

T H E
**MODAL
SHOP**
I N C .
A PCB GROUP CO.

The Modal Shop **Sound and Vibration Rental Selection Guide**

Effective October 2013

Contact Us for Pricing

Helping you test,
model, and modify the
behavior of structures.

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What's New in Rental



Tailor your rental period, starting at the minimum per product type shown on each page.

- **PCB /NC** model number suffix for certain triaxial rentals: allows you choose the cable length!
- **CCS001-831-4** case saves money on shipping multiple LxT or 831 sound meters by reducing weight and size
- **PCB 102B06** dynamic pressure sensors
- **The Modal Shop 9110D** portable vibe calibrator
- **PCB 352A60** ultra high frequency accelerometer
- **Larson Davis BAS004** tapping machine
- **Larson Davis BAS001** dodecahedral speaker
- **PCB 130A40** low-profile surface microphones
- **National Instruments 9237** strain DAQ cards
- **VTI Instruments VT1432B** 24-bit digitizer
- Additional models of **PCB DC** accelerometers
- **PCB 350D02** shock accelerometer
- **PCB 130E20** array microphones
- **Crystal Instruments Spider VCS** vibration control system
- Additional **Modal Shop** shakers

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Uniaxial Accelerometers

Single direction, single axis units. Generally, start the selection with the maximum g amplitude range in mind. Next, verify other factors including temperature, range, mounting, and cable configuration. For multi-axis testing, consider a triaxial unit (Page 5-6) or use a triaxial mounting adaptor. Contact us for detailed selection assistance, or for unique requirements not shown.

Single Axis ICP® Accelerometers

ICP® is PCB Group’s trademarked name for Integrated Electronic Piezoelectric (IEPE) sensors. ICP stands for Integrated Circuit – Piezoelectric and is the industry standard. Some reasons why:

- Powers and transmits signal using economical standard coaxial two-wire cables, even over long lengths
- Minimizes possible noise contamination substantially, compared with charge mode sensors
- ICP® or equivalent signal conditioning often built into analyzers or is cost-effective to rent if required (see Page 9)

- > 1000g max
- 1000g max
- 50g max
- 5g and less

General Purpose

These units cover a wide range of tests ranging from vibration control to machine testing, and product qualification. Sensors detailed measure either ±50g or ±500g ranges, but piezoelectric accelerometers often measure an extremely high dynamic range and are perfectly suited for measurements of quite low vibration levels.

Miniature

Lightweight units are ideal for high frequency testing with a small size and low mass. Applications include environmental testing, component qualification, structural testing and operational behavior of lightweight or thin objects, and fatigue testing.

⚠ When removing teardrop style sensors, it is essential to use the removal tool supplied along with an appropriate debonding agent.

Structural Test and Modal Analysis

Excellent phase characteristics and lightweight construction, ideal for structural vibration, multi-channel modal analysis, analytical model correlation, and force-response testing. Many units have TEDS functionality as an option, see information below. A wide range of structural test hardware is also available, including shakers and impact hammers, as well as large-channel cable management solutions.

Shock

Designed to withstand and measure extreme high-level, short-duration transient accelerations, units also feature internal filtering for resonance suppression. Applications include metal-to-metal tests, impacts and armor testing, explosive studies, pile driver monitoring, and simulated pyroshock events. High-g shock calibration is included with rental of 350 Series units.

Industrial

Ruggedized accelerometers from PCB’s IMI Sensors feature stainless steel housings, a MIL-C-5015 connector and electrical case isolation to protect against electromagnetic interference, surface noise pickup and ground loop problems.

Seismic/Low Frequency

Ideal for bridges, civil structures, floor and foundation monitoring, optical instrument studies, semiconductor manufacturing, and construction and other site surveys for sensitive equipment. Low frequency certification is included with rental of 393 Series units.



Alternative Power (Non-ICP®) Units for High Temp and DC Response

The same circuitry built inside ICP-powerable accelerometers that provides low noise performance, limits use in high-temperature environments (typically above 250 or 325°F, 121 or 163°C). Charge Mode Piezoelectric units for higher temperature use are overviewed on Page 7.

Capacitive and MEMS-based DC units to measure to true 0Hz DC are overviewed on Page 8.



357B14
Charge Mode



DC Low Frequency Units

Uniaxial Accelerometers

	Amplitude Range ($\pm g$ pk)	Sensitivity (mV/g)	Frequency Range ($\pm 10\%$ unless noted)	Resolution (g rms)	Mech. Shock Limit ($\pm g$ pk)	Temperature Range ($^{\circ}F$)	Connector Type/Location	To connect to BNC, use cable type (rented separately unless specified)	Sensor Mass (grams)	Mounting	Mounting Base included with Rental
350B21	100 000	0.05	0.5 - 10 000 ¹	0.3	200 000	-65 to +200	integral cable⇒10-32m	adaptor or cable ²	4.4	1/4-28 s	-
350D02	50 000	0.1	2 - 25 000 ¹	0.5	150 000	0 to +150	integral cable⇒10-32m	adaptor or cable ²	4.5	1/4-28 s	-
350B04	5 000	1	0.2 - 25 000 ¹	0.02	50 000	0 to +150	top 10-32	002C or 003C	4.5	1/4-28 s	-
352B70	5 000	1	0.4 - 20 000 ¹	0.025	10 000	-65 to +250	top 10-32	002C or 003C	4.3	10-32 t	080A04
352C23 ³	1 000	5	1.5 - 15 000	0.003	10 000	-65 to +250	integral cable⇒10-32m	adaptor or cable ²	0.2	adhesive	-
352A60	500	10	5 - 60 000 ¹	0.002	5 000	-65 to +250	top 5-44	003P or 018C	6.0	10-32 s	-
352C22 ³	500	10	0.7 - 13 000	0.0015	10 000	-65 to +250	side 3-56	030A10 included	0.5	adhesive	-
352B10	500	10	1 - 17 000	0.003	10 000	-65 to +250	integral cable⇒10-32m	adaptor or cable ²	0.7	adhesive	-
353B15	500	10	0.7 - 18 000	0.005	10 000	-65 to +250	side 5-44	003P or 018C	2.0	5-40 s	080A15
353B17	500	10	0.7 - 20 000	0.005	10 000	-65 to +250	integral cable⇒10-32m	adaptor or cable ²	1.7	5-40 s	080A15
353B18	500	10	0.7 - 18 000	0.005	10 000	-65 to +250	top 10-32	002C or 003C	1.8	5-40 s	080A15
353B04	500	10	0.7 - 11 000	0.003	10 000	-65 to +250	top 10-32	002C or 003C	10.5	10-32 t	080A
352A24 ³	50	100	0.8 - 10 000	0.002	5 000	-65 to +250	side 3-56	030A10 included	0.8	adhesive	-
352C65	50	100	0.3-12 000	0.00016	5000	-65 to +200	side 5-44	003P or 018C	2	5-40 t	080A15
352C68	50	100	0.3 - 12 000	0.00016	5 000	-65 to +200	top 10-32	002C or 003C	2	5-40 t	080A15
T333B32	50	100	0.5 - 3 000 ¹	0.00015	5 000	0 to +150	side 10-32	002C or 003C	4	adhesive	-
333B	50	100	2 - 1 000 ¹	0.00007	3 500	0 to +150	base 3 pin	080Bxx (Page 7)	5.6	3-pin	-
T333B	50	100	2 - 1 000 ¹	0.00007	3 500	0 to +150	base 3 pin	080Bxx (Page 7)	5.6	3-pin	-
603C01	50	100	0.5 - 10 000	0.00035	5 000	-65 to +250	MIL-C-5015	012E	51	1/4-28 t	request
628F01	50	100	0.67 - 6 500	0.001	5 000	-65 to +250	MIL-C-5015	012E	94	1/4-28 t	request
333B53	5	1000	0.5 - 3 000 ¹	0.00005	4 000	0 to +150	side 10-32	002C or 003C	7.5	5-40 t	080A25
393**	≤ 5	≥ 1000	See Page 5 for Seismic Single Axis ICP® Units								

$^{\circ}F$ -65 0 150 200 250
 $^{\circ}C$ -54 -18 66 93 121

t: tapped hole
 s: integral stud

¹ - 350 series sensor frequency ranges specified from -3dB to 1dB range, 352A60 frequency range specified to ± 3 dB, 352B70 specified at -3dB, 333 series sensor frequency ranges specified to $\pm 5\%$

² - Sensor includes integral cable (generally 5 or 10 ft) that terminates in a 10-32 male connector. Can be used with scope input adaptor 070A02 to connect to BNC, or may be extended in length by using a combination of 070A05 10-32 feed through connector and joined with 002C or 003C cable to terminate to BNC

³ - Sensor not hermetically sealed, not acceptable for certain harsh environments

Uniaxial/Seismic Accelerometers

	Amplitude Range ($\pm g$ pk)	Sensitivity (V/g)	Frequency Range (± 3 dB)	Resolution (g rms)	Mech. Shock Limit ($\pm g$ pk)	Temperature Range ($^{\circ}F$)	Connector Type/Location	To connect to BNC, use cable type (rented separately, Page 3)	Sensor Mass (grams)	Mounting Thread	Mounting Stud Included (Metric Available on Request)
393A03	5	1	0.3 - 4 000	0.000 01	5 000	-65 to +250	MIL-C-5015	012E	210	1/4-28	081B20
393B04	5	1	0.02 - 1 700	0.000 003	300	0 to +176	top 10-32	003C	50	10-32	081B05
393C	2.5	1	0.01 - 1 200	0.000 1	100 (!)	-65 to +200	side 10-32	003C	885	10-32	081B05
393B05	0.5	10	0.2 - 1 700	0.000 004	300	0 to +176	top 10-32	003C	50	10-32	081B05
393B12	0.5	10	0.05 - 4 000	0.000 008	5 000	-50 to +180	MIL-C-5015	012E	210	1/4-28	081B20
393B31	0.5	10	0.07 - 300	0.000 001	40 (!)	0 to +150	MIL-C-5015	012E	635	1/4-28	081B20

$^{\circ}F$ -65 -50 0 150 176 180 200 250
 $^{\circ}C$ -54 -45 -18 65 80 82 93 121

Notes for 393 Series sensor rentals:

- (!) The low mechanical shock limits of both the 393C and 393B31 require special handling during use and shipping
- Current traceable calibration for both standard (10 Hz-upper 5%) and low frequencies (0.5 Hz-10 Hz) are included
- In situ $\pm 1g$ handheld calibration of 393B04 can be performed with model 394C06, for 393A03 use 699A02; for remainder of 393 sensors larger than 250 gram mass and/or less than $\pm 0.5g$ maximum amplitude range, use calibrator model 9100D on Page 9
- Triaxial mounting blocks for 393B04 and 393B05 can be rented separately, model 080A204
- Triaxial mounting blocks for 393A03 and 393B12 can be rented separately, model 080A57
- Large aluminum mounting base for 393C: 080A88, \$30/30-day period

Coaxial Cables for Uniaxial Accelerometers and ICP®-Powerable Microphones

Standard cables follow this example: model 003C20 is a 20-foot 003C (10-32 to BNC) series cable. Cable styles are described below.

Cable style:

- 002: White general purpose Teflon cable, -130 to 400°F, 29pF/ft capacitance, 1.9 mm diameter
- 003: Blue low-noise Teflon cable, -320 to 500°F, 30pF/ft capacitance, 2.01 mm diameter
- 012: Black RG58/U cable, -40 to 176°F, 29pF/ft capacitance, 4.9 mm diameter
- 018: Miniature, lightweight, black coaxial cable, -22 to 221°F, 55pF/ft capacitance, 1.37 mm diameter
- 030: Miniature, low-noise, blue coaxial Teflon cable, -130 to 500°F, 30pF/ft capacitance, 1.09 mm diameter

	Pigtail [AD]	3-56 plug [EK]	5-44 plug [AG]	10-32 plug [EB]		SMB plug [FW]	BNC plug [AC]		MIL-C-5015 [AE]
BNC plug [AC]	 002ACxxxAD 10 ft , 25 ft		 003P30 30 ft \$18 018C Series 5 ft \$13, 20 ft \$16	 002C Series 30 ft , 50 ft	 003C Series 3 ft , 10 ft , 20 ft , 30 ft , 50 ft , 100 ft 003EB100AC]	 002AB007FW SMB Plug to BNC Female Jack 7 ft	 002T Series 3 and 5 ft, 10 ft , 20 ft , 30 ft 003D Series 3 ft , 10 ft , 20 ft	 012A Series 3 ft , 6 ft , 10 ft , 25 ft , 50 ft , 100 ft	 012E Series 10 ft , 20 ft , 50 ft
10-32 plug [EB]		030A10 10 ft	003G03 3 ft , 10 ft	003A Series 3 ft , 10 ft , 30 ft					

Cable Adaptors and Connectivity Accessories



070A02
Scope input adaptor, 10-32 jack to BNC plug



070A03
Connector adaptor, 10-32 plug to BNC jack



070A05
Cable feed-through connector, 10-32 jack to 10-32 jack



070A08
Cable adaptor, 10-32 jack to BNC jack



070A11
BNC "T" connector, 2 BNC jacks, 1 BNC plug

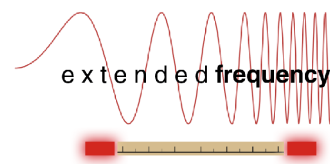


070A12
Coupler, BNC jack to BNC jack

Frequently Requested Extras for Accelerometer Rentals

Prices shown are in US\$ and are charged one time

In addition to mounting bases, mounting studs, removal tools, and sometimes integral cables included as noted on accelerometer pages, the items below are the most requested optional add-ons to accelerometer rentals. Just ask if you have a special request!



Rental Rx

Rental First Aid Kit. Includes no-charge incidental equipment to be used as needed, and returned with remainder of rental. *Murphy's Law can apply to even the best laid plans. A coaxial cable end may fail, or the cable may be a victim to rotating machines or an equipment cart. Or a small mounting base or stud falls into a machine, never to be seen again. Include part number "Rental Rx" when requesting a quote or order and get a no-charge bag of additional items (duplicate cables, bases, mounting studs and more) that may come in handy during testing. If cable failure occurs, please note the cable number (each have a unique ID) and include details of failure with the rental return. Certain items, such as mounting bases and studs, are also included. Use these items if the original items are inadvertently lost or additional are needed. Items not returned will be charged at list.*

TMS WP

Preparation charge for water-resistant cable/accelerometer junction. *If renting a hermetically sealed sensor and mating cable, add on "TMS WP" to provide an assembly of the cable directly attached and sealed to the sensor's electrical connector with o-rings and heat-shrink tubing. This sealing process guards against contamination from dirt and fluids and permits short-term underwater use. It is ideal for sensors in spray or humid environments.*

Calibration

Although some sensors including the 393-series Seismic line are provided with low-frequency calibrations, most rental single and triaxial sensors include calibration from 10 Hz to upper 10% of the frequency limit of the axis. NIST-traceable low-frequency calibration is available for any standard sensor at an additional charge. High frequency calibration is also available.

Mounting Accessories

Triaxial and Uniaxial Mounting Accessories

Adhesive mounting bases (and mating studs) are included with rental as shown in Tables on Pages 2 and 6. For metric studs or additional items, see below or inquire.



Mounting Stud

081A27 5-40 to 5-40
081B05 10-32 to 10-32 with shoulder
081B20 1/4-28 to 1/4-28 with shoulder
Metric available upon request



Triaxial Block for Array Accelerometer

080B55
 Triaxial mounting block, outside mount. Used with 333B and T333B.



Adaptor Stud

081A90 5-40 to 10-32
081A08 10-32 to 1/4-28
Metric available upon request



Removal Tool for Mini Accels

039 Series
 Avoid sensor damage by using tool and applying shear force: one supplied for each model of applicable sensor rented. *Additional units available upon request*



Adaptor Plate

080A149 5-40f to 10-32m
9155-MNT05 5-40f to 1/4-28m
9155-MNT06 10-32f to 1/4-28m
9155-MNT07 adhesive to 1/4-28m



Petro Wax

080A109 Petro Wax, *for purchase*. Petro wax provides a simple mounting method for many applications; ideal for temperatures below 160°F/70°C, lower level (±20g and less for lightweight accelerometers under 40 grams) and lower frequency (generally 3000Hz and below) applications. One square, 1" x 1" x 0.25"



Hardcoat Aluminum Adhesive Mounting Base

080A 10-32 thread, 0.187" thick, 1/2" hex
080A15 5-40 thread, 0.125" thick, 5/16" hex
080A25 5-40 thread, 0.125" thick, 7/16" hex
080A13 10-32 thread, 0.2" thick, 3/4" hex
080A12 10-32 thread, 0.2" thick, 3/4" hex
080A68 10-32 thread, 0.2" thick, 7/8" hex



Quick Bond Gel

080A90 Quick Bond Gel *for purchase* Cyanoacrylate-based mounting methods offer an ideal mounting method for lightweight accelerometers (under 20 grams). A fast room temperature cure time coupled with both a wide useable frequency and temperature range makes this option very popular. Be sure to use a debonder such as Acetone and wait a few minutes when removing the sensor.



Triaxial Mounting Adaptors

080B16 0.37" Aluminum cube, accels mount via 5-44, block mounts to structure via 10-32
080A57 1.5" stainless steel cube, accels mount via 1/4-28, block mounts to structure via 10-32 \$60
080A204 1.23" Al cube, accels and structure mount via 10-32. For 393B04 and 393B05 sensors \$36



Easy Mount Clips

Mounting clips can be attached to the test structure by double-sided tape or adhesive. Once installed, accelerometers are snapped into the clips. Typical grease mount frequency limit: 2kHz (±5%), dry mount limit: 1kHz (±10%). *Note that the clips have a 125°F (52°C) continuous and 175°F (79°C) short-term spec.*
080A160 (for 0.55" cube sensors including 356A02, 356A14, 356A15)
080A172 (for 0.4" cube sensors including 356B11, 356B21, 333B32)

Accelerometer Magnetic Mounting Bases



Use caution when using magnetic mounting bases, as the installation force can cause excessive shock and damage the sensor. Install the magnet base to the test object on the edge and "roll" the assembly gently into position, or install the magnet base to the test object first and then attach the sensor.



080A30
 2.5 lb (11N) pull, 3/8" hex, 5-40 thread, 0.23" (5.8 mm) thick



080A07
 6 lb (27N) pull, 1" dia, 10-32 thread, 0.75" (19 mm) thick



080A27
 12 lb (54N) pull, 3/4" hex, 10-32 stud, 0.27" (6.7 mm) thick



080A130
 15 lb (68N) pull, 0.75" diameter, 0.72" (18mm) thick, 1/4-28 thread (shown with stud, ordered separately)



080A132
 55 lb (225N) pull, 1.5" diameter, 1.25" (32 mm) thick, 1/4-28 thread (shown with stud, ordered separately)

Triaxial ICP® Accelerometers

Triaxial accelerometers are designed with three orthogonal sensing elements to enable simultaneous multi-axis measurements (x-, y-, and z-axis). Smaller units minimize mass loading effects and permit installation into confined areas. A unit with a tapped hole in its base may be secured with a screw passing through the object under test to aid in axis alignment, or may be stud-mounted to a separate adhesive mounting base.

Typically, ICP® types are preferred due to their ease of use, however, when temperatures exceed the limits established by their built-in electronics, then a charge output unit is recommended. These units typically feature a 4-pin electrical connector (for a single cable hook-up) or an integral 4-conductor cable.

General Purpose

This range of hermetically sealed 10.5 gram titanium triaxial accelerometers is our most popular style, and covers a wide range of uses. Applications vary widely and include general vibration testing, motor and pump monitoring, design studies, and vibration control. Many units are available with optional TEDS Transducer Electronic Datasheet built in to simplify test setup with a TEDS-capable DAQ system.

Structural Test / ODS / Modal

Suited for traditional experimental modal analysis or operational modal analysis, with tight phase specification vital for global parameter estimation. TEDS-enabled units help channel bookkeeping when used with compatible systems.

High Temperature

Adjusted circuitry allows measurement of these units in temperatures to +325°F (163°C) and are used with traditional ICP power systems. Slight low frequency and broadband resolution specifications may be affected. Testing above 325°F? See Page 7.

Miniature

Lightweight ceramic shear design, titanium cased hermetically sealed units that minimize effects of mass loading. Some units available with TEDS and high temperature options.

Filtered

Features built in internal low pass filter for resonance suppression, commonly used in vehicle test cells and environmental chambers.

Seat Pad Accelerometer

Used in whole body vibration and vehicle operation tests.

TEDS Option

Units with TEDS option feature onboard digital memory. Model, serial, sensitivity, last calibration date and more are stored for use with TEDS-capable analyzers and conditioners. These units can be used with non-TEDS analyzers and operate as standard sensors. To find full specs on PCB.com, omit the T or TLD prefix.

- > 1000g max
- 1000g max
- 50g max
- 5g and less



356A02 ●
356A14 ●



TLD356A14 ●



356B18 ●



T356M98 ●



HT356B21/NC ●



HT356A33 ●



HT356A02 ●

HT356A15 ●



356A01 ●



353B20/NC ●

356B21/NC ●



356A32 ●



356A63 ●



356B41 ●

Alternative Power (Non-ICP®) Units for High Temperature

The same circuitry built inside ICP-powerable accelerometers that provides low noise performance limits use in high temperature environments (typically above 250 or 325°F, 121 or 163°C). Charge Mode Piezoelectric units for testing to higher temperatures are overviewed on Page 7.



356A70 triaxial

Triaxial ICP® Accelerometers

	Amplitude Range (±g pk)	Sensitivity (mV/g)	Frequency Range: (±10% unless noted)	Resolution (g rms)	Mechanical Shock Limit (±g pk)	Temperature Range (°F)	Connector Location / Type	To connect to BNC, use cable type (rented separately unless specified)	Sensor Mass (grams)	Mounting	Mounting Base included with Rental
▲ 356B20/NC	5 000	1	2 - 10 000 ¹	0.03	7 000	-65 to +250	side 8-36 4-pin	034K	4	5-40	080A
▲ 356A01/NC	1 000	5	2 - 8 000 ¹	0.003	10 000	-65 to +250	cable⇒1/4-28 4-pin	010G, 034G, or 078G	1	adhesive	-
▲ 356A03/NC	500	10	2 - 8 000 ¹	0.003	5 000	-65 to +250	cable⇒1/4-28 4-pin	010G, 034G, or 078G	1	adhesive	-
▲ 356B21/NC	500	10	2 - 10 000	0.004	10 000	-65 to +250	side 8-36 4-pin	034K	4	5-40	080A
◊ ▲ HT356B21/NC	500	10	2 - 10 000	0.004	10 000	-65 to +325	side 8-36 4-pin	034K	4	5-40	080A
◊ HT356A33	500	10	2 - 10 000 ¹	0.004	10 000	-65 to +325	side 1/4-28 4-pin	010G, 034G, or 078G	5.3	5-40	080A
356A63	500	10	2 - 4 000 ¹	0.008	10 000	-65 to +250	side 1/4-28 4-pin	010G, 034G, or 078G	5.3	5-40	080A
356A02	500	10	0.5 - 6 000	0.000 5	7 000	-65 to +250	side 1/4-28 4-pin	010G, 034G, or 078G	10.5	10-32	080A12
○ TLD356A02	500	10	0.5 - 6 000	0.000 5	7 000	-65 to +250	side 1/4-28 4-pin	010G, 034G, or 078G	10.5	10-32	080A12
◊ HT356A02	500	10	0.7 - 6 000	0.000 8	7 000	-65 to +325	side 1/4-28 4-pin	010G, 034G, or 078G	10.5	10-32	080A12
▲ 356A32/NC	50	100	0.7 - 5 000	0.000 3	5 000	-65 to +250	side 8-36 4-pin	034K	5.4	5-40	080A
▲ TLD356A32/NC	50	100	0.7 - 5 000	0.000 3	5 000	-65 to +250	side 8-36 4-pin	034K	6.4	adhesive	-
○ TLD356A14	50	100	0.3 - 6 000	0.000 1	7 000	-65 to +176	side 1/4-28 4-pin	010G, 034G, or 078G	10.5	10-32	080A12
356A15	50	100	1.4 - 6 400	0.000 2	7 000	-65 to +250	side 1/4-28 4-pin	010G, 034G, or 078G	10.5	10-32	080A12
○ TLD356A15	50	100	1.4 - 6 400	0.000 2	7 000	-65 to +250	side 1/4-28 4-pin	010G, 034G, or 078G	10.5	10-32	080A12
▲ 356B41/NC	10	100	0.5 - 1 000 ¹	0.000 2	2 000	+14 to 122	cable⇒1/4-28 4-pin	010G, 034G, or 078G	272	contact	-
○ TLD356B18	5	1 000	0.3 - 5 000	0.000 05	5 000	-20 to +170	side 1/4-28 4-pin	010G, 034G, or 078G	25	10-32	080A68
○ T356M98	5	1 000	0.3 - 5 000	0.000 05	5 000	-20 to +170	side 1/4-28 4-pin	010G, 034G, or 078G	39	10-32	080A68

°F -65 -20 14 122 170 250 325
 °C -54 -29 -10 50 77 121 163

Note: Cables are rented separately from rental sensors, to allow selection of length. See section below for information.

¹ 356B20 and HT356A33 Y and Z axes specified to ±5%. X-axis specified from 2 - 7000 Hz at ±5%, 356A01 and 356A03 Y and Z axes specified to ±5%. X-axis 2-5000Hz, ±5%, 356A63 specified to ±5%, 356B41 Seat Pad Accelerometer specified to ±5%, similar to Larson Davis' SEN027

◊ and ○ - See Page 5 for notes on High Temperature and TEDS options.

▲/NC Suffix: No cable option. Although the base model from PCB includes a cable, the NC option omits the cable to allow selection of length when rented separately. To find full specs on PCB.com, omit the /NC suffix.

Cabling for Triaxial ICP Accelerometers

1/4"-28 Jack to BNC

All connect to common triaxial accelerometers with 1/4-28 4-pin socket connector and terminate in 3 BNC plugs labeled X, Y, Z



010G Series

General purpose shielded Teflon cable
 392°F (200°C) max, 0.10" (2.54mm) thick, 25.8pF/ft (84.6 pF/m) capacitance-conductor to shield, 1" (25.4 mm) bend radius minimum

010G05 5 ft (1.5 m) / 010G10 10 ft (3 m) / 010G20 20 ft (6 m) / 010G30 30 ft (9 m) / 010G50 50 ft (15 m)

034G Series

Lightweight general purpose Teflon cable
 -130 to 392°F (-90 to 200°C) range, 0.077" (1.96 mm) thick, 25pF/ft (82 pF/m) capacitance-conductor to shield, 1" (25.4 mm) bend radius minimum

034G05 5 ft (1.5 m) / 034G10 10 ft (3 m) / 034G20 20 ft (6 m) / 034G30 30 ft (9 m)

078G Series

Flexible polyurethane cable
 -58 to 185°F (-50 to 85°C) range, 0.119" (3.02 mm) thick, 24.8pF/ft (81 pF/m) capacitance-conductor to shield, 1" (25.4 mm) bend radius minimum

--- / 078G10 10 ft (3 m) / 078G20 20 ft (6 m) / 078G30 30 ft (9 m) / ---

Extension Cables for Triaxial Accelerometers with 1/4"-28 Jack

Used between triaxes with 1/4-28 4-pin socket connector and any cable above to extend length, 1/4"-28 4 pin jack at one end and 1/4"-28 4 pin plug at the other. Same cable specifications as 010G Series above. Can be used in series to create longer lengths.

010AY020CA 20 ft (6 m)
 010AY050CA 50 ft (15 m)
 010AY100CA 100 ft (30.5 m)

8/36 mini Jack to BNC

Connects to miniature triaxial accelerometers with 8-36 mini 4-pin socket connector. Terminates in 3 BNC plugs. Same cable specs as 034G Series above.

034K Series
 034K10 10 ft (3 m)
 034K20 20 ft (6 m)
 034K30 30 ft (9 m)

High Temperature, Charge Output Accelerometers

Charge output accelerometers directly output an electrostatic charge signal proportional to acceleration. These sensors do not contain built-in signal conditioning electronics. External signal conditioning is required to interface their generated measurement signals to readout or recording instruments. The sensors' charge output signals can be conditioned with either a laboratory-style, adjustable charge amplifier or an in-line fixed charge converter (such as 422E series below).



357B14 single axis

356A70 triaxial

	Amplitude Range ($\pm g$ pk)	Sensitivity (pC/g)	Frequency Range ($\pm 3dB$)	Mech. Shock Limit ($\pm g$ pk)	Temperature Range ($^{\circ}F$)	Connector Type/Location	To connect to BNC, use cable type (rented separately)	To connect to 10-32 used in 422E series, use cable type (rented separately)	Sensor Mass (grams)	Mounting
357B14 uniaxial	2300	3	x - 16 000	10 000	-95 to +490	top 10-32	003C	003A	2	5-40 male
356A70 triaxial	500	2.7	x - 7 000	5 000	(-70 to +254 $^{\circ}C$)	(3) side 5-44	(3) each 003P	(3) each 003G	7.9	081A46 stud

Notes for Charge Mode sensor rentals:

- Measurement resolution and low-frequency response are dependent upon noise floor and discharge time constant of the signal conditioning and readout systems used
- To use with standard ICP[®] signal conditioning, use 422E Series listed below.

422E Series Low-Noise In-Line Charge Amplifiers (Converters)

Used with 357-series (or any pC/g-output) charge mode sensor to interface to ICP[®] power. Output voltage: $\pm 2.5Vpk$, temperature range: -54 to +121 $^{\circ}C$. Use with low noise (003-style) cable to connect from sensor to 422E series 10-32 input. BNC output.



422 series model number index		Nominal Charge Conversion (mV/pC) / Input Range (pC)			
		0.1 / ± 25000	1 / ± 2500	10 / ± 250	100 / ± 25
-5% cutoff frequency	0.5 Hz	422E04	422E03	422E02	422E01*
	5 Hz	422E14*	422E13*	422E12	422E11

* Items marked: Contact PCB for purchase; not available for rent



What is the effective sensitivity and maximum measureable amplitude range for a charge-mode sensor and in-line converter pair?

Sensitivity is found by multiplying the actual sensitivity of the accelerometer (found on the calibration sheet) and the charge conversion of the converter (found etched on the converter or on the conformance sheet). If using the 422E0x or 422E1x series in-line charge amps, divide the $\pm 2.5V$ voltage output by the net sensitivity calculated to yield the maximum g level measurable.

$$\begin{array}{c}
 \text{accelerometer sensitivity} \rightarrow \\
 \frac{3pC}{g} \times \frac{10mV}{pC} = \frac{30mV}{g} \text{ net sensitivity} \\
 \text{charge mode sensor and cable can be used in high temperature} \rightarrow \\
 \text{charge conversion (422 series)} \rightarrow \\
 \text{only use 422 converter unit in 250}^{\circ}F \text{ maximum} \rightarrow \\
 \text{voltage output range of 422E0x and 422E1x units} \rightarrow \\
 \frac{2.5 V}{30mV/g} = 83.3 g \text{ maximum system measurable amplitude} \\
 \text{calculated net sensitivity} \rightarrow
 \end{array}$$

Are traditional charge mode amplifiers to condition charge-output sensors offered for rental?

We offer limited channel counts of 443A101 dual-mode vibration amplifier placed in a 440-series rack, but generally for larger quantities, traditional standalone charge-mode amplifiers are not currently offered at this time. 422E Series in-line units are available for rental, even in large quantities.

Are any accelerometers available to rent for temperatures above 500 $^{\circ}F$ / 260 $^{\circ}C$?

PCB Piezotronics manufactures several sensors with Inconel housings that are rated higher: some to 1200 $^{\circ}F$ / 649 $^{\circ}C$. Generally, cabling for these sensors are hardline and difficult to manage for short-term testing. At this time, nothing is offered beyond the items listed in the table above.

When analysis of very low frequency motion or constant acceleration is required, a DC accelerometer is necessary. Unlike piezoelectric accelerometers, DC sensors respond to 0Hz and are, therefore often referred to as DC response sensors.

Capacitive DC Single Axis Accelerometers

3701 and 3801 Series offer DC response with very low resolutions, ideal for low-frequency testing where amplitudes are very low, such as ride quality assessments and civil structures. Units also can be used to measure tilt and orientation data for feedback control and stabilization testing. These units feature built-in signal conditioning electronics to offer the ability to operate from unregulated power sources. Alternately, model 478A01 provides a 9V battery-powered single channel power supply with a DC offset/adjust.

	Range (±g pk)	Sensitivity (mV/g)	Frequency Range (±10%)	Resolution (g RMS)	Mech. Shock Limit (±g pk)	Excitation Voltage (VDC)	Temperature Range (°F)	Connector Type/Location	Housing	Sealing	Sensor Mass (grams)
3801D1FB200G	3	1 000	DC – 150	0.000 03	3 000	16 – 30	-40 to +185 (-40 to +85°C)	side 1/4-28 4-pin	Titanium	Hermetic	17.5
3701D3FA20G	20	100	DC – 500	0.000 08	3 000	16 – 30		side 1/4-28 4-pin	Titanium	Hermetic	17.5
3801D1FB200G	200	10	DC - 500	0.000 6	3 000	5 – 30		cable⇒1/4-28 4-pin	Polymer	Epoxy	30

- Each capacitive unit mounts via 2 x 0.116" through-hole locations. Rentals are supplied with (2) 018A64 mounting screws and one 080A152 mounting base/clip as well as phase and amplitude calibration from 2 Hz to +5% frequency range.

Accessories for 3701, 3801 and 3711 units:

- 010Dxx Cable: 1/4-28 4-pin microtech plug to same, connects between capacitive sensor and 478A01 power supply
- 034A05 Cable: 1/4-28 4-pin microtech plug to pigtail, 5 ft, to power capacitive sensor from DC power
- 080A152 Easy mount clip, plastic (one included with each rental – price shown for extra) [Purchase price:]
- 080A153 Easy mount triaxial block, plastic, 1.265" square
- 478A01 Battery powered signal conditioner for DC units, with zero adjust, 1/4-28 4-pin input, BNC output

Single-Ended Output MEMS DC Single Axis Accelerometers

3711 Series offer DC response, ideal for low-frequency structural behavior testing and braking, acceleration, suspension, and shock absorption studies. Units also can be used to measure tilt and orientation data for feedback control and stabilization testing. Units also feature built-in signal conditioning electronics to offer the ability to operate from unregulated power sources. Mounting patterns, power, and cabling accessories are the same for 3701 Series above.

	Range (±g pk)	Sensitivity (mV/g)	Frequency Range (±10%)	Resolution (g RMS)	Mech. Shock Limit (±g pk)	Excitation Voltage (VDC)	Temperature Range (°F)	Connector Type/Location	Housing	Sealing	Sensor Mass (grams)
3711B11200G	200	10	DC – 1250	0.021	3 000	6 – 30	-65 to +250 (-54 to +121°C)	side 1/4-28 4-pin	Titanium	Hermetic	16.3
3711B1130G	30	66.7	DC – 1500	0.003 5	3 000	6 – 30		side 1/4-28 4-pin	Titanium	Hermetic	16.3
3711D1FB20G	20	100	DC - 1500	0.003 5	3 000	5 – 30		10ft cable⇒pigtail	Titanium	Hermetic	78*

- Each 3711 Series unit mounts via 2 x 0.116" through-hole locations. Rentals are supplied with (2) 081A133 mounting screws and one 080A152 mounting base/clip, as well as phase and amplitude calibration from 2Hz to +5% frequency range.
- *3711D1FB20G unit sensor mass shown with cableage.

Differential Output MEMS DC Single Axis Accelerometers

3741 Series offer DC response with common mode noise rejection, commonly used in aerospace flutter and GVT testing. Units operate with standard bridge conditioning equipment, and operate as a full bridge type device which does not require bridge completion circuitry. 3741 units incorporate voltage regulation, and may therefore operate from an unregulated positive DC supply source.

	Range (±g pk)	Sensitivity (mV/g)	Frequency Range (±10%)	Resolution (g RMS)	Mech. Shock Limit (±g pk)	Excitation Voltage (VDC)	Temperature Range (°F)	Connector Type/Location	Housing	Sealing	Sensor Mass (grams)
3741B1250G	50	40	DC – 1500	0.005 2	3 000	6 – 30	-65 to +250 (-54 to +121°C)	10ft cable⇒pigtail	Anodized Aluminum	Epoxy	9.9
3741B1230G	30	66.7	DC – 1500	0.003 5	3 000	6 – 30		10ft cable⇒pigtail		Epoxy	9.9

- Each 3741 Series unit mounts via 2 x 0.125" through-hole locations. Rentals are supplied with (2) 081A103 mounting screws, as well as phase and amplitude calibration from 2 Hz to +5% frequency range.
- 3741 Units may be used in single-ended operation by disconnecting and floating the white wire (- Signal) and attaching the yellow wire (+ Signal) to ground. In this "pseudo differential" method, sensitivity remains the same but there is a 2.5VDC offset on the output.

Accessories for 3701, 3801 and 3711 units:

- 080A208 Triaxial mounting block, aluminum, for use with 3741 Series
- 482C27 4-channel, line-powered, bridge/differential/ICP® sensor signal cond., incremental gain, Autozero, RS-232, Ethernet

Accelerometer Calibration Options



394C06



699A02



9100D



9110D



9155D

- 394C06** Handheld shaker/accelerometer calibrator, 1 g at 159.2 Hz for accelerometers to 210-gram mass *Note: do not use for 10V/g sensor*
- 699A02** Handheld shaker/accelerometer calibrator, 1 g at 159.2 Hz for accelerometers to 250-gram mass *Note: do not use for 10V/g sensor*
- 9100D** Portable vibration calibrator, dial selectable amplitude range up to 10 g and dial selectable frequency range from 7-10 000 Hz, internal rechargeable battery or AC powered
- 9110D** Portable vibration calibrator, extends capabilities of the 9100D by adding on-board ICP and voltage input, with on-board memory and USB storage. Includes worksheet to create calibration certificates.
- 9155D** Accelerometer calibration workstation. Turnkey, fully automated system. Yields NIST-traceable calibration from 0.5 Hz (5 Hz to 10 kHz on standard system). Various options available. *Note: 9155D not available for short-term rental*
- 9100-PPA01** Proximity probe adaptor kit, supports probes with 1/4" and 3/8" case thread. Includes micrometer and steel target. *Note: used with 9100D or 9110D portable vibration calibrator systems, metric available as MPPA01*



Do accelerometers include traceable calibration?

Yes, A2LA-accredited NIST-traceable calibration information is provided. Generally, electronic calibration certificates are provided in .pdf format on CD or USB Drive unless 10 or fewer axes are rented, in which case paper copies are provided unless specified. The Modal Shop has internal calibration intervals of 1 year set for most test products. Per ANSI/ISO/IEC 17025:2000, it is the responsibility of the end-user (in this case, the renter) to determine the appropriate calibration interval under the requirements of its own quality system. Per this, calibration certificates of rented equipment have "calibrated on" dates, but blank "calibration due" dates. Rentals ship with a customer-specific expected return date in mind. If equipment is expected out for 5 months, the last calibration date will be within the past 7 months. Calibration to additional standards (e.g. Z540 or specific FAA requirements) is available at an additional charge.

Is post-test calibration available?

Yes. We understand that some critical tests require both pre-test calibration and post-test calibration be performed to ensure that measurements are accurate. For additional fees, accelerometers can be calibrated prior and post-test at The Modal Shop to provide you with this important information.

Is low frequency calibration included in the standard calibration with a rental?

393 Seismic Series accelerometers include low frequency calibration starting at 0.5 Hz. As damage is commonly seen in the higher frequencies, most other piezoelectric accelerometers include calibration, starting at 10 Hz to upper 5% of frequency range. Low frequency calibration is available for any rental units however, for an additional fee.

ICP® signal conditioning (also known as IEPE or CCLD constant current line drive, and others)

Additionally, small channel count systems can be made by combining 440 series racks with 442A104 4-channel input cards with BNC inputs/outputs, per-channel 1x 10x 100x gain and status indicator lights. These are also offered as a kit, e.g., K440-12BNC is an AC-powerable 12-channel system with (3) 442A104 cards.

	Channel Count	Gain	Low Freq Response (-5%)	High Freq Response (-5%)	Broadband Noise (µV rms)	Channel and/or Battery Check	Power	Input Type(s)	Output Type(s)	Mass (kg)	Notes
480E09	1	1x 10x 100x	0.15 Hz	100 kHz	2	√	(3) 9V, 40hr	BNC	BNC	0.34	General purpose
485B36	2	1x	1 Hz	50 kHz	12	—	USB port	BNC	3.5 mm stereo	0.07	Includes cable for RCA/BNC output
480B21	3	1x 10x 100x	0.15 Hz	100 kHz	3.54	√	(3) 9V, 25hr	BNC	BNC	0.5	
482A22	4	1x	< 0.1 Hz	>1 MHz	3.25	√	AC	BNC	BNC	0.76	
482A20	8	1x 10x 100x	0.22 Hz	100 kHz	25	√	AC	BNC	BNC	2.8	
483A	12	1x	0.05 Hz	1 MHz	150	√	AC	BNC	BNC	2.1	
483B07	12	0-100 (continuous)	0.3 Hz	150 kHz	150	√	AC	BNC	BNC	2.7	Buffered output
481A01	16	1x	0.5 Hz	100 kHz	11	√	AC	BNC and DB 50-pin	BNC	6.8	+ 50-pin input, used w/ 070C29 patch panel system
481A Bundle	16	0.1x-200x	0.5 Hz	65 kHz	4000	√	AC	BNC+50pin	BNC	8.5	See additional notes below
440 Series	16-512+	1x 10x 100	0.125 Hz	30 kHz	100	√	AC or DC	DB 50-pin	BNC	varies	See web

481A Bundle Note: Includes options to provide either computer or front panel display and control, bundle includes continuous gain control, velocity and displacement output for up to two channels, programmable Elliptical low pass filter (all channels), selectable ICP or voltage inputs, BNC inputs/outputs.

086 Series ICP® Modally Tuned® Impact Hammers

Easy-to-use method for delivering impulse forces with measurable amplitude and frequency content. Often used in modal analysis, resonance detection and in structural health testing. All connect via BNC.

○ symbol indicates that units are also available with TEDS (T and TLD Prefixes), see Page 5.



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	Force Range (±lbf pk)	Sensitivity (mV/lbf ±15%)	Typical Max Frequency (Hz)	Effective Mass (lb)	Length (in)	Includes <i>(for full details including model numbers, see website)</i>	Typical Uses
086E80	50	100	12 000+	0.17	4.2	10 ft cable with BNC adaptor, handle assembly, case	Disk drives, circuit boards, turbine blades
086C01	100	50	10 000	0.23	8.5	Extender mass, 4 tip ranges	Lightly damped panels and frames
○ 086C02	100	50	8 000	0.34	8.5	Extender mass, 4 tip ranges	Machine tool parts, small engines
○ 086C03	500	10	8 000	0.34	8.5	Extender mass, 4 tip ranges	Car frames, engines
○ 086C04	1000	5	8 000	0.34	8.5	Extender mass, 4 tip ranges	Car frames, engines
○ 086D05	5000	1	5 000	0.7	9	Extender mass, 4 tip ranges	Light trucks, pumps, turbines
○ 086D20	5000	1	1 000	2.4	14.5	4 tip ranges	Tool/Turbine foundations, storage tanks
○ 086D50	5000	1	500	12.1	35	2 tip ranges (grey supersoft omitted, use brown tip)	Heavy foundations, ships, buildings
086M92-ES	500	10	call		16	4 tip ranges, foot pedal trigger, AC/DC power, cables	Repeatable impacts for industrial use
088A	500	10	4 000		14.2	4 tip ranges, foam grip	Modal Punch to reach inaccessible areas

• If new within the past year, hammers from PCB include only calibration data from one tip type. Hammers calibrated by The Modal Shop include sensitivity for every type of tip provided. Please let us know when renting if you would prefer a full set of calibration information for your testing.

208 Series ICP® Dynamic Force Sensors

General purpose quartz force sensors measure dynamic tension and compression used in impact, drop and materials testing. Also used in dynamic shaker testing: mount force sensor to object under test and connect to shaker via stinger.

All units are stainless steel, 22.7 gram mass, have a side 10-32 coaxial jack, have a temperature range of -65 to +250°F (-54 to +121°C), include impact cap 084A03 and 10-32 mounting stud 081B05. Use 003C-style cable to mate to connect to BNC. Metric mounting stud M081A62 available upon request.



	Meas. Range (Compression) lb (N)	Measurement Range (Tension) lb (N)	Sensitivity mV/g (mV/N)	Broadband Resolution lb-RMS (N-RMS)	Lower Frequency Response (-5%)	Max. Static Force (Compression) lb (kN)	Max. Static Force (Tension) lb (kN)
208C01	10 (44.5)	10 (44.5)	500 (112)	0.0001 (0.00045)	0.01 Hz	60 (0.27)	60 (0.27)
208C02	100 (445)	100 (445)	50 (11.2)	0.001 (0.0045)	0.001 Hz	600 (2.7)	500 (2.2)
208C03	500 (2224)	500 (2224)	10 (2.25)	0.005 (0.02)	0.0003 Hz	3000 (13.5)	500 (2.2)
208C04	1000 (4448)	500 (2224)	5 (1.12)	0.01 (0.044)	0.0003 Hz	6000 (26.7)	500 (2.2)
208C05	5000 (22240)	500 (2224)	1 (0.225)	0.05 (0.222)	0.0003 Hz	8000 (35.6)	500 (2.2)

Cabling and Accessories for High Channel Count Tests

- 080B40 Cable, 10 ft with 3-pin mounting pad to IDC connector to patch panel *[Use with 333B, 333A, and 336 series. Not 333B32]*
- 080B55 Triaxial mounting block, outside mount
- 070C29 16-channel input patch (1/2" x 7" x 1.5"), (16) IDC and (16) BNC inputs to (1) DB-50 connector
- 009H100 Shielded 16-channel ribbon cable, DB50 pin connector both ends, mates 070C29 to 440 or another panel, 100 ft *[25 ft and 50 ft also available]*
- 009L05 Shielded 4-channel output cable, HP VXI to 4 BNC plugs, 5 ft
- 009S08 Shielded 4-channel output cable, HP VXI to HP VXI connectors, 8 ft

Shakers / Modal Exciter Kits

The Modal Shop's expanded line of electrodynamic exciters are ideal for a wide range of tests, from small component and sub-assembly testing to large aerospace modal analysis excitation. Rental kits include stinger kits, shakers with trunnion bases, amplifiers, cabling and power and shaker/amp interconnect accessories. Connect to an external signal source (not included) or rent additional items to complete a measurement setup, ranging from impedance heads or force sensor (Page 10), or a complete closed loop vibration control system (Page 13).



Miniature SmartShaker™ Kits

The Modal Shop Miniature SmartShaker™ kits include a miniature electrodynamic exciter with a new generation of ultra compact precision power amplifier built into the base. There is no need for a separate large lab-grade power amplifier - just plug the excitation signal from a dynamic signal analyzer or function generator directly into the BNC on the base of the shaker. Units include a DC power supply with a standard AC plug, but can be run directly from any 12-21 VDC supply.

K2007E01

	Max Force ±lbf (N) pk	Stroke In (mm) pk-pk	Maximum Frequency (Hz)	Shaker Model	Amplifier Model	Shaker/Amp Weight lb (kg)	Cooling Package	Trunnion	Stinger Kit(s)	Other Accessory Kit(s)	Shipment Weight, lb (kg)
K2007E01	7 (31)	13 (0.5)	9 000	K2007E01	Integrated	3 (7) /		√	√	√	7 (16)



Modal Shaker Kits

In addition to the miniature SmartShaker, The Modal Shop offers shakers and kits with force ratings up to 445 N (100 lbf), perfect for a wide range of modal analysis applications. Kits are complete with everything from amplifiers to power the shaker, to stinger kits to connect to your test object; just supply a signal source (not included). Need help selecting a shaker system? We offer a Modal Shaker Selection Guide online, or feel free to contact us for assistance!

2100E11

	Max Force ±lbf (N) pk	Stroke In (mm) pk-pk	Maximum Frequency (Hz)	Shaker Model	Amplifier Model	Shaker/Amp Weight lb (kg)	Cooling Package	Trunnion	Stinger Kit(s)	Other Accessory Kit(s)	Shipment Weight, lb (kg)
K2025E013	13 (58)	19 (0.75)	9 000	2025E	2100E21-400	13 (6) / 9 (4)		√	√	√	38 (17)
K2060E030	30 (133)	36 (1.4)	6 000	2060E	2100E21-400	37 (17) / 9 (4)		√	√	√	64 (29)
K2100E035	35 (156)	25 (1)	5 400	2100E11	2100E21-400	33 (15) / 9 (4)		√	√	√	110 (50)
K2100E100	100 (400)	25 (1)	5 400	2100E11	2050E09	33 (15) / 47 (21)	√	√	√	√	191 (87)*

Dual Purpose Shakers / Shaker Tables



In addition to our Portable Vibration Calibrator products 9100D and 9110D (see Page 9) designed to calibrate accelerometers and prox probes in the lab or in the field, The Modal Shop units below include a large armature and platform table to support payloads up to 10 lbs, ideal for traditional vibration control testing of components and subassemblies. Through-hole armature design also allows experimental modal testing via stinger attachment. Head expander and horizontal table options are available for larger and heavier objects.

2075E

	Max Force ±lbf (N) pk	Stroke In (mm) pk-pk	Maximum Frequency (Hz)	Shaker Model	Amplifier Model	Shaker/Amp Weight lb (kg)	Cooling Package	Trunnion	Stinger Kit(s)	Other Accessory Kit(s)	Shipment Weight, lb (kg)
K2075E040	40 (178)	25 (1)	6 500	2075E	2100E21-400	35 (16) / 9 (4)		√	√	√	64 (29)
K2075E075	75 (344)	25 (1)	6 500	2075E	2050E09	56 (25) / 81 (37)	√	√	√	√	169 (77)
K2110E110	110 (489)	25 (1)	6 500	2110E	2050E09-FS	56 (25) / 81 (37)	√	√	√	√	189 (86)



2000X03
Accessory Kit



2100E21-400
Amplifier



2050A
Excitation Stand

Individual Shakers

- 2004E** 4lbf mini The Modal Shop Modal Shaker, Miniature Shaker, 20 N (4.5 lbf) pk sine force, 5 mm (0.2”) pk-pk stroke. Includes trunnion mounting base and 2110G06 stinger kit. *Rental includes heavy duty transportation case.*
- 2007E** 7lbf mini The Modal Shop Modal Shaker, Miniature Shaker, 31 N (7 lbf) pk sine force, 13 mm (0.5”) pk-pk stroke. Includes trunnion mounting base and 2110G06 stinger kit. *Rental includes heavy duty transportation case.*
- 2025E** 13lbf modal The Modal Shop Modal Shaker, 58 N (13 lbf) pk sine force, 18 mm (0.7”) pk-pk stroke, with adjustable collet stinger attachment and through-hole armature design, includes 2000X03 accessory kit and trunnion mounting base. *Amplifier 2100E21-400 drives system to 13 lbf peak.*
- 2060E** 60lbf modal Modal Shaker, 267 N (60 lbf) pk sine force, 36 mm (1.4”) pk-pk stroke, with adjustable collet stinger attachment and through-hole armature design, includes 2000X03 accessory kit and trunnion mounting base. *Amplifier 2100E21-400 drives system to 30 lbf peak. To drive shaker to full 60 lbf peak, use amplifier 2050E09. Always use cooling package 2050E03 when driving shaker above 30 lbf pk sine force.*
- 2075E** 75lbf dual purpose The Modal Shop Dual Purpose Shaker, 334 N (75 lbf) pk sine force, 25.4 mm (1”) pk-pk stroke, through-hole armature for stinger attachment/modal testing, 83 mm (3.25”) diameter mounting surface. Trunnion base and 2000X03 accessory kit included. *Amplifier 2100E21-400 drives system to 40 lbf peak. To drive shaker to full 75 lbf peak, use amplifier 2050E09. Always use cooling package 2050E03 when driving shaker above 40 lbf pk sine force.*
- 2100E11** 100lbf modal The Modal Shop Modal Shaker, 440 N (100 lbf) pk sine force, 25.4 mm (1”) pk-pk stroke, with adjustable collet stinger attachment and through-hole armature design, includes 2100E11-001 accessory kit and trunnion mounting base. *Rental includes heavy duty transportation case. Amplifier 2100E21-400 drives system to 35 lbf peak. Amplifier 2100E18 drives system to 100 lbf peak. Always use cooling package 2050E03 when driving shaker above 50 lbf pk sine force.*
- 2110E** 110lbf dual purpose The Modal Shop Dual Purpose Shaker, 489 N (110 lbf) pk sine force, 25.4 mm (1”) pk-pk stroke, through-hole armature for stinger attachment/modal testing, 83 mm (3.25”) diameter mounting surface. Trunnion base and 2000X03 accessory kit included.
- 2050E01** MB Dynamics Modal 50 Shaker, 50 lbf pk sine force, 1” pk-pk stroke, 4 kHz maximum, 55 lb weight, modal accessory kit included.

Individual Amplifiers

- 2100E21-400** The Modal Shop SmartAmp™ Power Amplifier, 400 W, interlock and clip detection, continuous gain adjustment, 100-240V line power *Lightweight general purpose unit appropriate for standard duty testing. Features silent fanless operation and advanced features including real-time warning feedback for signal distortion and automatic shutdown of the supply signal for DC faults. Over-current and over-temperature protection prevent unexpected damages during testing. Safe Start feature avoids sudden shaker transients when the amplifier is powered up.*
- 2050E05** Linear Power Amplifier, selectable current/voltage mode, continuous gain adjustment, 100-240V line power *Classic general purpose linear amplifier. Includes voltage control mode, commonly used when performing burst random testing.*
- 2100E18** Power Amplifier, 2400 W, continuous gain adjustment *An appropriate choice to drive 2100E11 shaker to full capacity. Forced air cooling is required when driving the 2100E11 to excitation levels above 50lbf (27N); use cooling kit 2050E03. Amplifier and cooling kit included in shaker kit K2100E100.*
- 2050E09** Linear Power Amplifier, 900 W, selectable current/voltage mode, continuous gain adjustment *00-240V is required for the 2050E09 amplifier when used with a dual purpose platform shaker 2075E or 2110E. Renters are generally responsible for connecting a power plug for this amplifier. Contact us for more information.*

Shaker Accessories

- SRC20** Larson Davis Synthesized Signal Source, handheld waveform generator, sine, pulse, pink and white noise, linear or log sine sweep, battery or line power, RS-232 computer control or BNC output
- 2050E03** Cooling Package for Shakers *Provides forced air to safely drive 2060E, 2075E, 2100E11, 2050E01 and 2110E to full capacity. Included with shaker kits.*
- 2000X03** Shaker Accessory Kit for models 2025E, 2060E, 2075E, 2110E. Includes case, 2155G12 3/32” and 2150G12 1/16” stinger kits, adaptors, wrenches, fuses, and other accessories. *Included with any 2060E, 2075E shaker or kit rental detailed on Page 11*
- 2100E11-001** Shaker Accessory Kit for model 2100E11. Includes case, 2150G12, 2155G12, and K2160 stinger kits, chuck, collets, adaptors, wrenches, fuses, and other accessories. *Included with any 2100E11 shaker or kit rental detailed on Page 11*
- 2050A** Lateral Excitation Shaker Stand kit, provides a versatile means of adapting a modal shaker for horizontal input. The stand facilitates excitation with a tensioned “piano” wire stinger (not included). *This item requires special shipping, ship weight 182lb, crate 6ft x 2ft x 1ft.*

288 Series ICP® Impedance Head Sensors



Colinear force and acceleration used with structural shakers for driving-point measurements. Placed on structure under test, connect the stinger last.

- 288D01** Impedance Head, 100 mV/lb ± 50 lbf range, accelerometer: 100 mV/g, ±50 g range, (2) side 10-32 coaxial jacks, 10-32 mounting
- TLD288D01** Impedance Head, 100 mV/lb ± 50 lbf range, accelerometer: 100 mV/g, ±50 g range, (2) side 10-32 coaxial jacks, 10-32 mounting, with TEDS

Productivity Tools for Large Channel Test Systems

- 400B76** TEDS sensor interface kit. Enables communication to TEDS sensors over PC USB interface. Includes Windows software, USB adaptor, and 10-32 microdot cable. Supports IEE 1451, P1451 and LMS templates.
- 8030S** AirRide test fixture support. Air spring to support and isolate structures for modal testing; several may be used to test large structures. Offers typical mounting frequency of 1.35 Hz for 310-lb load. 680-lb max capacity per support.
- 8032S** AirRide test fixture support. Air spring to support and isolate structures for modal testing; several may be used to test large structures. Offers typical mounting frequency of 2.88 Hz for 650-lb load. 1790 lb max capacity per support.

Vibration Controller / Digital Shaker Control Systems

Closed loop vibration control systems for Dual Purpose shakers on the previous page, or to be used with an existing shaker setup. Systems support test modes for vibration testing according to ISO, DIN, MIL-STD 810, IEC, and many other standards. *[Sensors and shakers rented separately; contact us for specific control requests]*

Crystal Instruments Spider VCS (www.go-ci.com)

- S81B-P04-R** Crystal Instruments Basic Spider-81B VCS System, four inputs: Sine, Random, Shock. Fourth generation system with embedded DSP technology for enhanced control performance, system reliability, and failure protection. Operates in PC-tethered mode or standalone Black Box mode.
- S81-P08-R** Crystal Instruments Spider-81 VCS System, eight inputs; Sine, Random, Classic Shock, Transient, SRS, Sine-on-Random, Random-on-Random, and more. Fourth generation system with embedded DSP technology for enhanced control performance, system reliability, and failure protection. Operates in PC-tethered mode or standalone Black Box mode.

m+p VibRunner (www.mpihome.com)

Vibration Controller for 8+ channels, supports all test modes used for vibration testing according to ISO, DIN, MIL-STD 810, IEC and many other standards. System includes mainframe, digitizer, PC to VXI interface (1 Gigabit Ethernet or IEEE-1394 FireWire) and, optionally, an arbitrary source for sine-on-random testing. Various options include modes for random w/notching/force limiting, random data reduction, sine w/notching/force limiting, sine resonance search and dwell, sine data reduction, sine force/displacement/velocity control, shock classical, shock response spectrum (SRS), external pulse, transient capture, sine-on-random (SoR), random-on-random (RoR), sine-on-random-on-random (SoRoR), time domain replication, time history recording to throughput disk.

Also: Additional Controller systems including Data Physics SignalStar, Bruel & Kjaer VC-LAN, and ECON Technologies UCON may be available for rent.

Force Limited Vibration Testing System

Minimize over-testing and reduce risk of damage to critical structures with multi-axis Σ forces and measuring moments as inputs in a closed-loop control system to an existing large shaker or slip table. *[Rent cabling and sensors separately from kits]*



- KFLVT-Charge** Charge Mode Force Limited Vibration Test System, includes charge summing modules, charge amplifiers, and chasses
- KFLVT-ICP** ICP Force Limited Vibration Test System, includes computational conditioner modules and chassis
- 260A03** Triax ICP® force sensor, 10k lb (Fz), 4000 lb (Fx,y), 0.25 mV/lb (z), 1.25 mV/lb (x, y)
- 260A11** Triax force sensor, 1k lb (Fz), 500 lb (Fx,y), 15 pC/lb (z), 32 pC/lb (x, y)
- 260A13** Triax force sensor, 10k lb (Fz), 4k lb (Fx,y), 15 pC/lb (z), 32 pC/lb (x, y)

Industrial Machinery and Project Monitoring

Echo® Wireless Vibration System

Eliminate in-plant cabling, free up analyst time by automating data collection, transmit data wirelessly over long distances, through walls, and analyze more frequently. System works with Echo® wireless sensors or existing installed sensors.



- KEcho** Echo Wireless System. (1) Echo wireless sensor with Echo Receiver, monitoring software and system controller. *[Expand channel count with additional 670A01 Echo wireless vibration sensor units]* 670A01 Echo 672A02 EchoPlus 673A01 Receiver
- KEchoPlus** Echo Converter Kit. (1) 8-channel Echo wireless junction box with Echo Receiver, monitoring software and system controller. *[Expand channel count with additional 8-channel 672A01 junction box units]*
- 670A01** Echo® Wireless Vibration Sensor
- 672A01** EchoPlus® Wireless Junction Box (8-channels)

Industrial and Product Monitoring

- BEAR** Band Energy Alert Recorder system, monitors multiple channel / multiple frequency band energy to help identify specific condition faults or degradation.
- SDC002-Kit** Vibration Limit Switch, selectable 2 Hz to 20 kHz, with 4-20 mA and solid state relay outputs. Rental kit includes selectable single channel accelerometer, setup software, and serial connection cable. *[SDC002-PS24P AC Power Supply with pigtail termination: /30 day]*
- NDT Products** NDT Nondestructive Test, uses Resonant Acoustic Method to determine manufactured part integrity. Allows easy setup and test for product flaws in cast, powdered metal and stamped parts.

Human Vibration / Severity Meter

KHVM100

HVM100 Human Vibration Meter Kit. Frequency weightings and 3-channel measurements for vibration, hand-arm and whole body including integration of X, Y, Z and sum, ICP, charge or direct mode accelerometer compatibility. Kit includes PC interface, power supply, cabling, and adaptors as required for test. Blaze software is also included for report generation and unit setup. Sensor(s) rented separately. If using your own sensors, please contact us to assure that cabling and adaptors supplied will interface properly!



ADP060 Hand Accel Adaptor



ADP061 Handle Accel Adaptor



ADP062 Clamp Accel Adaptor



ADP063 Palm Accel Adaptor

SEN021F

Triaxial accelerometer, 10 mV/g with integral filter, 4-pin connector, used with hand and handle adapters or in direct mount applications

SEN026

Triaxial ICP accelerometer, 10 mV/g, 0.5-12000 Hz, 10 ft cable to 3 BNC included, 3.1 gram, for use with palm adaptor

356B41/NC

Triaxial seat pad accelerometer, ceramic shear, 100 mV/g, 0.5 Hz to 1kHz, 5 ft integral cable to 4-pin connector

Accelerometers

Additional rental accelerometers can be used with the HVM100. Check Pages 1-6 for additional options.

Standards met: ISO 8041:2005(E) incl. Am. 1: 1999(E), ISO 8041:2005, ergo: ISO 2631-1:1997 Part 1, ISO 2631-2:2003 Part 2, ISO 2631-4:2001 Part 4, ISO 5349-1:2001 Part 1, and ISO 5349-2:2001 Part 2

Larson Davis Noise Dosimeters

The Spark™ series noise dosimeters offer a fully featured line of dosimeters for the Industrial Hygiene and Safety markets. The easy-to-use units meet ANSI S1.4-1983, ANSI S1.25-1991, IEC 60651-1993, IEC 60804-1993 and IEC 61252-1993 standards and offer incredible battery life. Each time history sample stored includes the Leq, Lmax, Lmin, Peak and four TWAs with user-selectable exchange rates and thresholds. An Ln table is automatically stored every 5 minutes as well.



K706RC

Larson Davis Spark Series Noise Dosimeter with LCD Keypad and remote control capability. Kit includes MPR001 Type 2 microphone, preamplifier, windscreen, batteries, pouch and clip.

Complimentary Accessory Bundle:

SPARK-ACC

Standard accessory kit for Spark dosimeter-based system rental. Kit includes manual set, DVX008 infrared computer interface and adaptor to USB, Blaze software and a single calibrator. Contact The Modal Shop if additional accessories are required.

Additional dosimeters including multi-pack kits are available.

Rotating Equipment



LaserTach



PulseDriver



TSC002



TSC004

LaserTach

The Modal Shop ICP® optical laser tachometer, BNC output, to 30,000 rpm, 20 inch operating range (at 90° incidence), requires 3mA minimum, includes retro-reflective tape

PulseDriver

The Modal Shop Magnetic Tachometer Pickup Preamplifier for direct interface to ICP sensor signal conditioners, includes selectable divider circuit

TSC002

Structural Dynalysis Torsional Signal Conditioner, 2-channel, conditions output from a shaft encoder, mag pickup or Hall Effect sensor for torsional vibration measurements

TSC004

4-channel version of TSC002 above

Polytec Non-Contact Laser Measurement Systems

PDV-100

Portable Digital Single Point Vibrometer, to 22 kHz, low pass and high pass filters available, analog and digital output, velocity resolution 0.05µm/s/√Hz (20mm/s/√ range), AC powered

Additional non-contact laser systems may be available, including 3D, in-plane, scanning/out of plane, and rotational vibrometers. Please inquire.



Precision Condenser Microphone Cartridges

Any 0V microphone including the popular 377B02 1/2" and 377C01 1/4" shown mate with 426 Series Preamplifiers in section below, and are powered with ICP®

	Manufacturer	Diameter (in)	Type	Sensitivity (mV/Pa)	Freq Response (±2dB)	Dynamic Range (dB re: 20 µPa)	Polarization Voltage (V DC)
2520	Larson Davis	0.25	Freefield	3.7	4 Hz – 70 kHz	30 – 172	200
377C01	PCB	0.25	Freefield	2	4 Hz – 80 kHz	35 – 170*	0
2540	Larson Davis	0.5	Freefield	14	4 Hz – 40 kHz	20 – 160	200
377B41	PCB	0.5	Freefield	40	3.15 Hz – 20 kHz	15 – 146	200
377B02	PCB	0.5	Freefield	50	3.15 Hz – 20 kHz	15 – 146*	0
2570	Larson Davis	1	Freefield	50.7	2.6 Hz – 18 kHz	10 – 146	200
2530	Larson Davis	0.25	Pressure/Random	1.3	4 Hz – 63 kHz	31 – 172	200
377B11	PCB	0.5	Pressure	50	3.15 Hz – 10 kHz	15 – 146*	0
2575	Larson Davis	1	Pressure	45.5	4 Hz – 8 kHz	10 – 146	200
2559	Larson Davis	0.5	Random Inc.	11.7	4 Hz – 21 kHz	18 – 160	200
377B20	PCB	0.5	Random Inc.	50	3.15 Hz – 12.5 kHz	15 – 146*	0
377A60	PCB	0.5	Random Inc.	50	3.15 Hz – 10 kHz	15 – 146	200
40BI**	GRAS	0.25	Intensity Set	3	IEC 651 Type 1	40 – 168	200
2620PM**	Larson Davis	0.25	Intensity Set	3.7	4 Hz – 70 kHz	30 – 164	200
2640PM**	Larson Davis	0.5	Intensity Set	14	4 Hz – 15 kHz	20 – 160	200
40AI**	GRAS	0.5	Intensity Set	25	IEC 651 Type 1	21 – 152	200

* - When used with ICP power, reduce upper dynamic range level by about 8dB

** - Intensity microphone pair rentals include a pair of microphones and preamplifiers, spacers and adaptors

Preamplifiers

	Manufacturer	Diameter (in)	Connector	Use With	Additional Notes
426B03	PCB	0.25	10-32	1/4" 0V (Prepolarized) Mics and ICP power	
PRM910B	Larson Davis	0.25	Switchcraft 5 pin	LD 2200C, 2900, 870B only (not 812/820)	Integral 6 ft cable
426E01	PCB	0.5	BNC	1/2"0V(Prepolarized) Mics and ICP power	
HT426E01	PCB	0.5	BNC	LD 824, traditional microphone power	For high temp to 120°C (248°F)
PRM900C	Larson Davis	0.5	Switchcraft 5 pin	LD 2200C, 2900 family, 3200, 870B	Not for use with 812/820
PRM902	Larson Davis	0.5	LEMO 1B 7 pin	LD 824, traditional microphone power	

Traditional Microphone Power Supplies (To condition 130 series array and precision 0V polarized mics, use ICP power shown on Page 9)

	Manuf.	Channels	Gain (dB)	Weighting	Inputs/Outputs	Power	Notes
2200C	Larson Davis	2	-30 to +40 in 10dB steps	A, C or flat	Switchcraft 5 pin male / BNC	Battery/ Line	Dual output allows simultaneous flat and weighted measurements
2210	Larson Davis	10	0 to +42 in 2dB steps	A, B, C, flat	LEMO 7 pin/ 25pin D to BNC	Battery/ Line	Selectable highpass and lowpass filtering

Microphone Cabling

EXA010 Extension cable, LEMO 7 pin, 10 ft (3 m) (GRAS 3m LEMO extension AA0008 also available for 5)

EXA100 Extension cable, LEMO 7 pin, 100 ft (30 m)

EXC010 Extension cable, 5 pin Switchcraft, 10 ft (3 m), used with 831 and LxT

EXC050 Extension cable, 5 pin Switchcraft, 50 ft (15 m), used with 831 and LxT

EXC100 Extension cable, 5-pin Switchcraft, 100 ft (30 m), used with 831 and LxT

EXC010NF Extension cable, 5 pin Switchcraft, 10 ft (3 m), no ferrite bead, for use with 820 meters

EXC020NF Extension cable, 5 pin Switchcraft, 20 ft (6 m), no ferrite bead, for use with 820 meters

EXC100NF Extension cable, 5-pin Switchcraft, 100 ft (30 m), no ferrite bead, for use with 820 meters

Coaxial Cables BNC and 10-32 cabling for ICP compatible microphones – refer to Page 3 for details/pricing

Specialty Acoustics

Array Microphones	130E20	ICP Microphone with integral preamplifier, 45mV/Pa, 20-20000 Hz \pm 5dB, 20-10000 Hz \pm 2dB, BNC jack connector, includes TEDS
	<i>Additional</i>	Additional Array Acoustics items are shown online, including 130C10 and 130D10 microphone tips and 130E10 preamplifiers.
Surface Microphone	130A40	Low-profile surface pressure microphone and preamp, 45 mV/Pa, prepolarized
Sound Intensity	Intensity Probe	Larson Davis 2260 or GRAS 50AI Sound Intensity Probe complete with probe handle, microphones, spacers, and preamplifiers. <i>Various options for remote function capabilities may be available; contact us for requests.</i>
	Intensity Kit	Larson Davis 3000 Analyzer complete with accessories and with GRAS 50AI-LD or LD 2260 Intensity Probe with Remote Measurement Control Capability, includes probe handle, microphones, spacers, preamplifiers, adaptor cable, and accessories.
	CAL291	Larson Davis Residual
Room Acoustics	BAS001	Larson Davis Omnidirectional (Dodecahedral) source with 5M cable, with carrying case, use with BAS002-U power amplifier.
	BAS002-U	Larson Davis 500 Watt 110-125 BAC power amplifier for BAS001 or BAS003; includes remote control, carrying case
	BAS004	Larson Davis Tapping machine w/ remote control, battery and charger. includes soft carrying case
	NOR277A	Norsonic 277 tapping machine, 10kg mass, conforms to ISO140, ASTM E-1007, ASTM E492 standards, powered from 100-120V AC, built in self check of hammer fall speed and tapping sequence
	<i>Additional</i>	Additional Room Acoustics items are available. Firmware modules for Sound Meters 824 and 831 are shown on SLM pages, other items including DNA analysis software, Bruel & Kjaer Reference Sound Sources Types 4204 and 4205 and more are shown online.
Hydrophones	TC4013	Teledyne RESON miniature hydrophone, -211dB \pm 3dB receiving sensitivity, 1Hz-170kHz. Various cable lengths available, cable terminates in 2-pin LEMO with BNC adaptor. Used for pile driving, dolphins, general purpose measurements. More information available online.
	RA0043	Pistonphone coupler for TC4013 hydrophone (394A40 pistonphone listed in section below)
High Temp Acoustics	Probe Mic	PCB 377A26 or GRAS 40SC ICP [®] probe microphone, 3 mV/Pa, 2 Hz to 20 kHz, 800°C, <160 dB dynamic range
	HT426E01	High temperature 1/2-inch preamplifier for prepolarized microphones. <i>Mates with 0V microphones to allow temperatures to 120°C/248°F, powers with ICP.</i>

Microphone Calibration and Connectivity Accessories



CAL200 0
Type 1 speaker-phone, 94 or 114dB output, 1 kHz, 1/2" opening



394A40 80
Pistonphone, 114.0 (\pm 0.08) dB output at 250 (\pm 0.5%) Hz, 1/2" opening



ADP031
3/8" microphone adaptor for 1/2" acoustic calibrators



ADP024
1/4" mic adaptor for 1/2" acoustic calibrators



CAL250 \$250
Single point speaker-phone calibrator, 114dB output 250 Hz, 1" opening



ADP019
1/2" microphone adaptor for 1" acoustic calibrators (CAL250)



ADP043 0
1/4" Microphone to 1/2" Preamplifier Adaptor



079A11
Mounting clip for 1/2" diameter preamp, 1/4-20 thread



079A10
Mounting clip for 1/4" diameter preamp, 1/4-20 thread



ADP005 0
BNC to 1/2" microphone thread adaptor, 18pF with shorting cap



079A15 0
Tripod for short-term attended testing. Additional tripods available on SLM pages







079A06 (WS001)
3-1/2" dia windscreen for 1/2" microphones. Use **079A07** for 1/4" mics.

Sound Level Meter Overview and Selection

The Modal Shop offers a complete range of Larson Davis Sound Level Meters. Selecting the proper sound level meter testing system is one of the most important aspects of any sound test. The Modal Shop's Rental Program offers proven solutions with a variety of capabilities and kit configurations. Meters are available for both short- and long-term rentals.

Every meter offered is an integrating unit that logs data (including Leq, Lmax, Ln s), meets Class 1 standards and connects to a PC to setup and download data. First, a few points for each meter that answer some common questions:

- 
 Model **831** provides the most versatility and is the most common choice for a variety of tests. With the widest dynamic range, the 831 is used if site levels vary between quiet and quite loud, perfect for 24-hr construction measurement or if very low levels need to be analyzed. 831 also provides features (some unique) such as .wav sound recording, FFT, GPS, and room acoustics.
- 
 Model **LxT** is the most basic meter for a straightforward test. The LxT excels at walk-around workplace noise assessments, navigation, and a large screen makes it an easy choice for basic tests.
- 
 Model **820** is an industry standard environmental noise monitor and remains a popular choice for those familiar with the platform. The lack of ability to measure 1/1 or 1/3 octave data, limited memory and its dated interface tend to make the 820 a meter most often used by those who have used it in the past, but the low price point makes it an economical logging system.
- 
 Model **824** is primarily used for its unique capabilities ranging from use with 0V and 200V condenser microphones to audiometry testing. Its use as an environmental monitor has waned due to the superior memory, connectivity, and low power consumption of the 831.

Sound level meters can be rented from TMS as complete kits (indicated by a "K" prefix before the Larson Davis model number) and as complete outdoor NMS (Noise Monitoring Station) systems. Rental kits include a selectable microphone, preamplifier, microphone extension cable, windscreen, internal batteries, and calibration certificates. 831, LxT, and 824 units also include a hard case and AC line power supply. See individual meter pages for more details.

In addition, unless otherwise specified or arranged, all Sound Level Meter kit rentals of any quantity include Quantity 1 of the following line item at no charge. It appears as 100% discount for the line item and will not be charged for the duration of the paid meter kit rental:

KSLM-ACC	Standard accessory kit for SLM rental, includes manual sets, utility software for setup and data download (1 for each family of meter rented) with computer interface accessories, and a single calibrator. Contact The Modal Shop if additional items are required.	0 (at 100% discount)
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Sound Meter Capability/Comparison (Additional detail and specification shown on following page; even more detail available online)

	831	LxT1	824	820
Dynamic Range	>120dB	>100dB	>105	>110dB
Internal Memory (as rented)	2G	2G	2M	256k
Time History (Data Logging, including Leq and Lmax)	●	●	●	●
Measurement History (Intervals, including Ln data)	●	●	●	●
Exceedance History	●	-	●	●
Industrial Hygiene Parameters (Dose)	●	●	●	●
1/1 and/or 1/3 Octave	○	○	○	-
FFT (narrowband frequency analysis)	○	-	○	-
Voice Annotation	○	○	-	-
Sound Recording (events, timed, manual, and more)	○	-	-	-
Room Acoustics (RT60 and more)	○	-	○	-
Audiometry (hearing level, FM, pulse, THD and more)	-	-	○	-
Microphone Extension Cable	●	●	●	●
Standard Off-The-Shelf Battery Power	●	●	●	●
AC Power Adaptor	●	●	●	●
Cabling to USB for interface and/or power	●	●	●	●
Source Output	●	-	-	-
Setup and Download Software	●	●	●	●
DNA Data Navigation and Analysis software	○	○	○	○
Outdoor Kits Available	○	○	○	○
GPS	○	-	-	-
USB Memory Stick Data Transfer	○	○	-	-
Typical Data Storage Capabilities*				
Leq time history (at 0.1dB resolution)	>100,000,000	>100,000,000	>1,000,000	>120,000
Measurement History (Intervals, including Ln data)	>400,000	>1,200,000		>4,500
1/3 octave spectra	>12,000,000	>12,000,000	>28,000	-

* - without storing additional parameters

● standard with rental ○ optional - not available

The Larson Davis 831 is our most versatile and capable rental meter. Simultaneous measurement of a large number of acoustic metrics, 1/1 and 1/3 octave ability, can record .wav files on exceedances, large memory, large screen, GPS-capable, USB flash drive can be used to download data.

Metrics measured include date/time stamped selectable values, including:

Time History: peak levels (A,C,Z weighted), Levels (Leq, Lmax, Lmin for A/C/Z x Slow/Fast/Imp), Six Ln values, TWA1, TWA2, LCEq-LAeq, 1/1 and/or 1/3 eq/max/min (one weighting)

Measurement History: Leq Lmin, Lmax and six Ln values for one selected frequency and time weighting, SPL and Peak Counts / Durations, 2x projected TWA, 1/1 and/or 1/3 eq/max/min

Event History (Exceedances): Duration, LAeq, LASmax, Time, LZpeak (max), Trig. Level, Overload, OBA Overload, LAE, EA (Pa²s), 1/1 and/or 1/3 eq/max/min

Preconfigured 831-based Kits *full details and pictures of items included in kits are shown online*

K831L Larson Davis 831 Logging Analyzer Kit. Includes LOG, ELA, and IH firmware, microphone, preamplifier, windscreen, line power supply, case, calibration data, internal batteries and charger.

K831 Larson Davis 831 Logging Analyzer Kit with 1/1 and 1/3 Octave. Includes LOG, ELA, IH, and **OB3** firmware, microphone, preamplifier, windscreen, line power supply, case, calibration data, internal batteries and charger.

K831H Larson Davis 831 Kit with Logging, 1/1 and 1/3 Octave, and Sound Recording. Includes LOG, ELA, IH, **OB3**, and **SR** firmware, microphone, preamplifier, windscreen, line power supply, case, calibration data, internal batteries and charger.

Complimentary Accessory Bundle:

KSLM-ACC Standard accessory kit for SLM rental, includes manual sets, utility software for setup and data download (1 for each family of meter rented) with computer interface accessories, and a single calibrator. Contact The Modal Shop if additional items are required.

831-based Kits for Unattended Outdoor Monitoring *full details and pictures of items included in kits are shown online*

NMS-831L Outdoor Logging Noise Monitoring System. Includes 831 with LOG, ELA, and IH firmware, microphone, preamplifier, TRP003 tripod, EPS2106-2 environmental protection kit, EPS030-831 kit with BAT011 that provides 7-day use between charges, and accessories.

NMS-831 Outdoor Logging Noise Monitoring System with 1/1 and 1/3 Octave Capability. Includes 831 with LOG, ELA, IH, and **OB3** firmware, microphone, preamplifier, TRP003 tripod, EPS2106-2 environmental protection kit, EPS030-831 kit with BAT011 that provides 7-day use between charges, and accessories.

NMS-831H Outdoor Noise Monitoring System with Logging, 1/1 and 1/3 Octave, and Sound Recording. Includes 831 with LOG, ELA, IH, **OB3** and **SR** firmware, microphone, preamplifier, TRP003 tripod, EPS2106-2 environmental protection kit, EPS030-831 kit with BAT011 that provides 7-day use between charges, and accessories.

NMS021 Larson Davis NoiseTutor Environmental Noise System. Includes hard shell carrying case, 831-FF, LOG, ELA, OB3, FITPc, NoiseTutor client CD, USB color monitor, keypad, Sierra Wireless USB modem (requires SIM and data plan), EXC020 and EPS2106-2.

EPS041 NoiseTutor Accessory Kit. Includes hard shell carrying case, FITPc, USB color monitor, keypad, Sierra Wireless USB modem (requires SIM and data plan), EXC020, battery, and web starter software. *[included in NMS021, but can be added on to any 831 rental]*

831 Accessories Explained



BAS001
Omnidirectional source for Reverberation Time, Room and Building Acoustic Measurements – integrates with 831-RT option to offer easy ISO 3382-2 and ASTM E2235-04 testing



CCS001-831-4
Renting multiple 831 or LxT meters? Request they be put into this multi-case to save on shipping. This rugged case holds 4 meters, mics, preamps, and a calibrator.



079A15
Tripod for temporary / attended testing. When used with 079A11 clip, holds mic/preamp pair with windscreen. Not designed to support weight of a sound meter



TRP003
Ultimate Support Tripod, max height 8 ft, used in unattended NMS systems, used in general all purpose weather conditions



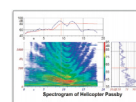
EPS030-831
Case with battery and connections to 831, provides power for 7 days of unattended measurements between charges. Tripod and environmental enclosure ordered separately



831-GPS
Includes Global Positioning information with measurements, for fixed or roving tests. Connects via aux USB input of 831



SEN031
Combined weather sensor: wind speed and direction, temperature, humidity, pressure, rainfall - requires CBL167 cable + DVX008A



831 DNA
Data Navigation and Analysis software allows advanced tools to analyze and report data: organization tools for templates, graphics and measurements

Customize or Build to Order 831 rental kits

Modify any K831 or NMS kit on the previous page with the items below to fit a specific test. If preferred, start with a base model and add items as required.

831-BTO Base model 831 rental. Includes meter with 2 GB memory and case.
Build your own rental by adding options below.

Firmware any options can be added or removed For Rental Kits - ● standard ○ option

- 831-LOG** Logging of time histories (increments from 20ms to 24hr)
- 831-ELA** Measurement History adds exceedance/event logging, intervals, and daily histories
- 831-OB3** Selectable real time 1/1 and/or 1/3 octave filter set
- 831-IH** Industrial Hygiene adds 2 selectable doses including OSHA, ACGIH, NIOSH, IEC standards
- 831-SR** Sound Recording includes level and dynamic based event recording and more
- 831-FST** Fast logging of time histories, adds 2.5, 5 and 10 ms speeds (requires LOG and OB3)
- 831-FFT** FFT 400 to 6400 line with selectable span 100 Hz-20 kHz, windowing and control
- 831-RT** Reverberation Time for room acoustics per ISO 3382-2:2008 and ASTM E2235-04

	K831L	K831	K831H	NMS-8321L	NMS-831	NMS-831H
●	●	●	●	●	●	●
●	●	●	●	●	●	●
○	○	●	●	○	●	●
●	●	●	●	●	●	●
○	○	●	○	○	○	●
○	○	○	○	○	○	○
○	○	○	○	○	○	○
○	○	○	○	○	○	○

Standard Accessories included with standard 831-based kits

- 377B02** 1/2" freefield, prepolarized condenser microphone, typical sensitivity= 50 mV/Pa (±1.5 dB), 3.15 Hz to 20 kHz (±2 dB) *Alternate microphones available. Model 831 features a built-in freefield-to-random incidence correction filter option for random incidence measurements.*
- PRM831** Preamplifier for 1/2" prepolarized microphones
- EXC010** Switchcraft 5 pin Microphone Extension Cable, 10 ft *other lengths available, see EXC section in Optional section below*
- KBAT15** AA Battery kit for short-term use *includes (4) 15-minute rechargeable AA batteries, charging station and AC power supply*
- PSA029** AC power adaptor *line power connector to USB A outlet*
- CBL138** CABLE USB A to Mini-B 1.8 Meter *Connects 831 to PC, or powers/charges unit when used with PSA029 AC power adaptor*
- WS001** 3-1/2" diameter windscreen for 1/2" microphones
- SWW-SLM-UTILG3** Utility software allows downloading, upgrading, translating, and printing of text reports or exporting to spreadsheet. CD with Quick Start Guide *Compatible with 32-bit versions of Windows XP, Vista and 7 and 64-bit Windows 7. Ask if using with another operating system.*

Standard Outdoor Components included with all 831-based NMS kits

- TRP003** Support tripod, maximum height 8 ft, used in portable NMS systems. *ship weight 14 lb for 1, 25 lb for 2, box 64 in x 8 in x 8 in*
- ADP034** Adaptor connecting EPS2106 or EPS2106-2 to TRP003 tripod
- EPS2106-2** Environmental protection for 1/2" PRM831, with windscreen, bird spikes, desiccants, 3/4" standard solid-wall PVC conduit thread.
- EPS030-831** Case for Model 831 sound level meter including (1) BAT011 21Ah battery, PSA032 charger, cabling *Provides 7-day use between charges*
- CBL142-010** Preamplifier cable connecting EPS030-831 case to PRM831, 5-pin LEMO to 5-pin Switchcraft, 10 ft

Optional Outdoor Components

- 079A15** Microphone stand with boom attachment and adaptor. *Boom connector has 5/8"-27 stud, converts to 1/4"-20 stud with included adaptor. Height adjusts from 36" to 63", 30" boom length, 23" base spread. Generally used to mount preamp/mic via 079A11 clip. Lightweight tripod, not recommended for unattended monitoring.*
- 079A11** Microphone clip for 1/2" microphones. *Microphone holder designed to attach to 1/4"-20 stud. Height from base to center of holder is 1".*
- K-EPS831** Environmental kit for Model 831 including (2) 21Ah batteries, PSA032 charger, cabling, environmental protection and case-connected tripod. *Provides 14-day use between charges.*
- EPS042** Small Environmental Enclosure kit, includes port for mic cable and BAT015 kit to power 831 for over 7 days on 8 D-cell batteries.
- EPS2108-2** Environmental protection kit for 1/2" PRM831, with windscreen, bird spikes, desiccants, 1/4"-20 female thread for tripod use. *Allows interface with standard camera tripods.*
- BAT011** DC 12V 21Ah External Sealed Lead Acid Battery *Nonspillable 6" x 9" x 4" 10-lb unit, charger included upon request*
- CBL143** External Power Cabling for Two External Batteries *[CBL168: Cabling for one external battery]*
- EXC** EXC010 10 ft: \$30, EXC020 20 ft: \$30, EXC050 50 ft: 0, EXC100 100 ft: 5 pin switchcraft extension cable

Supplemental Accessories and Software

- SWW-DNA** Data Navigation and Analysis Software *navigate through extensive data with measurement organization, reporting, and data post-processing tools*
- BAS001** Omnidirectional (Dodecahedral) Source *for reverberation time, room acoustic and building acoustic measurements*
- BAS002-U** Power Amplifier for BAS001 and BAS002
- TRP023** Tripod for omnidirectional source and directional source
- CAL200** CAL200 Calibrator
- 831-GPS** GPS unit for 831 *provides global positioning information to 831 data, connects via AUX USB connection*
- ACC003** Headset with microphone boom, 2.5mm micro-jack *for voice annotation*
- ADP074** ICP® interface cable allows connection of a single axis ICP® accelerometer, provides BNC connection

Additional information including pictures and descriptions are available online.

831 specification in detail

System measurement range: A: 28-140dB, Z: 35-140dB ; System noise floor: A: 18dB, Z: 23dB with 377B02 microphone; Linearity range: A: ±115dB to 140dB

Time weightings: Slow, Fast, Impulse, Integration and Peak simultaneously, Linear or Exponential Integration (Slow, Fast or Impulse); Frequency weightings: A, C, Z simultaneously; Ln Statistics (L0.01-L99.9), Voice notes and sound recording available, USB connectivity plus AC/DC outputs to recorder, >8 hours with (4) fast recharging AA batteries (included), 2 GB unit holds over 400M Leq histories or 4 M 1/1 and 1/3 octave measurements

Standards met: Sound Level Meter: IEC61672-1 Ed. 1.0 (2002-05) Class 1, Group X; IEC60651 Ed 1.2 (2001) + Am. 1 (1993-02) and Am. 2 (2000-10) Type 1, Group X; IEC60804 (2000-10) Type 1, Group X; ANSI S1.4-1983 (R 2006) + Am.S1.4A-1985 (R 2006) Type 1; ANSI S1.43-1997 (R 2007) Type 1. **Octave Filter:** IEC61260 Ed. 1.0 (1995-08) + Am. 1 (2001-09), 1/1 and 1/3-octave Bands, Class 0, Group X, all filters; ANSI S1.11-2004 Class 1. **Noise Dosimeter:** IEC61252 Ed. 1.1 (2002-03) Type 1; ANSI S1.25-1991 Class 1

Larson Davis LxT

The Larson Davis LxT is great for walkaround workplace noise surveys for plant surveys and task analysis, with voice annotation. Similar hardware to 831, with a slightly higher noise floor and lower dynamic range, limited speed for time and no ability to record sound files or connect to GPS.

Preconfigured Type 1 LxT-Based Kits *full details and pictures of items included in kits are shown online*

- KLxT1L** Larson Davis LxT1 Logging Analyzer Kit. Includes LOG and ENV firmware, microphone, preamplifier, windscreen, line power supply, case, calibration data, internal batteries and charger.
- KLxT1H** Larson Davis LxT1 Logging Analyzer Kit with 1/1 and 1/3 Octave. Includes LOG, ENV, and **OB3** firmware, microphone, preamplifier, windscreen, line power supply, case, calibration data, internal batteries and charger.
- KLxT-QPR** Larson Davis LxT Sound Level Meter Kit for with 1/4" microphone for impulsive and/or high-level sounds. Includes LOG, ENV, and OB3 firmware, preamplifier (PRMLXT1) and adaptors (ADP043+ADP024).

Complimentary Accessory Bundle:

- KSLM-ACC** Standard accessory kit for SLM rental, includes manual sets, utility software for setup and data download (1 for each family of meter rented) with computer interface accessories, and a single calibrator. Contact The Modal Shop if additional items are required. **0 (at 100% discount)**

Customize or Build to Order LxT Rental Kits

Any KLxT kit can be customized by adding or subtracting items to fit a specific test. If preferred, start with a base model and add items as required.

- LxT-BTO** Base model LxT rental. Includes meter with 2GB memory and case. *Build your own rental by adding options below.*

Firmware *any options can be added or removed*

- LxT-LOG** Logging of time histories, up to 16 parameters (increments from 1s to 24 hr)
- LxT-ENV** Environmental data logging of parameters including spectra and statistics (Ln), at time interval from 1 min to 24 hours
- LxT-OB3** Selectable real time 1/1 and/or 1/3 octave frequency analysis
- LxT-DVA** Digital Voice Annotation for LxT

Standard Accessories *included with standard LxT-based kits*

- 377B02** 1/2" freefield, prepolarized condenser microphone, typical sensitivity= 50 mV/Pa (± 1.5 dB), 3.15 Hz to 20 kHz (± 2 dB) *Alternate microphones available. The LxT features a built-in freefield-to-random incidence correction filter option for random incidence measurements.*
- PRMLXT1** Preamplifier for 1/2" prepolarized microphones **PRMLXT1L** also available for low noise applications, shifts usable range to 20-120 dB
- EXC010** Switchcraft 5 pin Microphone Extension Cable, 10 ft *other lengths available, see Page 16*
- KBAT15** AA Battery kit for short-term use *includes (4) 15-minute rechargeable AA batteries, charging station and AC power supply*
- PSA029** AC power adaptor *line power connector to USB A outlet,*
- CBL138** CABLE USB A to Mini-B 1.8 Meter *Connects LxT to PC, or powers/charges unit when used with PSA029 AC power adaptor*
- WS001** 3-1/2" diameter windscreen for 1/2" microphones
- SWW-SLM-UTILG3** Utility software allows downloading, upgrading, translating, and printing of text reports or exporting to spreadsheet. CD with QuickStart Guide *Compatible with 32-bit versions of Windows XP, Vista and 7 and 64-bit Windows 7. Ask if using with another operating system.*

Optional Outdoor Components

- TRP003** Support tripod, maximum height 8 ft, used in portable NMS systems. *ship weight 14 lb for 1, 25 lb for 2, box 64 in x 8 in x 8 in*
- ADP034** Adaptor connecting EPS2106 or EPS2106-2 to TRP003 tripod
- EPS2106-2** Environmental protection for 1/2" PRMLXT1, with windscreen, bird spikes, desiccants, 3/4" standard solid-wall PVC conduit thread.
- EPS030-LxT** Environmental Case for Model LxT including (1) BAT011 21Ah battery, PSA032 charger, CBL169 battery cable, PSA031 power adapter, CBL159 USB Cable to meter, CBL141 internal cable to connect meter to bulkhead *Provides 7-day use between charges*
- EPS042** Small Environmental Enclosure kit, includes port for mic cable and BAT015 kit to power LxT 14 days on 8 D-cell batteries.
- KLXT-12V** External Power Cabling Kit for one External 12V Battery. Includes CBL169 battery cable, PSA031 power adaptor, CBL159 USB cable
- Additional Items** Microphone stands, preamplifier clips, external batteries, alternate EPS2108-2 environmental protection kit, and extension cables are available for the LxT, and are the same as items detailed for the 831 on the previous page.

Supplemental Accessories and Software

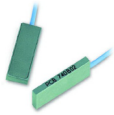
- SWW-DNA** Data Navigation and Analysis Software *navigate through extensive data with measurement organization, reporting and data post-processing tools.*
- ACC003** Headset with microphone boom, 2.5mm micro-jack *for voice annotation*

LxT specifications in detail

System measurement range: A: 39-140dB, Z: 44-140dB ; System noise floor: A: 29dB, Z: 34dB with 377B02 microphone; Linearity range: A: ≥ 104 dB to 140dB; all values lower when PRMLXT1L low noise preamplifier used. Time weightings: Slow, Fast, Impulse, Integration and Peak; Frequency weightings: A, C, Z; Voice message annotation available via ACC003; Ln Statistics (L0.01 through L99.9 available); USB connectivity plus AC/DC outputs to recorder, >16 hours continuous measurement with (4) fast recharging AA batteries (included), 256 MB unit holds up to 62 M Leq time histories, 1.3M 1/3 octave, or 3.6M dose measurements

Standards met:

Sound Level Meter: IEC61672-1 (2002-05) Class 1, Group X, IEC60651 (1979) plus Am. 1, (1993-02) and Am. 2 (2000-10) Type 1, Group X, IEC60804 (2000-10) Type 1, Group X, ANSI S1.4-1983 (R 2006) plus Am. S1.4A-1985 (R 2006), Type 1, ANSI S1.43-1997, Type 1 Octave Filter (where applicable): IEC61260 Ed. 1.0 (1995-07) plus Am. 1 (2001-09), 1/1 and 1/3-octave Bands, Class 0, Group X, all filters; ANSI S1.11-2004 Class 1. Personal Noise Dosimeter: IEC61252 Ed. 1.1 (2002-03) Type 1; ANSI S1.25-1991 Class 1

**Dynamic Strain Sensor**

740B02 ICP piezoelectric strain sensor, 50 mV/ $\mu\epsilon$, range 100 pk $\mu\epsilon$, titanium housing, 0.5 to 100,000 Hz

**Dynamic Pressure Sensor**

102B06 High frequency ICP® pressure sensor, 500 psi, 10 mV/psi, 3/8-24 mounting thread, accel. comp., ground isolated

Frequently Asked Questions Concerning The Modal Shop Rental Program

Most Frequently Asked Question

Is 30 days the minimum rental period?

No, depending on the product, 7 or 15 days are generally the minimum as shown on the top of each page. Any whole-day rental period is available starting with the minimum period, and pricing is scaled accordingly. For reference, 7-day rentals are 45% of the 30-day rate; 15-day rentals are 70% of the 30-day rate. Additionally, long-term rentals and leases may be discounted. Contact us for day-definite rental rates and long-term discounts.

Selecting Equipment

Is there help available for selecting which equipment is right for my test?

Feel free to speak to an Application Engineer at The Modal Shop 513.351.9919 or email sales@modalshop.com.

Are there online resources available to help with product selection?

Product and application video tutorials as well as detailed selection guides can be accessed by visiting our website at www.modalshop.com.

Where can I find additional information or datasheets for a certain product?

Datasheets and links to many products can be found on our website or via our sister companies' sites (www.pcb.com and www.larsondavis.com). If there are items you're interested in that aren't listed or you would like datasheets to be directly sent to you, please contact us.

I'm interested in items previously or currently sold by a PCB Group company that aren't listed; are they available?

Many specialty use or older products are not shown in the current pricelist. Depending on potential market, new items will be considered at any time. Please contact a TMS Application Engineer with any special requests-- 800.860.4867, 513.351.9919 or email sales@modalshop.com.

Payment and Purchase Options

What payment options do you offer?

Purchase Orders with Net 30 terms are accepted from any company with an open account and approved credit from TMS. Visa, MasterCard and American Express card orders are also accepted from anyone with approved credit.

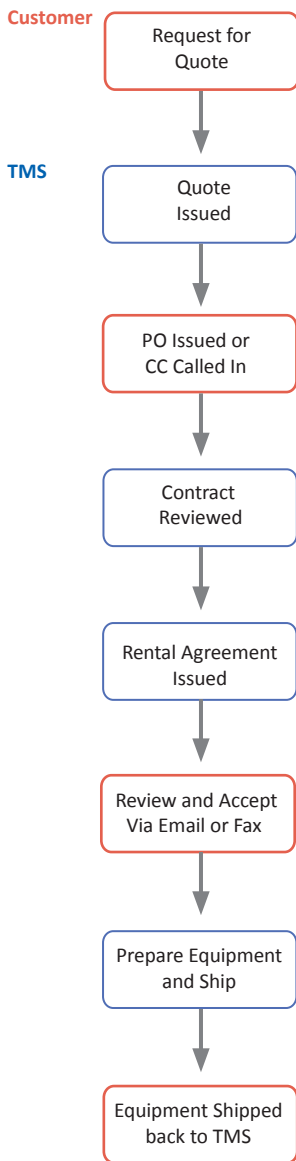
How do I set up an account with The Modal Shop?

If you do not have credit with us but do have active approved credit with PCB or any PCB Group company, please indicate this when placing a rental order. If you do not have approved credit with The Modal Shop, request a New Customer Credit Application from any Application Engineer at TMS. This form can be approved within hours. You can download this form from our website and return it via email or fax. You can respond with your own form, provided it has your company details, tax ID number, bank reference with contact details, and three trade references with address and contact details.

What buyout or purchase options exist for rental equipment?

Upon four contiguous months of rental, 40% of paid rental fees apply toward buyout of the rented product, up to 80% of the purchase cost at fair market value. Additionally, rental and demo units that are fully inspected and warranted may be available for purchase at discounted rates.

Rental Process Overview



Placing an Order

How do I place a rental order?

US customers can contact their direct field sales person or representative, or anyone in The Modal Shop Sales or Application Engineering Teams to have your request processed. Contact us at The Modal Shop: 3149 E Kemper Road, Cincinnati, OH 45241 – Phone: 800.860.4867 or 513.351.9919 – Fax: 513.458.2172. General sales requests can be made through sales@modalshop.com. International rentals may be placed with the appropriate international distributor.

Are there direct sales contacts in my area?

Yes! Please check The Modal Shop website for contacts of local direct sales employees, direct representatives and international distributors in your area.

Can items be reserved for rental?

Certain items may be reserved for testing, even months in advance. Typically these include large data acquisition or excitation systems, meters or analyzers used for consulting projects, large quantities of transducers or specialty transducers.

Is insurance available?

Our Incoterms are typically EXW: Cincinnati. Similar to a standard business purchase, the renter’s responsibility begins when equipment leaves our dock via your choice of carrier and ends when we receive the equipment back at TMS. Often your business insurance will cover the product while you are responsible for it. Check your individual coverage with your insurance provider.

What else should I know about the rental process?

For each rental order placed, a Rental Agreement is sent (typically by email), along with the Terms and Conditions of our rental program. Please review the Rental Agreement carefully, as it details the shipping, billing and product information as understood by The Modal Shop (i.e., it indicates our order acceptance and confirmation). A signed Rental Agreement is required for the rental to ship, which indicates agreement with details listed and to our Terms and Conditions.

Rental Period

When does a rental period begin and end?

North American Rental Periods begin the calendar day after shipment. International Rentals Periods begin the date received and ends the date returned to TMS or TMS agent/distribution. All rentals end the day everything is received at TMS/Cincinnati.

Are long-term rates available?

Depending on the product, certain long-term discounts may apply if the rental period is fixed from the rental start date.

I would like to extend my TMS rental – who do I need to contact?

You don’t need to contact TMS to extend your rental, unless the rental had a fixed return date or a TMS representative has contacted you and requested a return. Invoices will be automatically sent each rental period for PO orders; credit card orders will be billed accordingly.

Rental Period

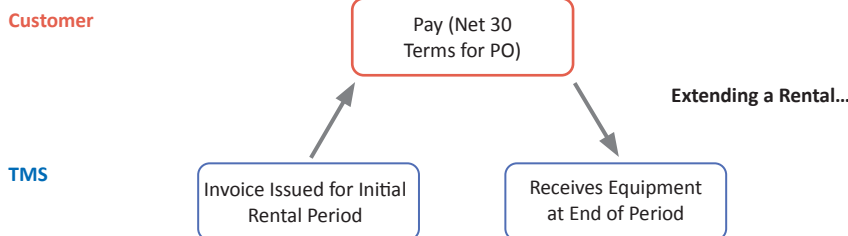
US and Canadian Customers

Begins calendar day after the equipment leaves TMS
Ends day equipment arrives back at TMS

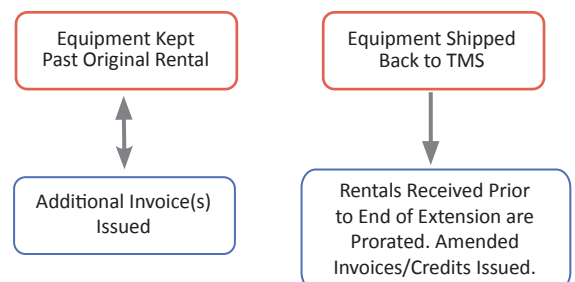
International Customers

Begins calendar day after the equipment leaves TMS
Ends day equipment arrives back at TMS

Billing Cycle for Rental



Billing Cycle for Rental Extensions



Shipping

How long do rentals take to process and ship?

Depending on the product mix and amount of testing required, two to three days is typically requested to test and prepare items and international logistics for shipment. Large rentals and systems may take longer for testing.

What shipping methods are available?

Shipping costs are not included in rental fees. Select any UPS, FedEx, or equivalent options for delivery. Provide an account number to bill, or charges are added to the invoice or credit card bill.

Where should I return my TMS rental products?

Rental returns can be shipped in original containers to The Modal Shop, 3149 E Kemper Road, Cincinnati, OH 45241. Products are tracked by serial/ID numbers, and shipments can be marked attn: Rental Return.

Application Support

Is on-site help available to me during my test?

The Modal Shop offers consulting services for some tests. Please contact us for details.

Equipment Calibration

Will the units arrive calibrated?

Yes, with NIST-traceable calibration certificates where applicable. The Modal Shop has internal calibration intervals of 1 year set for most test products. ANSI/ISO/IEC 17025:2000 makes clear that it is the responsibility of the end-user organization (in this case, the renter) to determine the appropriate calibration interval under the requirements of its own quality system. Per this, calibration certificates of rented equipment have "calibrated on" dates, but blank "calibration due" dates. Rentals ship with a customer-specific expected return date in mind - if equipment is expected out for 5 months, the last calibration date will be within the past 7 months. Calibration to additional standards (e.g. Z540 or specific FAA requirements) is available at an additional charge.

How often are rental units checked for functionality?

Rental products are functionally checked prior to each shipment and upon every rental return.

Miscellaneous

I have some unused PCB or Larson Davis items I am looking to sell. Are you interested in buying them?

Absolutely! Depending on the products, we are always looking to get items to be utilized. Send us a list!

Rental Terms and Conditions

The Modal Shop shall hereafter be referred to as TMS. Order for or statement of intent to rent or any direction to deliver rental Equipment constitutes agreement by Customer to be bound by TMS terms and conditions included herein.

No provisions of any purchase orders submitted by or additional or different terms proposed by Customer and no waiver, alteration or modification of any of the provisions below shall be effective or binding upon TMS, unless specifically assented to in writing and signed by an officer of TMS.

1. Rental Period and Rates

The Rental Period commences one calendar day after TMS ships Equipment to the Customer and shall in all cases extend until the date Equipment is returned to and received at TMS. Equipment is rented in increments based on product type, with a minimum Rental Period detailed on the quotation and/or Rental Agreement. Customer shall sign and return Rental Agreement, which indicates the contracted Rental Period, and submit paper copy of the purchase order before order can be filled.

Rentals not received at TMS by the end of contracted rental period shall be automatically invoiced for identical rental period and price. Rentals extended past the first (minimum) period but returned early in the extension period are allowed a credit applied to the final invoice, per: items returned 1-7 days after most recent rental: 20% (for 15-Day Rental) or 50% (for 30-Day Rental); items returned 8-14 days after most recent rental: 0% (for 15-Day Rental) or 20% (for 30-Day Rental).

Certain rentals shall have fixed rental return dates that cannot be extended and shall be indicated on invoice. Long-term rental discounts (for rental periods of 3 months or more) are available, and are applicable only if negotiated in advance.

Unless otherwise provided on the quotation, rates include normal packaging for shipment and receiving and receipt inspection upon return to TMS. Rental units, use of instruction books and initial operating supplies are included in the rental rate. All equipment is subject to TMS's terms, conditions and price provisions in effect at the time the order is accepted. If order is canceled after receipt of the purchase order, a restocking fee equal to 15% of the total monthly rental fee shall be applied.

Rental rates are subject to change without notice.

2. Payment

Customer shall pay TMS each rental interval during the contracted Rental Period the Rental Fee indicated on the Rental Agreement of each item of Equipment together with all sales and use taxes imposed thereon. The first rental period will be billed at the time of shipping and billing will occur thereafter as applicable. All amounts due hereunder shall be due according to the terms on the Rental Agreement, subject to charge on late payment accounts.

3. Shipping and Handling

All Equipment is provided FOB shipping point. Shipment will be made as specified by Customer and at Customer's expense. Equipment shall not be shipped via mail service. TMS will not be held liable for transportation delays. Unless Customer notifies TMS to the contrary within seventy-two (72) hours after receipt of Equipment, it shall be conclusively presumed that the Equipment was delivered to Customer and is in good operating condition. The Equipment may be used only at the location to which it is shipped unless written approval granted from TMS Sales or Application Engineering team member, or verbal approval granted from Application Engineer and noted by TMS Production on Rental Agreement.

4. Taxes

Customer shall pay all taxes and other governmental charges assessed in connection with the rental, use or possession of the Equipment including, without limitation, any and all sales and/or use taxes and personal property taxes (other than taxes on TMS's net income).

5. Warranty

TMS hereby warrants to Customer only that each item of Equipment, when shipped, will be in good operating condition. Should the rented Equipment fail to operate properly during the Rental Period through no fault of the Customer and the Customer notifies TMS within two (2) days of the failure, TMS will, at its option, either repair or replace the Equipment. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication or as a result of service or modification by anyone other than TMS. Customer's damages for any breach by TMS of such warranty with respect to an item of Equipment shall be limited to the direct damages caused by a defective operating condition which could not reasonably have been discovered by Customer after the delivery to it of such item, but in no event shall exceed the total rental fees paid by Customer for such item. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY AND IS IN LIEU OF ANY ORAL REPRESENTATION AND ALL OTHER WARRANTIES AND DAMAGES, WHETHER EXPRESSED, IMPLIED, OR STATUTORY, EXCEPT AS SPECIFICALLY SET FORTH IN THIS PARAGRAPH. TMS HAS NOT MADE NOR DOES MAKE ANY WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. TMS makes no warranty that the property will not infringe any patent or property right of any third party.

Addenda/Notes for International Rentals

1A. Rental Period and Rates

International rental fees are quoted based on local market pricing. All payments to be made in USD. Rental Period commences day after clearing customs, and ends on the date TMS receives the equipment at the factory, after Customs Clearance.

3A. Shipping and Handling

All equipment is provided ExWorks Cincinnati USA. International Customers may contact our local distributor and offices for assistance with temporary importation of equipment. The Customer is responsible for providing the appropriate freight/courier account along with broker details (name, address, telephone, contact person, email address).

4A. Taxes and Duty

Customer is responsible for paying all Customs fees at VAT.

9A. Delinquent Payments and Default.

International Customers may be approved for open terms of Net 30 days with proper credit clearance by TMS and/or PCB. Others may need to prepay for the rental period or for the full value of the goods being rented, on a customer by customer basis.

6. Ownership and Use

The Equipment shall remain the property of TMS and is provided to Customer solely on a rental basis without any option to purchase unless such an option is granted prior to the commencement of the Rental Period and explicitly set forth in writing on the Rental Agreement or some other document signed by the parties. Customer shall have sole use of the Equipment and shall not sublease, rent, transfer, assign, sell, alter, modify or encumber any item of Equipment without the prior written consent of TMS.

7. Safekeeping, Damage, and Loss

Customer shall bear the entire risk of loss, theft, damage or destruction from any cause whatsoever of the property, and Customer shall not be relieved of the obligation to pay rent or from any other obligation under the agreement. Customer shall be responsible for any pay to TMS on demand the new replacement cost of any lost or materially damaged Equipment (including accessories), as well as the cost of restoring any Equipment that is returned with extraordinary wear and tear or damage. With respect to lost or materially damaged Equipment, Customer shall be responsible for Rental Fees for the Equipment, or pro-rated portion thereof, to the date of receipt by TMS of the full new replacement cost. As used herein,

the term "materially damaged" means damage to the Equipment to such an extent that the cost to repair such Equipment equals or exceeds fifty percent (50%) of the fair market value of the Equipment at that time. Until a damaged item has been repaired, Customer shall be responsible for all Rental Fees. Customer shall not remove or deface ownership labels, calibration seals, and anti-tamper notices affixed to the property. Customer shall insure Equipment against risk of loss, damage, theft, or destruction for not less than the replacement cost of each item and if requested by TMS shall provide evidence of such insurance. Customer shall not undertake repair, modification, or disassembly of the rental Equipment without TMS's prior written authorization.

8. Limitation of Liability

In no event, whether as a result of breach of contract, warranty, tort (including negligence), or otherwise shall TMS or its suppliers be liable for any consequential, incidental, or exemplary damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damages to associated equipment, cost of substituted products, facilities, services or replacement power, downtime costs, lost data, or claims of the Customer's customer for such damages.

9. Delinquent Payments and Default

Customer shall pay to TMS a late charge on any late payment from the due date thereof until the date paid at 1.5% per month (equal to 18% per annum) or the maximum rate permitted by law, whichever is less. In the event any invoice remains unpaid for a period of thirty (30) days or more after becoming due, or the Customer is otherwise in default or breach of the Terms and Conditions herein, TMS shall have the right to terminate this Agreement and take immediate possession of the rented equipment and recover for the Customer in any action to enforce TMS's right hereunder, all amounts hereunder, together with TMS's costs and reasonable attorney's fees. Notwithstanding any requirements of notice of default provided above, in the event a petition under the federal bankruptcy laws is filed by or against the Customer, or the Customer makes an assignment for the benefit of creditors, or a receiver for the Customer is appointed or applied for, or the Customer to be in default and immediately thereon TMS may take possession of the rented equipment and exercise any other remedies or right that TMS may have at law or in equity.

10. Return

Property shall be returned to TMS by prepaid insured shipment, in original shipping container. Customer shall return Equipment and Accessories to TMS in good operating condition, normal wear and tear excepted. Customer shall properly pack for shipment all Equipment being returned and shall be responsible for any damage caused during the return shipment. Customer shall pay repair charges for any equipment returned in damaged conditions. If accessories integral to the equipment are not returned, the rental period will not cease until said accessories are returned or replaced. All rental items not returned will be billed to the customer at replacement cost plus any rental due or 0, whichever is greater.

11. Miscellaneous

The invalidity of any of the within terms and conditions shall not affect the validity of any other terms and conditions. Customer shall furnish such financial and business information about Customer and shall execute such financing statements and other documents as TMS may from time to time request. The right to TMS and the Customer hereunder shall be governed by the laws of the State of Ohio. The above terms and conditions are the only terms and conditions upon which TMS is willing to rent the equipment. No waiver of any breach of default by customer shall waive any other breach of default. These rental terms may not amended or modified except in writing signed by both parties.

About The Modal Shop



Our name was chosen to combine the science of “modal,” or structural testing, and the full-service attitude of our “shop-like” organization. Our business is dedicated to helping you test, model, and modify the dynamic behavior of structures and processes. We strive to provide the measurement community with a single source for all sound and vibration needs.

In addition to our Rental Program, The Modal Shop specializes in multi-channel sound and vibration sensing systems. Products include modal shakers and stingers, the LaserTach™, Air Ride supports and TEDS Sensor Interface Kits, as well as a host of other measurement accessories.

Complete turnkey accelerometer and precision microphone calibration workstations are available, as are smart sensing systems as applied to part quality including NDT analysis, process monitoring and machinery gauging.

The Modal Shop guarantees Total Customer Satisfaction. If, at any time, for any reason, you are not completely satisfied with any TMS product, TMS will repair, replace, or exchange it at no charge.

The PCB Group is a family of technology-based companies offering a wide range of sensor technologies. With PCB Piezotronics as its flagship, other individual PCB Group companies and divisions include:

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