

# Wrist Strap and Ground Monitor Installation, Operation and Maintenance



Made in the  
United States of America



Figure 1. SCS [773](#) Wrist Strap and Ground Monitor

## Description

The SCS 773 Wrist Strap and Ground Monitor can be used in work areas or other locations to monitor the ground impedance of metal ground connection in process tools including but not limited to semiconductor, disk drive, flat panel and electronic equipment manufacturing environments. Ground impedance monitoring can be used for up to two points for metal ground, such as within a tool. The Wrist Strap and Ground Monitor can be used to monitor the impedance-to-ground and voltage level on two persons wearing dual-wire wrist straps. The unit incorporates green and red LEDs and an audible alarm, as well as an output logic signal to a host equipment.

**Ground Impedance Monitor** – Continuously monitors for ground impedance on one or two separate channels that are connected to one or two process tools. The alarm level is set the same for all channels.

**Output Signal** – An output signal is available for connecting to the tool's computer or PLC. The 5V signal is either logic 1 or 0 for indicating the monitored ground resistance/impedance conditions and for the wrist strap.

**Operator Connection** – The Wrist Strap and Ground Monitor provides continuous monitoring of operator connection to the monitor via loop resistance check of operator's physical presence using a dual wire wrist strap.

**Voltage on Person Wrist Strap Monitor** – The Wrist Strap and Ground Monitor has one additional feature that allows continuous monitoring for excessive voltage on each operator.

The Wrist Strap and Ground Monitor is available in one model:

| Item                | Description                                                   |
|---------------------|---------------------------------------------------------------|
| <a href="#">773</a> | Wrist Strap and Ground Monitor, with World Wide Power Adapter |

SCS offers the following accessories for the Wrist Strap and Ground Monitor:

| Item                   | Description                                                   |
|------------------------|---------------------------------------------------------------|
| <a href="#">2368</a>   | Dual Conductor Fabric Adjustable Wristband                    |
| <a href="#">2360</a>   | Dual Conductor Coil Cord, 5'                                  |
| <a href="#">2370</a>   | Dual Conductor Coil Cord, 10'                                 |
| <a href="#">CTA252</a> | Replacement Jack PCB, 773 Wrist Strap and Ground Monitor      |
| <a href="#">CTE701</a> | Workstation Monitor Checker                                   |
| <a href="#">CTA212</a> | Power Adapter, 100-240VAC Input, 12VDC 1.5A Output, All Plugs |

## Packaging

- 1 Wrist Strap and Ground Monitor
- 1 Monitor Ground Cord (Green and Yellow)
- 1 Power Adapter, 12VDC, with interchangeable plugs (North America, UK/Asia, Europe)
- 1 Certificate of Calibration

## Installation

### Wire Attachment

Attach 18 AWG wires to the unit as described below. Strip back the vinyl insulation at each end of the wires to approximately 1/3 inch (8 mm). Twist the stranded wire on each end before inserting the wire into each connector location. In order to attach the wire, insert a small blade screwdriver into the orange slot above. Gently push inward and insert the stripped wire fully into the hole in the green connector. Hold the wire fully in and release the screwdriver to allow the wire to catch. Attach the ground wire to the "GND" connector on back of unit. Attach the impedance monitor wire(s) to the chosen ground lines "G1, G2" connector(s) on the back of the unit.

If you are planning to use the SCS Wrist Strap and Ground Monitor output to the tool, attach the wire to the "Out" connector on the back of the unit.



Figure 2. Rear view of Wrist Strap and Ground Monitor

### AC/DC Adapter Connection

Connect the circular plug of the power adapter into the power jack on the back of the unit.

### Mounting

Determine the mounting location of the Wrist Strap and Ground Monitor. Attach the unit using one of the following recommended methods:

- Screws
- Dual Lock Reclosable Fastener

Note: The unit can be mounted upside down from the current orientation of the front and back covers. If you wish to change the orientation, rotate the printed circuit board and covers 180 degrees. This will allow the unit housing to be mounted from the wider plate with screw slots.

## Operation

### Ground Impedance Alarm Level

Use the set switch and select through a combination of LED patterns on the front of the monitor to set the alarm level. The alarm level can be set to 1-10 ohms in 1 ohm increments. It can also be set to 10-20 ohms in 2 ohm increments. The two monitoring lines are set to the same selected impedance value. If the measured impedance on a line is lower than the setting, a green LED will remain illuminated for that line(s). If the impedance is higher than the preset level, a red LED and audible alarm are activated for that line(s). Their alarm duration will be on momentarily to prevent missing a short increased resistance event. If the impedance level remains above the preset alarm level, the red LED and audible sound remains on.

Note: A wire must be attached from the SCS Wrist Strap and Ground Monitor (GND terminal) to an approved ground point to monitor the grounding of process tools correctly.

### Output Signal Level

The output connector provides a logic 1 (+5V) when all grounds are within the limits and the unit is powered on. The output connector provides a logic 0 (0V) if any of the monitored grounds or wrist strap fail or power to the unit is lost.

### Person Voltage and Resistance Monitor

The alarm level is monitored when a person is wearing a dual conductor wrist strap assembly and plugged into the front jack. There is a short hold on the body voltage alarm so that it is not missed. The unit will respond to either a positive or negative voltage. The alarm is activated when the wrist strap is worn too loosely and the loop resistance level is exceeded. The red LED indicates the resistance limit without a voltage being generated on the person at the same time. The green LED indicates a proper connection of the operator. A green LED plus a blinking red LED will indicate if there is a body voltage generated; the operator may still be connected properly. The green LED is off when a dual conductor ground cord is not plugged into the jack.

### Enabling and Disabling Audible Alarm

The audible alarm can be enabled or disabled by momentarily pressing a recessed miniature push-button "Set" switch located on the back of the unit while the monitor's power is on. Use a paper clip to press the switch. One short beep on power up means that the sound is disabled. A series of two short beeps means that the sound is enabled.

### Enabling or Disabling Monitoring of Ground Lines

In some instances, both of the two ground points in the tool do not need to be monitored. This procedure will set up the number of ground lines (G1, G2) that will be used, so that there is no need to put jumpers or shunts on the unused ground monitoring inputs. The AC Adapter should not be plugged in at this time.

- Attach the "GND" line to ground.
- Attach the monitor line(s) (G1, G2) to the ground that has been determined to use. Do not plug any wires into those ground monitor inputs that will be unused.
- Press and hold the "Set" button using the end of a paper clip. While the button is pressed inward, plug in the AC Adapter and then release the "Set" button.
- Wait then for ~30 seconds. The SCS Wrist Strap and Ground Monitor will beep during this time. After this, it will produce one beep and will automatically disable the lines to which nothing was connected. You can repeat this procedure whenever a change in monitoring of the number of ground lines is required.

### Setting Impedance Alarm Levels

By default, the SCS Wrist Strap and Ground Monitor is set at the factory to 10 ohms alarm level.

If you wish to change the alarm level to your specifications, follow this procedure to set the impedance alarm level for all channels (G1, G2).

- Repeat the steps above in Enabling or Disabling Monitoring of Ground Lines section.
- Right after the beeping stops, continue pressing the "Set" button until the impedance level is matched.
- When the beeping stops, the left four LEDs allow for setting of resistance value. G1 & G2 red LEDs are upper location and G1 & G2 green LEDs are lower. Select the ground resistance value by repeatedly

pressing the “Set” button to advance the resistance limit. This will turn the LEDs on or off as indicated in the table on the following page.

- Do not press the “Set” switch for about seven seconds. The new limit will be saved and normal operation will start.

#### Using the LEDs to Set the Resistance Alarm Level

| Resistance (Ohms) | LED                                                                                 |
|-------------------|-------------------------------------------------------------------------------------|
| 1                 |    |
| 2                 |    |
| 3                 |    |
| 4                 |    |
| 5                 |   |
| 6                 |  |
| 7                 |  |
| 8                 |  |
| 9                 |  |
| 10                |  |
| 12                |  |

|    |                                                                                    |
|----|------------------------------------------------------------------------------------|
| 14 |  |
| 16 |  |
| 18 |  |
| 20 |  |

#### Calibration

##### Equipment Required

For this test, the SCS Wrist Strap and Ground Wrist Strap and Ground Monitor should be disconnected from the monitored grounds.

Use the SCS [CTE701](#) Workstation Monitor Checker. Connect the ground input of the checker to the ground terminal of the Wrist Strap and Ground Monitor. Set the checker to a proper resistance alarm level (see the CTE701 User Guide). Connect the red tip of the checker to the ground monitoring terminal (i.e. G1, or G2). Press the Fail button on the checker. The red LED of the corresponding ground of the monitor should remain on. Press the Pass button on the checker – the corresponding light on the monitor should be green. Repeat these steps for all enabled ground monitoring inputs.

The checker verifies the proper operation of dual wrist strap monitoring. Connect a 3.5 mm test cable to both the checker and to the operator jack of the monitor. At this point the monitor should indicate failure. Depress the Pass button on the wrist strap section. The monitor should indicate a good connection. While pressing the Pass button, press body voltage “high.” At this point the Wrist Strap LED would be blinking red.



Figure 3. SCS CTE701 Workstation Monitor Checker

## Functional Operation

### Ground Resistance Monitor

- Connect the ground wire to a known good electrical ground point.
- Connect the output wire to the tool if you intend to use it, otherwise leave it open.
- Connect the ground monitor inputs to the identified locations. Be sure to connect the monitoring inputs to different physical locations than those points used for their grounding.

### Person Voltage and Resistance Monitor

Plug the dual conductor ground cord of the wrist strap into the jack on the front of the unit. If the wrist strap is worn properly, a green LED will come on; otherwise red LED will be on. In order to provide good ground connection, the wrist strap must be worn tightly and the green light on the SCS Wrist Strap and Ground Monitor is an indication of that.

If for whatever reason, while properly connected, the operator developed excessive body voltage (in excess of  $\pm 2.5$  Volts in any polarity), the green LED may still be on, but the red LED will blink without alarm sound. No LED is on if a dual conductor ground cord is not plugged into the jack.

## Maintenance

### Replacement and Removing Input Wrist Strap Dual Conductor Input Jack

If the wrist strap input jack begins to show wear after heavy usage, the input jack can be replaced by ordering the SCS [CTA252](#) Replacement Wrist Strap Jacks. Remove the input jack in the unit by removing the locking collar and two screws on front cover. Slide the printed circuit board outside of the unit and unplug the pin connector with input jack board. Plug in new input jack board assembly and carefully slide the board back into the housing. Replace front cover and locking collar on the input jack.

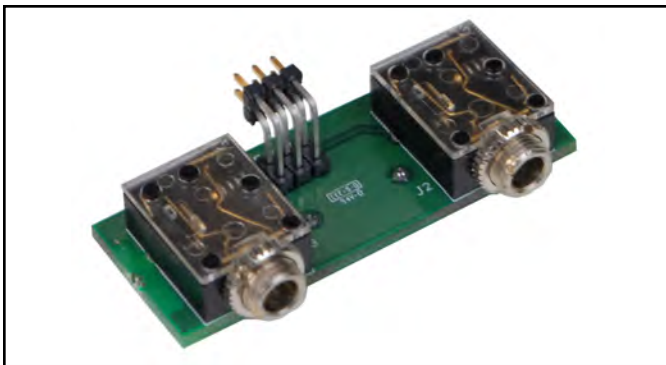


Figure 4. SCS CTA252 Replacement Wrist Strap Jacks

## Specifications

|                                              |                                                                                                                                                                                                                          |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ground Impedance Alarm Level                 | 1 to 20 ohms                                                                                                                                                                                                             |
| Wrist Strap Alarm - Body Voltage             | $\pm 2.5$ V on operator                                                                                                                                                                                                  |
| Wrist Strap Alarm - Operator Loop Resistance | 10 megohms on operator (plus two 1 megohm resistors in the end of the ground cord that attaches to the wristband)                                                                                                        |
| Output Signal Level                          | Logic 1 (+5V) if below selected resistance level (all "pass")<br><br>Logic 0 (0V) if above selected resistance level (any failure or power loss)<br><br>Note: This is for both process tools and wrist strap monitoring. |
| Visual Alarm Indicator (LED)                 | Green: OK<br>Red: Fault Condition<br>Note: Operator LEDs red and green will not illuminate if wrist strap is not plugged into jack.                                                                                      |
| Audible Alarm                                | Buzzer fault condition if enabled                                                                                                                                                                                        |
| Operating Environmental Range                | Temperature: 50 to 110°F (10 to 43°C)<br>Humidity: 75% R.H. maximum                                                                                                                                                      |
| Dimensions                                   | 2.42" W x 2.45" L x 0.85" H<br>(61mm W x 62mm L x 22mm H)                                                                                                                                                                |
| Power Adapter<br>100-240VAC<br>50-60 Hz      | Output: 12VDC @ 1.5A<br>Output Plug Polarization:<br>Center Positive<br>Output Plug: 5.5 mm O.D. x 2.1 mm I.D. x 9.5 mm L                                                                                                |

## Safety Information

Read, understand, and follow all safety information contained in this user guide prior to installation and use of the SCS Wrist Strap and Ground Monitor. Retain this guide for future reference.

### Intended Use

This user guide covers the Wrist Strap and Ground Monitor. The Wrist Strap and Ground Monitor has two input jacks for monitoring impedance and voltage on a dual conductor wrist strap. It monitors either one or two metal grounds in a workstation. The Wrist Strap and Ground Monitor operates from a universal AC power adapter. These systems are typically installed on a machine with multiple tools or on a work bench used for ESD-sensitive electronic assembly or repair.

The systems must be installed as specified in this user's guide and are intended for use in an indoor commercial/industrial environment. The systems have not been evaluated for other uses or locations.

### Warning

To reduce the risks associated with hazardous voltage, which if not avoided could result in electrical shock related injury; the risks associated with environmental contamination, which if not avoided could result in environmental contamination related injury; and the risk associated with false test results, which if not avoided could result in property damage:

- Read, understand and follow all safety information contained in this user guide for installation and use. Retain this guide for future reference.

To reduce the risks associated with hazardous voltage, which if not avoided could result in electrical shock related injury:

- Replace power adapter if damaged with SCS provided power adapter only.
- Do not modify or attempt to service the power adapter or use it if damaged.
- Use the power adapter in an indoor dry location only.

### Caution

To reduce the risks associated with environmental contamination which, if not avoided, could result in minor or moderate injury:

- Dispose of monitor in accordance with all applicable local and government regulations.

### Notice

To reduce the risks associated with property damage:

- Monitor must be checked periodically to verify each monitor circuit is functioning correctly.
- The SCS Wrist Strap and Ground Monitor requires a suitable ground to function properly. Refer to the proper section of this User Guide for information on connecting to a suitable electrical ground point.
- Do not use the Wrist Strap and Ground Monitor as a primary method of electrical grounding – this device is intended to monitor the ground connection only.

## Regulatory Information

### FCC

Note: 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.

Modifications to this device shall not be made without the written consent of SCS. Unauthorized modifications may void the authority granted under Federal Communication Rules and Industry Canada Rules permitting the operation of this device.

### 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-member 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.

### cULus Statement

Meets UL Safety Requirements.

## China RoHS

### Electronic Industry Standard of the People's Republic of China, SJ T11363-2006, Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products

This symbol, per Marking for the Control of Pollution Caused by Electronic Information Products, SJ/T11364-2006, means that the product or part does contain a substance, as detailed in the chart below, in excess of the following maximum concentration values in any homogeneous material: (a) 0.1% (by weight) for lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers; or (b) 0.01% (by weight) for cadmium. Unless otherwise stated by SCS in writing, this information represents SCS best knowledge and belief based upon information provided by third party suppliers to SCS.



| Part or Component Name         | Hazardous Substances or Elements |      |      |        |       |        |
|--------------------------------|----------------------------------|------|------|--------|-------|--------|
|                                | (Pb)                             | (Hg) | (Cd) | (CrVI) | (PBB) | (PBDE) |
| Termination in capacitor 0603  | X                                | O    | O    | O      | O     | O      |
| Solder in diode                | X                                | O    | O    | O      | O     | O      |
| Finish in diode                | X                                | O    | O    | O      | O     | O      |
| Terminations in PCBs           | X                                | O    | O    | O      | O     | O      |
| Terminations in resistors 0603 | X                                | O    | O    | O      | O     | O      |
| Plating in resistors 0603      | X                                | O    | O    | O      | O     | O      |
| Resistor ink in potentiometer  | X                                | O    | O    | O      | O     | O      |
| Solder in instrument           | X                                | O    | O    | O      | O     | O      |
| Solder in IC                   | X                                | O    | O    | O      | O     | O      |
| Solder in buzzer               | X                                | O    | O    | O      | O     | O      |
| Audio jack                     | X                                | O    | O    | O      | O     | O      |

O: Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in the SJ/T11363-2006.  
X: Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in the SJ/T11363-2006.