Rad Elec SPER-1E Electret Voltage Reader User Manual

Contents

Rad Elec

Rad Elec SPER-1E Electret Voltage Reader

The SPER-1E is a new addition to the Rad Elec family of SPER (Surface Potential Electret Reader) readers. New hardware and software enhancements provide for higher sensitivity and more reliable operation. At the same time, microprocessor technology allows for a range of capabilities to be provided through variations of the firmware installed. At a future date, it is anticipated that there will be several different models of the SPER-1E Reader. This document details the operation of the basic version.

Introduction

Figure 1 SPER-1E Front Panel

All models of the SPER-1E family have the same external appearance. The face of the reader is shown in Figure 1. At the top of the reader is the display where user prompts, data, and results are displayed. Below the LCD display is the electret receptacle with the shutter in the closed position. At the lower right is the shutter handle. Pulling this towards you open the shutter and start reading.

Note: The sensor behind the shutter is very sensitive and easily damaged. For this reason, the shutter must be left in the closed position except when performing readings. Do not touch or allow objects to come into contact with the sensor board behind the shutter.

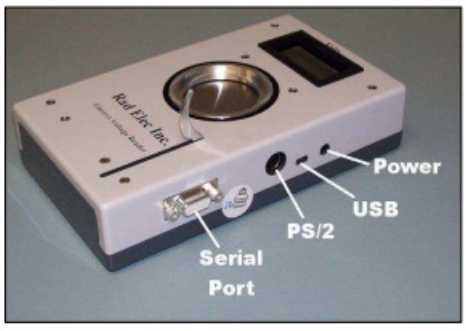


Figure 2 External Connections

On the right side of the reader are several connection interfaces. These are shown in Figure 2. Near the shutter, the handle is the RS-232 serial port. Moving to the right are a PS/2 port, a USB connector, and a power jack. On the basic model, neither the USB port nor the PS/2 port is enabled. The power jack allows for an external power supply for those units that are used only in the lab and do not require portability. It may also be used to extend the life of the batteries. The external power supply is an option available from Rad Elec, Inc. Using the external supply does not preclude using the unit with batteries. There is no conflict in having both installed at the same time.

Note: The unit should not have anything connected to the PS/2 port unless specifically called for by the appropriate procedures. Using the PS/2 port will shorten the battery life significantly!

Handling and Storage

The SPER-1E is a high-precision, non-contact voltmeter. It is a laboratory-grade instrument and must be handled with care. It is supplied with a cushioned carrying case. When not in use, the reader should be stored in this case. The carrying case has a desiccant canister located in the bottom. It should be periodically inspected and re-dried when necessary. The silica gel crystals can be seen through the window in the top of the canister. The desiccant crystals are blue when dry – pink or white when wet. If pink, the desiccant canister should be removed from the reader case and baked for about one-half hour in an oven at 350ºF (180ºC). It should be allowed to cool to room temperature in the oven before being returned to the carrying case. Proper care of the desiccant ensures that the instrument is stored in a relatively dry environment as required for its proper operation.

Calibration of the Reader

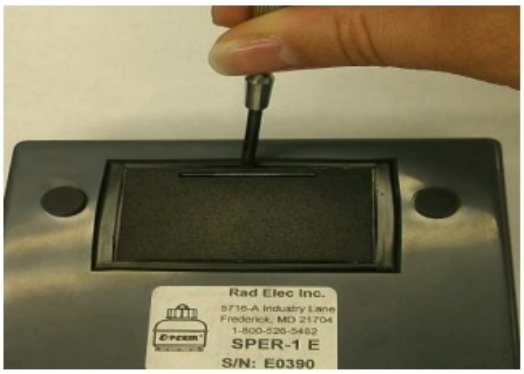
Calibration of the SPER-1E is recommended annually. It is important to send the Reference Electret Set along

with the Reader to Rad Elec for calibration services. Rad Elec will do routine maintenance on the Reader, change the battery, calibrate the Reader, issue a Reader Calibration Certificate and certify the Reference Electret Set. There is a charge for this service. Please use the Reader Calibration form on Rad Elec's website (www.radelec.com) when sending your Reader in for calibration. Readers seldom need to be calibrated more than once a year. However, the voltage response should be checked on a weekly basis for stability using the Reference Electrets. See the section below on "Using the Reference Electrets.

Changing the Batteries

The SPER-1E uses two AA alkaline batteries. The reader will display LO BATT when the batteries need to be changed. The battery compartment is located on the backside of the reader. There is a very small slit at the top of the lid directly above the long slit.

Insert a small flathead screwdriver into the small slit and gently push toward the larger slit and lift the lid up. Remove the old batteries. Follow the diagram inside the battery case when inserting the new batteries.



Using the Reader

Figure 5

To read the surface voltage of an electret using the SPER-1E reader, follow the below instructions. Note that it is

not necessary to remove the SPER-1E reader from its carrying case to perform a reading.

1. Place the electret face down into the circular receptacle on top of the SPER-1E reader.
2. Rotate the electret so that the serial number is upright from your point of view and the bar code is exactly parallel to the name “Rad Elec Inc” on the reader.
3. Make certain that the electret rests on the lower edge of the receptacle. The best way to do this is to slide the electret toward to the bottom of the reader as far as it will go.
4. If the reader is not currently on, turn it on by pulling the shutter handle with a slow but steady motion down to the lower limit and return it slowly back to the closed position. This turns on the reader. The display will show some diagnostic information during power-up including the battery condition and temperature in Fahrenheit. When the message “READY” is displayed, the unit is ready for use. If an error message is displayed, it is necessary that corrective action be taken. (See the section below on diagnosing problems.)
5. Pull the shutter handle again and hold it down until the voltage reading is displayed. The voltage will be displayed in the middle of the screen. The battery condition will be pictured to the left and the number in the upper right corner indicates the time it takes to pull the shutter open (in milliseconds). If it is pulled too quickly or too slowly, an appropriate message will be displayed and it is necessary to repeat this step.
6. After leaving the shutter closed for several seconds, repeat step 5 and read the voltage again. If this new value is different, repeat step 5 until a minimum of two successive readings are the same. This repeated value is the correct electret voltage reading.
7. Remove the electret from the reader and protect it either by placing the “keeper cap” over it or by installing it in an appropriate chamber.
8. If additional electrets are to be read at this time, repeat steps 1, 2, 3, 5, and 6 to obtain the desired readings. This may be repeated as often as necessary.
9. The SPER-1E reader will automatically turn off after two minutes of no slide activity.
10. Return the SPER-1E reader to its carrying case and close the cover to allow the desiccant to maintain the low-humidity environment recommended by the manufacturer.

Using the Reference Electrets
As mentioned above, calibration of the Reader is performed only by the manufacturer. However, due to the sensitivity of the instrument, it is important that the calibration be verified periodically by the user. This is done using the Reference Electrets and Zero Electret (Standards) provided under the flap in the SPER-1E reader case. A Reference Electret is one that is highly stable and has been measured with a calibrated reader. The Reference Electrets provided are in the range of approximately 250 volts. A record of the calibration including the date and exact voltage accompanies the Reference Electrets. Whenever the Reader is returned to the manufacturer for recalibration, the Reference Electrets should accompany it for re-certification as well. The “Zero Electret”, which consists of a metal plate, verifies that the Reader zeros properly. A weekly record of all three Standards should be maintained and are used as part of your Quality Assurance/Quality Control Program. The Reference Electrets are read in the same manner as those used in radon monitoring. Whenever they are not being read, they must be covered by their protective “keeper cap”. If the weekly readings remain constant within acceptable limits, you can be confident that your SPER-1E reader is functioning correctly. (Please see the information sent with the Reference Electrets).

Diagnosing Problems with the Reader

- **Fluctuating Electret Readings –** this can happen on very humid summer days or when moisture condenses inside the reader from being cold and damp. The reader uses ultra high impedance components that work properly only in a relatively dry environment. It is recommended that the reader be used in air conditioned

rooms with a relative humidity of less than 75%. The reader should also be kept in its carrying case and the desiccant checked frequently. Please see the “Handling and Storage” section earlier in this manual for proper use of the desiccant. The electret receptacle on the Reader can also become dirty which may not allow good contact with the electret. The receptacle may be wiped clean with alcohol wipes while the shutter is kept closed. Do not open the shutter and expose the interior while cleaning the receptacle.

- **“LO BAT” appears on the display –** this display is a warning to change the batteries. The SPER-1E uses two AA alkaline batteries. Always replace the batteries with new ones and follow the diagram inside the battery case for placement.
- **“ER FAST” appears on the display –** this means the slide was pulled too fast. Pull the slide back gently, hold until it is finished reading and the voltage appears. Then release the slide.
- **“ER OPEN appears on the display –** this means the slide was held open too long. Release the slide and pull again. Once the reading appears, release the slide to avoid this message.
- **“SLIDE” appears on the display –** this means that there was an error when pulling the slide. Pull the slide back gently, hold while displaying “READING” and release the slide once the voltage is displayed.
- **“SLOW” appears on the display –** the slide was pulled too slow. Pull the slide a little faster.
- **“ER WAIT” appears on the display –** the memory has not cleared from the previous reading before taking the next reading. Wait a second before pulling the slide between readings.
- **No display –** Pulling the shutter handle should turn on the reader. If this does not happen, most likely the batteries are too low. Replace the batteries. If the Reader will not turn on with fresh batteries, return the reader to Rad Elec for servicing and repair estimates.
- **The reader does not automatically turn off –** The SPER1-E should automatically turn off the display if not used within two or three minutes. If this does not happen and the display remains on, it indicates a defect in the auto off switch. Please return the Reader to Rad Elec for servicing and repair estimates.
- **Repair Services –** if your reader needs repair, ship it back to Rad Elec. Rad Elec will evaluate the problem and contact you with an estimate before performing any services.

Documents / Resources

	Rad Elec SPER-1E Electret Voltage Reader [pdf] User Manual SPER-1E Electret Voltage Reader, SPER-1E, Electret Voltage Reader, Voltage Reader, Reader

References

- Rad Elec Inc.