



Made in America

## Combo Tester X<sup>3</sup> Installation, Operation and Maintenance



Figure 1. Desco Combo Tester X3 and Dual Foot Plate

### Description

The Desco [19276](#) / [19277](#) Combo Tester X3 simultaneously tests an operator's wrist strap and footwear to determine that the wrist strap and/or foot wear will act as a path to ground; and it tests the presence of an inline 1 Megohm resistor. This product can be used as one of the tools to fulfill the ANSI ESD S20.20 paragraph 6.1.3.2 "Compliance Verification Plan. Verification should include routine checks of the Technical Requirements of the Plan." The Combo Tester X3 incorporates a test circuit design that allows operators to test their wrist strap and foot wear simultaneously and eliminates the need to conduct separate tests. The Combo Tester X3 is factory set to 750 kilohm - 10 megohm for wrist straps and to 750 kilohm - 35 megohm for footwear. The Combo Tester X3 can be tailored to other ESD Control Plan requirements with DIP switches. A green light signals the operator that the wrist strap and footwear is passing. A red light and an audible alarm will indicate if the wrist strap and/or footwear (left or right) is failing. If there is a failure it will also notify the operator if the circuit resistance is too low or too high. The Combo Tester X3 is calibrated to NIST traceable standards.

### Features

- Stainless Steel Split Foot Plate for Testing Foot Grounders (or Shoes)
- Solid State Touch Test Button With No Moving Parts
- 30 Volt Test Signal
- Relay For Use With Automatic Doors Or Other Locking Systems

Per ANSI/ESD S20.20 section 7.3 "A Compliance Verification Plan shall be established to ensure the Organization's fulfillment of the technical requirements of the ESD Control Program Plan. Process monitoring (measurements) shall be conducted in accordance with a Compliance Verification Plan that identifies the technical requirements to be verified, the measurement limits and the frequency at which those verifications shall occur. The Compliance Verification Plan shall document the test methods and equipment used for process monitoring and measurements. ... The test equipment selected shall be capable of making the measurements defined in the Compliance Verification Plan."

Per ANSI/ESD S1.1 section 6.1.3 Frequency of Functional Testing

"The wrist strap system should be tested daily to ensure proper electrical value."

Per ESD Handbook ESD TR20.20 section 5.3.2.4.2 Additional User Wrist Strap Testing "Proper testing of the wrist strap includes the resistance of the groundable point on the end of the cord, the cord itself, the resistor, the cord-to cuff snap connector, the resistance of the interface of the cuff, the cuff/wrist interface, and the resistance of the person between the wrist and the hand that contacts the test electrode."

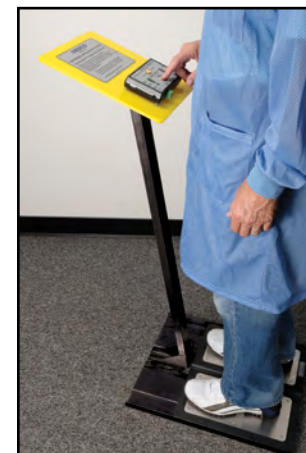
Per ESD Handbook ESD TR20.20 section 5.3.2.2.2 Wrist Strap Ground Cord "At first glance, the ground cord appears to be a relatively simple assembly. However, the design requirements are considerable, given the wide range of user applications and the durability requirements of constant tugging, flexing, and dragging over the edge of workstation tops and equipment chassis."

"Compliance verification should be performed prior to each use (daily, shift change, etc.). The accumulation of insulative materials may increase the foot grounder system resistance. If foot grounders are worn outside the ESD protected area testing for functionality before reentry to the ESD protected area should be considered." (ESD SP9.2 APPENDIX B - Foot Grounder Usage Guidance)

"A log should be maintained which verifies that personnel have tested their personal grounding devices. (Wrist Straps and ESD Footwear)" (ANSI/ESD S20.20 Section 6.2.2.2 Personnel Grounding Guidance)



Desco Combo Tester X3 with Dual Foot Plate, Item [19276](#)



Desco Combo Tester X3 with Stand, Item [19277](#)

## Packaging

- 1 Combo Tester X3
- 1 Dual Foot Plate
- 1 Power Adapter - Universal Input (with US style plug)
- 1 Stereo Plug to Stereo Plug Cord
- 1 Banana Plug to Ring Terminal Cord
- 1 [19255](#) Dual Foot Plate Stand ([19277](#) only)
- 2 Pedestal Bolts ([19277](#) only)
- 2 Nuts for Pedestal Bolts ([19277](#) only)
- 2 Tester Backplate Screws ([19277](#) only)
- 2 Nuts for Backplate Screws ([19277](#) only)
- 4 Footplate Screws ([19277](#) only)
- 1 Certificate of Calibration

## Installation

The resistance limits for footwear and wrist strap tests are controlled by the DIP switches located on the left-side of the tester (see Figure 2). See the following tables for the DIP switch settings and their corresponding test values.

### FOOTWEAR RESISTANCE

DIP switches 1 and 2 control the "HIGH" test limit

| Switch 1 | Switch 2 | HIGH Limit Resistance   |
|----------|----------|-------------------------|
| ON       | ON       | 10 Megohms (1 X 10E7)   |
| OFF      | OFF      | 35 Megohms (3.5 X 10E7) |
| ON       | OFF      | 100 Megohms (1 X 10E8)  |
| OFF      | ON       | 1 Gigohm†               |

DIP switches 3 and 4 control the "LOW" test limit

| Switch 3 | Switch 4 | Low Limit Resistance     |
|----------|----------|--------------------------|
| ON       | OFF      | 100 Kilohms (1 X 10E5)   |
| OFF      | ON       | 750 Kilohms (7.5 X 10E5) |

† NOTE: At 1 Gigohm high limit resistance, a dirty foot plate could result in a false pass. Be sure to keep the foot plate clean, particularly when using this setting. Not suitable for relative humidity greater than 50%.

### WRIST STRAP RESISTANCE

DIP switches 5 and 6 control the "HIGH" test limit

| Switch 5 | Switch 6 | HIGH Limit Resistance     |
|----------|----------|---------------------------|
| OFF      | OFF      | Wrist Strap Test Disabled |
| ON       | OFF      | 35 Megohms (3.5 X 10E7)   |
| ON       | ON       | 10 Megohms (1 X 10E7)     |

DIP switch 5 must be ON (default setting) for the wrist strap test to be active. If the wrist strap test is disabled by DIP switch 5 being OFF, the 3 LEDs for this test will remain OFF at all times.

The "Low" limit for the wrist strap test is set to 750 Kilohms and cannot be changed by the user

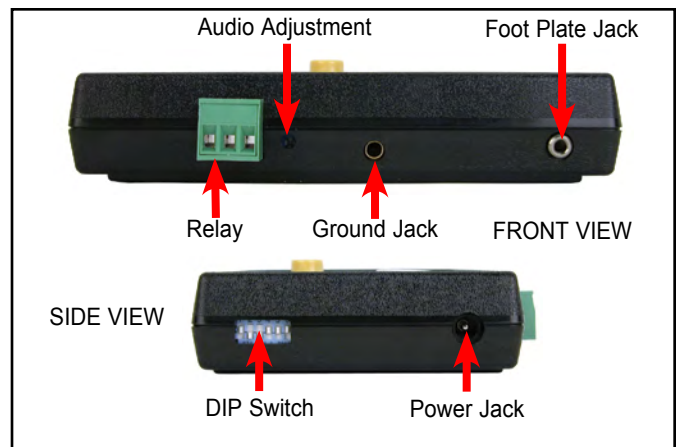


Figure 2. Combo Tester X3 views

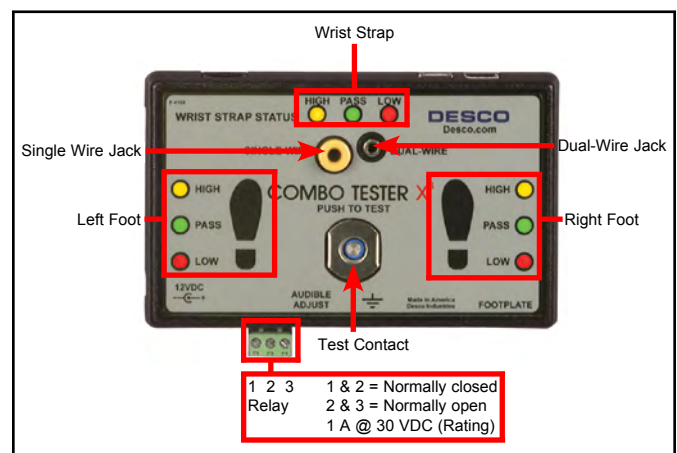


Figure 3. Combo Tester X3 panel

### INSTALLING THE MODEL 19276 TESTER

- I. Mount the Tester at the desired location using the four mounting holes in the corners of the yellow mounting plate.
- II. Set the Dual Foot Plate below the tester.
- III. Insert one end of the Stereo Plug to Stereo Plug cord into the stereo jack located at the bottom of the tester (see Figure 2). Insert the other end of the cord into the stereo jack at the back of the foot plate.
- IV. Insert the banana plug end of the Banana Plug to Ring Terminal cord into the ground jack located at the bottom of the tester (see Figure 2). Connect the ring terminal end of the cord to equipment ground. This connection will remove any static charge from the user before the test. NOTE: Failure to correctly ground the tester may result in damage not covered under warranty.
- V. Insert the power supply plug into the power jack located on the left-side of the tester (see Figure 2). Plug the power supply into an appropriate power outlet.

## ASSEMBLING THE MODEL 19277 TESTER

- I. Insert the pedestal to the baseplate with the tester mounting bracket sloping towards the operator. Be sure to align the screw holes located at the base of the pedestal.
- II. Install the two supplied socket cap screws and nuts (see Figure 4).
- III. Route the two included cords and power cord through the pedestal starting from the bottom to the top. All three cords should exit through the cut-out located at the top of the pedestal (see Figure 5).
- IV. Align the two screw holes of the yellow backplate to the screw holes on the pedestal mounting bracket. Secure the backplate using the supplied screws and nuts (see Figure 6).
- V. Insert one end of the Stereo Plug to Stereo Plug cord into the stereo jack located at the bottom of the tester (see Figure 2). Insert the other end of the cord into the stereo jack at the back of the foot plate.
- VI. Insert the banana plug end of the Banana Plug to Ring Terminal cord into the ground jack located at the bottom of the tester (see Figure 2). Connect the ring terminal end of the cord to earth ground. This connection will

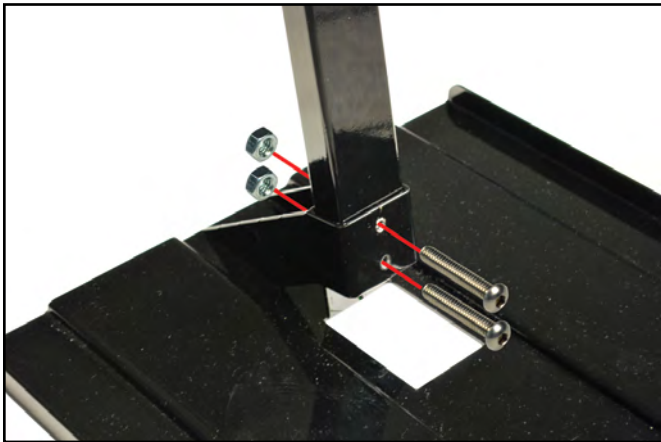


Figure 4. Securing the pedestal to the baseplate

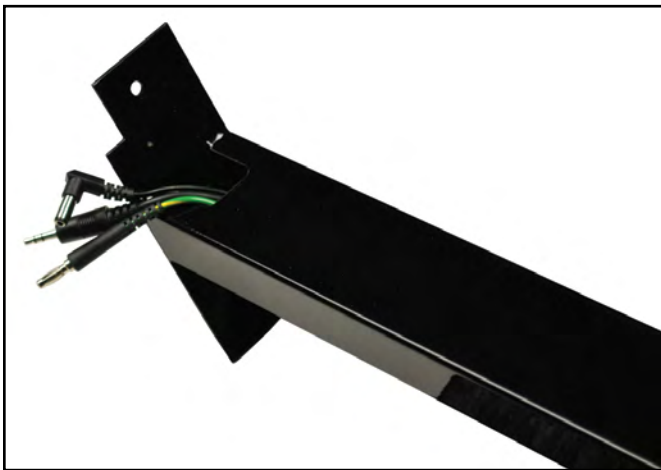


Figure 5. Routing the cords through the pedestal



Figure 6. Securing the Combo Tester X3 to the pedestal

remove any static charge from the user before the test.  
NOTE: Failure to correctly ground the tester may result in damage not covered under warranty.

- Value. Insert the power supply plug into the power jack located on the left-side of the tester (see Figure 2).
- VIII. Fit the the foot plate into position so that it is flush with the front and top of the baseplate. Secure the foot plate to the sides of the baseplate using the four supplied screws (see Figure 7).
- IX. Plug the power supply into an appropriate power outlet.

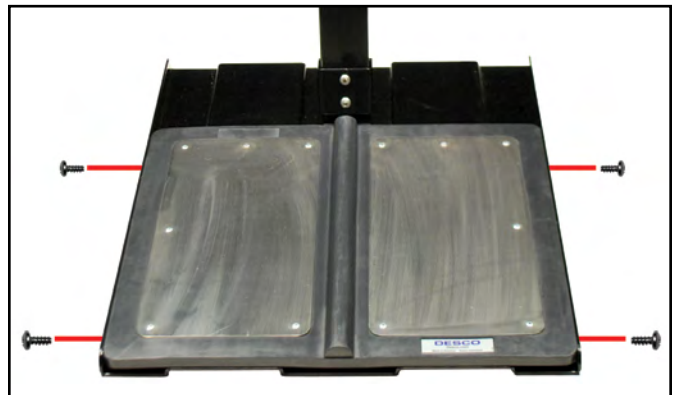


Figure 7. Securing the foot plate to the baseplate

## RELAY TERMINAL

A relay with both “normally open” and “normally closed” contacts is included for your convenience. Going from left to right, the terminal block on the bottom of the tester has terminals for “normally closed,” “common,” and “normally open” (see Figure 3). The relay can be used for opening an electric lock to an ESD protective area. The maximum contact rating is: 1A@30VDC.

## General Instructions

In the following test configurations, the [19276](#) / [19277](#) Combo Tester X3 can be used to test wrist straps and foot wear. NOTE: When testing or calibrating, press and hold for test results, then allow 1-2 seconds for the unit to reset before pressing the test button again.

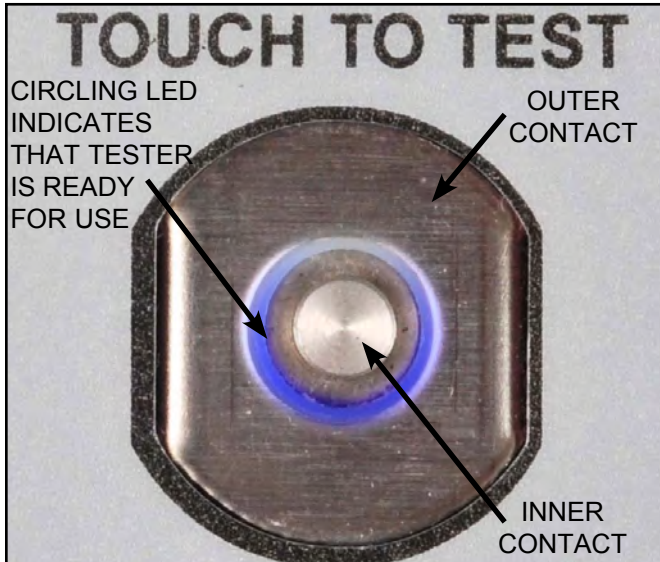


Figure 8. Test Contact

- I. A circling blue light between the inner and outer contacts will indicate that the tester is ready for use. (See Figure 8)
- II. While wearing the wrist strap and foot wear\*, plug the banana plug end of the cord into the jack (both single wire and dual wire wrist straps can be tested with the Combo Tester X3, make sure the correct jack is used. See Figure 3) on the face of the unit and step on to the test plate so that one foot is on each test plate. NOTE: DO NOT TOUCH ANY OTHER METAL WHILE PERFORMING TEST.
- III. To start the test, the operator's finger must bridge both the inner and outer contacts when touching the test contact. The circling blue light will become solid to indicate that a test has been activated. Hold down for up to 3 seconds while flexing coil cord area near resistor. (See Figure 9) NOTE: Often the initial intermittency will be failure of strain relief connection to resistor as simulated by ESD S1.1-1998 paragraph 5.7 Bending Life Test.
- IV. Lighting of the green “PASS” LEDs indicates that the wrist strap and/or foot wear are being worn correctly and functioning properly.

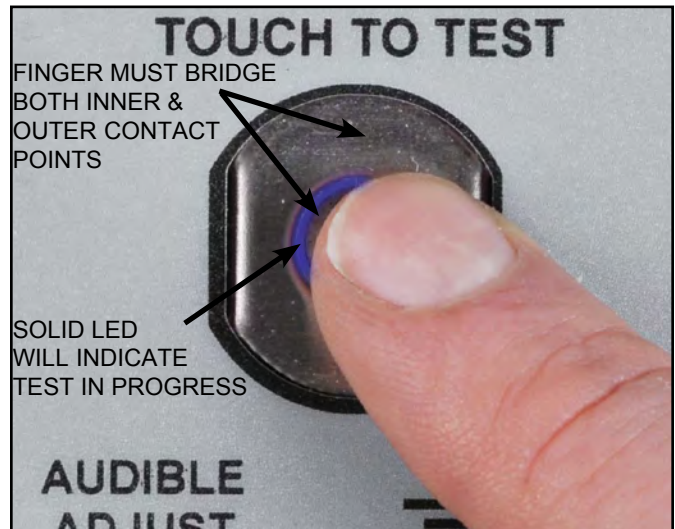


Figure 9. Bridge test contacts with finger

- V. If either “FAIL LO” or “FAIL HI” LEDs light and the audible indicator sounds, the wrist strap and/or foot wear should be checked to see if they functioning properly, being worn correctly, and/or need to be replaced. NOTE: Failures may be caused by dry skin or minimal sweat layer. For wrist straps, try using ESD hand lotion for a better connection and for foot wear, try taking a short walk to build up a sweat layer in the operator's shoe.

\*The Combo Tester X3 may also be used to test smocks or garments that feature a grounding mechanism for operators using a coil cord connection.

## Specifications

Rated tester voltage:  
12 VDC, (2.5 mm connector - center positive)

Relay contact rating:  
1 A @ 30 VDC max

Temperature range:  
41°F - 104°F (5°C - 40°C)

Operating conditions:  
Indoor use only at altitudes less than 6500 ft. (2 km).  
Maximum relative humidity of 80% up to 88°F (31°C) decreasing linearly to 50% @ 104°F (40°C).  
Maximum relative humidity of 50% at 1 Gigohm setting.

Pollution degree:  
2 per IEC 644

## Calibration

The Combo Tester X3 is calibrated to standards traceable to NIST. Frequency of recalibration should be based on the critical nature of those ESD sensitive items handled and the risk of failure for the ESD protective equipment and materials. In general, we recommend that calibration be performed annually.

The accuracy of the Combo Tester X3 is specified as:

- $\pm 5\%$  for < 1 Megohm range
- $\pm 10\%$  for 1 Megohm and higher resistance ranges
- $\pm 20\%$  for 1 Giga Ohm Range

A periodic check (once every 6 to 12 months) using a precision resistance box should be performed to verify proper operation.

The Desco [19259](#) Limit Comparator is available for the convenient period testing of the Combo Tester X3 (see figure 8).

The Limit Comparator allows the customer to perform NIST traceable calibration on the Combo Tester X3. The Limit Comparator can be used on the floor shop within a few minutes virtually eliminating downtime, verifying that the Combo Tester X3 is operating within tolerances.



Figure 8. Limit Comparator

## USING THE LIMIT COMPARATOR

### Wrist Strap Operation Test

- Insert the Limit Comparator's test plug into the "DUAL-WIRE" phono jack located on the face of the Combo Tester X3.
- Select "750K LOW" with the Limit Comparator's rotary switch.
- Press and hold the touch plate of the tester until the test is completed. The tester should indicate a wrist strap FAIL LOW condition.
- Select "750K PASS" on the Limit Comparator and repeat the test. The tester should indicate a wrist strap PASS condition.

- Select either the "10M PASS" or "35M PASS" setting, whichever one is appropriate, on the Limit Comparator and repeat the test. The tester should indicate a wrist strap PASS condition.
- Select either the "10M HIGH" or "35M HIGH" setting, whichever one is appropriate, on the Limit Comparator and repeat the test. The tester should indicate a wrist strap FAIL

### Limited Warranty

Desco expressly warrants that for a period of one (1) year from the date of purchase, Desco Combo Tester X3's will be free of defects in material (parts) and workmanship (labor). Within the warranty period, the product will be tested, repaired, or replaced at Desco's option, free of charge. Call our Customer Service Department at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for a Return Material Authorization (RMA) and proper shipping instructions and address. Include a copy of your original packing slip, invoice, or other proof of purchase date. Any unit under warranty should be shipped prepaid to the Desco factory. Warranty repairs will take approximately two weeks.

If your unit is out of warranty, call Customer Service at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for a Return Material Authorization (RMA) and proper shipping instructions and address. Desco will quote repair charges necessary to bring your unit up to factory standards.

### Warranty Exclusions

THE FOREGOING EXPRESS WARRANTY IS MADE IN LIEU OF ALL OTHER PRODUCT WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH ARE SPECIFICALLY DISCLAIMED. The express warranty will not apply to defects or damage due to accidents, neglect, misuse, alterations, operator error, or failure to properly maintain, clean or repair products.

### Limit of Liability

In no event will Desco or any seller be responsible or liable for any injury, loss or damage, direct or consequential, arising out of the use of or the inability to use the product. Before using, users shall determine the suitability of the product for their intended use, and users assume all risk and liability whatsoever in connection therewith.