



**TRANSFORMING TECHNOLOGIES**  
*OUTSTANDING ALTERNATIVES IN STATIC CONTROL*

RESISTANCE  
**RANGER**

**RangerBOSS Network Ready Constant Monitor  
Model CM2800**



**Instruction Manual**

# Contents

<b>1</b>	<b>Description</b>	
	CM2800	1
	Features	1
<b>2</b>	<b>Installation</b>	
	Installation Instructions	2
	Installation Diagram	3
<b>3</b>	<b>Operation</b>	
	Wrist Strap Indications	5
	Mat Indications	6
	GND monitor Indications	6
	Maintenance	6
<b>4</b>	<b>Specifications</b>	7
<b>6</b>	<b>Service and Warranty</b>	9

## ***Ohm Metrics Resistance Monitor: CM2800***

The Ohm Metrics' CM2800 Series dual conductor workstation monitor provides continuous monitoring of voltage and resistance for two wrist straps along with two mat and two workstation tool grounds. The status' are displayed using tricolor LED's on the front panel of the monitor and abnormal levels trigger an alarm to inform operators on the line. Utilizing low-voltage, resistive loop technology, and dual conductor ground products, the CM2800 is an extremely sensitive and reliable ground monitoring for use in highly critical areas.

The CM2800's alarm settings can be reconfigured quickly and easily with the optional PC software CM2800-SEE. Operator Resistance, Operator Voltage, Work-surface Resistance, Operator Presence Check (OPC) and Resistance of Equipment alarms can be enabled/disabled and limits selectable to user specifications.

The CM2800 is network ready and can easily be connected to other workstation monitors and a computer using the high speed network router, CM2800-H. The host computer can be transformed into a command center with the software CM2800-BOSS SEE, a central monitoring program that shows real time grounding results and allows for adjustment of alarm parameters of up to 4096 workstations. An entire assembly line's ESD protection can be remotely monitored and adjusted with one computer.

### **Features:**

- Monitors two wrist straps, work surfaces and tools.
- User programmable alarm levels
- Network Ready
- Ultra-Low voltage for highly critical areas.

## Operation

The CM2800 monitors the grounding functions of a workstation and alerts users when levels are out of the set range. The CM2800 has the capabilities to monitor:

**Operators:** Resistance and voltage of two wrist straps/personnel,

**Work surfaces:** Resistance levels of two dissipative surfaces.

**Tools:** Resistance levels of two grounded work station tools.

## Alerts

If any parameters exceed the preset high limits, the corresponding LED on the front panel of the monitor will change color from **green** (OK) to **red** (high warning) to indicate the abnormal situation. If the resistance is below preset low limit, the LED color will be **yellow** (low warning).

An audible alarm will sound, in addition to the corresponding LED indicator when the resistance is in an abnormal state. For instant differentiation, a single beep will sound if the abnormal situation occurs on "Station 1" whereas a double beep sound for "Station 2".



LIGHTS:

High Warning ■ Low Warning ■ OK ■ Idle/Disabled ■

(LED indicators illustration of GZ-1800 front panel.)

- "OP 1" - Grounding resistance of operator 1
- "OP 2" - Grounding resistance of the operator 2
- "V1" Induced voltage on operator 1 .
- "V2" Induced voltage on operator 2.
- "MAT1" Grounding resistance of work surface 1
- "MAT2" Grounding resistance of work surface 2
- "G1" Grounding resistance of tool 1
- "G2" Grounding resistance of tool 2

## 1. Operator Grounding

The operator is grounded when the dual conductor wrist strap is plugged in to the jack labeled “OP” of the grey remote. The corresponding LED label “OP” and “V” will be GREEN if levels are normal. If the any of these parameters exceed preset high limits, the corresponding LED will turn RED and alarm will sound. If the resistance of the wrist strap is below preset low limit, the LED will turn YELLOW and alarm. If the wrist strap is not plugged into the remote terminal jack, the LED’s of both “OP” and “V” will be off to indicate the stand-by mode. **Factory set resistance limit is 1.8 megohm. Default Voltage limit is 2V .**

Since the CM2800 is designed with a Ultra-Low Voltage circuit, the measurement voltage of the grounding resistance of the operator body can be as low as 0.2V. Therefore, when the low resistance of the wrist strap is measured, it may be affected by the small “Battery Effect” existed between the contact of the human body skin and the wrist-strap metal stud. To avoid this, the the low resistance measurement is disabled by default. If this measurement is turned on and the value is affected, you can reverse the direction of the wrist strap stud to resolve the influence.

### **Operator Presence Check (OPC) Alert**

Stand-By Mode (or “idle mode”) is when the monitor is powered on, and there is no wrist straps plugged in to the remotes. At this time, the monitor will start Operator Presence Check (OPC) if enabled. OPC is a pre-programmed count down that will trigger an alarm if the operator does not plug in the wrist strap into the remote jack in the specific time. The LED of “OP” and “V” will turn red and flash to indicate an OPC warning. OPC warning will stop after a wrist strap is plugged in to the remote.

If the cable connecting to a wrist strap remote is unplugged or severed at either end, the monitor's audible alarm will sound, and the corresponding "OP" LED will turn red.

*Note: Each remote has two jacks labeled "OP" and "AUX". The "OP" jack is monitored and "AUX" jack is not, but provides a grounding path for one more wrist strap. The status of "AUX" will not affect "OP".*

## **2. ESD Mat**

The CM2800 can monitor the ground resistance of two dissipative surfaces. When the resistance is within acceptable limits, the LED labeled "MAT" will be GREEN. If it exceeds preset high limits, the LED will change to RED and an alarm will sound. Factory limits are set at 100 meg ohm.

## **3. Tool**

The CM2800 monitor measures the low value grounding resistance of equipment or a tools in the range of 2 to 20 Ohm. Typical examples of equipment are electronic microscope or test instruments. When the resistance is within acceptable limits, the LED labeled "G" will be GREEN. If it exceeds preset high limits, the LED will change to RED and an alarm will sound. Only 100 microamperes of current are used for this measurement, and as a result only 4mV of potential is induced on the instrument being monitored.

## Installation

Before you install your device, check for the items below:

- **1 - CM2800 workstation monitor**
- **2 - Remote Jacks**
- **1 - Power Supply**
- **2 - Telephone Cables**
- **3 - Grounding Cables: FM1515, FM1515CM, FM1515NR**

Please carefully read the following instructions before proceeding with product installation.

1. Install monitor in a location where alarm indicators will be visible and alarm will be audible to operator. Typical locations are under a workstation table or low shelf.
2. Mount monitor securely in place with Velcro.
3. Install remote wrist strap terminals in a convenient location for operators. Frequently remotes are mounted on the underside of the workbench nearest operators.
5. Plug the telephone cable from the left remote to the **OP1** on the back of monitor.
6. Plug the telephone cable from the right remote to the **OP2** on the back of monitor.
7. Connect the bare end of the **FM1515CM** wire to the terminal on the back of the monitor labeled **GND** and connect to GROUND. See wiring diagram.

**Mat Set Up:** If no grounded ESD mats are to be monitored, connect a wire from both **M1** and **M2** terminals to the **GND** terminal on the back of the monitor and skip steps 8 and 9.

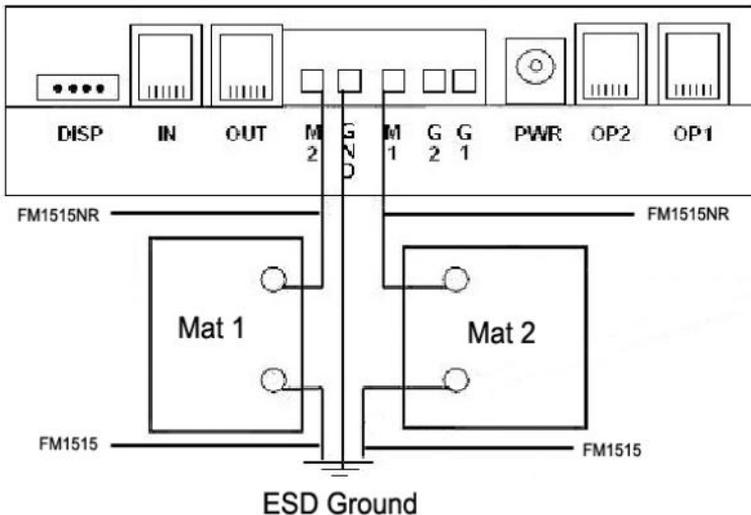
8. Connect the **FM1515NR** cord from the first grounded Mat to the terminal on the back of the monitor labeled M1.
9. Repeat step 8 with an additional FM1515NR (not-included) if an additional mat is to be grounded. If not, connect a wire from M2 to GND to disable alarm function.

**Note:** The work surface mats have to be connected to the CM2800 with zero Ohm wire for proper mat monitoring operation. Using a wire with a 1M resistor may cause alarm. The FM1515NR is the provided zero Ohm cord and more can be purchased from Transforming Technologies.

**Tool Set Up:** If there are no **Tools** to be monitored, connect a wire from both **G1** and **G2** terminals to the **GND** terminal on the back of the monitor and skip steps 10 and 11.

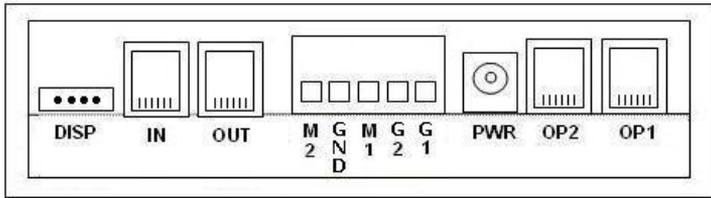
10. Connect a **wire** from the first Tool grounded connection to the terminal on the back of the monitor labeled **G1**.
11. Repeat step 10 with if an additional tool is to be grounded. If not, connect a wire from **G2** to GND to disable alarm function.
12. Plug power supply into the PWR connector on the back of the monitor and into the power line.

Wiring Diagram



Connection for the Tool (G1 & G2) mimic the connection for the Mats

(The connections illustration of GZ-1800's back panel.)



1. **DISP**-signal connection for the optional display module CM2800-D.
2. **IN/OUT RS-485 ports** – used when multiple units of monitors are being installed and interlinked. A maximum of 4 sets of CM2800 and CM2800-D can share a single DC adaptor with 1A power capacity.
3. **M1, M2 GND, G1 G2** - Wiring Ports to connect mats and tools to monitor and the monitor to ground.
4. **PWR** - port for AC power adapter
5. **OP1/OP2 port** is the connection to the wrist strap remotes.

There is an “I/O port” on the left-hand side of the CM2800 to support an external relay box. The optional relay box provides 3 dry-contact relays for OP1, OP2 and an external control port. When CM2800 is power on, the NO and COM contact is shorted as the default setting of external control port. When CM2800 is power off, the NO and COM contact will be opened.

### Calibration and Periodic Testing

Except the operator resistances, CM2800 never needs calibration. You can verify proper operation of the monitor by periodically testing the monitor with a resistance limit comparator box CM2800PV. Every CM2800 unit is calibrated at factory to meet the following criteria:

**Operator Resistance:**  $\pm 10\%$

**Operator voltage:**  $\pm 10\%$ , or within 3 counts at 2V or less

**Mat resistance:**  $\pm 10\%$

**Tool resistance:**  $\pm 10\%$ , or within 3 counts at 5 $\Omega$  or less

If you need to calibrate the operator resistance of your CM2800 unit, please contact Transforming Technologies

## Accessories

The CM2800 comes with a line of optional accessories:

1. **CM2800-D**: Digital Display & External Control Module
2. **CM2800-SEE**: Alarm and Hardware Management Software
3. **CM2800-H**: Network Router
4. **CM2800-IMS**: Real-time Central Monitoring Software
5. **GZ-Relay**: External Relay Box

### CM2800– D: Digital Display Unit.

CM2800-D is a digital display unit used with a CM2800 ESD monitor. It displays the values of the results that CM2800 measures in a real-time so that the users in the field can observe the accurate measurements of the monitoring status. Besides the digital measurement values, the device can also show the current limit options and other external interface control settings selected by the user. Using external control interfaces located on the back of the device, the CM2800 can attach the warning of each operator to an external siren.



CM2800 with the CM2800-D attached.

Using external control interfaces located on the back of the device, the CM2800 can attach the warning of each operator to an external siren.

Push the red “Menu” Button to enter the 1st page of the on-screen menu. There are total of 8 pages. The display module will go back to main screen if the menu screen is idle for more than 30 seconds. Displays “O” for monitored items, “X” for disabled items.

## CM2800-D Display Screens



**Main Screen:** Display the real-time measurement value of the resistance and voltage.

**PAGE 1:** CM2800's ID number, S/N#, current limit option and status for V1 & V2.

**PAGE 2:** Current High/Low limit option and status of OP1&OP2.

**PAGE 3:** Current limit option and status of M1, M2, G1 & G2.

**PAGE 4:** Real-time measurement results in "OK" or "Err" for all monitored items of CM2800.

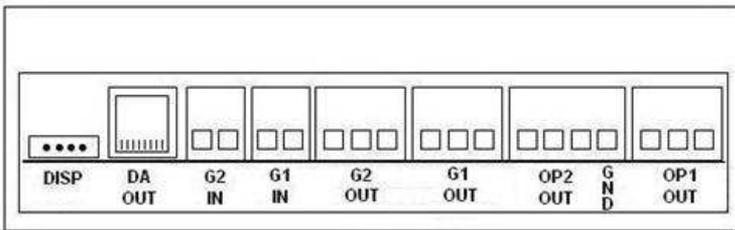
**PAGE 5:** Current limit option and status of OPC1.

**PAGE 6:** Current limit option and status of OPC2.

**PAGE 7:** Current control status of G1 & G2

**PAGE 8:** Hardware version of CM2800 & CM2800-D.

## CM2800-D Back Panel



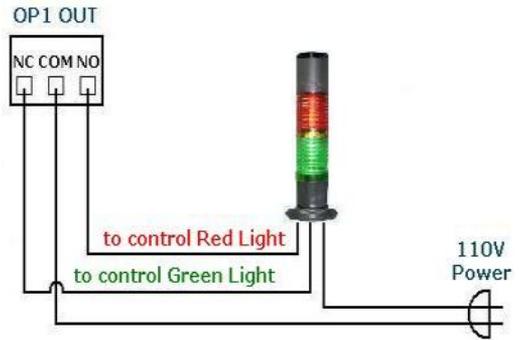
CM2800-D is connected to a CM2800 through the port "DISP".

- **"OP1 OUT"**: Dry-Contact relay output for OP1 alarm.
- **"OP2 OUT"**: Dry-Contact relay output for OP2 alarm.
- **"GND"**: DC power ground.
- **"G1 OUT"**: Dry-Contact relay output for G1 alarm.
- **"G1 IN"**: Open/Short input control from external device for G1. Shorted input means the IN is active.
- **"G2 IN"**: Open/Short input control from external device for G2. Shorted input means the IN is active.
- **"DA OUT"**: Digital/Analog Output. These signals are optional.

The “OP1 OUT” dry-contact relay is activated along with the monitoring status of OP1’s resistance and voltage. When OP1’s resistance or voltage exceeds the preset limits, the corresponding built-in dry contact relay will switch from NC to NO. Every relay has 3 contacts with the center contact as common contact, the left contact as NC (Normally Close) and the right contact as NO (Normally Open). Each of these relays has contact rating of 1A at 30VDC, 2A at 120VAC, and 3A at 24VDC.

The “OP2 OUT”, “G1 OUT” and “G2 OUT” can be activated in a way similar to “OP1 OUT”.

These relay contacts can be used to control the external devices such as a tower siren or other access control devices. In the connection diagram on the right, we illustrate how to utilize “OP1 OUT” to control an external 110V Green/Red tower alarm.

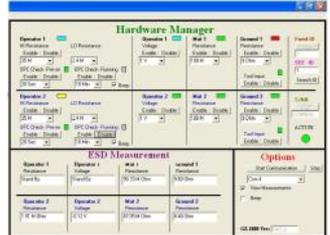


**(Note:** You need to reserve 250mA power capacity for each CM2800 with digital display module CM2800-D among the inter-linked units that share the same DC power adaptor. For example, a 1A DC power adaptor will be required if you plan to let 4 sets of CM2800 + CM2800-D share one DC power.) These monitors are interlinked with a special 10-foot communication cable provided by Transforming Technologies with the Part# of **GZ-485CABLE**.

## CM2800 SEE - Hardware Management Program

The CM2800-SEE is a PC-based program that communicates to the monitor through an RS-232 port and an RS-232/RS-485 converter. All the CM2800 supported monitor functions can be re-configured dynamically with a clear on-screen menu:

- Enable/Disable operator resistance and voltage measure
- Set the limit of operator resistance and voltage
- Enable/Disable ESD mat resistance
- Set the limit of ESD mat resistance
- Enable/Disable Tool/Equipment resistance
- Set the limit of Tool/Equipment resistance
- View the measured data in real-time
- Set the monitor ID and Description



CM2800 SEE On Screen Menu

## CM2800-H - CM2800 Network Router

CM2800-H is a dedicated network router to be used with a CM2800 dual wire ESD monitor. It has 4 connection ports each of which can connect to a maximum of 32 CM2800 monitors. A maximum of 128 monitors can be connected to this Router. The Router contains an RJ45 port that can connect to a LAN through TCP/IP. A special high speed processing technique is used in the Router to provide high performance data processing and communication amongst networked monitors and the host PC-based network management software.

## CM2800 IMS - Central Monitoring Software

The CM2800-IMS is a PC-based control program used to monitor a network of CM2800 monitors. A host computer is transformed into a command center with the CM2800-BOSS SEE, a central monitoring program that shows real time grounding results and allows for adjustment of alarm parameters of up to 4096 workstations. An entire assembly line's ESD protection can be remotely monitored and adjusted with one computer.

For more information on the CM2800 accessories please contact Transforming Technologies.

## CM2800 Series Monitor Specifications

**Wrist-strap resistance alarm limit:** User programmable from 750K $\Omega$ ~2.4M $\Omega$  resistance for “Low” wrist-strap alarm and 8M $\Omega$ ~35M $\Omega$  resistance for “High” wrist-strap alarm.

**Maximum wrist-strap operator voltage:** 50 mV max with 10 M max operator resistance, less than 100 mV under wrist strap open fault conditions.

**Operator Voltage Detection:** User programmable to detect a voltage on the operator relative to ground, from +/- 1 volt up to +/- 5 volts in increment of 1 volt.

**Mat (soft ground) resistance alarm limit:** User programmable from 1M $\Omega$  to 140M $\Omega$ .

**Maximum mat (soft ground) voltage:** Less than 50 mV even under fault conditions.

**Tool (hard ground) resistance alarm limit:** User programmable from 2 $\Omega$  resistance to 20 $\Omega$  resistance.

**Maximum tool (hard ground) voltage:** Less than 50 mV even under fault conditions.

**Maximum tool (hard ground) current:** Less than 0.2 mA.

**Configurability:** Every monitored parameter can be programmed by a PC-based program to be enabled / disabled or to set the alarm limit to a specific threshold.

**RJ-485 Socket IN/OUT Communication:** Built-in RJ-485 IN and OUT communication ports to support multiple units drop-line internetworking.

**DC Power Supply:** 7-15 VDC, 100mA.

AC Input: 100-240 VAC, 1A. (The excess current capacity is reserved for multiple units interlinking.)

## CM2800-D Technical Specification

**Parameters Status:** display ID# and S/N#, current high/low limits, monitored item options selected, and current monitoring result for operator resistance, operator voltage, mat resistance, tool resistance

**Tool Control Status:** display current status of external interface control settings of G1 and G2

**OPC Status:** display current status and control limits

**Display Control:** mini Enable/Disable push button

**LCD Display:** 20 x 2 characters

**DC Power Supply:** 5VDC, 150mA

**Dimensions:** L: 4in W: 3in H: 1in

## **Service and Warranty**

Transforming Technologies, LLC provides a limited warranty for the CM2800 series. All new products are guaranteed to be free from defects in material and workmanship for a period of one (1) year from the date of shipment. Liability is limited to servicing (after evaluating, repairing or replacing) any product returned to Transforming Technologies. The company does not warrant damage due to misuse, neglect, alteration or accident. In no event shall Transforming Technologies be liable for collateral or consequential damages. **NOTE:** *Wrist strap remotes terminal boxes are subject to mechanical wearing and considered to be “consumable items”. They have separate warranty of 6 months.*

To receive service under warranty, please contact Transforming Technologies Technical Support.

## **About Transforming Technologies**

Since 1998, Transforming Technologies, has provided critical solutions to the numerous manufacturing problems associated with static electricity. Transforming Technologies offers a wide range of unique and outstanding products to detect, protect, eliminate and monitor electrostatic charges. Our products are integral components of an effective static control program.

## Transforming Technologies, LLC



3719 King Rd.

Toledo, Ohio 43617

Phone: 419-841-9552

Fax: 419-841-3241

E-mail: [info@transforming-technologies.com](mailto:info@transforming-technologies.com)