

ACL 780/781 Economy Combo Tester

OPERATION MANUAL



Meter is warranted for one year from the date of purchase on parts and labor.

Calibration is recommended every twelve months.

INTRODUCTION

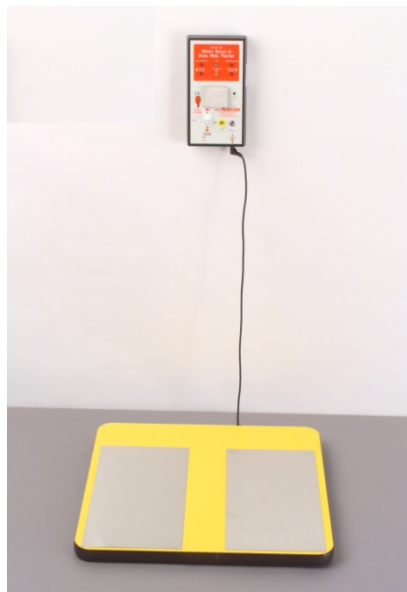
Get the performance of a state-of-the-art tester for a cost-effective price. The 780/781 Economy Combo Tester will individually and simultaneously test each wrist strap and heel grounder for proper connection and resistivity values in less than three seconds. With speed, ease and clarity, colored LED shows test results. No computer is necessary for pass/fail testing so you don't pay for features you don't need.

FEATURES

- Tests wrist strap and heel grounders individually and simultaneously
- No switch flipping or foot changing
- Automatic calibration
- Measures from 10^5 ohms (100 kilohms) to 10^8 (100 megohms), with an option to 10^9 (1000 megohms)
- Conforms to US EOS-20/20 standard and European standards
- Adjustable resistivity limits
- NIST-traceable calibration certificate included
- AC or DC powered
- OK, failure warning, and low battery LED display; buzzer sound
- Can be mounted on the wall or used on optional heavy-duty stand

ACL 780 includes Tester and Heavy Duty Footplate (as shown below).

ACL 781 includes Tester, Heavy Duty Footplate and Stand.



SPECIFICATIONS

- Display: red, yellow, and green LED with buzzer sound
- Accuracy: $\pm 15\%$
- Weight: 1.0 lb (454 g)
- Environment: 32°F to 100°F (0°C to 38°C); 15% to 85% RH.
- Testing Range: $10^5 - 10^8$ ohms
- Wrist Straps:
 - High Range: 2M, 5M, 10M, 25M, 35M, 50M, 75M, 100M ohms
 - Low Range: 500k, 750k ohms
- Footwear:
 - High Range: 2M, 5M, 10M, 25M, 35M, 50M, 75M, 100M ohms
 - Low Range: 500k, 750k ohms

INSTALLATION GUIDE

1. Select a suitable site near an AC power outlet if adapter is to be used. If outlet is unavailable, use 9-volt alkaline battery. Do not use both, as the battery may overheat.
2. If testing heel grounders, select location for foot plate.
3. If wall-mounting, select a location approximately five feet up from the floor. Before mounting, it is recommended to plug the footplate lead into the meter to ensure there is enough wire available to reach tester.
4. Drill four .20-inch diameter (5mm) holes at the marked positions in a 2.5" rectangular pattern. Insert the plastic wall anchors and attach screws through the hook disc into the wall.
5. Attach the enclosed adhesion strips to the mounted anchors. Peel off the adhesive backing covers to expose the adhesive. Press meter against exposed adhesive to mount meter to the wall.
6. To remove the meter from the hook and loop strips, gently lift the meter with two hands from the bottom corners.
7. The meter can also be attached to work surfaces using two adhesive-backed hook and loop strips provided.

OPERATION

It is important to test wrist straps and footwear daily to ensure their proper function and to minimize charge generation on the human body, which may cause damage to integrated circuits. Wrist straps and heel grounders are the primary means by which electrical charges are drained from the body. Too fast a drain will cause sparking, field generation, and failures. Too low an electrical path can cause electrical shock. Too high an electrical path can cause integrated circuit damage. To adapt to ISO certification, the results should be recorded and monitored.

Wrist Straps

The 780/781 Economy Combo Tester will verify that there is a safe and continuous electrical path between the user, wrist strap and the ground cord. When using the meter for wrist strap testing or monitoring, the following is suggested:

1. Position the selector switch located on the front of the meter into the wrist strap position.
2. Put the wrist strap on with the ground cord attached. Be sure the strap is in snug contact with the wrist. Dry skin, hair, or foreign contaminants may cause failures for well functioning wrist straps that are within specification.
3. Insert the end of the ground cord into the wrist jack located on the front of the Combo Tester.
4. Press and hold test button until the LED illuminates.
5. If the green "OK" LED illuminates, the wrist strap is functioning within the resistance specification range and therefore may be used while handling static-sensitive devices.
6. If the red "High Warning" or red "Low Warning" LED illuminates and the buzzer activates, the worker must test the wrist strap cord immediately. To test a faulty cord, leave the cord plugged into the meter and detach the wrist cord from the strap. Press the wrist strap metal snap-end of the cord against the metal test button, avoiding skin contact. If the cord tests fail, replace the cord.
7. If the cord passes, tighten the band cuff around wrist and retest using the cord. If it continues to fail, apply ESD hand lotion to wrist area and repeat test. Replace wristband if failure continues.

Footwear

1. Position the footplate on the floor directly in front of the Combo Tester. Check to ensure the plate does not slide when the meter is being used.
2. Insert the 3.5mm stereo plug into socket marked "Heel Plate" on the base of the meter.
3. Position the selector switch on the front of the meter to the "Dual Heel Foot Plate" position.
4. Stand on the foot plate making sure that each foot is aligned on the left or right stainless steel pad.
5. Press and hold test button until an LED illuminates.
6. If the green "OK" LED illuminates, the ESD shoes or heel grounders are functioning within specifications.
7. If either of the "Low Warning" or "High Warning" red LEDs illuminate accompanied by the activation of the buzzer for either foot, then the user should check the shoe or heel grounder. Check heel grounder for good skin contact and dirt contamination.

Wrist Straps & Footwear

The ACL 780 Economy Combo Tester will test both feet and wrist strap simultaneously. If there is a failure, the meter defaults in the following order: right foot, left foot, wrist.

1. Position the selector switch between the wrist and heel positions, in the "Wrist/Foot" position.

2. Position the foot plate on the floor directly in front of the Combo Tester. Check to ensure the plate does not slide when the meter is being used.
3. Insert the 3.5mm stereo plug into socket marked "Heel Plate" on the base of the meter.
4. Stand on the foot plate making sure that each foot is aligned on the left or right stainless steel pad.
5. Put the wrist strap on with the ground cord attached. Be sure the strap is in snug contact with the wrist. Dry skin, hair, or foreign contaminants may cause failures for functioning wrist straps that are within specification.
6. Insert the end of the wrist strap's ground cord into the wrist jack located on the front of the Combo Tester.
7. Press and hold the metal test button until an LED illuminates.
8. If the green "OK" LED illuminates, then the ESD shoes or heel grounders and wrist strap are functioning within specifications.
9. If there is a failure, the meter defaults in the following order: right foot, left foot, wrist. If either of the "Low Warning" or "High Warning" red LEDs glow accompanied by the activation of the buzzer for either foot, then the user should check the shoe or heel grounder. Check heel grounder for good skin contact and dirt contamination.
10. If either red "High Warning" or red "Low Warning" LED illuminates and the buzzer activates, the user must test the wrist strap cord immediately. To test a faulty cord, leave the cord plugged into the meter and detach the wrist cord from the strap. Press the wrist strap metal snap-end of the cord against the test button, avoiding skin contact. If the cord tests fail, replace the cord.
11. If the cord passes, tighten the band cuff around wrist and retest using the cord. If it continues to fail, apply ESD hand lotion to wrist area and repeat test. Replace wristband if failure continues.

TESTER ADJUSTMENTS

The ACL 780/781 Economy Combo Tester is calibrated to NIST-traceable standards.

The tester can be adjusted for various electrical resistances by opening the meter case and pressing the dipswitches corresponding to the desired test ranges. These resistance ranges depend on what test standard (i.e. EOS, CECC) the user follows. The user must know what resistance range values are acceptable for their wrist straps, shoes, and heel grounders. The ACL 780/781 Economy Combo Tester comes preset to EOS/ESD recommended test limits and are represented in **bold**.

Foot Low sw1

.5M	off		
.75M	ON		(US & IEC default)

Wrist Low sw2

.5M	off		
.75M	ON		(US & IEC default)

Foot High sw3 sw4 sw5

2M	off	off	off	
5M	ON	off	off	
10M	off	ON	off	
25M	ON	ON	off	
35M	off	off	ON	(IEC & CECC default)
50M	ON	off	ON	
75M	off	ON	ON	
100M	ON	ON	ON	(US default)

Wrist High sw6 sw7 sw8

2M	off	off	off	
5M	ON	off	off	
10M	off	ON	off	(US default)
25M	ON	ON	off	
35M	off	off	ON	(IEC & CECC default)
50M	ON	off	ON	
75M	off	ON	ON	
100M	ON	ON	ON	

CALIBRATION CHECK

The ACL 780/781 Economy Combo Tester can be adjusted to various electrical resistance specifications (limits) depending on what test standard (i.e. EOS for US and CECC for Europe) the user follows or what a company requires. To change settings, open the ACL 780/781 Economy Combo Tester and adjust the dip-switches to desired resistance value. (See below for values.)

If calibration traceable to NIST is desired, send to the ACL Meter Department in order to determine and trace accuracy. Remember the ACL 780/781 Economy Combo Tester cannot be calibrated. The meter's accuracy can only be checked. The meter has resistor and capacitor on the circuit board. Every time the tester is used, it self-calibrates against this 1% resistor.

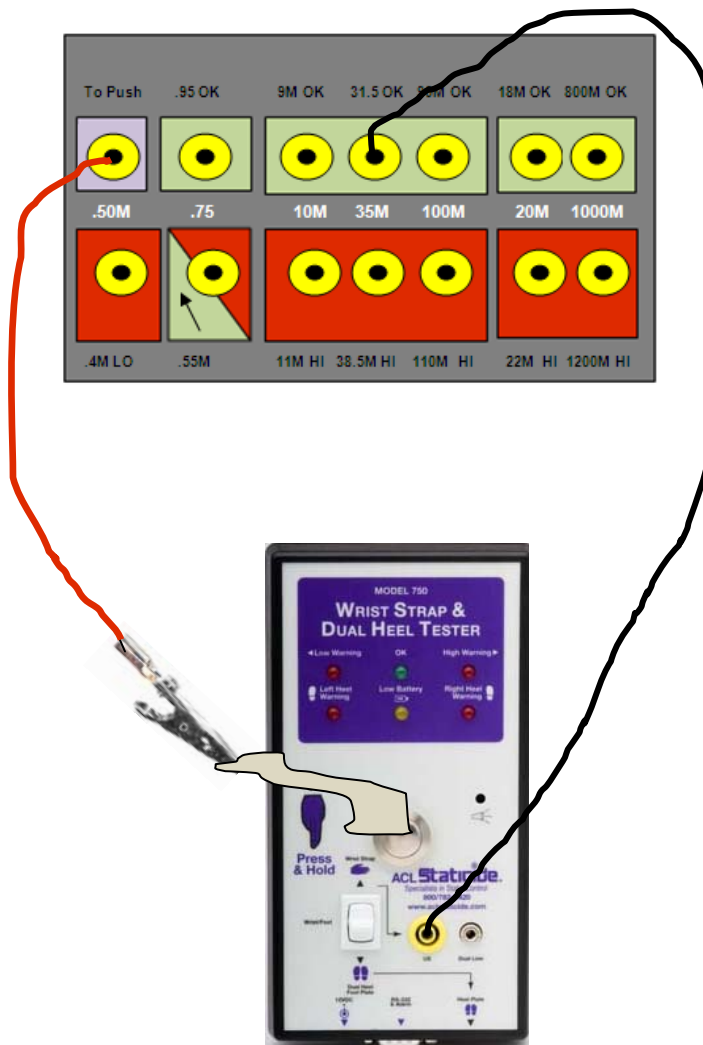
1. Purchase 1% resistors on each side of the resistance value that is set in the meter. Factory settings (in bold) require the following resistors.
 - a. Foot Low (**.75M**) 675k & 825k
 - b. Wrist Low (**.75M**) 675k & 825k
 - c. Foot High (**100M**) 90M & 110M
 - d. Wrist High (**10M**) 9M & 11M
2. Solder, clip or twist wires to both ends of the resistors.
 - a. Attach one end of the resistor to the stainless steel button on the front of the meter using an alligator clip and piece of aluminum tape. Alternatively, the banana plug can be held to the button.
 - b. Attach the other end of the resistor to the receptacle that is being tested using the appropriate plug attachment: banana plug or stereo plug for wrist, stereo plug for testing footplate. When the feet are checked, both the right and left leg of the circuit must have a load on the wire. If not, the unloaded leg will buzz. To accomplish this, a stereo plug with two pigtail wires must be used. Each of these two wires must have a resistance load on one end. The other end must be attached to the button using an alligator clip and piece of aluminum tape or help to the button.
3. To begin test:
 - a. Position selector switch to "Wrist" setting when testing the wrist limits or the "Foot" setting when testing the foot limits. Remember when testing feet a stereo plug is inserted into the jack that usually has the foot plate plug inserted. The other end has the resistor attached.
 - b. When testing wrist limits, plug resistor in wrist strap plug-in. When testing foot limits, insert two resistors into the plug-in jack usually used for the foot plate.
4. Press the test button and compare to the resistance range to be calibrated.

5. Release the test button and compare the pass or fail response to limits being tested.
6. Since the meter is self-calibrating and self-zoning there is no adjustment necessary.

CALIBRATION USING THE ACL 795 CALIBRATION BOX

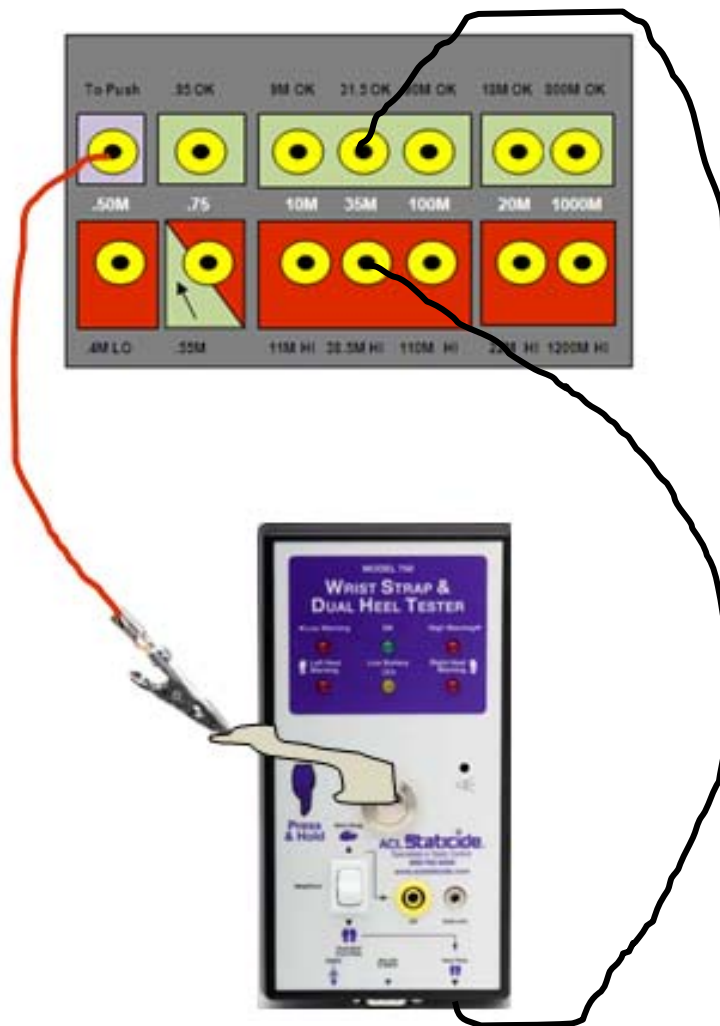
TO TEST WRIST STRAPS

1. Connect the red test lead to the common point banana jack labeled "To Push" on the ACL 795 Calibration Box.
2. Connect the opposite end of the red test lead to the power button on the ACL 780/781 Economy Combo Tester using the alligator clip and a piece of aluminum tape.
3. Attach the other test lead to the wrist strap jack in the ACL 780/781 Economy Combo Tester. Then insert other end of the wrist strap cord to the wrist strap jack located on the front of the calibration unit corresponding to the resistance value being tested.
4. Position the selector switch on the ACL 780/781 Economy Combo Tester to "Wrist Strap".
5. Press the power button and observe results on both the meter and on the tester's display. Green indicates a passing test. Red indicates failure.



TO TEST FOOTWEAR

1. Connect the red test lead to the common point banana jack labeled "To Push" on the ACL 795 Calibration Box.
2. Connect the opposite end of the red test lead to the power button on the ACL 780/781 Economy Combo Tester using the alligator clip and a piece of aluminum tape.
3. Position the selector switch to "Dual Heel Foot Plate".
4. Using the lead with the split cable, plug the stereo 3.5 mm lead into the foot plate jack on the bottom of ACL 780/781 Economy Combo Tester and attach the other two ends into the test resistance test limits in the ACL 795 Calibration Test Box. The ends can be inserted into different values in order to test each foot at different resistance values.
5. Press down on tester with enough pressure to activate the test circuit. Observe the LED's for the proper response as indicated below. Be sure to hold cables at an insulated point, so that the resistance value is not affected by the body.



OPTIONAL ACL 740 DOOR RELAY WIRING AND SPECIFICATIONS

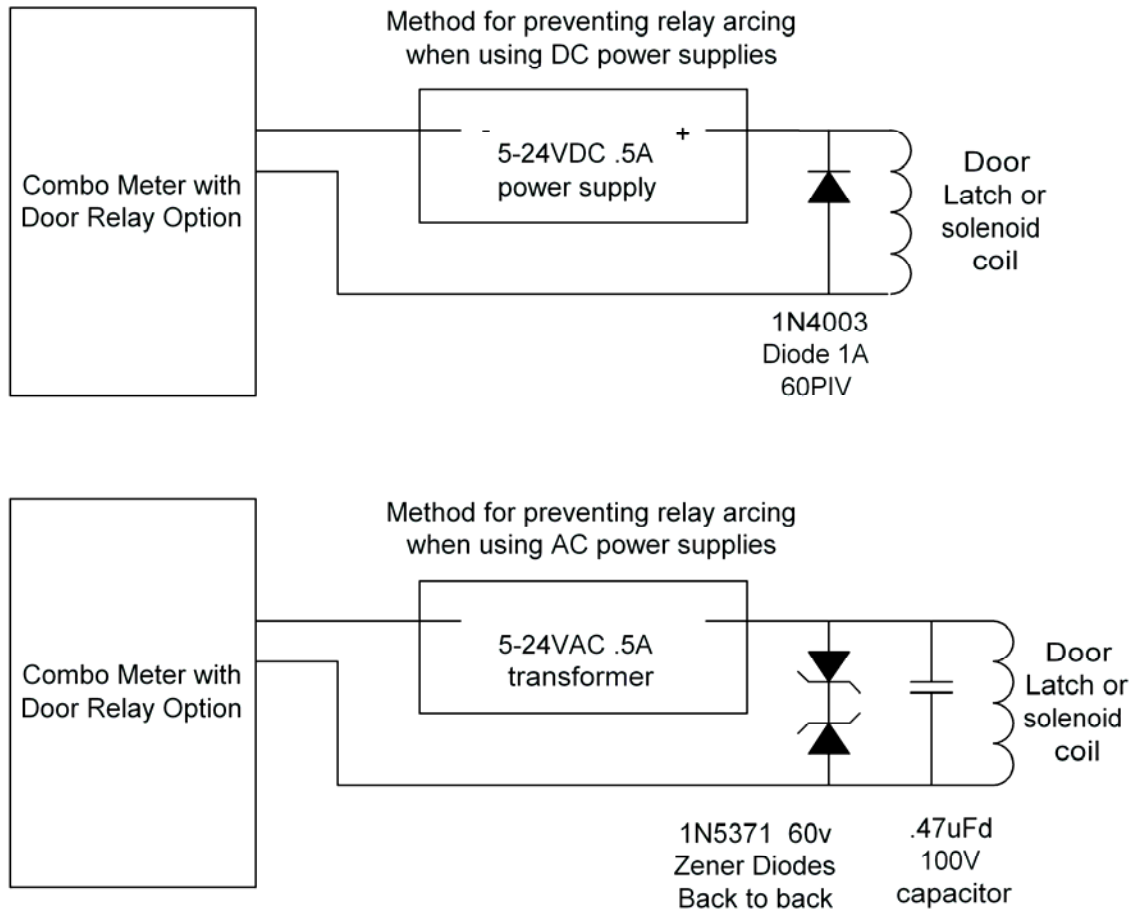


ACL 740 door opening option:
 Both wires connect to customer's door relay.
 The wires can be disconnected from the meter via bayonet connection.

Units that are ordered with an ACL 740 door-opening relay option will be equipped with two pigtail wires found on the right side of the unit. There are two male bayonet type plugs attached to these wires. There are two unwired female jacks attached to these male plugs, which can be attached to the open/close schematics on the door/bell circuit board (connected to the door mechanism). The relay in the ACL 780/781 Economy Combo Tester is a single throw, low voltage single pole normally open relay. When the user passes a test, the relay is activated and remains closed for about 3 – 5 seconds after the user releases the test button. Units manufactured after 1/30/2006 have an activation time adjust trimpot in them which can be used to set the door open time.

The relay is rated .5 amps at 24 volts. Please refer to the schematics of a footplate door opening mechanism. Substitute the two wire door wires for the two-wire connection of the door foot-switch or hand-switch.

The door in a facility has a second relay, usually of a higher voltage of 110 or 220VAC that allows voltage into the door electrical motor that opens and closes a door. This relay can be activated by a press button, a proximity sensor, or a floor switch as in a super market. When a person passes the combo meter strap tests, the low voltage relay in the combo meter is closed thus allowing current to pass into the higher voltage door relay and activate the motor in the door. When the low voltage relay in the meter opens the reverse happens – the high voltage relay in the door is opened thus stopping the door current, and the door closes.



If the door relay contact is in series with a high current inductive load door latch such as a large solenoid or electromagnet, then arcing can develop across the relay contact when the contact breaks the circuit, and shorten the relay life.

To prevent relay contact arcing if the contact current is DC, then a diode (such as a 1N4003 or 1N4004) across the coil leads, with cathode (band side) on the positive lead, may be wired across the contacts. The diode should have a PIV (peak inverse voltage) rating of at least twice the DC voltage.

To prevent relay contact arcing if the contact current is AC, then two zener diodes back to back (band to band) may be wired across the coil leads. The zener voltage should be at least twice the AC voltage. If running 24VAC (30VAC open load?), use two 60 volt 1N5371B zeners.