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## **OPERATING MANUAL**

### **VIBRATRON II**

### **Vibration Sensitivity Tester**

## APPENDIX A

VIBRATION UNITS (X)	PEAK TO PEAK AMPLITUDE (A) (microns)
0.1	0.005
0.2	0.02
0.3	0.045
0.4	0.08
0.5	0.125
0.6	0.18
0.7	0.245
0.8	0.32
0.9	0.405
1.0	0.5
2.0	2.0
3.0	4.5
4.0	8.0
5.0	12.5
6.0	18.0
7.0	24.5
8.0	32.0
9.0	40.5
10.0	50.0
11.0	60.5
12.0	72.0
13.0	84.5
14.0	98.0
15.0	112.5
16.0	128.0
17.0	144.5
18.0	162.0
19.0	180.5
20.0	200.0

## **6.0 CALIBRATION**

6.1 When Vibratron II is being used in extensive, long-term studies, it may be appropriate to have the unit calibrated periodically. Factory testing and calibration are available. Please call for more information

## **7.0 WARRANTY AND SERVICE**

### **7.1 WARRANTY**

Physitemp Instruments Inc. warrants this system to be free from defects in material or workmanship for 12 months from date of shipment. Repair or replacement will be made at no charge at the discretion of Physitemp if the defect is not the result of misuse or abuse. Physitemp accepts no consequential liability for delay in delivery, alleged faulty performance of the product or any other cause.

### **7.2 REPAIRS AND SERVICE**

For technical applications information on this instrument contact us at:

Tel: 973-779-5577  
Fax: 973-779-5954  
E-mail: [physitemp@aol.com](mailto:physitemp@aol.com)

In the event that any part of this system is to be returned for repair or recalibration, please pack it with care (in the original packing material if possible) and send it prepaid to:

Service Department  
PHYSITEMP INSTRUMENTS INC  
154 Huron Avenue  
Clifton, NJ 07013 USA

Please include with the instrument:

1. A note describing any problems encountered
2. The name and telephone number of a person we can contact
3. The complete return address for shipping.

For your protection, please pack the item carefully and insure against possible damage or loss. Physitemp will not be responsible for damage resulting from careless packaging. Please return freight prepaid.

Testing is completed when the subject has made a **total** of five errors. A single error often appears early in the testing sequence. This anomalous data point is compensated for in the data analysis procedure (see below.)

It should be noted that accurate measurements below 1 vibration unit (0.5 microns peak to peak amplitude) are not possible with this equipment. Readings obtained below this level should merely be used as an indication of a test subject's ability to detect low vibration thresholds and should not be interpreted quantitatively for the purpose of statistical analysis.

## **DATA ANALYSIS PROCEDURE**

**Vibration Threshold** The first step in calculating the vibration threshold is to determine the vibration setting of the five errors and the five lowest correct scores. The highest and lowest values of the ten scores are eliminated and the mean of the remaining eight scores determines the vibration threshold. The thresholds, measured in vibration units, can then be converted into microns by using the formula in Section 3.

## **NORMAL VALUES**

The vibration threshold for the index finger in the normal population between 18 and 65 years of age is 0.7 vibration units with a standard deviation of 0.4 vibration units. The vibration threshold for the great toe in a similar population is 1.2 vibration units with a standard deviation of 0.5 vibration units. There is an increase in threshold scores and in variance as a function of age.

## **5.0 SPECIFICATIONS**

### **5.1 CONTROLLER SPECIFICATIONS**

Range - high resolution:	0 - 6.5 vibration units
- low resolution:	6.5 - 19.9 vibration units
Resolution:	0.1 vibration units
Display	3 1/2 digit, 1/2" LED
Power Supply:	110V or 220V AC. See operating instructions (Section 2.3) for explanation
Size	5 3/4" x 3.3/8" x 9 1/4" 14.5 x 8.5 x 23.5 cm

### **5.2 VIBRATOR MODULE SPECIFICATIONS**

Size of Base:	5" x 3" x 4" 12.5 x 7.5 x 10.2 cm
Vibration Frequency:	120Hz with 60Hz AC line frequency 100Hz with 50Hz AC line frequency
Post Height:	3/8", 95 cm
Accessories Supplied:	Carrying case 16" x 11" x 5" 40.5 x 28 x 12.5 cm
Weight, including carrying case	14 lbs

4.1 The recommended method of testing is a “two-alternative” forced choice procedure.” For each trial the subject is required to determine which of the two rods is actually vibrating. The position of vibration is under experimental control, determined by a randomized sequence. The intensity of the sequence is similarly under the control of the experimenter and is determined by a testing algorithm (see below.) Prior to testing, all subjects should be allowed an adaptation period of between 10 and 15 minutes, during which they can become accommodated to room temperature.

During this period each subject should be given an opportunity to become familiar with the testing apparatus and with the expected vibratory sensations. The experimenter can use this time to instruct the subject as to the appropriate length and force with which to contact the vibrating rod. An ideal duration for contact is approximately one second, while the force should be less than that required to blanch the nail. This adaptation period allows the experimenter to determine the appropriate voltage level at which to begin testing. A number of vibration intensities should be set and sampled by the subject. For the initial trial, the experimenter should set the voltage at the level detectable by the subject 100% of the time.

At the beginning of each testing session the subject should be issued the following instructions:

“Please press your finger against each rod in sequence for approximately one second. During each trial you will be allowed to touch the rods only once. Only one of the rods will be vibrating and you must decide whether it’s on the right or the left. The task will become increasingly more difficult and I understand that you will be guessing on many of the trials.”

To determine accurate vibration thresholds, the experimenter must be concerned with the following details:

I) The subject should be consistent in the location of touch and in the approximate force applied to the vibrating surface. Instructions such as “please press more firmly” can be issued during testing to ensure trial to trial consistency.

II) Throughout testing, the sounds and motions associated with changing the stimulus position should be presented between each trial. For conditions where the stimulus position remains unaltered, the “dummy” switch must be utilized.

III) The subject must take care not to contact the rods or any part of the vibration unit’s surface between trials.

IV) The subject should be carefully screened from viewing the instrument settings or the data sheet.

## TESTING ALGORITHMS

If the subject is correct on the initial trial, the vibration unit setting should be reduced by approximately 5 - 10% for the next trial, and this process should be continued until the first error. This percentage is not an exact requirement but rather a guideline. When the subject makes his/her first error, the identical voltage setting should be repeated twice for a total of three trials at that level. If the position of the stimulus is correctly identified on two of the three trials, the voltage setting should be raised 5 - 10%. If errors are made at two successive settings at a given level, presentation of the third stimulus is **not necessary**.

All levels below 0.7 vibration units should be repeated twice - even if the subject selects the correct stimulus position.

## 22.4 CONNECTION TO AC POWER SUPPLY AND “SWITCH ON”

Connect line cord to socket on the back of the controller and to AC outlet. Use POWER switch on rear panel to turn ON.

## 3.0 OPERATION

*IMPORTANT NOTE: This instrument is normally calibrated at 60Hz line frequency. If it is to be used at 50Hz line frequency there will be a calibration sticker attesting to this on top of the control unit.*

### SELECT THE RANGE

There are two operating ranges:

**High resolution**, 0 - 6.5 vibration units. This range is used when fine control of amplitude is required. It covers the 0 - 20 micron range.

**Low resolution**, 6.5 - 19.9 vibration units. This range covers the 20 - 200 micron amplitude range.

### SELECT THE MODULE

There are two switches on the front panel below the display:

**The left switch** controls the module selection. When it is in the “up” position, module A will be vibrating. When in the “down” position, module B will be vibrating.

**The right switch** is a dummy switch and is used during testing and questioning to conceal which module is being selected.

### ADJUST THE VIBRATION AMPLITUDE

The output (signal to the modules from the controller) is indicated on the digital display in vibration units. Vibration amplitude can be continuously adjusted with the OUTPUT control.

When the OUTPUT control is set to MIN (minimum) and the range switch to 6.5, the display will read 00.0 ±.1 unit. As the control is turned clockwise, the output will increase to a maximum of approximately 6.5 units.

When the OUTPUT control is set to MIN and the range is 20.0, the display will read 6.5 ±.1 unit. The maximum output is approximately 19.9 units.

The readings shown on the digital display (X) are related to the true amplitude (in microns) of the vibration (A) by the following formula:

$$A = KX^2$$

where  $K = 1/2$

and A is the peak to peak amplitude in microns

A table for vibration units in whole numbers is provided in Appendix A.

## 4.0 TESTING PROCEDURES

This procedure and algorithm have been used successfully with the Vibratron II. However, this is not the only possible approach and Physitemp welcomes input from Vibratron users.

The information in this section has been supplied by Dr. Joseph Arezzo, Albert Einstein College of Medicine, Bronx, NY.

# VIBRATRON II

## Vibration Sensitivity Tester

### 1.0 GENERAL DESCRIPTION

The Vibratron II provides a means of measuring sensitivity to vibration in the hands and feet.

The instrument consists of two modules with vibrating posts and a controller. Vibration amplitude is measured in microns (1 micron =  $10^{-4}$ cm) and either post can be set to vibrate at different amplitude levels. (The digital display reads in vibration units which bear a square law relationship to the peak to peak amplitude in microns.) During testing, the subject is asked to detect, with finger or toe, which of the posts is vibrating. There are two vibration ranges.

### 2.0 INITIAL INSTALLATION

#### 2.1 EQUIPMENT SUPPLIED

After unpacking the instrument, check that all parts of the system are present. The box should contain:

- 1 Controller, with AC line cord
- 1 Vibrator Module A
- 1 Vibrator Module B
- 2 Vibration Damper Mats
- 1 Carrying Case
- 1 Operating Manual

#### 2.2 CONNECTING VIBRATOR MODULES TO THE CONTROLLER

Insert polarized electrical connector from each vibrator module to the matching socket on the back of the controller.

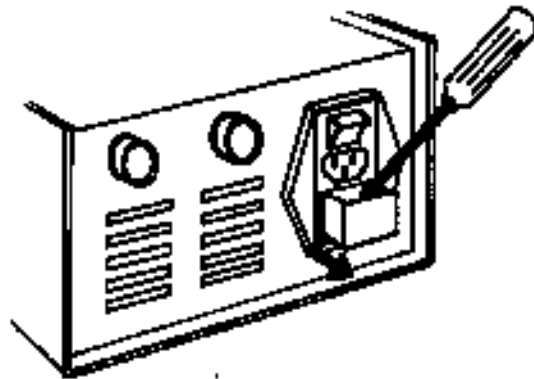
Be sure module A is connected to socket A, and module B to socket B. Twist locking nuts in a clockwise direction to lock connector to controller.

Place vibrator modules on damper mats.

#### 2.3 SETTING LINE VOLTAGE SELECTOR SWITCH

This instrument may be used on 110V AC or 220V AC by a simple adjustment on the rear of the control box. Voltage selector will normally be set at the factory for 110V. **If you are using 220V AC line, check and set unit as follows:**

- a) Disconnect controller from the AC line
- b) Using a 1/4" flat screwdriver blade, pry out the fuse holder in the AC input socket on the rear panel. (See diagram at right.) For 220 - 240V AC operation insert the fuseholder so that the arrow indicating 220V operation aligns with the arrow at the bottom of the input module.



# **OPERATING MANUAL**

## **VIBRATRON II Vibration Sensitivity Tester**

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