EM Eye - ESD Event Meter
Installation, Operation, and Maintenance

Made in the
United States of America

Figure 1. SCS 770715 EM Eye - ESD Event Meter

Description

The SCS EM Eye - ESD Event Meter detects, counts and measures ESD events that can damage ESD items and cause tool lock-ups, erratic behavior, and parametric errors. It calculates event magnitude for Charged Device Model (CDM), Human Body Model (HBM), and Machine Model (MM). All measurements are recorded onto a microSD card for PC download. It features a touchscreen display and rechargeable lithium ion battery. Each EM Eye - ESD Event Meter is calibrated with accepted procedures and standards traceable to the National Institute of Standards and Technology (NIST).

Resistive Touchscreen

The EM Eye Meter is designed with a modern user interface. All buttons and controls are within the display itself. With its display and touch screen, it is easier for users to quickly navigate through the features that were built into the meter.

Figure 2. Using the resistive touchscreen

Data Logging

The EM Eye Meter supports data logging by using a microSD card and exports to an Excel spreadsheet. Having data at hand enables quick analysis. Solutions can be decided quickly and can be measured on the spot.

Figure 3. Inserting a microSD card

Speaker & Headphone Audio

The EM Eye Meter, with a speaker and headphones, allows flexible means for audible indications, beeping or “warbling” like a radio. If one is in a noisy place, a headphone jack for optional headphones can be used for clearer audio.

Figure 4. Using the headphone output

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The EM Eye Meter and its accessories are available as the following item numbers:

Item	Description
770715	EM Eye - ESD Event Meter
CTC021	Replacement ESD Sensor
CTC113-6FT	Replacement Remote Antenna
CTC115-6FT	High Temp Remote Antenna
CTS001	Replacement Local Antenna
770756	Replacement Power Adapter

Packaging

1 EM Eye Meter
1 ESD Event Sensor
1 Local Antenna
1 Remote Antenna with 6' RF Cable
1 microSD Memory Card
1 microSD to USB Type A Adapter
1 Power Adapter, 5VDC, with interchangeable plugs (North America, UK/Asia, Europe)
1 Carrying Case

Precautions

- Do not drop the meter. This may damage the device and will void the warranty.
- Do not discharge directly into the antenna metals as it may damage the input sensors and will void the warranty.
- Be cautious in the placement of antenna and the module heads; align the parts while assembling.
- Do not use sharp objects to touch the screen.
- Do not use a wrench or pliers to screw or unscrew the antenna. Use your bare hands.
- Do not remove the microSD card while the power is on. Turn off the meter before removing the microSD card.
- Do not remove the sensor heads while the power is on. Turn off the meter before removing and replacing the heads.

Attaching the Sensor Heads

Keep in mind the following when using the modular sensor heads.

BEFORE CONNECTING TO AN INPUT SOURCE, TOUCH THE OUTSIDE SURFACE OF THE EM EYE METER INPUT CONNECTOR. THIS WILL HELP PREVENT ESD SHOCK TO THE METER.

1. The power must be turned off when changing the sensor heads.
2. Make sure to gently plug or unplug EM Eye Meter and the sensor heads.
3. Plug or unplug the sensor heads by firmly gripping them. Then fit the sensor over the EM Eye unit. Do not grab the antenna for plugging and unplugging the sensor heads.
4. If the antenna is separated from the sensor head, reattach it when the sensor head is securely in place.

Attaching the Antenna

In order to avoid damaging the EM Eye Meter, installation and replacement of the antenna must be done with great care. An excessive amount of force or improper installation may permanently damage the meter.

Attach the antenna to the input connector by simply screwing it in by hand.

DO NOT OVERTIGHTEN THE CONNECTION. Screw in the antenna firmly but gently. Do not use any tools other than your hand to attach and detach the antenna.

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Power Supply and Charger

Use only the power supply that comes with the EM Eye Meter. Do not use any other power supply as it may damage the meter.

Battery Care - Charging for the first time

NOTE: The power switch must be in the ON position when charging the battery. To improve the battery life we recommend performing three fully charge-discharge cycles. For example: fully charge the meter for two hours or overnight, then use the meter until it is fully discharged (do not recharge it at half-charge-life). Repeat this step two times. It would normally take two hours to fully charge the battery, but since the meter power is on while charging; it would extend the charge time to four hours. Succeeding charging would be at any duration. Use only the supplied charger.

Power On

Use the slide switch at the bottom of the meter to power the device. If a new sensor was installed, a sequence of initialization will take place for the first time for approximately ten seconds. After that, the switch-on action will take approximately three seconds. The main display screen appears after the initialization and a beep will sound. The EM Eye Meter will then perform a battery check. If the battery is too low to provide reliable operation, it will not turn on. The screen will go white momentarily and then the meter will power up. After the initial power up, the meter will go directly to the main screen.

Features and Components

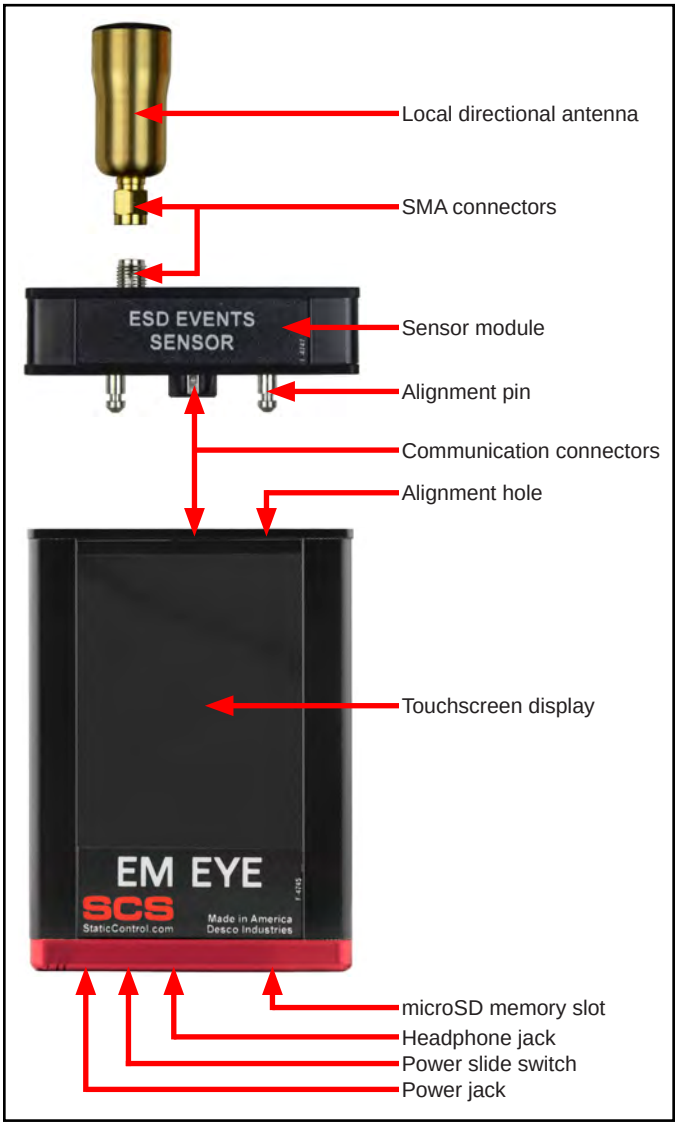

Figure 5. EM Eye features and components

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Modular Assembly and Disassembly

1. Position the sensor head so that the dowel pins align with the holes.
2. With the initial head midway through, reposition it so that it is parallel to the body. Press the sensor head firmly against the body until both surfaces are flat with each other.
3. Insert and screw in the antenna making sure that it is not too tight or too loose. Do not use any tools.

Figure 6. Attaching the sensor module to the EM Eye Meter

If the assembly is not done correctly, one of the following error and warning messages may appear. To correct, follow the instructions as indicated within the message.

Error Message	Reason for Error
ERROR: Sensor is disconnected. Click here to turn device off.	The meter is turned on without the sensor module.
ERROR: Card was removed. Data may be lost and card could be damaged. Click here to close the window.	The storage card (microSD) is removed while the meter is powered on.
WARNING: No memory card. You can add it at any time. Click here to close the window.	The meter is turned on with no storage card in place.
PREPARING CARD FOR RECORDING!!! DO NOT REMOVE!!! PLEASE WAIT.	A new card is inserted or when a card is empty.
WARNING: This card contains the data. Remove the card or click here to erase the data.	Inserting a card that has contents other than the EM Eye Meter files.
ERROR: Invalid memory card. Format or replace it. Click here to close the window.	The card is not formatted to FAT32. Formatting is done using the PC.
ERROR!!! STACK OVERFLOWED. Click here to turn device off.	This is a fatal error. If it appears even after resetting, please contact SCS Customer Service.

Power Reset

If the EM Eye Meter locks up or the display freezes, cycle the power to the meter by sliding its power switch to the OFF position and back to the ON position.

Figure 7. Location of the power switch at the bottom of the EM Eye Meter

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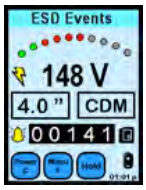
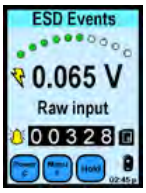
ESD Event Detection Sensor

The SCS EM Eye Meter will help you detect most ESD events. This will help you make sound decisions in tackling what may have been a daunting task. The EM Eye Meter detects the magnitude of events and using the filters built into the unit. It can provide approximate values for some ESD Events for models (CDM, MM, HBM) using proprietary algorithms. Switching between any of the modes will give you immediate data analysis. Solving ESD problems requires data; a before-and-after analysis of data may now be measured and used to tailor ESD control programs.



CDM Mode	MM Mode
In IC testing, ICs that are sliding through tubes may be charged up. Once the lead touches the metal tracks, a CDM event can occur.	A moving, ungrounded cart may accumulate charges in its path. As it approaches a metallic worktable and bumps into it, a discharge may occur and may adversely affect nearby products or instruments
In feeder bowls where the ICs are arranged for sorting or orientation, voltages may be induced by the vibrating bowl.	In using a bad soldering iron, induced voltages may cause discharges to the components mounted into the PCB. Use grounded tools and confirm that no ESD events will be detected by using the MM mode.



HBM Mode	Raw Input Mode
In IC testing, operators that are handling an IC (i.e. fixing bent leads) may be discharging through the IC.	For engineers who want to simply analyze raw ESD signals for further analysis, the Raw Input mode provides actual voltages received by an antenna.
During picking up of an IC by a person not properly wearing a wrist strap, use the EM Eye Meter to alarm the operator of such events.	

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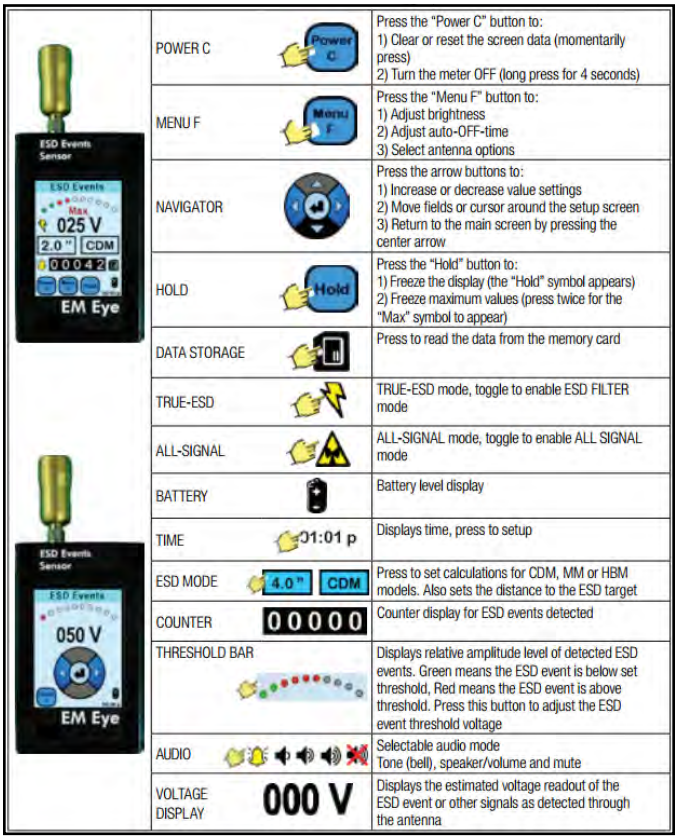
ESD Events Sensor - Display and Controls

For the detection of most ESD events using CDM, MM or HBM models.



POWER C	Power C	Press the "Power C" button to: 1) Clear or reset the screen data (momentarily press) 2) Turn the meter OFF (long press for 4 seconds)
MENU F	Menu F	Press the "Menu F" button to: 1) Adjust brightness 2) Adjust auto-OFF-time 3) Select antenna options
NAVIGATOR		Press the arrow buttons to: 1) Increase or decrease value settings 2) Move fields or cursor around the setup screen 3) Return to the main screen by pressing the center arrow
HOLD	Hold	Press the "Hold" button to: 1) Freeze the display (the "Hold" symbol appears) 2) Freeze maximum values (press twice for the "Max" symbol to appear)
DATA STORAGE		Press to read the data from the memory card
TRUE-ESD		TRUE-ESD mode, toggle to enable ESD FILTER mode
ALL-SIGNAL		ALL-SIGNAL mode, toggle to enable ALL SIGNAL mode
BATTERY		Battery level display
TIME	01:01 p	Displays time, press to setup
ESD MODE	4.0" CDM	Press to set calculations for CDM, MM or HBM models. Also sets the distance to the ESD target
COUNTER	00000	Counter display for ESD events detected
THRESHOLD BAR		Displays relative amplitude level of detected ESD events. Green means the ESD event is below set threshold, Red means the ESD event is above threshold. Press this button to adjust the ESD event threshold voltage
AUDIO		Selectable audio mode Tone (bell), speaker/volume and mute
VOLTAGE DISPLAY	000 V	Displays the estimated voltage readout of the ESD event or other signals as detected through the antenna

Figure 8. ESD Event Sensor displays and controls

Common Display and Controls

POWER and CLEAR

The POWER C button turns off the SCS EM Eye Meter or clears the values that are on display.

To turn off the meter, press and hold the POWER C button for approximately four seconds or longer until the meter goes off.

To reset all of the values on the display, press the POWER C button for approximately one second.

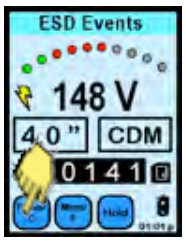


Figure 9. Using the Power / Clear button

HOLD and MAX

The HOLD button toggles the HOLD data and MAX data sequentially.

HOLD freezes the current data on the display. The instrument will not be active at this point.

MAX displays the maximum voltages detected by the EM Eye Meter above the set threshold.

Pressing the HOLD button for the third time will disable the HOLD and MAX function and returns to normal run mode.

HOLD and MAX does not affect recording into memory storage. Data is still being recorded even if HOLD and MAX is active.

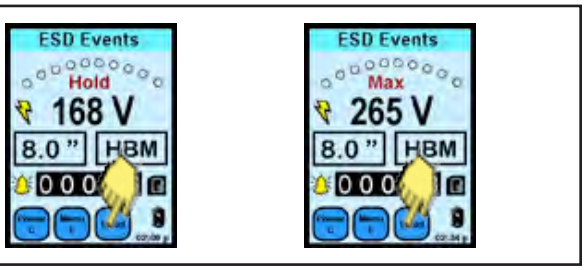


Figure 10. Using the Hold button

TIME

To set the time, press the battery icon.

The NAVIGATOR screen appears.

Press the left or right arrows to move the shaded area that need to be changed.

Press the up or down button to scroll and set the numbers.

Press the center button to return to the main screen.

Time: AM/PM format or 24-hour format
Date: Format as MM/DD/YY
Mode: 12-hour, 24-hour format

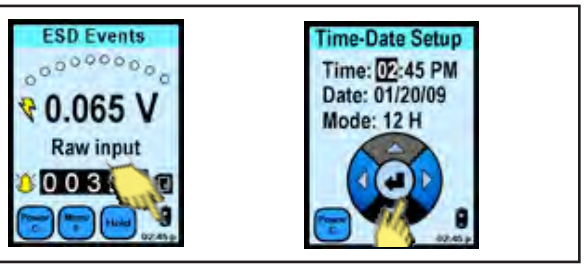


Figure 11. Setting the time

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Battery
The BATTERY symbol displays the approximate level of battery life remaining for use.

- Full charge life.
- Half charge
- <1 hour charge, charging is required
- Battery is discharged, charging is required
- Charging in progress

Figure 12. Locating the battery icon

Audio Indicators
The AUDIO INDICATOR button scrolls through the following audio modes:
1) Tone (bell)
2) Speaker at low volume
3) Speaker at middle volume
4) Speaker at loud volume
5) Mute

The BELL audio mode sends an audible beep for every ESD event count detected. The SPEAKER, on the other hand, produces the “crackling” or “humming” amplitude de-modulated sounds of ESD event or EMF. This may provide a better feel of what discharges or EMF sounds like. The MUTE disables the audio and the unit operates in silent mode.

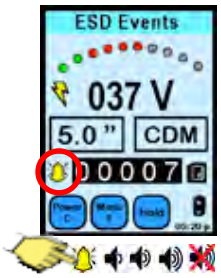

Figure 13. Using the Audio Indicator button

ESD Events Display and Controls

Menu Function
Press the MENU F icon and the NAVIGATOR icon appears.
Press the up/down arrows to scroll through functions.
Press the left or right arrows to set values and options.
Press the center button to return to the main screen.

Serial Number
The serial number is a five-digit number indicated at the top left section of the screen.

Brightness
10% to 100%, with 10% increments.

Auto Off Time
Disabled or adjustable between 1 to 9 minutes.

Antenna
1) Local antenna; 2) Remote antenna.

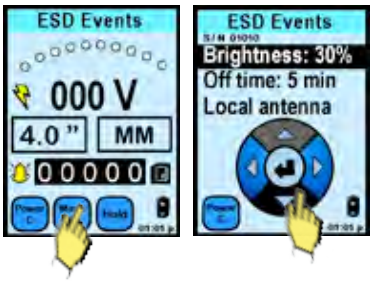

Figure 14. Using the Menu F button

Antenna Types

Local Antenna
The local antenna is directional and intended for general purposes.

Figure 15. SCS CTS001 Local Antenna

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Remote Antenna
The SCS Remote Antenna is omnidirectional and intended in instances where the local antenna cannot be used. One example is the the inside of an pick-and-place machine.

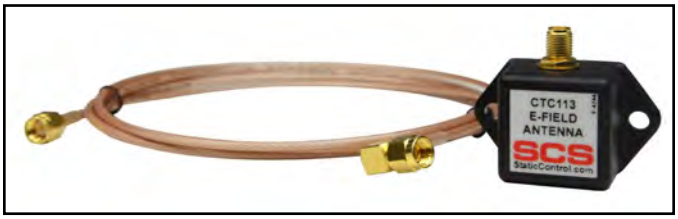

Figure 16. SCS CTC113-6FT Remote Antenna

ESD Event Magnitude and Counter
The VOLTAGE display is not a touch feature. This displays the estimated voltage detected at the antenna which corresponds to a filter selected at the ESD MODE button.

The COUNTER is not a touch feature, but it displays the number of ESD events that had occurred above the threshold level setting.

The maximum event count it can register is up to 32,767. The counter restarts to zero after the maximum count.

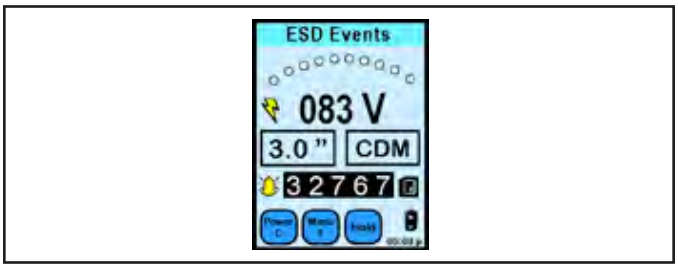

Figure 17. ESD Event voltage display

ESD Filter Models*
The ESD MODE button enables the user to choose between RAW INPUT and calculations of HBM, MM and CDM.

At the NAVIGATOR button:
Press the up/down arrows to set the distance.
Press the left or right arrows to set ESD event models.
Press the center button to return to main screen.

Effective distance range
0.5" (1.3 cm) to 15.0" (38.1 cm)

Filter
1. Human Body Model (HBM)
2. Machine Model (MM)
3. Charge Device Model (CDM)
4. Raw input

**NOTE: Not all ESD events are captured by the EM Eye Meter. The magnitude of the event can be measured. CDM, HBM and MM Model results are estimated based on proprietary algorithms.*

Figure 18. Navigating through different ESD Filter Models

ESD Threshold
The THRESHOLD, in a form of an ARC LED bar, displays the detection level of the ESD events detected. When pressed, the threshold level may be adjusted.

With the NAVIGATOR bar:
Press the left or right arrows to set the ESD event threshold voltage. Press the center button to return to the main screen.

Threshold Levels
0 - 10 Volts at 1V increments
10 - 990 Volts at 10V increments
1 - 1,500mV for RAW input

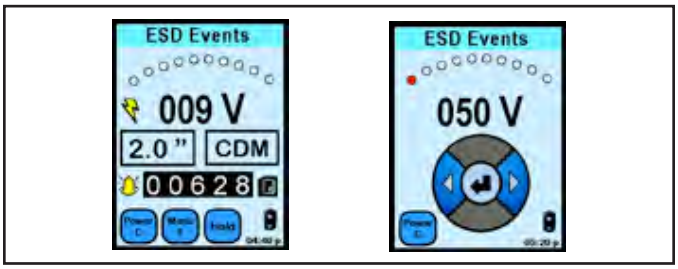

Figure 19. Setting the ESD Threshold

“True-ESD Filter” and “All Signal”
After pressing the lightning bolt symbol or the TRUE ESD FILTER button, the triangle button appears on the display. In this mode, the EM Eye Meter will detect most signals, including ESD and some EMI signals.

Figure 20. Changing the filter from “True ESD mode” to “All Signal mode”

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After pressing the triangle or the ALL SIGNAL button, the lightning bolt symbols appears on the display. In this mode, the EM Eye Meter will detect ESD events that are mostly CDM in nature. Not all events are captured and the information provided is based on proprietary algorithm which models and approximates for the event type.

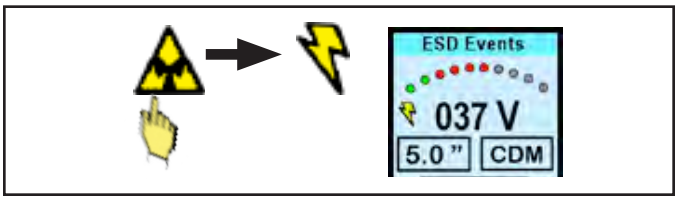

Figure 21. Changing the filter from “All Signal mode” to “True ESD mode”

Data Storage and Read
The DATA STORAGE button displays the data stored in the microSD card found at the bottom of the EM Eye Meter.

Scroll through the recorded data using the NAVIGATOR button.

The displayed information is as follows:
(ESD mode) (Threshold) (Distance) (CDM on/off) (Date) (Voltage sensed) (Time) (Data bar indicator)

Data from the microSD card can be exported using the utility software described in the following section.

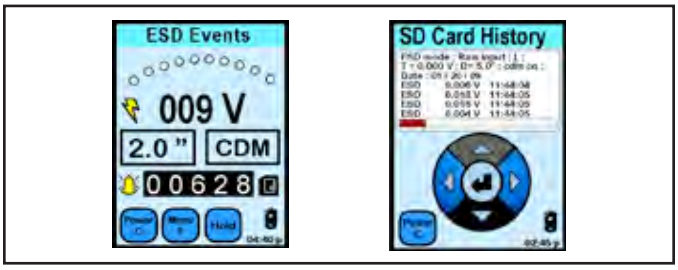

Figure 22. Viewing stored data

Memory Storage Card
The EM Eye Meter works with microSD Cards.

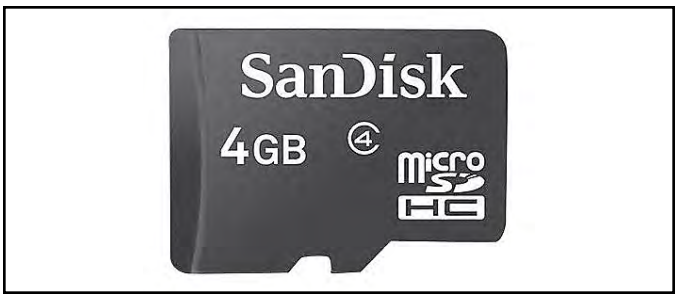

Figure 23. MicroSD card example

Some cards may not be compatible. Non-compatibility is indicated by an “X” mark overlaid on the card button display. For other memory card types, please contact SCS Customer Service for verification.

To Access the Data Using a PC

1. Visit http://staticcontrol.descoindustries.com/SoftwareDownloads.aspx to download the EM Eye File Converter software. This software will allow you to download the data from the EM Eye Meter and save it to your PC.
2. Install the EM Eye File Converter software.
3. Remove the microSD card from the EM Eye Meter and insert it into your PC using an adapter (not included).
4. Open the EM Eye File Converter software and click File > Open.
5. Navigate to the mircoSD card location. Open the file inside the microSD card. The extension is “ESD3M0003.esd”.
6. Select a row of data.
7. Save it into a folder.
8. Launch Microsoft® Excel.
9. Open the file that you just saved from the folder.
10. Sort and analyze the data using the tools in Excel.

Calibration

The EM Eye Meter comes from the factory calibrated. It is recommended that you calibrate the EM Eye Meter once a year at the factory.

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Specifications

General	
Audio Indicators	Speaker: Beep or analog audio with selectable volume
External Data Storage	microSD Card
Recording Interval	Peaks: 1 to 360 seconds Average signals: 0.1 to 360 seconds
Display	Touch LCD
Size	65 W x 32 D x 105 L mm
Headphone Jack	3.5 mm (1/8 in.)
Power Supply/Charger	Input: 100-240 VAC, 50-60 Hz Output: 5.0V 1000mA Plug: Center positive 1.3 mm I.D. x 3.5 mm O.D.
Country of Origin	United States of America

ESD Event Sensor	
ESD Event Detection Characterization Modes	Raw input for magnitude and estimated CDM, HBM, MM using proprietary algorithm
Raw Input Resolution	1 mV (1 mV to 15 mV); 15 mV (15 mV to 1500 mV) Detection Resolution: 1 mV
Threshold (Display) Resolution	1 to 10 V, 10 to 990 V Raw input: 1 mV (1 to 15 mV) and 15 mV (15 to 1500 mV)
Distance Detection Range	1.3 cm (0.5 in.) – 38.1 cm (15.0 in.)
Event Detection Rate	3,000 per second
Counter Range	0 to 32,767 counts (screen count)
Hardware Setup	Adjustable Brightness, Auto-off-time
CTC115 Remote Antenna Temperature Range	-100 to 400° F (-73 to 204° C)

Limited Warranty, Warranty Exclusions, Limit of Liability and RMA Request Instructions

See the SCS Warranty -
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