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.

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 G4 LD Utility Software. Various set-ups and configurations can be created within G4 and transferred to the sound level meter such that they are easily accessible.

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.
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.

<table>
<thead>
<tr>
<th>Combined Meteorological Unit (SEN031 Vaisala WXT520)</th>
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</thead>
<tbody>
<tr>
<td>Measurement Method</td>
</tr>
<tr>
<td>Connectivity</td>
</tr>
<tr>
<td>Measured Parameters</td>
</tr>
</tbody>
</table>

Model 831-INT Docking Station – Configuration

Vaisala WXT520 (SEN031) – Wind/Temp/Rain/Hail
Sierra Wireless RV50 Gateway (COM-RV40-DC)
Broadband
Internet
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.

<table>
<thead>
<tr>
<th>Location and Timestamp with GPS001</th>
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</thead>
<tbody>
<tr>
<td><strong>Time Synchronization</strong></td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
</tbody>
</table>

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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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.
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)

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.
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.

AUTOMATIC EVENT DETECTION AND EVENT HISTORY (831-ELA)

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 to right).

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.

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
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
- **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.

Automatic Recording Mode:

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-ELA Recordings:

- **Event History Sound Recordings** - Acquired upon events meeting preset conditions with fixed or dynamic triggering available
- **Measurement History Sound Recordings** - 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 G4 LD Utility 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)

<table>
<thead>
<tr>
<th>INSTRUMENT GAIN</th>
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</thead>
<tbody>
<tr>
<td>Range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Overload Level</td>
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<td>110 dB</td>
</tr>
<tr>
<td>Lower Level of A/D Range</td>
<td>50 dB</td>
<td>17 dB</td>
</tr>
<tr>
<td>Instrument Noise Floor</td>
<td>23 dB</td>
<td>23 dB</td>
</tr>
<tr>
<td>Sound Recording Range</td>
<td>50 - 143 dB</td>
<td>23 - 110 dB</td>
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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 G4 LD Utility 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.
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.
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.

SOFTWARE SOLUTIONS

The G4 LD Utility 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. G4 LD Utility can simultaneously access multiple 831-based noise monitoring stations via USB, modem or Ethernet, which makes managing multiple noise monitors simple and convenient.

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 layout. This allows for drag-anddrop 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.
SYSTEM-AT-A-GLANCE

Model CAL250
Calibrator

Model CAL200
Calibrator

Model WS001
Windscreen

Model PRM831
Preamplifier

Model ADP074
ICP® Sensor Adaptor

Model ADP043
1/2 inch – 1/4 inch Calibration Adaptor

Model ADP021
1 inch – 1/4 inch Calibration Adaptor

Model ADP024
1/2 inch – 1/4 inch Calibration Adaptor

Model PRN003
Printer

Model SEN031
Weather Station

Model GPS001
GPS

Model PRM2103-FF
Microphone & Preamplifier

Model TRP003
Tripod

Model EPS2116
Environmental Shroud

Model TRP001
Tripod

Model PRM2103-FF
Microphone & Preamplifier

Model 831-INT(-ET)
Docking Station

Model GPS025
Microphone & Preamplifier

Model BAT003
12V Battery

Model BAS001
Speaker Source

Model BAS002
Amplifier

Model 378A04
Microphone & Preamplifier

Model BAT015
12V Battery

Model BAT011
12V Battery

Model 831-INT(-ET)
Docking Station

Model EPS036/7
Environmental Case

Model 002T10
AA Alkaline
Model 002C10
AA e-Lithium
Model 002A10
AA NiMH
MODEL 831 STANDARDS, FEATURES & SPECIFICATIONS

STANDARDS MET BY MODEL 831

The Model 831 meets the specifications of the following standards:

**Sound Level Meter Standards**
- IEC6126-1 Ed. 3.0 (2013-09) Class 1, Group X
- IEC66051 Ed. 1.2 (2001) plus Amendment 1 (1993-02) and Amendment 2 (2000-10) Type 1, Group X
- IEC61060-4 (2000-10) Type 1, Group X
- ANSI S1.2-2014 Type 1

**Octave Filter Standards (Option 831- OB3)**
- IEC81996 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)**
- IEC81292 Ed. 1.1 (2002-03) Type 1
- ANSI S1.2S-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 (2013-06)

**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 CRF 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, or 6 dB with optional 831-HH
- **Sample Rate**: 51,200 Hz
- **Peak Rise Time**: 30 μs

**Physical Characteristics**

- **Length with Microphone and Preamplifier**: 11.35 in 29.0 cm
- **Length, Instrument Body Only**: 8.9 in 22.4 cm
- **Width**: 2.8 in 7.1 cm
- **Depth**: 1.6 in 4.1 cm
- **Weight with Batteries, No Preamplifier or Microphone**: 13.6 oz 390 g
- **Weight with Batteries, Preamplifier and Microphone**: 1.2 lb 550 g

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference level</td>
<td>114.0 dB re. 20 μPa</td>
</tr>
<tr>
<td>Reference level range</td>
<td>Single large range for SLM Normal for OBA option, Gain 0 dB</td>
</tr>
<tr>
<td>Reference frequency</td>
<td>1000 Hz</td>
</tr>
<tr>
<td>Reference direction</td>
<td>0° is perpendicular to the microphone diaphragm</td>
</tr>
<tr>
<td>Temperature Effects</td>
<td>± 0.5 dB error between +14 to +122 °F (-10 to 50 °C)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-13 °F to +122 °F (-25 °C to 50 °C)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-13 to +158 °F (-25 to +70 °C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>± 0.5 % error from 30% to 90% relative humidity at 104 °F (40 °C)</td>
</tr>
<tr>
<td>Equivalent Microphone Impedance</td>
<td>12 pf for Larson Davis 1/2 in microphone</td>
</tr>
<tr>
<td>Range Level Error (OBA option)</td>
<td>± 0.1 dB relative to the reference range</td>
</tr>
<tr>
<td>Digital Display Update Rate</td>
<td>Four times per second (0.25 sec between updates), first display indication is available 0.25 seconds after initiation of a measurement.</td>
</tr>
<tr>
<td>Effect of an Extension Cable</td>
<td>None (up to 200 ft or 61 m with EXCxxx cable)</td>
</tr>
<tr>
<td>Electrostatic Discharges</td>
<td>The instrument is not adversely affected by electrostatic discharges</td>
</tr>
<tr>
<td>Extended Weather Options</td>
<td>-40 to +158 °F (-40 to +70 °C) operation with CER-831-E</td>
</tr>
</tbody>
</table>

**Resolution Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>0.1 dB</td>
</tr>
<tr>
<td>Dose</td>
<td>0.1%</td>
</tr>
<tr>
<td>Elapsed time</td>
<td>0.1 second</td>
</tr>
<tr>
<td>Real time clock</td>
<td>1 second</td>
</tr>
<tr>
<td>Calendar</td>
<td>Through 31 Dec 2100</td>
</tr>
</tbody>
</table>

**Integration Time**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Averaged Levels and Sound Exposure Levels (s)</td>
<td>Minimum: 0.1 second, Maximum with Daily Autostore Enabled: Unlimited, Maximum with Daily Autostore Disabled: &gt; 23 days with error &lt; 0.5 dB</td>
</tr>
<tr>
<td>Dosimeter Metrics: TWA, Dose (s)</td>
<td>Minimum: 0.1 second, Maximum: Unlimited</td>
</tr>
<tr>
<td>Ln Statistics</td>
<td>Number of selectable parameters: 6 in xx.xx% format, visible on the Model 831</td>
</tr>
<tr>
<td>Storage of Complete Table</td>
<td>0.1 dB Steps, Spectral Statistics Requires Octave Analysis option (831-OB3)</td>
</tr>
<tr>
<td>Markers</td>
<td>Number of Markers: 10, Prenamed Markers: 5: Truck, Automobile, Motorcycle, Aircraft, Exclude, Link Marker to Automatic Sound Recording: Yes, requires Sound Recording option (831-5R)</td>
</tr>
</tbody>
</table>

**Back Erase**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back Ease Time</td>
<td>5 or 10 seconds</td>
</tr>
<tr>
<td>Supported Modes</td>
<td>Manual</td>
</tr>
</tbody>
</table>

**Measurement Control Modes**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Modes</td>
<td>Manual Stop, Timed Stop, Stop when Stable, Continuous, Single Block Timer, Daily Block Timer</td>
</tr>
<tr>
<td>Timed Stop</td>
<td>Time in hh:mm:ss</td>
</tr>
<tr>
<td>Stop When Stable</td>
<td>Delta level in xx.x dB and time in hh:mm:ss</td>
</tr>
<tr>
<td>Continuous with Daily Auto-Store</td>
<td>1, 2, 4, 6, 12, 24, 48, 96, or 144 files per day, automated file numbering “yymmdd.LD0”</td>
</tr>
<tr>
<td>Continuous Restart on Power Failure</td>
<td>Automatic if powered by 12V DC</td>
</tr>
<tr>
<td>Single Block Timer</td>
<td>Start date and time to End data and time</td>
</tr>
<tr>
<td>Daily Block Timer</td>
<td>Up to 3 blocks with each start and end date, blocks can cross date line</td>
</tr>
</tbody>
</table>

**Clock Stability**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 sec in 24 hours, at 75 °F (+24 °C)</td>
<td>&lt; 10 sec in 30 days, at -40 to +158 °F (-40 to +70 °C)</td>
</tr>
</tbody>
</table>

**Digital Voice Annotation**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annotate Recordings</td>
<td>Use headset (ACC003) or measurement microphone</td>
</tr>
<tr>
<td>Recording Sample Rate</td>
<td>8 ksps</td>
</tr>
<tr>
<td>Listening Options</td>
<td>On the Model 831 or using processing software for .wav files</td>
</tr>
</tbody>
</table>

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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 GΩ / 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 μs (typical)
- **Electronic Noise With 12 pF Equivalent Microphone:**
  - Typical A-weighted: 1.8 µV
  - Flat 20 Hz to 20 kHz: 4.3 µV
- **Power Supply Voltage:** 15 to 36 V
- **DC Output Level:** 1/2 power supply voltage
- **Power Supply Current:** 1.9 mA (typical)
- **Temperature Sensitivity:** < ±0.05 dB from -40 to +176 °F (-40 to +80 °C)
- **Humidity Sensitivity:** < ±0.05 dB from 0 to 90% RH, non-condensing at +122 °F (+50 °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

### General Specifications (continued)

#### AC/DC Output
- **Jack:** 2.5 mm (3/32 in), see CBL139 cable
- **AC Output Voltage Range:** ± 2.3 Vpeak maximum output, 0.5 mV to 1.6 Vrms sine
- **DC Output Scale:** 10 mV per dB, 0 V for 0 dB, 1 V for 100 dB
- **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: ≥ 10 minutes with batteries removed
- **Broadband Noise Levels**
  - **Self-generated Electrical Noise**
    - **Weighting:**
      - **0 dB Gain:** Typical (dB) Max (dB)
      - **20 dB Gain:** 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:** Typical (dB) Max (dB)
        - **20 dB Gain:** Typical (dB) Max (dB)
        - **A:** 18 19 17 17
        - **C:** 18 23 17 19
        - **Z:** 23 26 21 26

### DC/AC OUTPUT, POWER SUPPLY, MEMORY RETENTION, BROADBAND NOISE LEVEL & PREAMPLIFIERS

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**Notes**

MODEL 831 OPTIONS-AT-A-GLANCE

### FAST FOURIER TRANSFORM (831-FFT)

<table>
<thead>
<tr>
<th>FFT lines</th>
<th>400, 800, 1600, 3200 or 6400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Span</td>
<td>100, 200, 500, 1000, 2000, 5000, 10000 or 20000 Hz</td>
</tr>
<tr>
<td>Window</td>
<td>Hamming, Flattop or Rectangular</td>
</tr>
<tr>
<td>Frequency Weighting</td>
<td>A, C, Z</td>
</tr>
<tr>
<td>Bandwidth, Z Weighting</td>
<td>3 Hz to 20 kHz</td>
</tr>
<tr>
<td>Cursors</td>
<td>Manual and Max Tracking with or without Harmonic cursors</td>
</tr>
</tbody>
</table>

### Reverberation Time (831-RT)

<table>
<thead>
<tr>
<th>Methods</th>
<th>Impulse Excitation and Interrupted Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filters</td>
<td>1/1 (63 Hz to 8 kHz) and 1/3 (50 Hz to 10 kHz)</td>
</tr>
<tr>
<td>Sample Time</td>
<td>2.5, 5, 10 or 20 ms</td>
</tr>
<tr>
<td>Measurements</td>
<td>T30, T30 and ISO 3382-2 quality indicators</td>
</tr>
</tbody>
</table>

### 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, 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 Lin; absolute or relative
- 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
- Logging Parameters: Any combination of available broadband and spectral
- Measurement History “MH” Logging (831-ELA)
  - Interval: 1 min to 99 hr.
  - Logging Parameters: Same as Overall Measurements
  - 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, Dlle, and T30; and available spectral Leq and maximum
- Sound Record Tagging: Required to enable SR at 8 or 16 ksps
- SEL: Yes (L)

**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: Selectable level
- Threshold: Selectable level
- Criterion: Duration and Time Numeric input

### COMMUNICATION

#### Serial Communication

- Serial Communication Prerequisite: USB to serial bridge (DVX008A)
- Serial Communication Protocol: Z-Modem
- Serial Communication Control: Model 831 USB port as host controller

#### NETWORK (CATS & Internet)

- Required accessory: 831-INT-ET
- Interface: Ethernet RJ45
- IP address: From DHCP
- Protocol: TCP/IP

#### 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 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sound Level Meter</strong></td>
<td></td>
</tr>
<tr>
<td>831</td>
<td>Model 831 Sound Level Meter for Environmental / Community Noise including AnyData and Voice Annotation, without microphone or preamplifier</td>
</tr>
<tr>
<td>831-FF</td>
<td>Model 831 Sound Level Meter with Class I free-field, pre-polarized precision condenser microphone (50 mV/Pa), preamplifier (PRM831), accessory kit (831-ACC)</td>
</tr>
<tr>
<td>831-RI</td>
<td>Model 831 Sound Level Meter with Class I random-incidence pre-polarized condenser microphone (50 mV/Pa), preamplifier (PRM831), accessory kit (831-ACC)</td>
</tr>
<tr>
<td><strong>Sound Level Meter Options</strong></td>
<td></td>
</tr>
<tr>
<td>831-LOG</td>
<td>Upgrade Model 831 Sound Level Meter with logging of time histories with periods from 25 ms to 24 hr</td>
</tr>
<tr>
<td>831-ELA</td>
<td>Upgrade Model 831 Sound Level Meter with Real-time 1/1 &amp; 1/3 octave filter set</td>
</tr>
<tr>
<td>831-SR</td>
<td>Upgrade Model 831 Sound Level Meter with sound recording. Adds sound snapshot on demand, with Measurement History (831-ELA required) or on events</td>
</tr>
<tr>
<td>831-FST</td>
<td>Upgrade Model 831 Sound Level Meter to logging of time histories with periods from 2.5 ms to 24 hr (requires 831-LOG &amp; 831-OB3)</td>
</tr>
<tr>
<td>831-IH</td>
<td>Upgrade Model 831 Sound Level Meter with Industrial Hygiene feature</td>
</tr>
<tr>
<td>831-RT</td>
<td>Upgrade Model 831 Sound Level Meter with Remediation Time Analysis</td>
</tr>
<tr>
<td>831-FFT</td>
<td>Upgrade Model 831 Sound Level Meter with FFT Analysis</td>
</tr>
<tr>
<td>831-MSR</td>
<td>Upgrade Model 831 Sound Level Meter with Measurement History and Sound Recording</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th><strong>No.</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>WS001</td>
<td>3 1/2 inch diameter windscreen for 1/2 inch microphone</td>
</tr>
<tr>
<td>831-ACC</td>
<td>Accessory kit for Model 831 Sound Level Meter, which includes case (831-CCS), battery (6 AA), power supply w/ USB cable (CBL140) and windscreen (WS001)</td>
</tr>
<tr>
<td>831-CCS</td>
<td>Hard shell case for Model 831 Sound Level Meter</td>
</tr>
<tr>
<td>ACC005</td>
<td>Headset with microphone boom, 0.09 inch (2.5 mm) sub-miniature plug</td>
</tr>
<tr>
<td>ADP004</td>
<td>ICP® cable adapter for Model 831 Sound Level Meter</td>
</tr>
<tr>
<td>ADP007</td>
<td>Direct input adapter with BNC connector for Model 831 Sound Level Meter</td>
</tr>
<tr>
<td>BAT015</td>
<td>8 D cell battery holder with fuse; batteries not included</td>
</tr>
<tr>
<td>CBL138</td>
<td>Cable USB A to Mini-B 6 (1.8 m)</td>
</tr>
<tr>
<td>CBL139</td>
<td>Cable 0.09 inch (2.5 mm) sub-miniature plug AC/DC out to BNC or RCA</td>
</tr>
<tr>
<td>CBL170</td>
<td>Cable connecting Model 831 to 9-pin D connector (wind speed, direction, logic 1/0, 3 slow ADC) and coaxial DC connector (to PSA027)</td>
</tr>
<tr>
<td>CCS032</td>
<td>Soft pouch for Model 831 and SoundTrack LxT®</td>
</tr>
<tr>
<td>EXC006/10/20/50</td>
<td>Extension cable, 5 pin Switchcraft, 8 (2m), 10 (3m), 20 (6m), 50 (15m), Additional lengths available</td>
</tr>
<tr>
<td>PSA027</td>
<td>90 to 280 VAC to 1x2 switching power supply for 831 and 831 sound level meter and (426A12)</td>
</tr>
<tr>
<td>PSA029</td>
<td>AC Power supply for Model 831 and SoundTrack LxT® (100-240 VAC) to 5 V USB w/ Mini-B cable, CBL139</td>
</tr>
<tr>
<td>PSA031</td>
<td>12 VDC to USB Converter for SoundTrack LxT® and Model 831 Sound Level Meter</td>
</tr>
<tr>
<td>CBL140</td>
<td>DC power cable for Model 831 Sound Level Meter, 8 – 30 VDC includes lead-acid battery clamps and 12 V aux power</td>
</tr>
<tr>
<td>SEN025</td>
<td>Single axis accelerometer, 10 m/√m/2c or 100 mV/g ICP®</td>
</tr>
</tbody>
</table>

### Microphones and Preamplifiers

<table>
<thead>
<tr>
<th><strong>Model Number</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PRM831</td>
<td>Model 831 Sound Level Meter preamplifier for 1/2 in free-field or random incidence pre-polarized microphones</td>
</tr>
<tr>
<td>377B01</td>
<td>1/2 inch teflon, pre-polarized condenser microphone, typical sensitivity = 56 mV/Pa, 3.15 Hz to 20 kHz (±2 dB)</td>
</tr>
<tr>
<td>377C01</td>
<td>1/2 inch pre-polarized, pre-polarized condenser microphone 50 mV/Pa, 3.15 Hz to 16 kHz (±2 dB)</td>
</tr>
<tr>
<td>377C10</td>
<td>1/4 inch pressure, pre-polarized condenser microphone typical sensitivity = 6 mV/Pa, 4 Hz to 70 kHz (±2 dB)</td>
</tr>
<tr>
<td>378A04</td>
<td>ICP® low noise microphone &amp; preamplifier system, 0.5 dB A-weighted typical noise</td>
</tr>
<tr>
<td>ADP043</td>
<td>1/4 inch microphone to 1/4 inch preamplifier adapter</td>
</tr>
<tr>
<td>426A12</td>
<td>Permanent outdoor preamplifier with electrostatic actuator, humidity reading, TEGS and supporting electronics and pre-polarized microphone (microphone not included)</td>
</tr>
<tr>
<td>PRM2103</td>
<td>Permanent Outdoor Pre Amplifier for Model 831 with Remote Calibration Check, humidity reading and heater, for pre-polarized microphone (MIC and cables not included)</td>
</tr>
<tr>
<td>PRM2103-FF</td>
<td>Permanent Outdoor Pre Amplifier for Model 831 with Remote Calibration Check, humidity reading and heater, for pre-polarized microphone (MIC and cables not included)</td>
</tr>
</tbody>
</table>

### Sound Level Meter Options

- **Model Number** | **Description** |
- **Software** |
- **Sound Level Meter Options** |
- **Accessories** |
- **Microphones and Preamplifiers** |
- **Upgrade Models** |
- **Battery Options** |
- **Environmental Monitoring** |
- **Noise Monitoring System Components** |
- **Permanent Noise Monitoring Systems** |
- **Calibration Standards** |

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MTS Sensors, a division of MTS Systems Corporation (NASDAQ: MTSC), vastly expanded its range of products and solutions after MTS acquired PCB Piezotronics, Inc. in July, 2016. PCB Piezotronics, Inc. is a wholly owned subsidiary of MTS Systems Corp.; IMI Sensors and Larson Davis are divisions of PCB Piezotronics, Inc.; Accumetrics, Inc. and The Modal Shop, Inc. are subsidiaries of PCB Piezotronics, Inc.

Larson Davis offers a full line of noise and vibration measurement instrumentation such as Class 1 and 2 sound level meters, outdoor noise monitoring systems, personal noise dosimeters, human vibration meters, audiometric calibration systems, microphones and preamplifiers, and data analysis software. Instrumentation is used in community and environmental noise monitoring, measurement of building acoustics, managing worker exposure to noise and vibration, and various automotive, aerospace, and industrial applications. Larson Davis is a division of PCB Piezotronics, Inc., a wholly owned subsidiary of MTS Systems Corporations.

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