

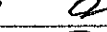





Precision Measurements Inc.	CALIBRATION PROCEDURE Helmut Klein 4500 Timometer	PMI-0103-0316 Rev B.
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APPROVALS	PRINT/SIGNATURE	ORIGINAL ISSUE
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METROLOGY MNGR./SUPV.	A Torres / 	3-16-2016
TECHNICAL OPERATIONS	A Torres / 	3-16-2016
DOCUMENT CONTROL	D. Miller / 	3/16/2016
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REVISION NO.	DESCRIPTION	DATE	PREPARED BY	APPROVED BY
A	Initial Issue	03/16/2016	D. Miller	A. Torres 
B	Modified to include the methodology for obtaining the measurement uncertainty of the Timometer.	04/06/2016	 D. Miller	A. Torres

1.0 PURPOSE

1.1 To establish a comprehensive procedure for the calibration of Helmut Klein 4500 Timometer in accordance with applicable ISO/ANSI calibration standards, and/or customer requirements.

2.0 SCOPE

2.1 This procedure includes basic instructions for the calibration and performance testing of the Helmut Klein 4500 Timometer.

2.2 This procedure includes the testing of essential instrument parameters.

2.3 Tolerances are according to individual manufacturer specifications, or as designed by the applicable customer.

Note: Certain, specific procedural elements contained in this procedure may be omitted or altered according to individual customer designated requirements.

2.4 From this point forward the Test Instrument will be referred to as the "TI".

3.0 STANDARDS

3.1 The following listed standards are representative of those required to perform the calibration outlined in this procedure and which are available at Precision Measurements, Inc.

<u>DESCRIPTION</u>	<u>MANUFACTURER</u>	<u>MODEL #</u>	<u>Substitute Item</u>
Time and Frequency	Symmetricom	XLi	No Substitute

4.0 TEST CHARACTERISTICS

<u>INSTRUMENT CHARACTERISTIC</u>	<u>PERFORMANCE SPECIFICATION</u>
Time Interval (1 PPS)	Per Manufacturer Specification

5.0 PRELIMINARY OPERATION

5.1 Check instrument for damage and basic operating performance. Any observed damage and/or performance malfunction(s) shall be recorded on the service documentation.

Note: Any damage degrading the performance of the instrument and/or malfunction(s) detected at any point in the process described in this procedure must be corrected prior to proceeding with the calibration process herein described.

6.0 PROCEDURE

- 6.1 Once this procedure is started, all Out of Tolerance conditions are to be recorded. Continue to the end prior to attempting any adjustment or repair.
Note: If the unit is not safely operable, then the TI shall be deemed inoperative and submitted for repair.
- 6.2 Verification of the TI will involve using the 1 PPS output from the Symmetricom XLi to verify the internal oscillators of the TI.
- 6.3 Remove the Acoustic Pickup for the TI from the rear panel connection.
- 6.4 Install the cable from the pickup input connector to the 1 PPS output connector on the Symmetricom.
- 6.5 Allow 30 minutes for stabilization before attempting any measurements.
- 6.6 On the TI, using the function select button, select MOT (yellow LED). Once selected, the yellow LED in the top row and the left LED in the lower row will be illuminated.
- 6.7 View the front panel readout of the TI, the nominal value displayed on the unit should be 0.00. Record the value. If the readout is not within ± 0.03 , the unit will require adjustment.
- 6.8 Optimize the TI if the displayed reading is ± 0.02 to ± 0.03 . Refer to the manufacturer's adjustment procedure to perform the adjustment.
- 6.9 If the TI was found out of tolerance, refer to the manufacturer's adjustment procedure for the adjustment process.
- 6.10 Disconnect the cable from the TI and the standard. Connect the Acoustic Pickup for the TI to the rear panel connector.
- 6.11 Power down the TI and store all equipment and cables.

7.0 DOCUMENTATION

- 7.1 Record the calibration results including quantitative data, if required, in accordance with Precision Measurements, Inc.'s Operational Procedures and customer requirements, as applicable.
- 7.2 Calculations of the measurement uncertainties for the Timometer, if required, are performed using the following steps. The method used for the calculations is "One way GPS Measurements" as described in NIST 1424. The uncertainties traceable to the BIPM time standards are obtained through NIST, and USNO.
- 7.2.1 The chain of traceability is as follows: SI -> UTC (NIST) -> USNO GPS Broadcast -> Symmetricom XLi GPS Received -> Helmut Klein Timometer.
- 7.2.2 In order to get the timing uncertainties, open the spreadsheet for the Helmut Klein and proceed to the BIPM website listed. This will give you the one way deviation for the SI UTC value and the NIST UTC value. Once this value is obtained enter it into the spreadsheet. Go to the NIST website listed on the spreadsheet to get the GPS Constellation one way deviation from UTC (NIST) and enter this value into the spreadsheet. Since these values are relatively small in comparison to the DUT, they will have almost no effect in the outcome of the uncertainty budget. The measurement uncertainty calculated will be listed as the $k=2$ value on the spreadsheet.