

NX APPLICATION NOTE

Calibration Verification Device



The Calibration Verification Device is used to verify that the NX Tester is properly calibrated. It verifies the tester's resistance and capacitance measuring performance. It also verifies that the tester's voltage reference is within a specified range to assure accuracy.

The Calibration Verification Device may be used with any NX Tester equipped with firmware version 2.1.103 or later.

Low voltage NX Testers and Hipot NX Testers use different Calibration Verification Devices:

- For low voltage NX Testers, the Calibration Verification Device is part number 5-1040.
- For Hipot NX Testers, the Calibration Verification Device is part number 5-1041.

The Calibration Verification Device's main use is to support quality assurance programs that require the accuracy of all test equipment be validated using NIST-traceable measurement equipment. The Calibration Verification Device provides an external NIST-traceable validation of the NX Tester's measurement accuracy that such quality assurance auditing programs require.

It should be noted that the NX Tester has sophisticated and reliable internal self-diagnostics and automatic calibration. The NX Tester performs automatic calibration upon power-up and every time a Test Workflow item is executed. Automatic calibration is based on readings made using a set of internal precision components of known values. This provides a significant level of assurance that the NX Tester is operating accurately even if the Calibration Verification Device is not being used.

To verify the NX Tester's calibration, disconnect the NX Tester from any fixture connections, and insert the Calibration Verification Device into position 1 (the first set of test points on the NX Tester) as shown below:

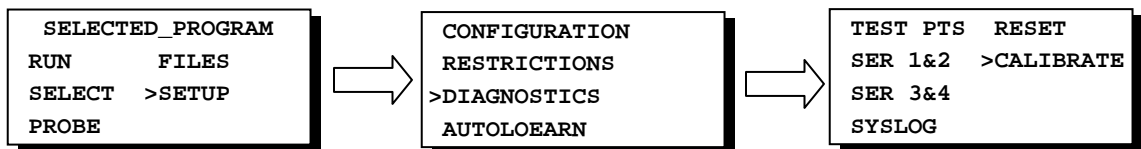


Insert Calibration Verification Device into position 1 – this is the upper right-most set of test points when viewed from the rear of the NX Tester. (For an NX Pro+ tester, position 1 is the upper right-most set of test points on the first Expansion Unit.)



View of rear of NX Tester with Calibration Verification Device installed.

Access the CALIBRATION menu on the NX Tester. Starting at the Main Menu, select SETUP -> DIAGNOSTICS -> CALIBRATE:



The CALIBRATION menu provides the following options:

```
CALIBRATION
VERIFY CALIBRATION
VIEW RESULTS
XFER > MEM-CARD
```

- **VERIFY CALIBRATION**
With the Calibration Verification Device inserted in Position 1, select VERIFY CALIBRATION to verify that the NX Tester is properly calibrated
- **VIEW RESULTS**
Select VIEW RESULTS to view the results of the calibration verification. The results of the most recent calibration verification will be summarized on the display - including the date, serial number of the Calibration Verification Device, and whether it passed or failed:

```
DATE:21 AUGUST 2006

CALIB BOARD: 00002
CALIBRATION: PASSED
```

- **XFER > MEM-CARD**
Select XFER > MEM-CARD to transfer the Calibration Certificate to the testers memory card. The results provided in an html document. The filename is in the format: Calibration-SNxxxxxxxx.html, where xxxxxxxxxx is the tester's serial number. After transferring the file to a PC, it can be viewed with a web browser as well as printed.

Calibration Verification Failure

If a tester fails calibration verification, it will continue to operate, but may not meet its published accuracy specifications. At power-up, a warning message will be displayed until the user presses any button:

```
EXTERNAL CALIBRATION
FAILED
```

To correct the failure, the tester's CPU board must be replaced. For repair service for a NX Tester that fails calibration verification, please contact Dynalab.

Calibration Verification Interval

Dynalab's recommended calibration verification interval is one year.

The following is an example of the Calibration Certificate for a successful calibration verification of a low voltage NX Tester:

Dynalab

555 Lancaster Avenue
 Reynoldsburg, Ohio 43068
 www.dynalabtesters.com

Calibration Verification Certificate

This document certifies that the Dynalab Tester indicated below is in compliance with its published operating specifications:

Model: Dynalab NX Tester
 Serial No: 004400274
 Verification Date: 14-Mar-2005
 Expiration Date: 14-Mar-2006

The Dynalab Performance Verification Device indicated below was used for calibration verification. This device was calibrated at Dynalab using standards and accuracies traceable to NIST (National Institute of Standards and Technology).

<u>Model Number</u>	<u>Model Description</u>	<u>Serial Number</u>
5-1040	Performance Verification Device	000036

Measured Values:

<u>Nominal Value</u>	<u>Acceptable Variance</u>	<u>Measured Value</u>	<u>Measured Variance</u>	<u>Status</u>
1k ohm	+/- .9%	996 ohm	-0.40%	Pass
3k ohm	+/- .9%	2.852k ohm	+0.42%	Pass
10k ohm	+/- .9%	10.05k ohm	+0.50%	Pass
30k ohm	+/- .9%	33.35k ohm	+0.45%	Pass
100k ohm	+/- .9%	99.60k ohm	-0.40%	Pass
300k ohm	+/- .9%	199.6k ohm	-0.20%	Pass
1M ohm	+/-4.8%	997.0k ohm	-0.30%	Pass
2.3M ohm	+/-4.8%	2.203M ohm	+0.13%	Pass
10nF	+/-4.0%	10.20nF	+2.00%	Pass
5.000V	+/-10%	4.999V	-0.02%	Pass
5mA	+/-5%	5.03mA	+0.23%	Pass
1.5mA	+/-5%	1.53mA	+ .25%	Pass
500uA	+/-5%	506uA	+ .41%	Pass
149.5uA	+/-5%	151uA	+1.00%	Pass
49.5uA	+/-5%	56uA	+ .56%	Pass
14.5uA	+/-10%	16.1uA	+4.04%	Pass
4.5uA	+/-20%	4.8uA	+5.87%	Pass

The following is an example of the Calibration Certificate for a failed calibration verification of a low voltage NX Tester:

Dynalab

555 Lancaster Avenue
 Reynoldsburg, Ohio 43068
www.dynalabtesters.com

Calibration Verification

Calibration Failure

Model: Dynalab NX Tester
 Serial No: 004001110
 Verification Date: 17-Apr-2009
 Expiration Date: N/A (Calibration Failed)

The Dynalab Performance Verification Device indicated below was used for calibration verification. This device was calibrated at Dynalab using standards and accuracies traceable to NIST (National Institute of Standards and Technology).

Model Number	Model Description	Serial Number
5-1040	Performance Verification Device	00001

Nominal and Measured Values:

Nominal Value	Acceptable Variance	Measured Value	Measured Variance	Status
1k ohm	+/-0.90%	0 ohm	63.84%	Fail
3k ohm	+/-0.90%	2.998k ohm	-0.06%	Pass
10k ohm	+/-0.90%	10k ohm	0.00%	Pass
30k ohm	+/-0.90%	30.01k ohm	0.03%	Pass
100k ohm	+/-0.90%	100k ohm	0.00%	Pass
300k ohm	+/-0.90%	300.9k ohm	0.30%	Pass
1M ohm	+/-4.80%	998k ohm	-0.20%	Pass
2.3M ohm	+/-4.80%	2.296M ohm	-0.17%	Pass
10nF	+/-4.00%	9.01nF	-9.90%	Fail
5 V	+/-10.00%	5.025 V	0.50%	Pass
5mA	+/-5.00%	0nA	63.84%	Fail
1.5mA	+/-5.00%	1.477mA	-1.53%	Pass
500uA	+/-5.00%	493.7uA	-1.26%	Pass
149.5uA	+/-5.00%	145.8uA	-2.47%	Pass
49.5uA	+/-5.00%	48.78uA	-1.45%	Pass
14.5uA	+/-10.00%	14.19uA	-2.13%	Pass
4.5uA	+/-20.00%	4.214uA	-6.35%	Pass

The following is an example of the Calibration Certificate for a successful calibration verification of an NX Hipot Tester:

Dynalab

555 Lancaster Avenue
 Reynoldsburg, Ohio 43068
www.dynalabtesters.com

Calibration Verification

This document certifies that the Dynalab Tester indicated below is in compliance with its published operating specifications:

Model: Dynalab NX Hipot
 Serial No: 003801030
 Verification Date: 13-May-2009
 Expiration Date: 13-May-2010

The Dynalab Performance Verification Device indicated below was used for calibration verification. This device was calibrated at Dynalab using standards and accuracies traceable to NIST (National Institute of Standards and Technology).

Model Number	Model Description	Serial Number
5-1041	Hipot Performance Verification Device	10022

Nominal and Measured Values:

Nominal Value	Acceptable Variance	Measured Value	Measured Variance	Status
1k ohm	+/-0.90%	999 ohm	-0.10%	Pass
3k ohm	+/-0.90%	3k ohm	0.00%	Pass
10k ohm	+/-0.90%	9.999k ohm	-0.01%	Pass
30k ohm	+/-0.90%	30.02k ohm	0.06%	Pass
100k ohm	+/-0.90%	100.1k ohm	0.10%	Pass
300k ohm	+/-0.90%	300.5k ohm	0.16%	Pass
1M ohm	+/-4.80%	999k ohm	-0.10%	Pass
2.3M ohm	+/-4.80%	2.295M ohm	-0.21%	Pass
10nF	+/-4.00%	10.1nF	1.00%	Pass
5 V	+/-10.00%	5.011 V	0.22%	Pass
5mA	+/-5.00%	4.988mA	-0.24%	Pass
1.5mA	+/-5.00%	1.473mA	-1.80%	Pass
500uA	+/-5.00%	493.5uA	-1.30%	Pass
149.5uA	+/-5.00%	145.8uA	-2.47%	Pass
49.5uA	+/-5.00%	48.77uA	-1.47%	Pass
14.5uA	+/-10.00%	14.15uA	-2.41%	Pass
4.5uA	+/-20.00%	4.207uA	-6.51%	Pass
300 V	+/-5.00%	299.8 V	-0.06%	Pass
1kV	+/-20.00%	1.1kV	10.00%	Pass

The following is an example of the Calibration Certificate for a failed calibration verification of an NX Hipot Tester:

Dynalab

555 Lancaster Avenue
 Reynoldsburg, Ohio 43068
www.dynalabtesters.com

Calibration Verification

Calibration Failure

Model: Dynalab NX Hipot
 Serial No: 003801030
 Verification Date: 13-May-2009
 Expiration Date: N/A (Calibration Failed)

The Dynalab Performance Verification Device indicated below was used for calibration verification. This device was calibrated at Dynalab using standards and accuracies traceable to NIST (National Institute of Standards and Technology).

Model Number	Model Description	Serial Number
5-1041	Hipot Performance Verification Device	10022

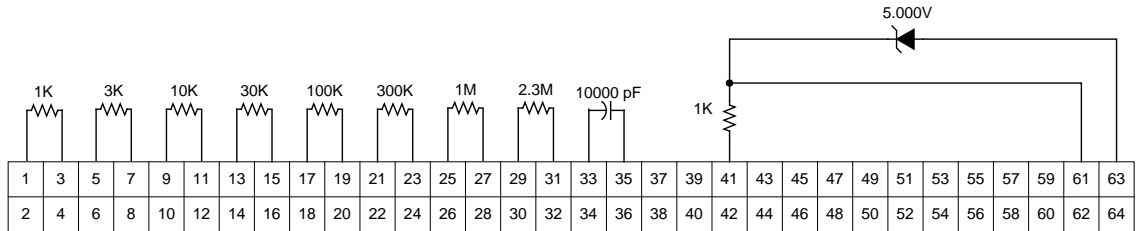
Nominal and Measured Values:

Nominal Value	Acceptable Variance	Measured Value	Measured Variance	Status
1k ohm	+/-0.90%	999 ohm	-0.10%	Pass
3k ohm	+/-0.90%	2.999k ohm	-0.03%	Pass
10k ohm	+/-0.90%	9.994k ohm	-0.06%	Pass
30k ohm	+/-0.90%	30.02k ohm	0.06%	Pass
100k ohm	+/-0.90%	100.1k ohm	0.10%	Pass
300k ohm	+/-0.90%	300.5k ohm	0.16%	Pass
1M ohm	+/-4.80%	998.2k ohm	-0.18%	Pass
2.3M ohm	+/-4.80%	2.294M ohm	-0.26%	Pass
10nF	+/-4.00%	10.1nF	1.00%	Pass
5 V	+/-10.00%	5.012 V	0.24%	Pass
5mA	+/-5.00%	4.986mA	-0.28%	Pass
1.5mA	+/-5.00%	1.473mA	-1.80%	Pass
500uA	+/-5.00%	493.4uA	-1.32%	Pass
149.5uA	+/-5.00%	145.7uA	-2.54%	Pass
49.5uA	+/-5.00%	48.76uA	-1.49%	Pass
14.5uA	+/-10.00%	14.15uA	-2.41%	Pass
4.5uA	+/-20.00%	4.206uA	-6.53%	Pass
300 V	+/-5.00%	4.2 V	65.24%	Fail
1kV	+/-20.00%	850 V	-15.00%	Pass

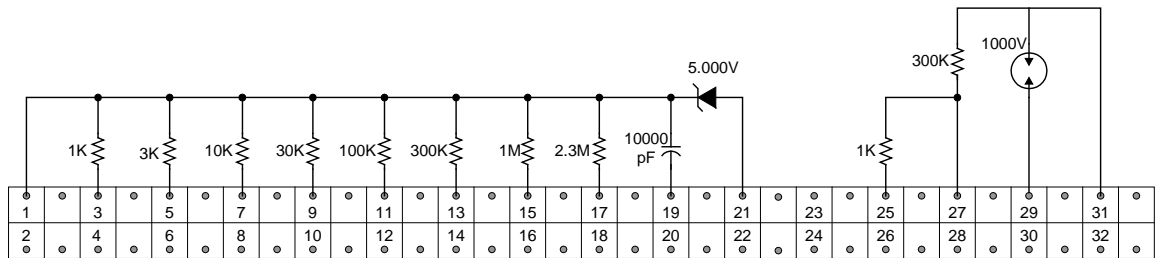
Schematics

The following are schematics for both the low voltage and hipot Calibration Verification Devices. The connector numbering scheme perspective is looking at the rear of the devices. For the hipot device, note that only every other pin is used.

Schematic of part number 5-1040 (for low voltage NX Testers):



Schematic of part number 5-1041 (for NX Hipot Testers):



Note: High voltage is applied to pin 29 for gas discharge tube breakdown test. High voltage is applied to pin 31 for voltage calibration through 1K and 300K resistors.

Hipot IR Accuracy Verification

The NX Hipot Tester's specifications indicate that the insulation resistance (IR) range and accuracy are: 5 MΩ – 1 GΩ (± 10%). The following method is presented as a way of verifying the NX Hipot Tester's measurement accuracy for insulation resistance tests.

It is important to note that the NX Hipot Tester only provides an IR measurement in the case of an error. So the method for verification of IR measurement accuracy is as follows:

- 1 Using the NX Editor, build a simple hipot program that has only one connection defined.
- 2 Obtain a precision high value resistor, i.e. 100 Meg ohms and measure its value using lab equipment whose calibration has been verified.
- 3 In the Test Hipot workflow item of the program, make sure that Soak Mode is "Fixed Time" for at least 2000 ms.
- 4 In the Test Hipot workflow item, set the Minimum Insulation Resistance to a value that is higher than the precision resistor being tested.
- 5 Build a fixture that has 4 connections back to the NX Hipot Tester. Connect the two points that were defined in step 1. Also, connect the precision resistor across the other two points.
- 6 Execute the program. The Hipot test will fail the IR criteria, and the tester will display the measured value of the precision resistor as shown below:

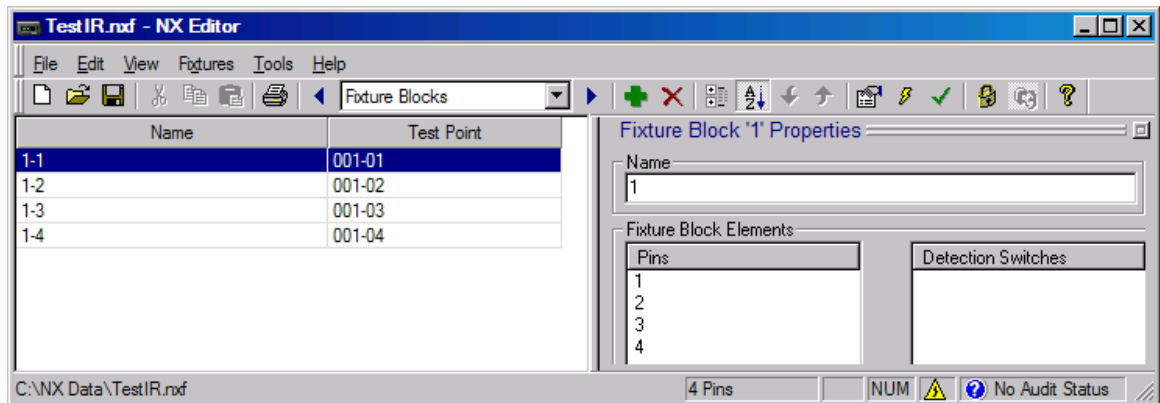
```
IR FAILURE      1 / 2
1-3             1 / 1PT
1000MΩ         105MΩ
```

On the fourth line, the minimum acceptable IR value is displayed in the lower left corner, and the measured IR value is displayed in the lower right corner. In this example, the measured value is 105 MΩ and the minimum acceptable IR value is 1000 MΩ.

NX Editor program details are provided below:

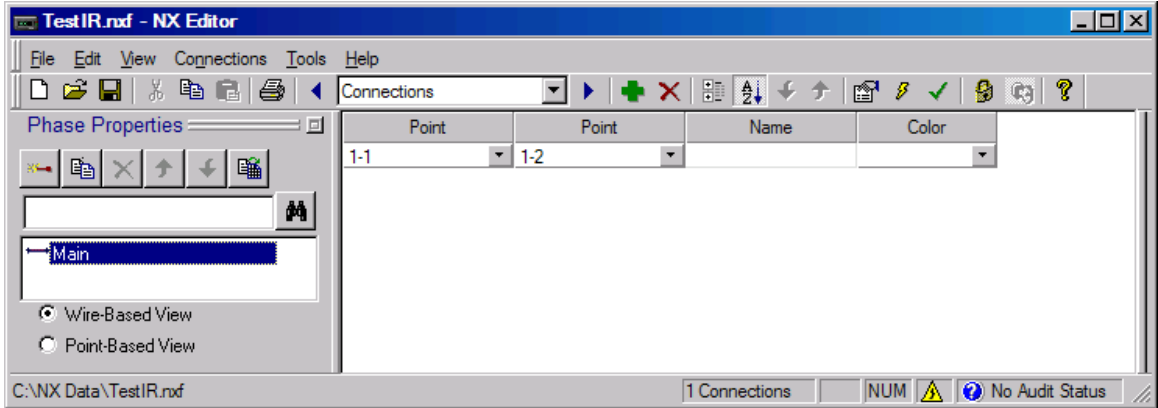
FIXTURE BLOCKS VIEW

In the Fixture Blocks View, define one fixture block with 4 pins. Assign each fixture block pin to a test point:



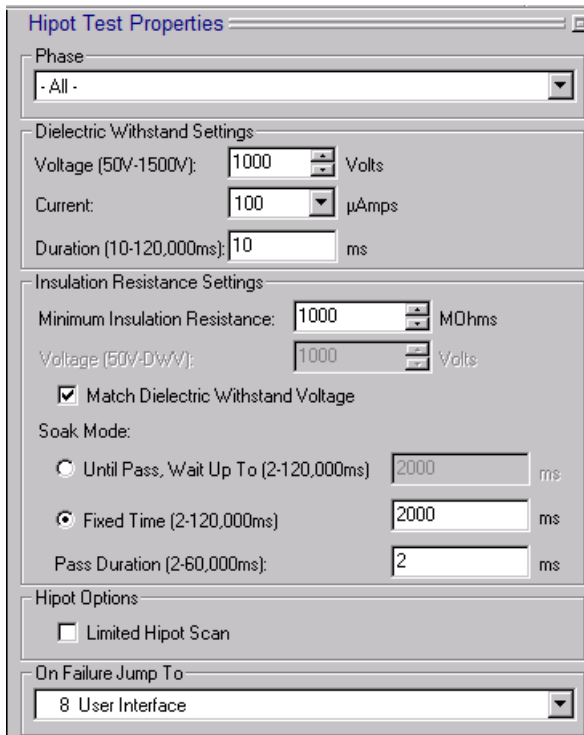
CONNECTIONS VIEW:

In the Connections View, add a single connection that connects points 1-1 and 1-2:



WORKFLOW VIEW:


Use the default workflow for the NX Hipot Tester. In the Hipot Test workflow item, configure the parameters as shown below:



Make sure that the Soak Mode is set to “Fixed Time” with a value of at least 2000 ms.

Calibrating the Calibration Verification Device

The Calibration Verification Devices are certified for five years from time of original shipment to the customer. Dynalab Test Systems decided that it would be more efficient to offer these devices at a low price versus implementing a program where these devices would be returned to Dynalab for calibration verification. When the Calibration Verification Device date expires, contact Dynalab and purchase a new device. Below is a sample of Calibration Certificate for the actual Calibration Verification Device (5-1040)

			
555 Lancaster Avenue Reynoldsburg, Ohio 43068 614-866-9999			
Calibration Certificate			
Model No:	5-1040		
Description:	Dynalab NX Calibration Verification Device		
Serial No:	0000020		
Customer Name:	Dynalab, Inc.		
Calibration Date:	Sep-11-2007		
Expiration Date:	Sep-10-2012		
This certifies that the component values for the Calibration Verification Device are within the allowable tolerance ranges. The Verification Equipment that was used was calibrated at Dynalab using standards and accuracies traceable to NIST (National Institute of Standards and Technology).			
Verification Equipment Used:			
Model Number	Model Description	Trace Number	
AGILENT 34401A	34401A Digital Multimeter	513	
CM1555	Elenco Capacitance Meter	382E	
Nominal Value	Accepted Range	Measured Value	Status
1k ohm	999.000 – 1.00098 k ohm	999.999 ohm	Pass
3k ohm	2.99706k – 3.00294 k ohm	3.0003k ohm	Pass
10k ohm	9.9902k – 10.0098k ohm	10.0015k ohm	Pass
30k ohm	29.9706k – 30.0294k ohm	30.011k ohm	Pass
100k ohm	99.902k – 100.098k ohm	100.054k ohm	Pass
300k ohm	299.706k – 300.294 ohm	300.183k ohm	Pass
1M ohm	999.020k – 1.00098M ohm	999.977k ohm	Pass
2.3M ohm	2.2977M – 2.30225M ohm	2.3004M ohm	Pass
10nF	9.90nF – 10.10nF	9.94nF	Pass
5.000V	4.950V – 5.050V	5.000V	Pass

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