DeFelsko®

Management Procedure 2002
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Calibration Procedure

DeFelsko Corporation

PosiTest HHDC Verifier

High voltage Holiday Detector Verifier

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1 Introduction and UUC Performance Requirements

1.1 This procedure describes the calibration of DeFelsko Corporation PosiTest HHDC Verifier with the following specification:

Table 1-1 Measurement Ranges

Probe	Measurement Range
500 – 30,000V	±5%

1.2 The unit being calibrated will be referred to as the UUC (Unit-Under-Calibration).

2 Measurement Standards and Support Equipment Performance Requirements

2.1 The UUC accuracy requirements are based upon the published UUC performance specifications.

2.2 The test uncertainty ratio (TUR) applied in this Calibration Procedure is 4:1 unless otherwise stated.

2.3 The Minimum-Use-Specifications are the minimum test equipment specifications required to meet all the UUC accuracy requirements and the test uncertainty ratio applied.

Table 2-1 UUC Accuracy Requirements and Description

UUC	Performance Specifications		Test Method
HHDC Verifier	500 – 30,000 V	± 5% of reading	Digitizer and High Voltage Probe

Table 2-2 Minimum use specification

Range	Accuracy
500 – 30,000V	± 1.25%

Table 2-3 Actual Equipment Specification

Equipment Generic Name	Range	Accuracy	Manufacturer / Model #'s Applicable
Digitizer	0 to 2V† >2 to 32V† >32 to 64V† >64 to 128V†	± (0.10% of reading + 0.12% of range) ± (0.10% of reading + 0.12% of range) ± (0.10% of reading + 0.30% of range) ± (0.10% of reading + 0.20% of range)	Keysight, L4532A
High Voltage Probe	N/A	1000:1 attenuation ± 0.1%††	North Star PVM-1
PosiTest HHDC	0 to 30,000	± 5%	DeFelsko, HHDC

[†]With the use of the high voltage probe the effective digitizer range is multiplied by 1000.

***Caution*:** The instructions in this Calibration Procedure relate specifically to the equipment and conditions listed in Section 2. If other equipment is substituted, the information and instructions must be interpreted accordingly.

Table 2-4 Calibration Environmental and Warm-Up Requirements

Measurement Standards & Support Equipment Environmental Requirements:	Temperature: 23 ± 5° C. Relative Humidity: Less than 95%
Measurement Standards & Support Equipment Warm-up and Stabilization Requirements:	60 minutes

3 Uncertainty Calculation

3.1 The high voltage probe is used to reduce the voltage output from the PosiTest HHDC to levels that are within the Digitizer's input range. When calculating the error associated with the digitizer, the input value is the HHDC output divided by 1,000. The calculated digitizer error then needs to be multiplied by 1,000 before being combined with the voltage probe error.

3.2 The accuracy of the PosiTest HHDC has no impact on the measurement system since it is only used as a voltage source. The reading of the supplied voltage is taken from the digitizer not the PosiTest HHDC display.

3.3 At a PosiTest HHDC output of 500V, digitizer input of 2V :
High Voltage Probe accuracy @ 500V = 500 * 0.1% = 0.5V
Digitizer accuracy @ 2V range = 0.10% of reading + 0.12% of range
= (0.5*0.10%) + (2*0.12%)
= 0.0029V
The combined accuracy using a sum of squares = $(\text{probe}^2 + \text{digitizer}^2)^{0.5}$
$= (0.5^2 + (0.0029*1000)^2)^{0.5}$
$= (0.25 + 8.41)^{0.5}$
= 3V
TUR = (500*5%) / 3V = 8

3.4 At a PosiTest HHDC output of 5,000V, digitizer input of 32V :
Probe accuracy @ 5,000V = 5000 * 0.1% = 5V
Digitizer accuracy @ 32V range = 0.10% of reading + 0.12% of range
= (5*0.10%) + (32*0.12%)
= 0.0434V
The combined accuracy using a sum of squares = $(\text{probe}^2 + \text{digitizer}^2)^{0.5}$
$= (5^2 + (0.0434*1000)^2)^{0.5}$
$= (25 + 1884)^{0.5}$
= 44V

TUR = (5,000*5%) / 44V = 5

3.5 At a PosiTest HHDC output of 20,000V, digitizer input of 64V :
Probe accuracy @ 20,000V = 20000 * 0.1% = 20V
Digitizer accuracy @ 64V range = 0.10% of reading + 0.30% of range
= (20*0.10%) + (64*0.30%)
= 0.212V
The combined accuracy using a sum of squares = $(\text{probe}^2 + \text{digitizer}^2)^{0.5}$
= $(20^2 + (0.212*1000)^2)^{0.5}$
= $(400 + 44944)^{0.5}$
= 213V
TUR = (20,000*5%) / 213V = 4

3.6 At a PosiTest HHDC output of 30,000V, digitizer input of 128V :
Probe accuracy @ 30,000V = 30000 * 0.1% = 30V
Digitizer accuracy @ 128V range = 0.10% of reading + 0.20% of range
= (30*0.10%) + (128*0.20%)
= 0.286V
The combined accuracy using a sum of squares = $(\text{probe}^2 + \text{digitizer}^2)^{0.5}$
= $(30^2 + (0.286*1000)^2)^{0.5}$
= $(900+ 81796)^{0.5}$
= 287V
TUR = (30,000*5%) / 287V = 5

4 Preliminary Operations

Note: Review the entire document before starting the calibration process.

4.1 Connect the High Voltage Probe to the HHDC output and connect the digitizer to the High Voltage Probe output. Connect the HHDC ground.

4.2 Connect the UUC to ground and the HHDC output then turn on the UUC.

5 Calibration Process

Note: Whenever the test requirement is not met, verify the results of each test and take corrective action before proceeding.

5.1 Adjust the HHDC output to 500V and the digitizer input to 2V. Activate the HHDC Detection Mode by pressing and holding the trigger. In table 6-1, record the voltage output V*ave* from the digitizer and the voltage displayed on the UUC. Release the trigger to exit Detection Mode.

5.2 Repeat step 5.1 for the following settings:

HHDC set point (V)	Digitizer input setting (V)
5,000	32

20,000	64
30,000	128

6 Performance Requirements

Note: The technician will collect the data needed to complete the appropriate table below. Do not write in this procedure.

Table 6-1 Performance Requirements and Calibration Data for PosiTest HHDC Verifier

HHDC Set Point (V)	UUC Reading (V)	Digitizer * Reading (V)	Min Reading Allowed (V) ❶	Max Reading Allowed (V) ❷
500				
5,000				
20,000				
30,000				

*V*ave*

❶ Calculation: (Digitizer reading times 1000) times 0.95. Round up to the nearest 1V.
❷ Calculation: (Digitizer reading times 1000) times 1.05. Round down to the nearest 1V.

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Reason for Change:
• New product
Description of Change:
• New procedure

I confirm I have read and understand the procedure and the change described above.

Printed Name	Signature	Date

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