



Model 699B02

Handheld vibration shaker 1g (rms or peak) at 159.2 Hz operating frequency and max 8.8 oz load capacity, "AA" battery powered or optional model 073A16 AC adaptor, includes protective carrying case

Installation and Operating Manual

**For assistance with the operation of this product,
contact the PCB Piezotronics, Inc.**

**Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
Fax: 716-684-3823
E-mail: imi@pcb.com
Web: www.imi-sensors.com**



Model 699B02 Handheld Vibration Shaker



Operating Guide with Enclosed Warranty Information

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MANUAL NUMBER: 18428
MANUAL REVISION: A



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Introduction

Model 699B02 Handheld Shaker is a small, handy, completely self-contained vibration reference source. It is intended for rapid checking of vibration measurement, monitoring and recording systems using piezoelectric accelerometers, as well as other types of vibration transducers having a maximum weight of 250 grams.

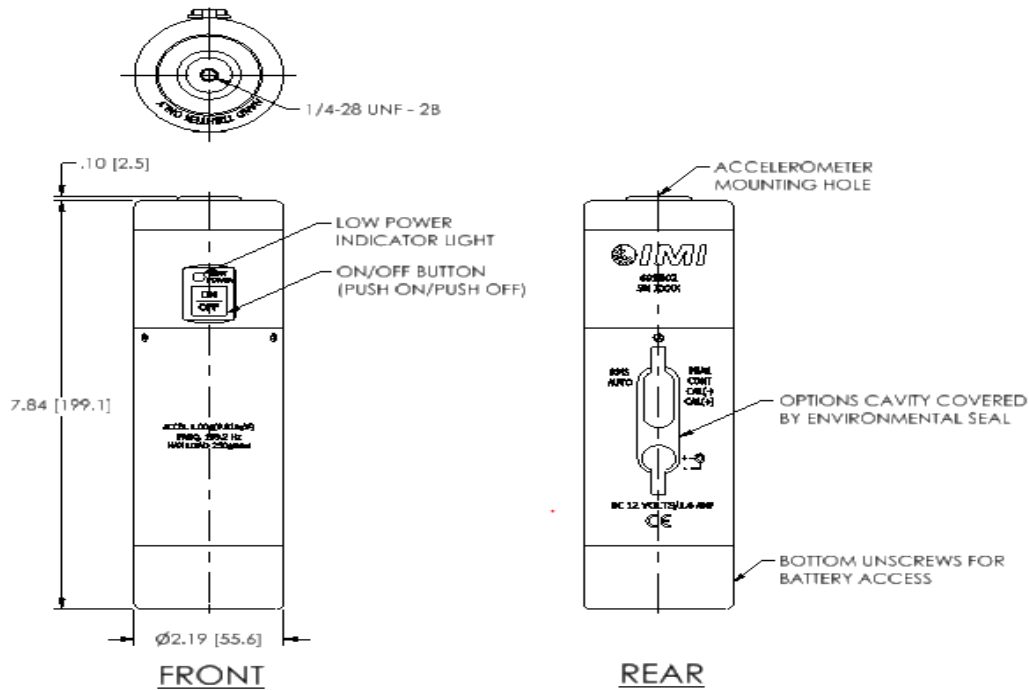


Figure 1: Model 699B02 Handheld Shaker

Description

Model 699B02 permits accurate adjustment of measuring instrumentation to indicate a standard acceleration level of 1 g RMS or 1 g peak, adjusting the system for correct measurement. The reference signal may also be used for velocity and displacement, at 10 mms^{-1} RMS or 10 mms^{-1} peak and $10 \mu\text{m}$ RMS or $10 \mu\text{m}$ peak-to-peak respectively. To change between RMS and peak, depress the corresponding side of the rocker switch in the options cavity of the shaker. For example, to choose RMS, depress the left side of the rocker switch as per Figure 1.

A system adjustment using Model 699B02 also provides a quick check of the correct function of the complete measurement system.

A section view of the shaker's vibration head is shown in Figure 2. The shaker consists of an electromagnetic exciter, driven by an oscillator at a frequency of 159.2 Hz (1000 rads^{-1}). A small ICP® accelerometer provides a servo feedback to maintain a constant vibration level of 1 g. This enables accelerometers with masses up to 250 grams to be adjusted without their mass influencing the reference level.

Use of the shaker is straight-forward. The accelerometer is attached to the shaker using the supplied ¼-28 stud. Alternatively, the shaker is supplied with adapter mounting studs for 10-32 and M6 x 1.0 mounting threads. Note: When the sensor mass is lighter than 75 grams, screw in adapter mass between the sensor and the shaker head. The unit will not operate if mass of sensor system is less than 75 grams.

Connect the accelerometer to the vibration level indicating instrument and activate the shaker by pushing the On/Off button on the side of the shaker. See Figure 1.

The indicating instrument may now be adjusted to read the relevant reference value. Following the system adjustment, the shaker is switched off by pressing the On/Off button a second time. To prolong the useful life of the batteries, Model 699B02 automatically switches off after 90 seconds. With new batteries, 80 sensitivity checks with maximum load are possible. To change between auto shutoff and continuous run, depress the corresponding side of the rocker switch in the options cavity of the shaker. For example, to choose auto shutoff, depress the left side of the rocker switch as per Figure 1.

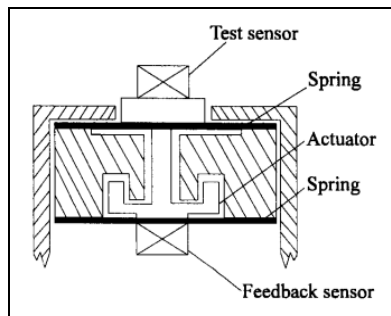


Figure 2: Cross-Section of Handheld Shaker Vibration Head

When the On/Off button is pushed for the first time, Model 699B02 handheld shaker is activated. Power is ramped up to the actuator to provide a smooth, gradual turn-on. This action prevents shock-induced overloads to the test sensor. A special sensor within the unit constantly measures the g level and adjusts to maintain 1 g. The frequency is 159.2 Hz. Since a relatively stiff suspension is used, any sensor up to 250 grams can be verified without affecting accuracy. Model 699B02 is powered by four (4) "AA" batteries in a pack. The pack model number is 073A15. Alkaline batteries are recommended for a longer service life. Since Model 699B02 is a

precision instrument and is used to check the sensitivity of sensors, it should be verified prior to use with a reference standard. The unit has several unique features of interest:

- **Continuous Use Option Switch:** In this mode, once the shaker is turned on, it does not shut off until the On/Off button is depressed a second time. The default position of this switch is Auto; the unit turns off automatically after a preset time.
- **Peak/RMS Selection:** If a 100 mV/g sensor is on the shaker table, and the unit is in peak mode, then the output is 100 mV/g. If the switch is set to RMS, then the output is 141 mV. See Figure 3.
- **External Power Supply:** An optional DC power supply (Model 073A16) is available for power Model 699B02 handheld shaker. It operates off 85-245 VAC, 47-63 Hz input. When this power supply is plugged into the shaker, the internal batteries are automatically disconnected.

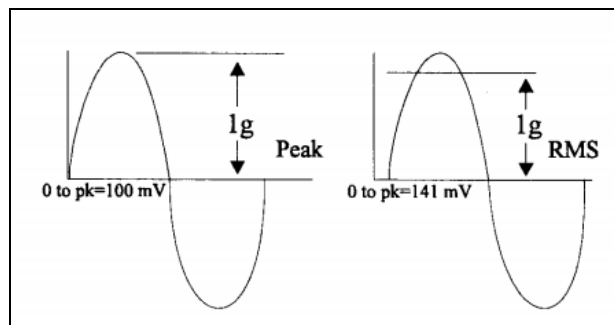


Figure 3: Peak vs RMS Selection with 100 mV/g Accelerometer

- **Calibration Check Points:** Calibration of the internal feedback circuit can be verified via test points (located in the options cavity). See Figure 1. The measured value in volts AC should agree with the calibration certificate. This is useful for quick field check of unit integrity, such as that which might be needed if the shaker is dropped and a reference standard is not immediately available. This test is not a guarantee of shaker function. If the data does not agree with expected values, the shaker should be checked with a calibration standard before continued use.
- **Low Power Indicator:** A low power indicator light is located above the On/Off switch. See Figure 1. This light glows when the available power is marginally adequate to drive the shaker (with the mass on the shaker). This indicator does not signify erroneous data. If Model 699B02 cannot obtain 1 g at 159.2 Hz, then the unit shuts off. The low power indicator signifies an imminent inability to drive the mass on the shaker because the test sensor is too heavy, the batteries are low on power or the external power supply is inadequate.

Maintenance - Repair

This is fully CE-compliant. Aside from battery replacement, no maintenance is required for this unit. It is suggested that, if trouble occurs, the factory be contacted. Because of the nature of IMI instrumentation, field repair is typically not recommended and voids the warranty. If factory service is required, return the instrument to IMI. A free quotation will be provided prior to servicing.

IMI, a division of PCB Piezotronics, Inc., is an ISO 9001 certified company that has embraced its company mission of TOTAL CUSTOMER SATISFACTION. This is a guarantee that means, if at any time you are not satisfied with any of our products or service, we will correct the problem. Please contact us for high-quality equipment and unmatched customer support. If you have any questions or concerns on the use of any IMI product or the aforementioned policies, call the IMI Vibration Group at 716-684-0003.

Warning 1 – ESD Sensitivity

The power supply/signal conditioner should not be opened by anyone other than qualified service personnel. This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

Warning 2 – ESD Sensitivity

This equipment is designed with user safety in mind. However, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by PCB Piezotronics, Inc.

Caution 1 – ESD Sensitivity

Cables can kill your equipment. High voltage electrostatic discharge (ESD) can damage electrical devices. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, such as that which occurs in the following:

- Laying on and moving across a rug,
- Any movement through air,
- The action of rolling out a cable, and/or
- Contact with a non-grounded person.

The PCB solution for product safety:

- Connect the cables only with the AC power off.
- Temporarily “short” the end of the cable before attaching it to any signal input or output.

Caution 2 – ESD Sensitivity

ESD considerations should be made prior to performing any internal adjustments on the equipment. Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should therefore be done ONLY at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.



Warranty

IMI instrumentation is warranted against defective material and workmanship for 1 year unless otherwise expressly specified. Damage to instruments caused by incorrect power or misapplication, is not covered by warranty. *If there are any questions regarding power, intended application, or general usage, please consult with your local sales contact or distributor.* Batteries and other expendable hardware items are not covered by warranty.

Service

Because of the sophisticated nature of IMI instrumentation, field repair is typically **NOT** recommended and may void any warranty. If factory service is required, return the instrumentation according to the "Return Procedure" stated below. *A repair and/or replacement quotation will be provided prior to servicing at no charge.* Before returning the unit, please consult a factory IMI applications engineer concerning the situation as certain problems can often be corrected with simple on-site procedures.

Return Procedure

To expedite returned instrumentation, contact a factory IMI applications engineer for a RETURN MATERIAL AUTHORIZATION (RMA) NUMBER. Please have information available such as model and serial number. Also, to insure efficient service, *provide a written description of the symptoms and problems with the equipment to a local sales representative or distributor, or contact IMI if none are located in your area.*

Customers outside the U.S. should consult their local IMI distributor for information on returning equipment. For exceptions, please contact the International Sales department at IMI to request shipping instructions and an RMA. For assistance, please call (716) 684-0003, or fax us at (716) 684-3823. You may also receive assistance via e-mail at imi@pcb.com or visit our web site at www.pcb.com.

Customer Service

IMI, a division of PCB Piezotronics, guarantees **Total Customer Satisfaction**. If, at any time, for any reason, you are not completely satisfied with any IMI product, IMI will repair, replace, or exchange it at no charge. You may also choose, within the warranty period, to have your purchase price refunded.

IMI offers to all customers, at no charge, 24-hour phone support. This service makes product or application support available to our customers, day or night, seven days a week. When unforeseen problems or emergency situations arise, call the **IMI Hot Line at (716) 684-0003**, and an application specialist will assist you.



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**ICP® is a registered trademark of PCB Piezotronics, Incorporated,
which uniquely identifies PCB sensors that incorporate built-in microelectronics.**

Model Number
699B02

HAND HELD SHAKER

Revision: C
ECN #: 49738

	ENGLISH	SI	
Performance			
Operating Frequency(± 1 %)	159.2 Hz	159.2 Hz	
Acceleration Output(± 3 %)	1 g rms	9.81 m/s ² rms	[1]
Velocity Output	0.39 in/sec rms	9.81 mm/s rms	[2]
Displacement Output	0.39 mil rms	9.81 µm rms	[2]
Transverse Output	≤ 3 %	≤ 3 %	
Distortion(0 to 250 grams load)	7 %	7 %	[3]
Maximum Load	8.8 oz	250 gm	[4]
Automatic Switch Off Time	1.0 to 2.5 minutes	1.0 to 2.5 minutes	[5]
Calibration Cycles(250 gram load)	90 cycles	90 cycles	[6]
Environmental			
Temperature Range(Operating)	15 to 130 °F	-10 to 55 °C	
Electrical			
Ramp-Up time	≤ 3 sec	≤ 3 sec	[7]
Power Required(Standard)	Internal Battery	Internal Battery	
Power Required(Alternate)	DC Power	DC Power	
Internal Battery(Quantity)	4	4	
Internal Battery (Type)	AA	AA	[8]
DC Power(± 5 %)	12 VDC	12 VDC	
DC Power	1.67 Amps	1.67 Amps	
Battery Life(250 gram load)	2.3 hours	2.3 hours	[6]
Physical			
Size - Height	7.8 in	200 mm	
Weight(with batteries)	31 oz	900 gm	[7]
Mounting Thread	1/4-28 Female	No Metric Equivalent	[9][10]
Mounting Torque(Maximum)	to 10 in-lb	to 10 in-lb	[9]
Size - Diameter	2.2 in	56 mm	

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

NOTES:

- [1]Unit supplied set to rms; see manual for peak selection.
- [2]Calculated values for reference only.
- [3]Typical max for range
- [4]For sensors weighing <75 grams add model 080A136 mass
- [5]Unit supplied set to auto shut off; see manual for continuous use selection.
- [6]Approximate values, based on automatic switch off time and dependent on type of batteries.
- [7]Typical.
- [8]Alkaline type recommended for longest service life.
- [9]Transducer to shaker table.
- [10]Test sensor should be hand tightened (without tools).
- [11]See PCB Declaration of Conformance PS022 for details.

SUPPLIED ACCESSORIES:

- Model M081A19 Mounting stud, 1/4-28 to M6 x 1, SS with shoulder (1)
- Model 073A15 Battery Pack (1)
- Model 080A136 Calibration Mass (1)
- Model 081A08 Mounting Stud (10-32 to 1/4-28) (1)
- Model 081A40 Mounting Stud (2)

Entered: LK	Engineer: BAM	Sales: MC	Approved: BAM	Spec Number:
Date: 07/10/2019	Date: 07/10/2019	Date: 07/10/2019	Date: 07/10/2019	67896


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All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.
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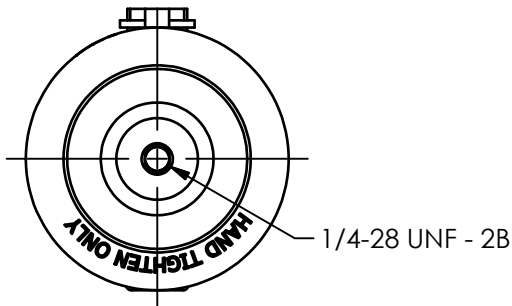
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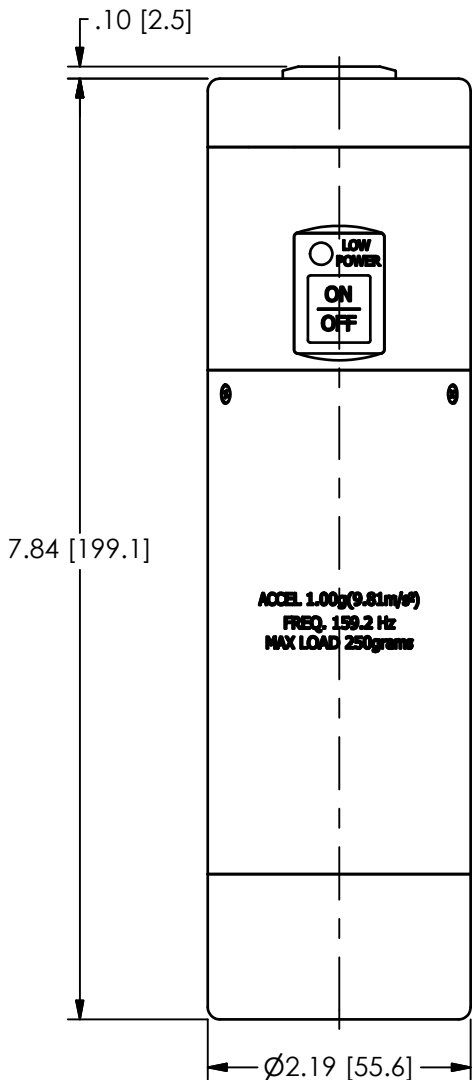
REVISIONS		
REV	DESCRIPTION	DIN
C	DC 12 VOLTS WAS DC 10 VOLTS	48673

8792



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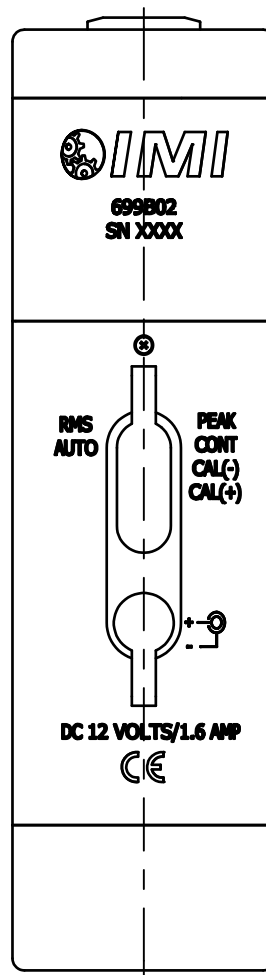
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A

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FRONT



REAR

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	KRM	11/1/18	KRM	11/1/18	CPH	11/1/18		
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ±.08 XX ±.025	TITLE OUTLINE DRAWING MODEL 699A02, 699B02 HAND HELD CALIBRATOR							CODE IDENT. NO. 52681
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES								DWG. NO. 8792
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13	SCALE: .625X	SHEET 1 OF 1						

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