HI-POT setup and testing

FOR HIPOTRONICS HD–103 AND HD–106 AC/DC VOLTAGE TESTERS

OVERVIEW

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To ensure your own personal safety and the safety of your co-workers, and to be sure that our displays are suitably tested to ensure customer safety, it is essential that you understand the proper setup and use of our hi-pot testers. Please familiarize yourself with the contents of this manual.
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Hi-pot testing verifies the integrity of high-voltage AC primary wire insulation in an electrical system to ensure that it is safe to operate. When done properly, this test will expose short circuit conditions or weak components that could compromise electrical safety and create a higher than normal risk of human electrical shock. Again, this test checks only the high-voltage AC primary wiring of an electrical system.

The test method is simple: apply a very high voltage potential (thus the name “hi-pot”) between the “hot” (L1, L2, etc.) & “neutral” (L0) wires and the main safety ground point and monitor the system for excessive current flow. A properly wired and insulated electrical system will have negligible current flow during this test.

Intertek ETL SEMKO, the organization that certifies the electrical safety of our displays, accepts pass results for the following four hi-pot test methods:

**AC VOLTAGE** (desired method) **DC VOLTAGE** (accepted alternate method)

1 (one) second test @ 1.488 K-volts AC 1 (one) second test @ 2.104 K-volts DC

– OR –

60 (sixty) second test @ 1.24 K-volts AC 60 (sixty) second test @ 1.754 K-volts DC

– OR –

There are several hi-pot testers on premises: two Slaughter brand AC voltage testers, one Slaughter brand DC voltage tester, and two Hipotronics brand AC/DC voltage testers – one that can produce up to 3 K-volts AC or DC (model # HD-103), and one that can deliver up to 6 K-volts AC or DC (model # HD-106).

This instruction document explains how to set up and use the Hipotronics HD-103 & HD-106 AC/DC voltage testers. Separate instruction documents are available for the Slaughter model 2510 AC voltage testers (98-0069-01), and the Slaughter model 2503 DC voltage tester (98-0069-02).
FRONT PANEL CONTROLS

AC VOLTAGE TEST SETUP AND PROCEDURE

SETUP (for one-second and sixty-second AC voltage test methods):

Referencing illustration A, confirm the following information and switch settings before each use.

D) CALIBRATION LABEL: Identify the tester model number and verify that the calibration has not expired. Do not use a tester if it is out of calibration!

S) AC POWER ON SWITCH: Toggled OFF.

T) VOLTAGE RANGE SWITCH: HIGH on the HD–103 MED (medium) on the HD–106

H) OUTPUT & CURRENT SWITCH: 5 mA AC

J) OVERLOAD SENS DIAL: Full clockwise rotation to MIN (minimum)

Connect the high voltage test cable to the AC OUT (U) post and the ground test cable is connected to GROUND (G) post as shown in illustration B.
TESTING:

AC VOLTAGE TEST ~ ONE-SECOND METHOD

1. Hook up the test power cable leads to the display’s primary power wires, black to black, white to white & green to green. Make sure that all protective fuses, breakers, switches, etc., of the display being tested are installed and switched ON.

2. Connect the opposite end of the test power cable to either outlet of the duplex box mounted to the test cart.

3. Plug the tester power cable into a standard 120 VAC power outlet and toggle the AC POWER switch (front lower left-hand corner) to the ON position. The AC POWER and AC OUT indicators should both light up.

4. **Loudly yell “HI-POT”** to alert other workers that you are about to begin high voltage testing. **UNDER NO CIRCUMSTANCE IS ANYONE TO TOUCH THE DISPLAY OR ANY OF THE CABLES LEADING UP TO IT WHILE THE HIGH VOLTAGE TEST IS IN PROCESS.**

5. During the test process, keep yourself and all nearby persons at least three feet away from the display being tested.

6. Press the black HIGH VOLTAGE ON button on the front of the hi-pot tester. Note: if you do not hear the internal relay click on and see the red HIGH VOLTAGE indicator illuminate, make sure the black RAISE VOLTAGE dial is rotated fully counterclockwise to (0) ZERO START and press the HIGH VOLTAGE ON button again.

7. Slowly rotate the black RAISE VOLTAGE dial clockwise until the AC–DC KILOVOLTS meter needle rests at 1.5 (top scale on the HD-103, middle scale on the HD-106) as shown in illustration C.
8. Leave the output voltage on for one (1) full second, and then press the red **HIGH VOLTAGE OFF** button, rotate the **RAISE VOLTAGE** dial fully counter-clockwise back to **(0) ZERO START**, and toggle the **AC POWER** switch to the **OFF** position. If the display passes, disconnect the hi-pot tester.

If you must stop the test for any reason, press the red **HIGH VOLTAGE OFF** button.

If the display should fail the test, the red **OVERLOAD FAILURE** indicator will light up, the test voltage will disengage and the tester will emit a continuous beep. Press the red **OVERLOAD RESET** button to over-ride these warning indicators, and then rotate the black **RAISE VOLTAGE** dial back to **(0) ZERO START** to reset for another hi-pot test.

9. If a display fails the one-second test method, redo the test using the sixty-second ETL test outlined below, as required by article 36 of UL standard 1433.

**AC VOLTAGE TEST ~ SIXTY-SECOND METHOD**

1. Hook up the test power cable leads to the display’s primary power wires, black to black, white to white & green to green. Make sure that all protective fuses, breakers, switches, etc., of the display being tested are installed and switched ON.

2. Connect the opposite end of the test power cable to either outlet of the duplex box mounted to the test cart.

3. Plug the tester power cable into a standard 120 VAC power outlet and toggle the **AC POWER** switch (front lower left-hand corner) to the **ON** position. The **AC POWER** and **AC OUT** indicators should both light up.

4. **Loudly yell “HI-POT”** to alert other workers that you are about to begin high voltage testing. **UNDER NO CIRCUMSTANCE IS ANYONE TO TOUCH THE DISPLAY OR ANY OF THE CABLES LEADING UP TO IT WHILE THE HIGH VOLTAGE TEST IS IN PROCESS.**

5. During the test process, keep yourself and all nearby persons at least three feet away from the display being tested.

6. Press the black **HIGH VOLTAGE ON** button on the front of the hi-pot tester. Note: if you do not hear the internal relay click on and see the red **HIGH VOLTAGE** indicator illuminate, make sure the black **RAISE VOLTAGE** dial is rotated fully counter-clockwise to **(0) ZERO START** and press the **HIGH VOLTAGE ON** button again.

7. Slowly rotate the black **RAISE VOLTAGE** dial clockwise until the **AC–DC KILOVOLTS** meter needle rests at **1.25** (the middle division line between **1.0** and **1.5**, top scale on the HD-103, middle scale on the HD-106) as shown in Illustration D.
Illustration D

8. Leave the output voltage on for sixty (60) full seconds, being sure to keep yourself and others clear of the test area during this time. Afterward press the red **HIGH VOLTAGE OFF** button, rotate the **RAISE VOLTAGE** dial fully counter-clockwise back to (0) **ZERO START**, and toggle the **AC POWER** switch to the **OFF** position. If the display passes, disconnect the hi-pot tester.

If you must stop the test for any reason, press the red **HIGH VOLTAGE OFF** button.

If the display should fail the test, the red **OVERLOAD FAILURE** indicator will light up, the test voltage will disengage and the tester will emit a continuous beep. Press the red **OVERLOAD RESET** button to over-ride these warning indicators, and then rotate the black **RAISE VOLTAGE** dial back to (0) **ZERO START** to reset for another hi-pot test.

9. If the display fails the sixty-second ETL test method, disconnect it from the tester and inspect the wiring to determine the cause of failure. This may require technical assistance from the engineering department.

Some displays may be equipped with a component or series of components that together create a higher than typical leakage current. If this is suspected to be the case, repeat the test using the DC voltage tests outlined in the next section.
DC VOLTAGE TEST SETUP AND PROCEDURE:

SETUP (for one-second and sixty-second DC voltage test methods):

Referencing illustration A, confirm the following information and switch settings before each use.

D) CALIBRATION LABEL: Identify the tester model number and verify that the calibration has not expired. Do not use a tester if it is out of calibration!

S) AC POWER ON SWITCH: Toggled OFF.

T) VOLTAGE RANGE SWITCH: HIGH on the HD–103
   MED (medium) on the HD–106

H) OUTPUT & CURRENT SWITCH: DC uA x100

J) OVERLOAD SENS DIAL: Full clockwise rotation to MIN (minimum)

Connect the high voltage test cable to the DC OUT (F) post and the ground test cable is connected to GROUND (G) post as shown in illustration E.
TESTING:

**DC VOLTAGE TEST ~ ONE-SECOND METHOD**

1. Hook up the test power cable leads to the display’s primary power wires, black to black, white to white & green to green. Make sure that all protective fuses, breakers, switches, etc., of the display being tested are installed and switched ON.

2. Connect the opposite end of the test power cable to either outlet of the duplex box mounted to the test cart.

3. Plug the tester power cable into a standard 120 VAC power outlet and toggle the **AC POWER** switch (front lower left-hand corner) to the **ON** position. The **AC POWER** and **AC OUT** indicators should both light up.

4. **Loudly yell** “HI-POT” to alert other workers that you are about to begin high voltage testing. **UNDER NO CIRCUMSTANCE IS ANYONE TO TOUCH THE DISPLAY OR ANY OF THE CABLES LEADING UP TO IT WHILE THE HIGH VOLTAGE TEST IS IN PROCESS.**

5. During the test process, keep yourself and all nearby persons at least three feet away from the display being tested.

6. Press the black **HIGH VOLTAGE ON** button on the front of the hi-pot tester. Note: if you do not hear the internal relay click on and see the red **HIGH VOLTAGE** indicator illuminate, make sure the black **RAISE VOLTAGE** dial is rotated fully counterclockwise to **(0) ZERO START** and press the **HIGH VOLTAGE ON** button again.

7. Slowly rotate the black **RAISE VOLTAGE** dial clockwise until the **AC–DC KILOVOLTS** meter needle rests at the third division line between **2.0** and **2.5** (top scale on the HD-103, middle scale on the HD-106) as shown in illustration F. (note 1)

Illustration F
8. Leave the output voltage on for one (1) full second, and then press the red HIGH VOLTAGE OFF button, rotate the RAISE VOLTAGE dial fully counter-clockwise back to (0) ZERO START, and toggle the AC POWER switch to the OFF position. If the display passes, disconnect the hi-pot tester.

If you must stop the test for any reason, press the red HIGH VOLTAGE OFF button.

If the display should fail the test, the red OVERLOAD FAILURE indicator will light up, the test voltage will disengage and the tester will emit a continuous beep. Press the red OVERLOAD RESET button to over-ride these warning indicators, and then rotate the black RAISE VOLTAGE dial back to (0) ZERO START to reset for another hi-pot test.

9. If a display fails the one-second test method, redo the test using the sixty-second ETL test outlined below, as required by article 36 of UL standard 1433.

**DC VOLTAGE TEST ~ SIXTY-SECOND METHOD**

10. Hook up the test power cable leads to the display’s primary power wires, black to black, white to white & green to green. Make sure that all protective fuses, breakers, switches, etc., of the display being tested are installed and switched ON.

11. Connect the opposite end of the test power cable to either outlet of the duplex box mounted to the test cart.

12. Plug the tester power cable into a standard 120 VAC power outlet and toggle the AC POWER switch (front lower left-hand corner) to the ON position. The AC POWER and AC OUT indicators should both light up.

13. Loudly yell “HI-POT” to alert other workers that you are about to begin high voltage testing. UNDER NO CIRCUMSTANCE IS ANYONE TO TOUCH THE DISPLAY OR ANY OF THE CABLES LEADING UP TO IT WHILE THE HIGH VOLTAGE TEST IS IN PROCESS.

14. During the test process, keep yourself and all nearby persons at least three feet away from the display being tested.

15. Press the black HIGH VOLTAGE ON button on the front of the hi-pot tester. Note: if you do not hear the internal relay click on and see the red HIGH VOLTAGE indicator illuminate, make sure the black RAISE VOLTAGE dial is rotated fully counter-clockwise to (0) ZERO START and press the HIGH VOLTAGE ON button again.

16. Slowly rotate the black RAISE VOLTAGE dial clockwise until the AC–DC KILOVOLTS meter needle rests at the sixth division line between 1.5 and 2.0 (top scale on the HD-103, middle scale on the HD-106) as shown in illustration G. (note 1)
Illustration G

17. Leave the output voltage on for sixty (60) full seconds, being sure to keep yourself and others clear of the test area during this time. Afterward press the red HIGH VOLTAGE OFF button, rotate the RAISE VOLTAGE dial fully counter-clockwise back to (0) ZERO START, and toggle the AC POWER switch to the OFF position. If the display passes, disconnect the hi-pot tester.

If you must stop the test for any reason, press the red HIGH VOLTAGE OFF button.

If the display should fail the test, the red OVERLOAD FAILURE indicator will light up, the test voltage will disengage and the tester will emit a continuous beep. Press the red OVERLOAD RESET button to over-ride these warning indicators, and then rotate the black RAISE VOLTAGE dial back to (0) ZERO START to reset for another hi-pot test.

18. If the display fails the sixty-second ETL test method, disconnect it from the tester and inspect the wiring to determine the cause of failure. This may require technical assistance from the engineering department.

(Note 1) The specified DC voltages are determined by multiplying the AC test voltage requirements by a factor of 1.414. This is per verbal communication with Mike Larson; project manager @ ETL SEMCO in Oakdale, Minnesota, and Duane Davis; technical services manager @ Slaughter Company Inc. in Lake Forest, Illinois. Support text is located in a white paper published by Slaughter Company Inc. titled “Basic Facts About High Voltage Testing”, ninth edition, copyright 2001; page 19, in the last paragraph.