

ReferenceMate portable vibration reference source

REF1500 operation manual



This guide should be read carefully before operating the unit.

Safety Section

ReferenceMate handheld shakers can be used safely when the instructions in this manual are carefully followed. This section summarizes the safety considerations. Reminders in the form shown below will appear in the detailed instructions to assure operator awareness of these safety considerations. Qualified personnel should use the REF1500 only after becoming thoroughly familiar with this manual.



WARNING: This symbol is used in the instruction manual when the safety of the operator must be considered. The instruction manual should be consulted and read carefully.



CAUTION: This symbol is used when caution is needed to prevent damage to equipment. It is used where careful attention to certain procedures described in the instruction manual is needed. This symbol is also used to emphasize procedures other than normal operating procedures.

Safety summary

1. The products covered in this installation guide do not require any special precautions, protective devices, or equipment.
2. Because these products are designed to be used in an industrial environment, personnel involved with the operation of this instrument should be familiar with all plant safety requirements before beginning use.
3. The REF1500 is NOT certified for use in explosive or hazardous environments.
4. There are no user-serviceable parts within this product.
5. Use common sense and avoid haste during operation.

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1 Description

The ReferenceMate REF1500 portable vibration reference source enables users in the field to easily verify sensor performance and the integrity of the cabling between the sensor and data acquisition equipment.

A built-in reference accelerometer assures that a 1 g test level is maintained for a unit under test (sensor and mounting hardware) weighing up to 250 grams. The shaker consists of an electromagnetic exciter, driven by an oscillator at a frequency of 159.2 Hz. A section view of the shaker's vibration head is shown in Figure 1.

The Unit Under Test (UUT) can be an accelerometer, a piezovelocity sensor, or a displacement sensor.

- An accelerometer will generate a vibration level of 1 g RMS or peak.
- A piezovelocity sensor will generate a vibration level of approximately 9.8 mm/s RMS or peak.
- A displacement sensor will generate a vibration level of approximately 9.8 μm RMS or peak.

The shaker is powered by four (4) "AA" batteries in a pack. Alkaline batteries are recommended for a longer service life. With new batteries, 80 tests with the maximum load are possible.

An optional DC power supply, REF005, is available to power the handheld shaker. It operates on 85-245 VAC, 47-63 Hz input. When this power supply is plugged into the shaker, the internal batteries are automatically disconnected.

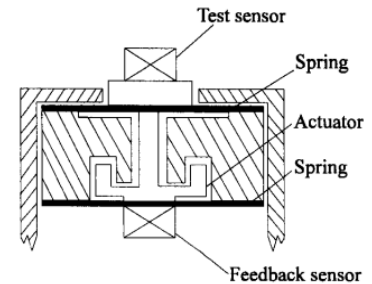


Figure 1. Cross-section of handheld shaker vibration head

1.1 Features

- **Peak/RMS selection:** The shaker is capable of outputting 1 g in either RMS or Peak mode, per an internal switch setting. See Figure 2.
- **Continuous use option switch:** To prolong the useful life of the batteries, the REF1500 automatically switches off after 80 seconds. To change between auto shutoff and continuous run, depress the corresponding side of the rocker switch in the options cavity of the shaker, per Figure 3. In this mode, once the shaker is turned on, it does not shut off until the ON/OFF button is depressed a second time.
- **Calibration check points:** Calibration of the internal feedback circuit can be verified via test points located in the options cavity. See Figure 3. The measured value in volts AC should agree with the calibration certificate. This is useful for quick field check of unit integrity, such as 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:** An LED indicator light is located above the ON/OFF switch. See Figure 3. The LED light notifies the user when the battery condition falls below operational levels. This indicator does not signify erroneous data. The LED 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. If the handheld shaker cannot obtain 1 g at 159.2 Hz, then the unit shuts off.

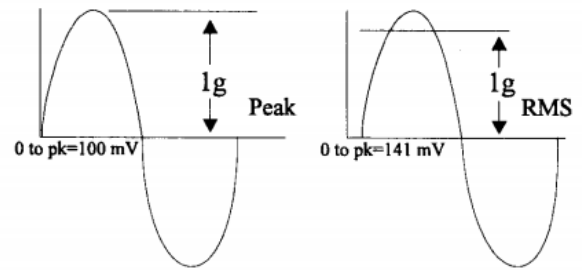


Figure 2: Peak vs RMS selection with a 100 mV/g accelerometer

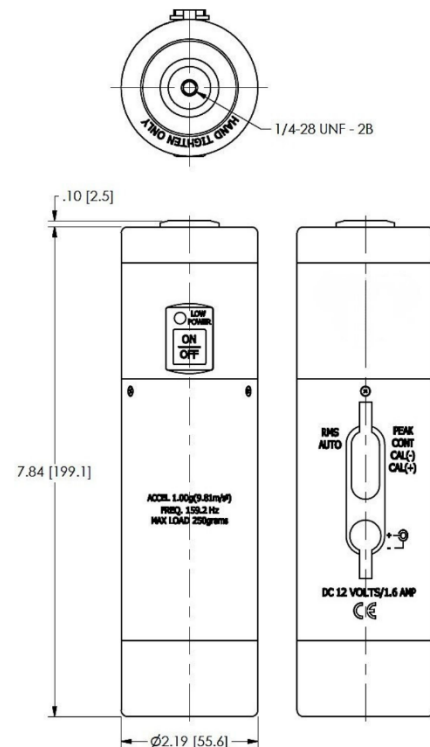


Figure 3. REF1500 features and dimensions

2 Operation

1. Select the mounting feature that is compatible with the UUT. The REF1500 mounting head accepts a 1/4-28 mounting stud, which is included. If the UUT has something other than a 1/4-28, 10-32 or M6 mounting thread, adapter mounting studs are available, outlined in Table 1 in section 3.
2. Attach the UUT to the mounting feature. Only hand-tighten the UUT. The appropriate mounting torques for adapters used with the REF1500 are also shown in Table 1.

When the sensor mass is lighter than 75 grams, screw in the REF004 ballast mass between the sensor and the shaker head. The unit will not operate if the mass of the sensor system is less than 75 grams.

3. Once the UUT (and any mounting accessory) is mounted to the REF1500 head, connect all cables from the UUT to the readout equipment.
4. Press the ON/OFF button to initiate the 1 g test cycle with a frequency of 159.2 Hz.
5. Allow three seconds for the REF1500 to achieve the controlled vibration level. Power is ramped up to provide a smooth, gradual turn-on and prevent shock-induced overloads to the test sensor.
6. Confirm the Low Power LED is not illuminated. If the indicator remains on, or if the unit will not stay on after releasing the ON/OFF switch, replace the batteries and try again.
7. To change between RMS and peak, depress the corresponding side of the rocker switch in the options cavity of the shaker, shown in Figure 3. For example, to choose RMS, depress the left side of the rocker switch.
8. To turn the REF1500 off before the end of its auto shutdown cycle, press the ON/OFF button.

3 Mounting

The UUT can be attached directly to the shaker head using a 1/4-28 stud.

3.1 Mounting Adapters

Adapter studs and plates are available for mounting sensors with different size mounting threads. See Table 1.

3.2 Mounting Torque

The stud or plate should be hand tightened only, not exceeding 10 in-lb (112 N-cm) into the shaker head.



CAUTION: Over torquing the shaker head can result in permanent damage to the shaker suspension system. Hand-tighten only!

Table 1: Recommended torque values for included and optional accessories

Included mounting accessories		
Description	Rec. torque	
	in-lb	N-m
1/4-28 mounting stud	24 (24)	2.7 (2.7)
1/4-28 to 10-32 adapter stud	24 (18)	2.7 (2.0)
1/4-28 to M6 adapter stud	24 (30)	2.7 (3.4)
Ballast mass	24	2.7

Optional mounting accessories					
Part number	Description	Rec. torque		Accessories kit	
		in-lb	N-m	REF001	REF002
SF3	1/4-28 to 10-32 adapter stud	24 (18)	2.7 (2.0)	✓	
13249-01	1/4-28 to 8-32 adapter plate (997 and 712 sensors)	24 (20)	2.7 (2.3)	✓	
13249-02	1/4-28 to 10-32 adapter plate	24 (18)	2.7 (2.0)	✓	
13267-01	90° adapter plate (993 series sensors)	24 (24)	2.7 (2.7)	✓	
SF6M-1	1/4-28 to M6 adapter stud	24 (30)	2.7 (3.4)		✓
SF6M	1/4-28 to M8 adapter stud	24 (40)	2.7 (4.5)		✓
13249-03	1/4-28 to M4 adapter plate (997 and 712 sensors)	24 (20)	2.7 (2.3)		✓
13249-04	1/4-28 to M6 adapter plate (captive screw sensors)	24 (30)	2.7 (3.4)		✓
13249-05	1/4-28 to M8 adapter plate (captive screw sensors)	24 (40)	2.7 (4.5)		✓
TAA01	triaxial mounting plate	24	2.7		

3.3 Ballast Mass

The unit will not operate if the mass of the UUT is less than 75 grams. When the sensor mass is lighter than 75 grams, the REF004 screw-in ballast mass must be used between the sensor and the shaker head.

3.4 Triaxial Mounting

An optional triaxial accelerometer angled adapter can be purchased separately (part number TAA01) for testing the 993B-7-M12 triaxial accelerometer. The fixture has a mounting surface that has been designed to excite all of the sensor's axes simultaneously. The resulting vibration level will be approximately 57.8% of the applied acceleration, resulting in 0.57 g per axis. It is important that the sensor be mounted using its positioning pin to achieve the desired result.

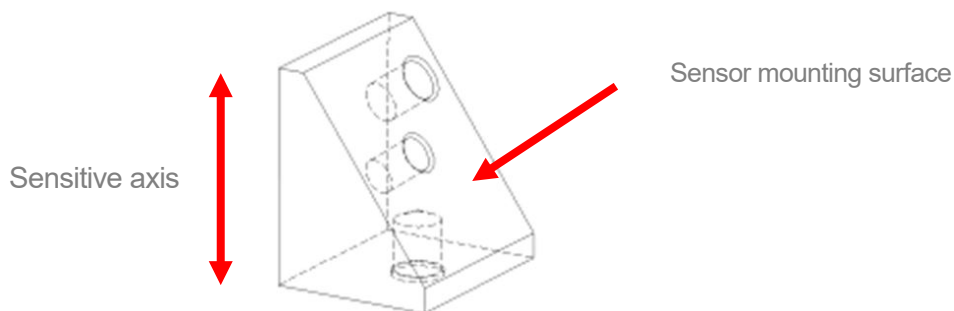


Figure 4: Triaxial mounting adapter that allows for simultaneous excitation of all three axes

Note that there are two holes on the mounting surface. The 10-32 threaded hole is for mounting the sensor; the unthreaded hole is to accommodate the alignment pin provided on the 993B-7-M12 accelerometer. The weight of the fixture is 93 grams.

4 Maintenance and Repair

Aside from battery replacement, no maintenance is required for this unit. Field repair is not recommended and voids the warranty. Contact the factory if maintenance or repair is required. See Section 6.

5 ESD Warning Information

High voltage electrostatic discharge (ESD) can harm operators and/or damage electrical devices.

Warning 1 – ESD Sensitivity



The vibration reference source 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 not used in accordance with manufacturer instructions.

Caution 1 – ESD Sensitivity



ESD from cables can damage equipment. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, including:

- 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

To prevent damage from ESD buildup, 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.

6 Technical Assistance

For technical assistance, please contact Wilcoxon Sensing Technologies at 301-330-8811, fax 301-330-8873, or email info@wilcoxon.com.