

**MOBILE PRECISION TOOL SERVICE
CALIBRATION PROCEDURES MANUAL
CALIBRATION PROCEDURE MPTS-1**

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1. **Objective:**
 - 1.1. The purpose of this document is to describe the procedure used for calibrating precision measuring tools. This is to ensure that precision tools perform in accordance with MIL-STD-120.
 - 1.2. Mobile Precision Tool Service (MPTS) shall provide the calibration service for all existing customers.
2. **Reference and military documents:**
 - 2.1. MIL-STD-120 Gage inspection and tolerances
 - 2.2. ANSI/NCSL Z540-1-1994 (ISO Guide 25)
[Sections 4.6.2, 4.10.4, 4.11 (a, b, c, d, e, f, g, h, i) 4.12 & 4.16]
3. **MPTS Standards used for calibration:**
 - 3.1. DSL-10001 through 10013; DSL-10015; DSL-10017; DSL-10019; DSL-10021; DSL-10026; 4000; DSL-10926; DSL-10049;
 - 3.2. DSL-10926; DSL-10049; JJ-0363
 - 3.3. MPTS-1; MPTS-8; 4001
 - 3.4. Temp gage standard 7-101010
 - 3.5. Traceable documents - NIST test number LEN821/253315-94
4. **MPTS Test equipment:**
 - 4.1. Surface plate
 - 4.2. Dial indicator test comparator
 - 4.3. Micrometer reference bar
 - 4.4. Gage blocks and standards
 - 4.5. Optical flat
 - 4.6. Plain ring gages
 - 4.7. MPTS calibration history card
 - 4.8. Labels
5. **Laboratory environment:**
 - 5.1. The calibration laboratory shall have a controlled ambient temperature between 68F and 73F inclusive.
 - 5.2. The calibration laboratory shall have a controlled ambient humidity between 38% and 58% relative humidity inclusive.
 - 5.3. Conditions outside of the above limits shall be cause for shutdown of all calibration, or implementation of corrective factors to compensate for the ambient conditions.
6. **Records:**
 - 6.1. All tools shall be provided with an MPTS Calibration History card.
 - 6.1.1. The Calibration History card shall have the following information on the header portion of the card:
 - 6.1.1.1. "Instrument type" (description of the tool)
 - 6.1.1.2. "Model No."

- 6.1.1.3. "Serial" number (assigned to the tool by MPTS per customer protocol)
- 6.1.1.4. "Manufactured by"
- 6.1.1.5. "Mfg Serial No." (where available)
- 6.1.1.6. "Calibration interval" (assigned by MPTS unless modified per customer's request)
- 6.1.1.7. "Location" (assigned department, name, number and/or person)
- 6.1.1.8. "Tool Tol." (the specified tolerance(s) for the tool, in accordance with MIL-STD-120)

- 6.2. The following information shall be recorded in the body of the Calibration History card upon completion of the calibration:
 - 6.2.1.1. "Date tested"
 - 6.2.1.2. "Tested by" (initials)
 - 6.2.1.3. "Due date"
 - 6.2.2. Blank area for notes:
 - 6.2.2.1. Record the NIST test number
 - 6.2.2.2. Record all required adjustments and to what extent they were made, noting abnormal tool conditions, temperature and humidity at the time of testing, and any related information
 - 6.2.3. "Error" (error found during calibration process)
 - 6.2.4. "Corrected error" (error after calibration process)
- 6.3. After calibration, the tool shall receive a NIST-traceable label containing the tool's serial number, date, metrologist's initials, and due date.
- 6.4. A Calibration Certificate for each calibrated precision measurement tool shall be provided upon request by the customer.
- 6.5. Tools that cannot be brought into MIL-STD-120 requirements by repair or adjustment shall be labeled with a Reject label, and the rejection shall be noted on the case history card.
- 6.6. The rejected tool shall be brought to the attention of the tool location's department head.

7. **Cleaning of tools:**

- 7.1. Where necessary, a tool shall be disassembled and cleaned with isopropyl alcohol or solvent. Where necessary, repairs are performed at this time. The tool shall then be oiled and reassembled.

8. **Calibration procedures for precision measuring tools:**

8.1. Vernier calipers:

- 8.1.1. Calipers shall be tested at .200", 1.000", 6.000", and every multiple of 6.000" thereafter. The outer diameter jaws shall be tested at 2.00" for parallelism. The depth rod (if applicable) shall be tested at .200". The inner diameter jaws shall be tested at .500" or 1.000".

8.2. Dial and digital calipers:

8.2.1. Calipers shall be tested at .100", .200", .300", .500", 1.000", and every inch thereafter. The outer diameter jaws shall be tested at 2.000" for parallelism. The depth rod (if applicable) shall be tested at .200". The inner diameter jaws shall be tested at .500" or 1.000".

8.3. Depth gages:

8.3.1. Depth gages shall be tested at .100", .200", .300", .500", and 1.000". Each rod over 1.000" shall be tested at its nominal length.

8.4. Pitch micrometers:

8.4.1. Pitch micrometer anvils shall be visually inspected for chips, dents, and wear. The micrometer shall then be tested at .100", .200", .300", .500", and 1.000".

8.5. Micrometers, 0-1":

8.5.1. 0-1" micrometers shall be tested at .100", .200", .300", .500", and 1.000". The anvils shall be tested for flatness and parallelism with optical flats.

8.6. Micrometers, 1-2" and larger:

8.6.1. Each micrometer shall be tested with standards at its minimum and maximum measurements. Parallelism shall be tested with a standard of the micrometer's nominal length at four places across the faces of the anvils.

8.7. Digital, dial, and vernier height gages:

8.7.1. The gage's scribe shall be visually inspected for burrs and chips, and parallelism to a surface plate's datum line.

8.7.2. Vernier height gages shall be checked on a surface plate at .100", .200", .300", .500", 1.000", and every multiple of 6.000" thereafter.

8.7.3. Digital and dial height gages shall be checked on a surface plate at .100", .200", .300", .500", 1.000", and every inch thereafter.

8.8. Inside micrometers:

8.8.1. Inside micrometers shall be tested at their minimum and maximum head measurements using the minimum-length rod. Each rod above the minimum length shall be tested in a linear fixture that has been calibrated using a standard of that rod's nominal length.

8.9. Dial indicators and dial indicator devices:

8.9.1. Dial indicator and dial indicator devices shall be tested on a dial test comparator at a minimum of ten (10) random points over their full range of motion.

8.9.2. Each indicator/device shall be checked for probe sideplay, repeatability, and ease of movement.

8.10. Thread gages

8.10.1. Thread gages shall be cleaned and visually checked for damage.

8.10.2. The over-wire pitch diameter (OWPD) of each thread gage shall be checked, using the three-wire system, on a Pratt & Whitney Model B Supermicrometer, as follows: Pitch diameter shall be taken from the value inscribed on each thread gage; this value shall be added to the value printed on the container holding the appropriate wires. The OWPD reading shall be compared with this total. Tolerances shall be taken from *Machinery's Handbook, 16th Edition* or later editions, unless otherwise stated by the gage owner or manufacturer.