

3M™ EM Eye Meter CTM048 Handheld ESD Event Detector

User's Guide



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Safety Information

Please read, understand, and follow all safety information contained in this User's Guide prior to use of the 3M™ EM Eye Meter CTM048. Retain these instructions for future reference.

Explanation of Signal Word Consequences



WARNING Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury and/or property damage.



CAUTION Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury and/or property damage.



WARNING

To reduce the risks associated with hazardous voltage, which if not avoided, could result in death or serious injury:

- Never allow children or other non-qualified persons to come in contact with battery charger;
- Never use battery charger outdoors or in other wet locations;
- Always use extreme caution to avoid coming into contact with any exposed electrical conductors of the equipment being measured with the 3M™ EM Eye Meter CTM048.

To reduce the risks associated with hazardous voltage or possible fire or explosion related to internal Li-ion battery, which if not avoided, could result in death or serious injury:

- Use only the battery charger provided with the product;
- If the battery charger is missing or damaged, only replace with one supplied by 3M.

To reduce the risks associated with electrostatic discharge (ESD) voltage, which if not avoided, could result in damage to the meter:

- To install or change antennas, turn off the meter, install or change antennas, turn meter back on;
- Avoid touching antenna when meter is turned on



CAUTION

To reduce the risks associated with environmental contamination from the EM Eye Meter CTM048 with the lithium battery and power supply:

- At the end of service life, dispose of the EM Eye Meter CTM048 accordance with federal, state and local requirements.

Overall Features

The 3M™ EM Eye Meter CTM048 is capable of providing measurements for many various parameters, which are determined by the type of sensor connected to the EM Eye Meter CTM048. Below are the three sensors that are available now:

- **ESD Events Detection** – The portable, easy-to-use EM Eye Meter CTM048 serves as a measuring instrument for most ESD signals. The EM Eye Meter CTM048 measures the magnitude of ESD events. This meter also provides filters to estimate the events magnitude for CDM, HDM and MM models.
- **Electromagnetic Field Measurement** – Enables the EM Eye Meter CTM048 to be transformed into an EMF Meter, Power Density Meter and EIRP Meter.
- **RF Signal Sensor** – The EM Eye Meter CTM048 measures the amplitude of an RF signal.

User Features

Modular Construction

The EM Eye Meter CTM048 with the modular construction concept can expand to different applications. With the current design, it measures the magnitude of most ESD events when in one of its filter modes, electromagnetic fields (EMF), power density, effective isotropically radiated power and radio frequency (RF).



Touch Screen to Power ON

The EM Eye Meter CTM048 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.



Speaker and Headphone Alarm Outputs

The EM Eye Meter CTM048, 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.



Easy Data Logging to Memory Card

The 3M™ EM Eye Meter CTM048 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.



Package Contents

Please confirm that the following accessories are included in your EM Eye Meter CTM048 package when you open it:

- Base EM Eye Meter module
- One or more of the following sensors heads:
 - ESD event sensor with antenna
 - Electromagnetic field sensor with antenna
 - RF signal sensor (includes RF cable and 20 dB attenuator)
- Power supply adapter
- Optional accessories may be ordered separately:
 - Remote antenna CTC113

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

Please keep in mind the following when using the modular sensor heads.
BEFORE CONNECTING TO AN INPUT SOURCE, TOUCH THE OUTSIDE SURFACE OF THE 3M™ EM EYE METER CTM048 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 CTM048 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 CTM048, 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.

Power Supply and Charger

Use only the power supply that comes with the EM Eye Meter CTM048. Do not use any other power supply as it may damage the meter.

Battery Care – Charging for the first time

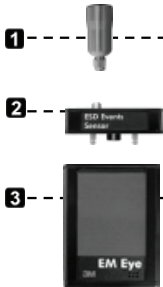
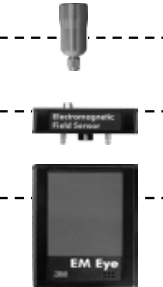
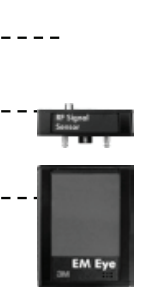




To improve the battery life we recommend that you make three fully charge-discharge cycles. For example: fully charge the meter for two hours or overnight, then use the meter until it is fully discharged (do not recharge it at half-charge-life). Repeat this step two times. It would normally take two 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

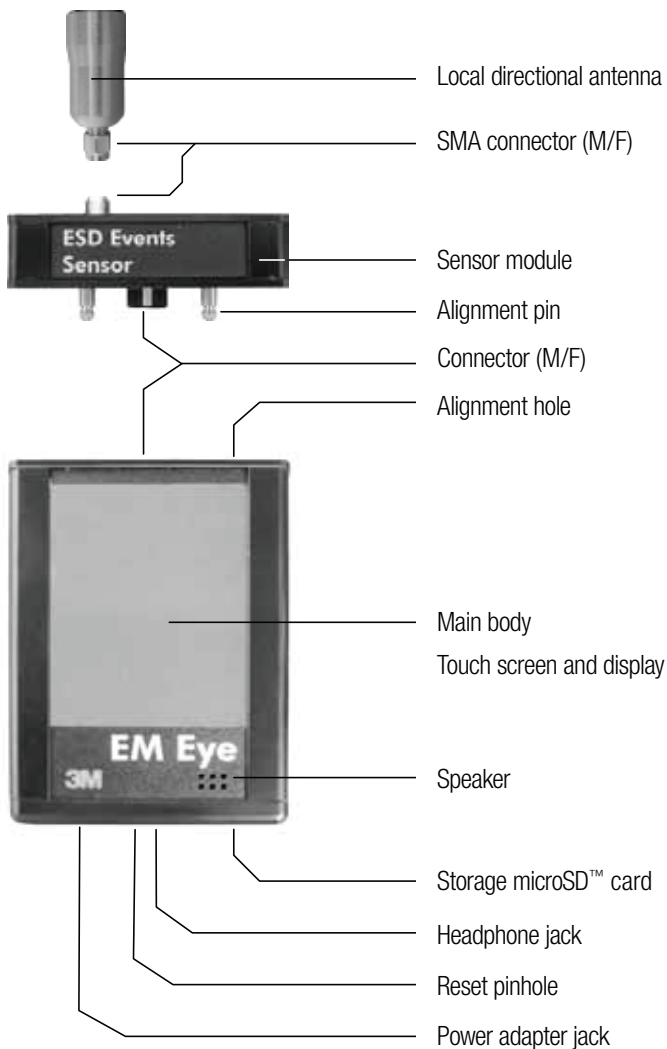
Using your finger, press and hold any spot on the screen for approximately three seconds – do not use any tools to perform this action. If a new sensor was installed, a sequence of initialization will take place for the first time

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 CTM048 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.

Connecting the Sensor Head

		
1 Antenna CTS001	Antenna CTS001	(External cable sources)
2 ESD Event Module	Electromagnetic Field Module	RF Signal Module
3 Base 3M™ EM Eye Meter CTM048 Module	Base EM Eye Meter Module	Base EM Eye Meter Module
4 Memory Card (microSD™ card)	Memory Card (microSD™ card)	Memory Card (microSD™ card)
5 Power Supply/Charger  <p>*Not included: Australian power plug</p>	Power Supply/Charger  <p>*Not included: Australian power plug</p>	Power Supply/Charger  <p>*Not included: Australian power plug</p>
6 3M™ Remote Antenna CTC113 <p>*Not included: order separately</p>	3M™ Remote Antenna CTC113 <p>*Not included: order separately</p>	RF Cable BNC connector 20db Attenuator  <p>* Included with the purchase of the CTC029 model. Otherwise needs to be ordered separately.</p>

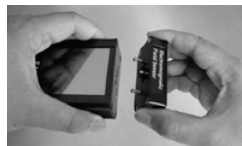
Parts Description for the 3M™ EM Eye Meter CTM048



Modular Assembly and Disassembly

Carefully insert the sensor head and antenna to avoid damaging the 3M™ EM Eye Meter CTM048.

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.



3. Press the sensor head firmly against the body until both surfaces are flat with each other.



4. Insert and screw in the antenna making sure that it's not too tight or too loose. Do not use any tools other than your hand.



Note: Antenna is not applicable for the RF Signal Sensor.

If the assembly isn't done correctly, you may receive one of the following error and warning messages. 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.
ERROR: Card was removed. Data may be lost and card could be damaged. Click here to close the window.	The meter is turned on with no storage card in place.
ERROR: Card was removed. Data may be lost and card could be damaged. Click here to close the window.	A new card is inserted or when a card is empty.
ERROR: Card was removed. Data may be lost and card could be damaged. Click here to close the window.	Inserting a card that has contents other than the 3M™ EM Eye Meter CTM048 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 3M.

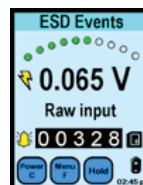
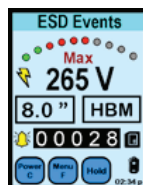
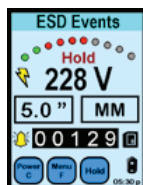
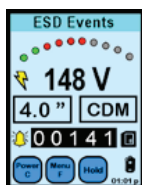
Reset Button

If the 3M™ EM Eye Meter CTM048 locks up or the display freezes, press the reset button to restart the meter. The reset button is in a small hole found near the power supply jack. Use a paper clip to push the button inside the small hole.



ESD Event Detection Sensor

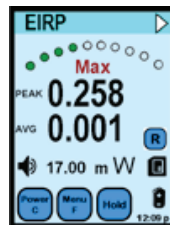
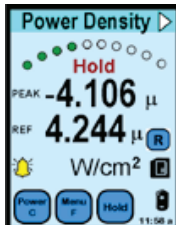
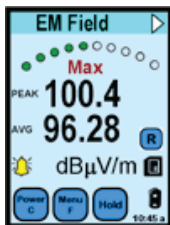
The 3M™ EM Eye Meter CTM048 will help you detect most ESD events. This will help you make sound decisions in tackling what may have been a daunting task. The EM Eye Meter CTM048 detects the magnitude of events and using the filters built into the unit. It can provide approximate values for some ESD Events 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	HBM Mode	Raw Input Mode
<p>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.</p>	<p>A moving, un-grounded 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.</p>	<p>In IC testing, operators that are handling an IC (i.e. fixing bent leads) may be discharging through the IC.</p>	<p>For engineers who want to simply analyze raw ESD signals for further analysis, the Raw Input mode provides actual voltages received by an antenna.</p>
<p>In feeder bowls where the ICs are arranged for sorting or orientation, voltages may be induced by the vibrating bowl.</p>	<p>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.</p>	<p>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.</p>	

EM Field/Power Density/EIRP Sensor

The 3M™ EM Eye Meter CTM048 is a handy tool for the detection and analysis of some electromagnetic fields.



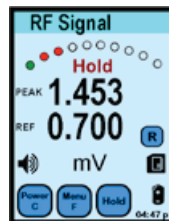
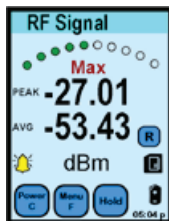
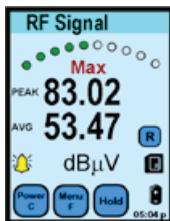
EM Field Sensor

This sensor provides several important functions:

- For the EMC engineer, it helps with diagnostics of electromagnetic emission from the product and for troubleshooting a problem.
- For the manufacturing engineer, it assists in identifying sources of harmful electromagnetic interference in production that causes equipment lock-up, sensitive component damage and other problems.
- For those who install and maintain antennae of radio transmitters and mobile phones, the EM Eye Meter CTM048 can provide readings of the field strength, including peak and average values. Further, proprietary algorithm allows the EM Eye Meter CTM048 to measure EIRP of some emission sources.
- For those who are concerned with EMI and RF safety, the EM Eye Meter CTM048 provides measurements of power density.

RF Signal Detection Tool

The EM Eye Meter CTM048 is a handy tool for the RF communications design engineer. Used in the laboratory, this tool measures signals from RF emitting devices.










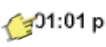








ESD Events Sensor – Display and Controls

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

Settings and Displays

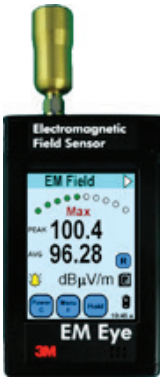









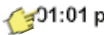



 (denotes a touch screen feature)

	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		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		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		Displays time, press to setup
	ESD MODE		Press to set calculations for CDM, MM or HBM models. Also sets the distance to the ESD target
	COUNTER		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		Displays the estimated voltage readout of the ESD event or other signals as detected through the antenna

EM Field Sensor – Display and Controls

Settings and Displays










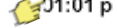



 (denotes a touch screen feature)

 	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		<div> Momentary press adjusts time interval for data recording 1) INTERVAL recording 2) AVERAGE value </div> <div> Long press 1) Adjust brightness 2) Adjust OFF-time 3) Select AF </div>
	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		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
	RECORD DATA		Press record area to start data writing onto the microSD™ storage card
	UNIT		Press "UNIT" button to change units between dBµV/m or V/m
	BATTERY		Battery level display
	TIME		Displays time, press to setup
	MODE OPTION		The triangle at the upper right side of display switches modes sequentially as follows: EM Field Power Density EIRP EM Field When pressed at the "Hardware" setup menu, any of the mode options maybe disabled or enabled
	THRESHOLD BAR		Displays relative amplitude level of EMF detected. Green means EMF is below set reference. Red means EMF is above reference. Press it to adjust the EMF references
	AUDIO		Selectable audio mode: Tone (bell), speaker/ volume, mute
	PEAK	PEAK 100.4	Displays the peak readout of EMF, Power Density and EIRP
	AVG	AVG 96.28	Displays the average readout of EMF, Power Density and EIRP
	REF	REF 0.010	Displays the reference level setting, either memory or current references. (EMF and Power Density only)

RF Signal Sensor – Display and Controls

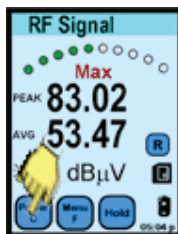
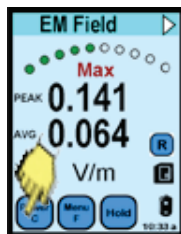
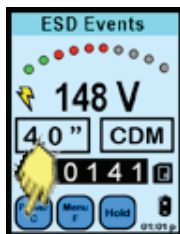
Settings and Displays

 (denotes a touch screen feature)

	POWER C		Press the "Power C" button to: 1) Turn the meter ON (press the screen for three seconds) 2) Turn the meter OFF (press for three seconds)	
	MENU F		Momentary press adjusts time interval for data recording 1) INTERVAL recording 2) AVERAGE value	Long press 1) Adjust brightness 2) Adjust OFF-time 3) Select AF
	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		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	
	RECORD DATA		Press "Record" button to start data writing onto the microSD™ storage card	
	UNIT		Press "UNIT" button to change units between dBμV/m, dBm and mV	
	BATTERY		Battery level display	
	TIME		Displays time, press to setup	
	THRESHOLD BAR		Displays amplitude level of RF signal detected. Green means RF signal is below reference, Red means RF signal is above reference. Press it to adjust the RF signal references.	
	AUDIO		Selectable audio mode Tone (bell), speaker/volume and mute	
	PEAK	PEAK 67.35	Displays the peak readout of RF signal.	
	AVG	AVG 60.93	Displays the average readout of RF signal.	
	REF	REF 78.39	Displays the reference level setting, either memory or current references.	

Common Display and Controls

POWER and CLEAR

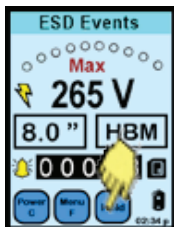
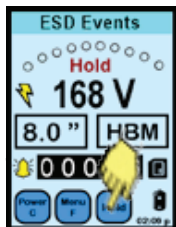


The POWER C button turns off the 3M™ EM Eye Meter CTM048 or clears the values that are on display.

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.

HOLD and MAX



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

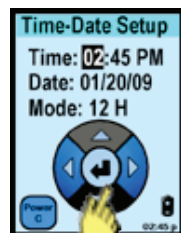
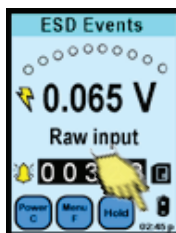
HOLD freezes the current data on the display. The instrument will not be active at this point.

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.

TIME



To set the time, press the time display.

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.

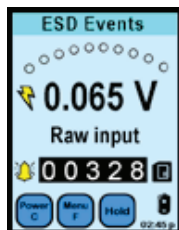
Press the center button to return to the main screen.

Time: AM/PM format or 24-hour format

Date: Format as MM/DD/YY

Mode: 12-hour, 24-hour format

BATTERY



The BATTERY symbol is not a touch feature. It displays the approximate level of battery life remaining for use.



Full charge life.



Half charge



<1 hour charge, charging is required

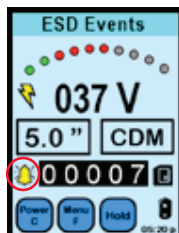


Battery is discharged, charging is required



Charging in progress

AUDIO INDICATORS



The AUDIO INDICATOR button scrolls through the following audio modes:

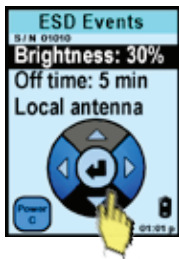
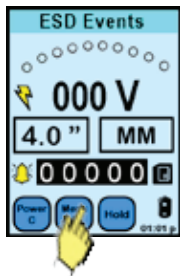
- 1) Tone (bell)
- 2) Speaker at low volume
- 3) Speaker at middle volume
- 4) Speaker at loud volume
- 5) Mute

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-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.



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.

ANTENNA TYPES

Local Antenna

CTS001 is a directional antenna that comes as a default with the set. Use this antenna for general purposes.

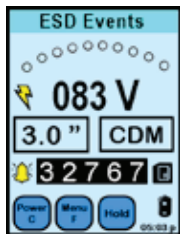


3M™ Remote Antenna

CTC113-6FT – general use omnidirectional antenna, ambient temp, black plastic with screw mounting.



ESD EVENT MAGNITUDE and COUNTER

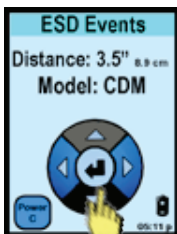
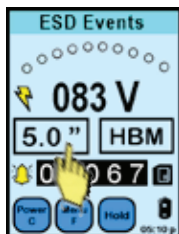


The VOLTAGE display is not a touch feature. This displays the estimated voltage detected at the antenna which corresponds to a filter selected at the ESD MODE button.

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.

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

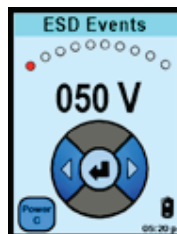
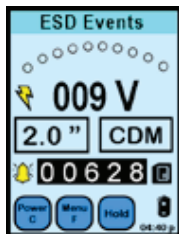
0.5" (1.3 cm) to 15.0" (38.1 cm)

Filter

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

**Not all ESD events are captured by the 3M™ EM Eye Meter CTM048. The magnitude of the event can be measured. CDM, HBM and MM Model results are estimated based on proprietary algorithms.*

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.

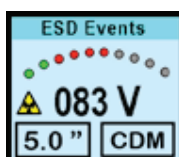
Threshold Levels

0 - 10 Volts at 1V increments

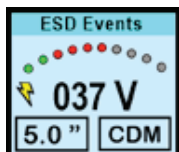
10 - 990 Volts at 10V increments

1 - 999mV for RAW input

"TRUE-ESD FILTER" and "ALL-SIGNAL"

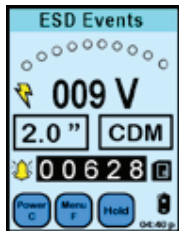


After pressing the lightning bolt symbol or the TRUE-ESD-FILTER button, the triangle button appears on the display. In this mode, the 3M™ EM Eye Meter CTM048 will detect most signals, including ESD and some EMI signals.



After pressing the triangle or the ALL-SIGNAL button, the lightning bolt symbols appears on the display. In this mode, the EM Eye Meter CTM048 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.

DATA STORAGE and READ



The DATA STORAGE button displays the data stored in the microSD™ card found at the bottom of the 3M™ EM Eye Meter CTM048.

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.

MEMORY STORAGE CARD



Memory storage card

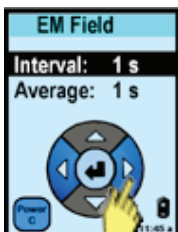
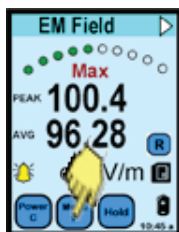
The EM Eye Meter CTM048 works with microSD™ Cards.



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 3M for verification.

Electromagnetic Field Sensor, Power Density Meter and Effective Isotropically Radiated Power (EIRP) Meter Display and Controls

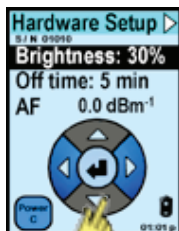
MENU FUNCTION



When the MENU F button is pressed momentarily, the INTERVAL and AVERAGE data recording timing can be configured.

INTERVAL, in seconds, is the sampling time for PEAK data to be recorded onto the microSD™ storage card.

AVERAGE, in seconds, is the sampling time for AVERAGE data to be recorded onto the microSD storage card.

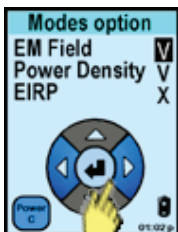


When the MENU F button is pressed for a longer period, the hardware setup is shown. At this point, brightness, off-time and antenna factor can be adjusted.

Relative Antenna Factor (AF)

-40 dBm-1 to 40 dBm-1

Default relative antenna factor for the supplied local antenna is 0.



At the HARDWARE SETUP menu, press the triangle (MODE OPTION) button located at the upper right side of the display.

The MODES OPTION screen is used to enable or disable any of the functions modes: 1) EM field; 2) Power Density; and 3) EIRP.

You can always enable previously disabled modes.

Use the navigation bar as follows:

UP/DOWN scrolls the cursor field through the three modes.

LEFT/RIGHT enables or disables the selected mode.

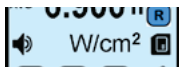
“V” – enabled; “X” – disabled

EMF UNITS CONVERSION



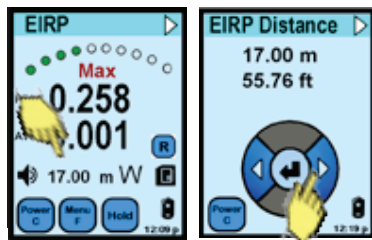
Pressing the UNITS button toggles between dBµV/m and V/m unit.

POWER DENSITY UNITS



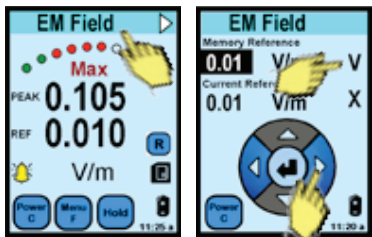
The UNIT button is not a touch feature.
The unit of power density is W/cm².

EIRP UNITS



By pressing the distance area, the distance for EIRP measurements can be configured from 0.25 to 20 meters.

BAR GRAPH/REFERENCE Display and Button



When the bar graph area is pressed, the THRESHOLD mode is entered and the reference level for EMF measurement can be set.

With the NAVIGATOR bar:

Press the left or right arrows to adjust EMF references.
Press the up or down arrows to move the field cursor.
Press the center button to return to the main screen.

Reference options:

1. Memory Reference
2. Current Reference

To choose between Memory or Current reference, press "V" (enable) or "X" (disable) at the right side of display.

Reference mode is helpful if you wish to hear an audio alarm whenever EMF exceeds a certain level. If any of the reference modes are enabled, you should see the REF label shown on the main screen. The bottom line of the display will now show the reference value of the peak signal. PLEASE NOTE: The top line shows the “difference” (not the PEAK as labeled) between the ACTUAL PEAK measured and the REFERENCE setting. Therefore, whenever the “actual peak” value of the EMF signal is higher than the reference, the difference is a positive number and an alarm is issued. In the example display shown, the difference is 0.105 V/m, the reference is 0.010 V/m, therefore the actual peak is 0.115 V/m.

Adjust the reference settings by pressing the THRESHOLD and NAVIGATOR button.

When data is being recorded, the actual peak value above the reference setting will still be recorded.

Memory and Current Reference

These references are used for convenience. The “memory” reference is the value which is stored in the memory all of the time and saved when the device is powered off or when the main battery is removed. The “current” reference is the average value of the measured signal (background noise shown in PEAK value) which was detected by the unit, when you entered into the reference menu. If you enable this reference, it works the same way as the memory reference. When you disable it and switch back to the main menu, this value is lost. Current reference is useful to detect signals with the level higher than background noise.



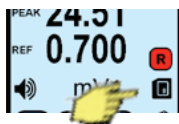
DATA STORAGE and READ (EM Field Sensor)



The RECORD button ("R") writes the displayed readings and settings onto the microSD™ storage card; press the "R" button to activate RECORD. At this point, the button turns red and data is being written onto the storage card. To stop recording, press the red button again. The recording works in conjunction with the settings made on page 21 (Intervals), and/or pages 22-23 (Reference) of this manual.

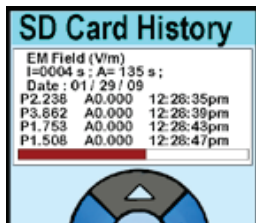
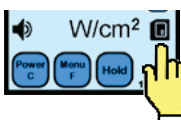
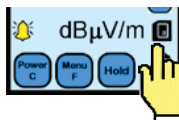
A data line is recorded based on the timing interval which was preset at the "Intervals" menu.

It is also based on the settings for References on pages 22-23. If any of the references are enabled, a data line is added within the preset interval whenever a peak signal was detected above the reference setting. If the Reference is not enabled, data lines are added at intervals showing the current peak and average signals.

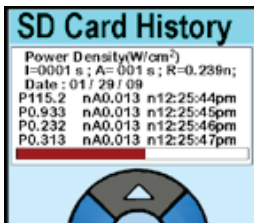


The DATA STORAGE button displays the data stored on the microSD™ card found at the bottom of the meter. Press this button to show the SD™ card history screen. Scroll through the data recorded using the NAVIGATOR button.

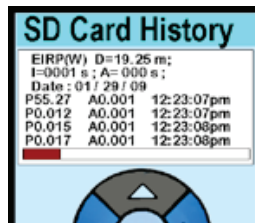
Note: If an "X" mark is overlaid onto the DATA STORAGE button, a noncompatible SD storage card is inserted. (See Data Storage section.)



EM FIELD Data:
(EM field meter) (Units) (Interval)
(Average) (Date) (Peak) (Average
record) (Time)



POWER DENSITY Data:
(Power density meter) (Interval)
(Average) (Reference) (Date)
(Peak) (Average) (Time)

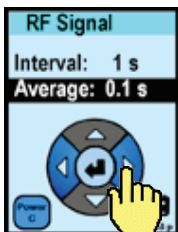
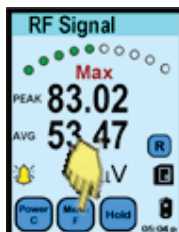


EIRP Data:
(EIRP meter) (Distance) (Interval)
(Average) (Date) (Peak) (Average
record) (Time)

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

RF Signal Sensor Display and Controls

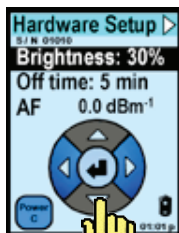
MENU FUNCTION



When the MENU F button is pressed momentarily, the INTERVAL and AVERAGE data recording timing can be configured.

INTERVAL, in seconds, is the sampling time for PEAK data to be recorded onto the microSD™ storage card.

AVERAGE, in seconds, is the sampling time for AVERAGE data to be recorded onto the microSD storage card.

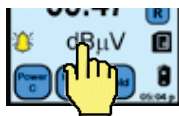


When the MENU F button is pressed for a longer period, the hardware setup is shown. At this point, brightness, off-time and attenuation can be adjusted.

Attenuation (ATT): If the input to the antenna is big enough, set the attenuation from 0 to 20dB.

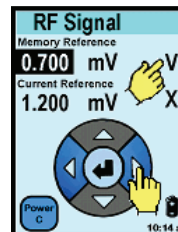
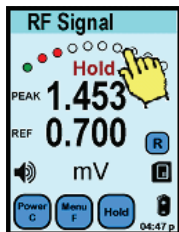
When the attenuation is set to 20dB, an additional label of "20dB" is placed along with the "RF Signal" top heading.

RF UNITS CONVERSION



When pressed, the units area toggles between dBμV, dBm and mV units.
dBμV → dBm → mV

BAR GRAPH/REFERENCE Display and Button



When the bar graph area is pressed, you can set the reference level for RF measurement.

With the NAVIGATOR bar:

Press the left or right arrows to adjust RF references.
Press the up or down arrows to move the field cursor.
Press the center button to return to the main screen.

Reference options:

1. Memory Reference
2. Current Reference

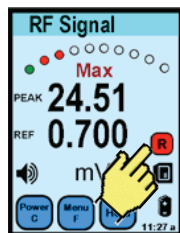
To choose between Memory or Current reference, press "V" (enable) or "X" (disable) at the right side of display.

Reference mode is helpful if you wish to hear an audio alarm whenever the RF exceeds a certain level. If any of the reference modes are enabled, you should see the REF label shown back in the main screen. The bottom line of the display will show the reference value of the peak signal. PLEASE NOTE: The top line shows the “difference” (not the PEAK as labeled) between the ACTUAL PEAK measured and the REFERENCE setting. Therefore, whenever the “actual peak” value of the RF signal is higher than the reference, the difference is a positive number and an alarm is activated. In the example display shown, the difference is 1.453mV, the reference is 0.700 mV, therefore the actual RF signal peak is 2.153 mV.

Adjust the reference settings by pressing the THRESHOLD and NAVIGATOR buttons.

When data is being recorded, the actual peak value above the reference setting is recorded, not the “difference” value.

DATA STORAGE and READ (RF Signal Sensor)

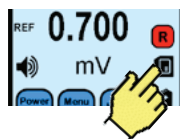


The RECORD button (“R”) writes the displayed readings and settings onto the microSD™ storage card; press the “R” button to activate RECORD. At this point, the button turns red and data is being written onto the storage card. To stop recording, press the red button again.

The recording works in conjunction with the settings made on page 25 (Intervals), and/or pages 25-26 (Reference) of this User’s Guide.

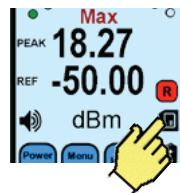
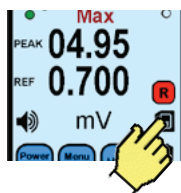
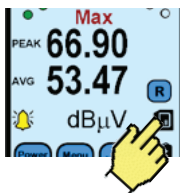
A data line is recorded based on the timing interval which was preset at the “Intervals” menu.

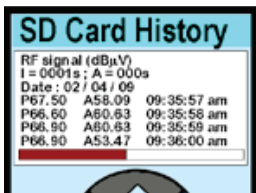
It is also based on the settings for References on pages 25-26. If any of the references are enabled, a data line is added within the preset interval whenever a peak signal was detected above the reference setting. If the Reference is not enabled, data lines are added at intervals showing the current peak and average signals.



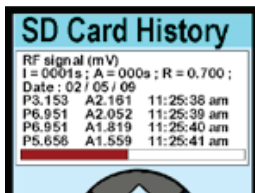
The DATA STORAGE button displays the data stored on the microSD™ card found at the bottom of the meter. Press this button to show the SD™ card history screen. Scroll through the data recorded using the NAVIGATOR button.

Note: If an “X” mark is overlaid onto the DATA STORAGE button, a noncompatible SD storage card is inserted. (See Data Storage section.)

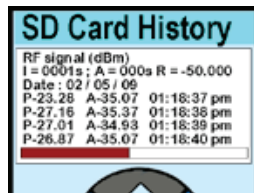




RF Signal Data:
(Interval) (Average) (Date) (Peak)
(Average record) (Time)



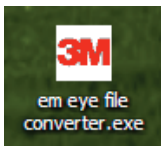
RF Signal Data:
(Interval) (Average) (Reference)
(Date) (Peak) (Average) (Time)



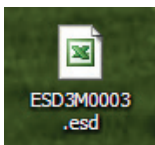
RF Signal Data:
(Interval) (Average) (Reference)
(Date) (Peak) (Average record)
(Time)

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

To Access the Data Using a PC



1. Go to www.3Mstatic.com, click on Technical Info, Software Downloads to download the EM Eye File Converter software that will allow you to access the data from the 3M™ EM Eye Meter CTM048 from your PC.
2. Download the .EXE or the .ZIP files for the EM Eye Meter CTM048.
3. Install the program "em eye file converter.exe".



4. Insert your microSD™ card assembly into the SD card reader. In the EM Eye File Converter software, click on the file folder icon. From there, navigate to your SD card location. Run and open the file from the microSD™ card. The extension is "ESD3M0003.esd".

Record * 00003
Total Events : 0000013
Date : 01/22/09
Start Record Time : 02:29:39pm
ESD Sensor : RAW input
cdm filter : on
Antenna : Local
Reference : 0.000 V

Number	Time	Value(V)
1	2 29 39 PM	0.188
2	2 29 39 PM	0.03
3	2 29 39 PM	0.009
4	2 29 41 PM	0.216
5	2 29 43 PM	0.137

5. From the data shown, select the row of data.
6. Save it into a folder.
7. Launch Excel application.
8. Open the file that you just saved from the folder.
9. Sort and analyze data by using the tools in Excel.

Calibration

The 3M™ EM Eye Meter CTM048 comes from the factory calibrated. It is recommended that you calibrate the EM Eye Meter CTM048 once a year at the factory.

Specifications

GENERAL	
Audio Indicators	Speaker: Beep or analog audio with selectable volume
External Data Storage	microSD™ Card
Recording Interval	Peaks: 1 – 360 seconds Average signals: 0.1 – 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: 100-240V ~ 50-60 Hz 0.2A Output: 5.0V 1000mA Center: Positive, ID 1.3 mm; OD 3.5 mm
ESD EVENT SENSOR	
ESD Event Detection Characterization Modes	Raw input for magnitude and estimated CDM, HBM, MM using proprietary algorithm
Raw Input Resolution	1mV (1mV-15mV) ; 15 mV (15mV-1500mV) (Detection Resolution: 1mV)
Threshold (Display) Resolution	1-10 Volts, 10-990 Volts Raw input: 1mV (1-15mV) and 15mV (15-1500mV)
Distance Detection Range	1.3 cm (0.5 in.) – 38.1 cm (15.0 in.)
ESD Counter Range	0 – 32,767 counts (screen count)
Hardware Setup	Adjustable Brightness, Auto-off-time

ELECTROMAGNETIC FIELD SENSOR

Function Modes	Electromagnetic Field	Power Density meter	EIRP meter
Peak range	Min: 0.001 V/m Max: 20.00 V/m	Min: 0.027 nW/cm ² Max: 106.1 uW/cm ²	Min: 0.001W Max: 5333 W
Average range	Min: 0.001 V/m Max: 20.00 V/m	Min: 2.65 nW/m ² Max: 1.06 Watts/m ²	
Units	V/m	W/cm ²	Watts

Antenna Factor range -40.0 to 40.0 dBm

Hardware setup Brightness, Off-time, Antenna factor (AF)

Antenna options Local, or remote (CTC 111)

Record interval range 1 – 360 seconds

Record average range 0.1 – 360 seconds

RF SIGNAL SENSOR

Unit modes dBuV , dBm , mV

Dynamic range Min: -55 dBm
Max: 0 dBm

ATT (Attenuation) 00 dB / 20 dB

Model and Part Numbers

CTM048-2128 3M™ EM Eye Meter with ESD and EMI sensors, 80-0012-2091-4

CTM048-21 3M EM Eye Meter with ESD sensor, 80-0012-2092-2

CTM048-28 3M EM Eye Meter with EMI sensor, 80-0012-2093-0

CTM048-29 3M EM Eye Meter with RF sensor, 80-0012-2094-8

When sensors are added to a customer's existing EM Eye Meter CTM048:

CTC021 ESD sensor for use with the CTM048 EM Eye Meter, 80-0012-2095-5

CTC028 EMI sensor for use with the CTM048 EM Eye Meter, 80-0012-2096-3

CTC029 RF sensor for use with the CTM048 EM Eye Meter, 80-0012-2097-1

Regulatory Information

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

ICES Statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la NMB-003 du Canada.

WEEE Statement

The following information is only for EU-members States: The mark shown to the right is in compliance with Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE). The mark indicates the requirement NOT to dispose the equipment as unsorted municipal waste, but use the return and collection systems according to local law.

CE Statement

Meets CE (European Conformity) requirements.

3M is a trademark of 3M Company.

microSD is a trademark of SD-3C, LLC Limited Liability Company Delaware

Important Notice

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This product will be free from defects in material and manufacture for one year from the time of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.**



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