DeFelsko®

Management Procedure 2583
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Date Revised:

Calibration Procedure

DeFelsko Corporation

PosiTest HHD 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 HHD Verifier with the following specification:

Table 1-1 Measurement Ranges

Probe	**Measurement Range**
500 – 35,000V	±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
HHD Verifier	500 – 35,000 V	± 5% of reading	Digitizer and High Voltage Probe

Table 2-2 Minimum use specification

Range	Accuracy
500 – 35,000V	± 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 attentuation ± 0.5%††	Tektronix, P6015A
PosiTest HHD	0 to 35,000	± 5%	DeFelsko, HHD

[†]With the use of the high voltage probe the effective digitizer range is multiplied by 1000.
[††]DeFelsko restricts the manufacturer's specification from 3% to 0.5% by requiring tighter calibration limits.

***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 HHD to levels that are within the Digitizer's input range. When calculating the error associated with the digitizer, the input value is the HHD 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 HHD is no 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 HHD display.

3.3 At a PosiTest HHD output of 500V, digitizer input of 2V :
High Voltage Probe accuracy @ 500V = 500 * 0.5% = 2.5V
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 = $(probe^2 + digitizer^2)^{0.5}$
= $(2.5^2 + (0.0029*1000)^2)^{0.5}$
= $(6.25 + 8.41)^{0.5}$
= 4V
TUR = (500*5%) / 4V = 6

3.4 At a PosiTest HHD output of 5,000V, digitizer input of 32V :
Probe accuracy @ 5,000V = 5000 * 0.5% = 25V
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 = $(probe^2 + digitizer^2)^{0.5}$
= $(25^2 + (0.0434*1000)^2)^{0.5}$
= $(625 + 1884)^{0.5}$
= 50V

TUR = (5,000*5%) / 50V = 5

3.5 At a PosiTest HHD output of 20,000V, digitizer input of 64V :
Probe accuracy @ 20,000V = 20000 * 0.5% = 100V
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 = $(probe^2 + digitizer^2)^{0.5}$
= $(100^2 + (0.212*1000)^2)^{0.5}$
= $(10000 + 44944)^{0.5}$
= 234V
TUR = (20,000*5%) / 234V = 4

3.6 At a PosiTest HHD output of 35,000V, digitizer input of 128V :
Probe accuracy @ 35,000V = 35000 * 0.5% = 175V
Digitizer accuracy @ 128V range = 0.10% of reading + 0.20% of range
= (35*0.10%) + (128*0.20%)
= 0.291V
The combined accuracy using a sum of squares = $(probe^2 + digitizer^2)^{0.5}$
= $(175^2 + (0.291*1000)^2)^{0.5}$
= $(30625+ 84681)^{0.5}$
= 340V
TUR = (35,000*5%) / 340V = 5

4 Preliminary Operations

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

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

4.2 Connect the UUC to ground and the HHD output then turn out 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 HHD output to 500V and the digitizer input to 2V. Activate the HHD Detection Mode by pressing and holding the power button and then depressing and holding the trigger. Once the Detection Mode is started the power button can be released. In table 6-1, record the voltage output 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:

HHD set point (V)	Digitizer input setting (V)
5,000	32
20,000	64
35,000	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 HHD Verifier

HHD Set Point (V)	UUC Reading (V)	Digitizer Reading (V)	Min Reading Allowed (V) ❶	Max Reading Allowed (V) ❷
500				
5,000				
20,000				
35,000				

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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