

**3M**

# Model 725 Wrist Strap Monitor Instructions



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## Safety Information

### *Intended Use*

The 3M™ Model 725 Wrist Strap Monitor is designed to monitor the operation of a wrist strap grounding system for a single operator. This product has been designed and tested

for use with 3M™ Dual Conductor Wrist Straps and 3M™ Work Surfaces Grounding Systems (Fig. 1). This unit is powered by a 9 volt battery. Use of other components may cause improper performance and or an unsafe condition.

### CAUTION

- Incorrect grounding of an operator may cause electrostatic discharge (ESD) damage to components or assemblies being handled. For proper grounding of the operator when using the 3M 725 Wrist Strap Monitor, connecting to an electrical ground with the supplied ground wire and metal ground clip is required.
- Verify that the electrical ground point is suitable. If you are not sure what a suitable ground is, contact a licensed electrician before installation.

### Explanation of Symbols



– Caution: refer to user instruction manual.



– See user instruction manual for explanation of the indicator lamp.



– See user instruction manual for explanation of the audible alarm.

Read and Understand all Safety Information Before Operating this Equipment.

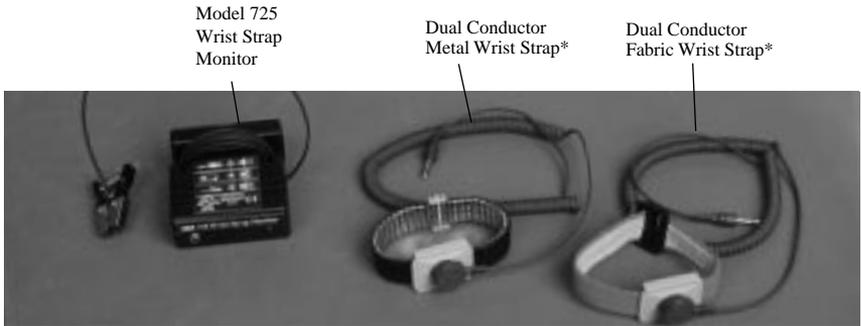


Fig. 1 - Model 725 Wrist Strap Monitor with dual conductor wrist strap assemblies

## Section 1. Theory of Operation (Refer to Fig. 1)

The 3M™ Model 725 Wrist Strap Monitor is designed to monitor the operation of the wrist strap grounding system of a single operator. The system features special wrist bands and ground cords that contain two independent conductors.\*

The Model 725 Monitor performs a resistance measurement by applying an electrical current of less than 1  $\mu$ A. The path for the current is through one conductor of the wrist strap ground cord that contains a current-limiting resistor, through one side of the wrist band, through the skin of the wearer under the band, through the second side of the wrist band, through the second conductor of the wrist strap ground cord that contains a current-limiting resistor, and finally back to the monitor.

\* 3M Dual Conductor Cord & Wrist Band are required for use with the 725 Monitor, ordered separately.

If the resistance of the wrist strap loop is less than 35 megohms\*\*, the wrist strap ground cord, wrist band, and the interface of the wrist band to the arm of the wearer are considered to be functioning correctly. If the measured resistance is over 35 megohms\*\*, a red lamp flashes along with a chirping audible alarm.

In addition, the Model 725 monitors the ground clip connection to a predetermined electrical ground. This is accomplished by measuring the resistance from the monitor, through one conductor of the monitor's ground cord and metal clip, through the ground point conducting medium, through the other metal clip and conductor of the monitor's ground cord, and finally back to the Model 725 Monitor. If the resistance of this loop exceeds 10 megohms\*\*\*, a red lamp will illuminate with a continuous audible alarm. This indicates that there is a problem with the monitor's ground cord or the ground point connection.

\*\* Resistance values are  $\pm 15\%$

\*\*\* Resistance values are  $+15\%$ ,  $-50\%$

**▲ Caution**

The Model 725 Monitor does not have the capability of verifying that the ground point is a suitable ground. If you are not sure what a suitable ground is, contact a licensed electrician before installation.

The Model 725 Monitor requires only a small amount of current to operate. When the red lamp and the audible alarm are activated simultaneously the monitor requires approximately 5  $\mu$ A of current. When the lamp and alarm are not activated (normal condition) the monitor requires approximately 50  $\mu$ A of current.

As with any battery operated electronic device, the life of the battery will be determined by the frequency of use. However, for the Model 725 Monitor you can expect a battery life of approximately one year in continuous operation under normal conditions.

**Note:**

*Use an alkaline battery for longer life.*

The Model 725 monitors the battery voltage and alerts the operator when it is necessary to change the battery. When the battery voltage falls below 6 volts the red lamp will illuminate with no audible alarm. At this time the Model 725 is still operational, making reliable resistance measurements of the wrist strap assembly and the ground connection.

*Voltage on Operator when Connected to the Model 725 Monitor*

There is a concern about the voltage that is applied to an operator while they are connected to a monitor. Some of today's electronic components are extremely sensitive to electrostatic discharge from a person (less than 10 volts). The following chart for the Model 725 Monitor illustrates the level of voltage that will appear on the operator under various resistance conditions.

**Voltage on Operator When Connected to the Model 725 Monitor**

<u>Condition</u>	<u>Observed Voltage</u>
No Skin Resistance	0.8V
200K Ohm Skin Resistance	0.9V
Likely Case Before Alarm	3.5V
Worst Case Before Alarm	6.8V
Absolute Worst Case	9.0V

**Note:**

For more information about wrist strap monitoring see *Additional Wrist Strap Monitoring Information (Section 12)*.

## Section 2. Operating Your System

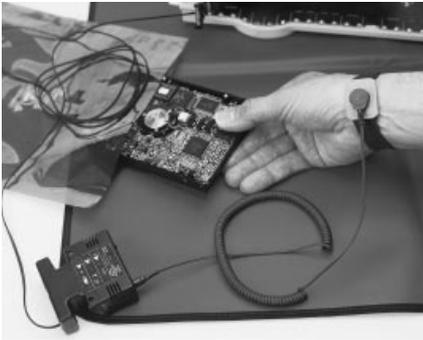


Fig. 2

To operate the 3M™ Model 725 Wrist Strap Monitoring system, attach the monitor's (6 ft.) ground cord with dual conductor ground clip to a suitable ground.

**⚠ Caution**

If you decide not to use the dual conductor ground clip that is attached to the monitor's ground cord in the way described in this user instruction manual, observe the following precaution: Attach each of the two wires of the monitor's ground cord to separate ground bonding points. By attaching the wires to the same ground but at different physical locations, the monitor can check for loose or lost connections.

Attach a 3M™ Dual Conductor Ground Cord to a 3M™ Dual Conductor Wrist Band. Place the wrist band on your wrist and plug the cord into the jack on the front of the Model 725 Monitor. Plugging into the jack activates the monitor and causes it to emit a short beep and the red lamp to momentarily flash. If the red lamp flashes with an intermittent audible alarm or at any time during use, the resistance of the wrist strap assembly is greater than 35 megohms.\*\* If the red lamp and the audible alarm remain on continuously, check the dual conductor ground clip connection.

The system is now ready for use.

**Note:**

*Operators may complain that the alarm is sounding too often until they learn to adjust the wrist band to fit securely or apply an approved skin moisturizer on a frequent basis. Please remember that the monitor is informing you that the operator is exceeding the established static control requirement for resistance to ground when wearing a static protective wrist strap assembly. These alarms alert the operator when sensitive electronics are possibly being exposed to static electricity. Prior to incorporating the wrist strap monitor into your static control process, the operator was unaware of these events.*

\*\*Resistance values are  $\pm 15\%$

### Section 3. Installation When Attaching to a Static Control Work Surface



Fig. 3

The Model 725 Monitor can be used to ground a work surface while providing a monitored grounding point for an operator. To ground a work surface, the Model 725 Monitor contains a snap located on its bottom cover, that is connected internally to the monitor's ground cord. To use this feature there must be a female (10 mm) snap fastener attached to the grounding layer of the work surface. Simply align the male snap on the monitor with the female snap on the work surface and press downward on the monitor. The work surface is now automatically grounded through a one megohm resistor by the Model 725 Monitor.

#### **Note:**

*Although the work surface is grounded by the Model 725 Monitor, it is not monitoring the ground to the work surface.*

3M™ 8200 Series Work Surfaces use the female 10 mm (3M™ Model 3050) snap fastener for grounding. 3M™ 1800, 8300, and 8800 Series Work Surfaces use the female 10mm (3M™ Model 3034) snap fastener for grounding. In addition all 3M™ 8500 Series Portable Field Service Kits include the 10 mm (3M Model 3034) snap fastener.

Use of an optional 3M™ 3057 Stand-By Jack at the work station extends the life of the monitor's input jack. The user disconnects the wrist strap ground cord from the wrist band and plugs into the 3057 jack which is mounted at the work station. Plugging into the 3057 jack prevents the Model 725 from continuously alarming when disconnected from the wrist band.

The system is now ready for use.

## Section 4. Installation Under Work Bench



Fig. 4

The Model 725 can be mounted under a work bench by securing with two #8 screws (not supplied) through the mounting hole tabs located on the top cover.

### **Note:**

*Use of the monitor in this way precludes grounding a work surface through the snap connector on the bottom of the monitor. A static control work surface, if present, would require grounding separately through an additional ground cord.*

When mounting the Model 725 Monitor under a work bench for non mobile use, remove the parking clip (Section 6) from the Model 725 Monitor using a small screwdriver. The Model 725 Monitor is now ready to mount.

Position the monitor so that it is convenient for the operator to plug their wrist strap ground cord into the jack on the front of the monitor. It is

recommended that the front face of the monitor be flush or slightly recessed from the front edge of the work bench. Attach the monitor to the work bench with the screws. It may be necessary to pre-drill pilot holes for the screws.

Attach the dual conductor ground clip or each wire of the monitor's dual conductor ground cord to a suitable ground.

### **⚠ Caution**

If you decide not to use the dual conductor ground clip that is attached to the monitor's ground cord in the way described in this user instruction manual, observe the following precaution: Attach each of the two wires of the monitor's ground cord to separate ground bonding points. By attaching the wires to the same ground but at different physical locations, the monitor can check for loose or lost connections.

Use of an optional 3M 3057 Stand-By Jack at the work station extends the life of the monitor's input jack. The user disconnects the wrist strap ground cord from the wrist band and plugs into the 3057 jack which is mounted at the work station. Plugging into the 3057 jack prevents the Model 725 from continuously alarming when disconnected from the wrist band.

The system is now ready for use.

## Section 5. Installation Using 723 Belt Clip (Optional)

An optional belt clip is available to further enhance the portability feature of the Model 725 Monitor. This expands the use of the monitor when operators need to be highly mobile as in an electronic manufacturing environment. Simply attach the belt clip with female snap connector to the male snap connector on the monitor bottom cover. Slide the clip over your belt in a convenient place, so that the wrist strap ground cord will not interfere with normal body movements when attached to the monitor. Attach the dual conductor ground clip to a suitable ground at the work location. During mobility, attach the dual conductor ground clip to the parking clip on the Model 725 Monitor (See Section 6).

## Section 6. Parking Clip



Fig.5

A parking clip is supplied with the Model 725 Monitor allowing mobile users to silence the ground clip disconnect alarm. Attaching the dual conductor ground clip to the parking clip prevents unnecessary disconnecting/connecting of the wrist strap ground cord from the input jack during mobility. An added benefit of this feature is that it extends the life of the dual conductor ground cord plug and the monitor's input jack. The parking clip is already attached to the mounting tab of the Model 725 Monitor. If the Model 725 is to be mounted under a work bench for permanent use, remove the parking clip from the Model 725 Monitor using a small screwdriver.

## Section 7. Battery Replacement



Fig. 6

When only the red lamp illuminates on the Model 725 Monitor, it is time to change the battery. Unplug the wrist strap ground cord from the 725 Monitor jack before proceeding.

Remove the top cover of the Model 725 case by squeezing the two tabs (grooved area located on the bottom cover) inward while lifting the top cover. Remove the used battery carefully by using a pulling-twisting motion to unsnap the battery from the connectors on the printed circuit board.

Install a new 9 volt alkaline battery by supporting the snap connectors on the printed circuit board with your fingers, while using a pushing-twisting motion to fully seat the terminals of the battery into the snap connectors.

**Note:**

*Use an alkaline battery for longer life.*

Pass the monitor's ground cord through one of the two exit wire slots in the bottom half of the case. Align the rear locking tab on the top cover, to the tab slot on the bottom cover while maintaining the ground cord in the desired wire slot. Rotate the top cover downward onto the two side locking tabs of the bottom cover and snap firmly into place.

## Section 8.

### Verification Procedure for the Model 725 Monitor

The Model 725 Wrist Strap Monitor cannot be recalibrated after the initial factory calibration. However, the following steps can be used to determine if the Model 725 is operating within its specifications.

### Equipment Needed:

- Resistance Substitution Box (RSB), 1 Ohm to 45 Megohms  $\pm$  1%.
- One two conductor cable with standard 3.5 mm (miniature) phone plug attached on one end and appropriate connectors on the other end to connect to a RSB.
- Two single conductor wires with clip style on one end and appropriate connectors on the other end to connect to a RSB.

**Note:**

*Two conductor cables must have an isolation resistance of  $>1$  Gigohm between conductors. Two separated wires may also be used to obtain higher isolation resistance.*

### Procedure:

- a) Install a new 9 volt battery into the Model 725.
- b) Short the dual conductor ground clip by attaching to a conductive metal object such as a coin.
- c) Plug the phone jack test cord into the wrist strap jack on the front of the monitor and attach the other end of the cord to the RSB.

*Set the RSB as follows and observe the lamp and audible alarm:*

### **Wrist Strap**

29.8 Megohms - Red lamp OFF,  
audible alarm OFF.

40.2 Megohms - Red lamp ON  
(Flashing), audible alarm ON  
(Chirping).

### **Ground Clip Disconnect**

- d) Connect the two single conductor wires to the RSB. Attach the other ends of the wires with clips to the metal jaws of the Model 725 Monitor dual conductor ground clip. Be sure to prevent the clips from contacting each other. Plug in the phone jack test cord into the wrist strap jack on the front of the monitor and short the opposite ends together.

*Set the RSB as follows and observe the lamp and audible alarm:*

5.0 Megohms - Red lamp OFF,  
audible alarm OFF

11.5 Megohms - Red lamp ON  
(Continuous), audible alarm ON  
(Continuous tone).

## **Section 9. Specifications**

Model 725 Monitor Size:  
2.5 x 2.6 x 1.1 in. (6,4 x 6,6 x 2,8 cm)

Accuracy:  $\pm 15\%$

Test Voltage: 9 Vdc Open circuit

Test Current: Less than 1 microamp

Power Supply Requirements:  
9 Volt alkaline battery  
recommended (Not supplied)

Environmental Operating Conditions:  
Temperature: Maximum 110°F, (43°C)  
Minimum 50°F, (10°C)  
Humidity: Maximum 75% R.H.

## **Section 10. Parts Included**

- 1 ea. Model 725 Wrist Strap Monitor with 6 ft. dual conductor ground cord/clip and parking clip.
- 1 ea. User Instruction Manual & Verification Procedure

Section 11.

Required Accessories and Optional Available Parts

Model No.	Description	Size
2361	Dual Conductor Fabric Wrist Strap*	small
2362	Dual Conductor Fabric Wrist Strap*	medium
2363	Dual Conductor Fabric Wrist Strap*	large
2364	Dual Conductor Fabric Wrist Band	small
2365	Dual Conductor Fabric Wrist Band	medium
2366	Dual Conductor Fabric Wrist Band	large
2368	Dual Conductor Fabric Wrist Band	adjustable
2381	Dual Conductor Metal Wrist Strap*	small
2382	Dual Conductor Metal Wrist Strap*	medium
2383	Dual Conductor Metal Wrist Strap*	large
2384	Dual Conductor Metal Wrist Band	small
2385	Dual Conductor Metal Wrist Band	medium
2386	Dual Conductor Metal Wrist Band	large
2360	Dual Conductor Coil Cord	5 ft. (1,5 m)
2370	Dual Conductor Coil Cord	10 ft. (3,0 m)
2371	Dual Conductor Coil Cord	20 ft. (6,1 m)
3057	Stand-By Jack	1.9 x 1.3 x 1.1 in. (4,8 x 3,3 x 2,8 cm)
723	Belt Clip	

\* Includes Band & Cord

## Section 12. Additional Wrist Strap Monitoring Information

*Suggested reading on wrist strap requirements and wrist strap monitoring:*

- EIA 625 - Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices.
- EN100015/1 - Protection of Electrostatic Sensitive Devices.
- 3M Tech. Response #123 - Pulsed Current vs. Constant Current in Work Station Monitors.
- 3M Static Digest Issue No.1, 1998 - Disc Drive Industry - Static Control Considerations.

***Note:***

*The 3M references are available by calling 3M Electronic Handling & Protection Division Customer Service Department at 1-800-328-1368. Industry standards (EIA & EN), are available through Global Engineering Documents at 1-800-854-7179.*

## Section 13.

### Warranty

**Limited Warranty** - 3M expressly warrants that for a period of one year from the date of purchase, 3M static control products will be free of defects in materials (parts) and workmanship (labor).

Defects occurring during the warranty period will be repaired or products will be replaced at 3M's option and expense, if 3M receives notice during the warranty period. Defective products must be returned to 3M with proof of purchase date.

**Warranty Exclusions** - THE FOREGOING EXPRESS WARRANTY IS MADE IN LIEU OF ALL OTHER PRODUCT WARRANTIES, EXPRESS AND IMPLIED.

**INCLUDING FITNESS AND MERCHANTABILITY.** The express warranty will not apply to defects of damage due to accidents, negligence, misuse, alterations, operator error, or failure to properly maintain, clean, or repair products.

**Limit of Liability** - In no event will 3M or Seller be responsible or liable for special, incidental, or consequential losses or damages, whether based in tort or contract. Fulfillment of 3M's warranty obligations will be Customer's exclusive remedy and 3M's and Seller's limit of liability for any breach of warranty or otherwise.