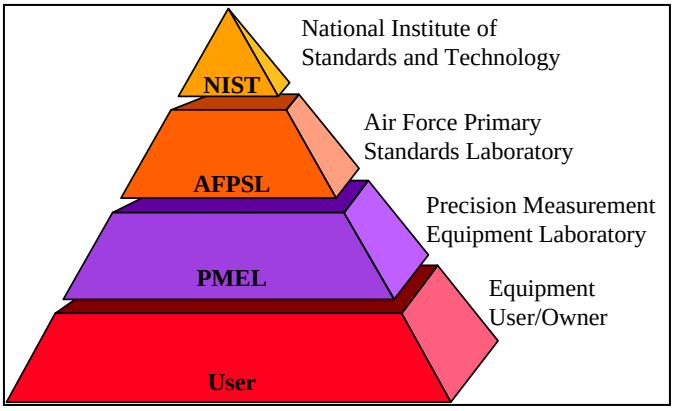
AFMETCAL (AFLCMC/WNM)
Air Force Metrology and Calibration Traceability

Traceability is defined in International Vocabulary of Metrology (VIM) 3rd edition (JCGM 200:2012) as the "property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty." A 'reference' can be a definition of a measurement unit through its practical realization, or a measurement procedure including the measurement unit for a non-ordinal quantity, or a measurement standard.

Policy: It is Air Force policy that calibration of USAF owned TMDE, employed in support of USAF weapons and support systems, will be performed with measurement standards traceable to either the National Institute of Standards and Technology (NIST) or AFMETCAL-approved sources.

Implementation: The Air Force Metrology and Calibration (AFMETCAL) Program has established a hierarchical system of calibration laboratories, personnel, equipment, and procedures to ensure systems and equipment measurements are safe, accurate, uniform, reliable and traceable to either the National Institute of Standards and Technology (NIST) or AFMETCAL-approved sources. In this hierarchy, AFLCMC/WNM, known as AFMETCAL, is the Air Force single point of contact for calibration services and traceability of measurements to NIST. AFMETCAL then provides traceability through the Air Force Primary Standards Laboratory (AFPSL) to Precision Measurement Equipment Laboratories (PMELs) owned and operated by all Air Force major commands (MAJCOMs) and forward operating agencies (FOAs) and ultimately to equipment users/owners.

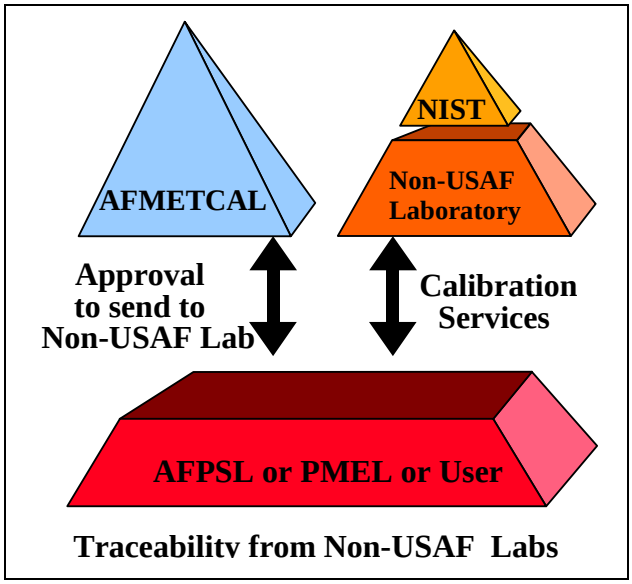


When a piece of equipment enters the Air Force inventory, a calibration determination request is submitted to AFMETCAL. AFMETCAL reviews the request to determine if the item needs to be calibrated, where it should be calibrated, how it should be calibrated, and how often it should be calibrated. The results of this review (namely need for calibration, calibration responsibility, calibration procedure, and calibration interval) are documented in a Calibration Requirements List, TO 33K-1-100 or a system specific Calibration Measurement Summary (CMS) technical order (TO). USAF equipment users/owners and USAF calibration laboratories (both the AFPSL and PMELs) follow the instructions in TO 33K-1-100 and/or the appropriate CMS to obtain calibration services from the proper laboratory.

USAF calibration laboratories (both the AFPSL and PMELs) utilize AFMETCAL approved calibration procedures and operate laboratories in accordance with AFMETCAL Program requirements contained in TO 00-20-14. The AFMETCAL program adheres to the general requirements of ISO 17025. Additionally, laboratories must participate in the AFMETCAL Assessment and Certification Program. The Assessment and Certification Program objective is to assess each laboratory's compliance with TO 00-20-14 and capability to perform measurements that are accurate, uniform, reliable, and traceable to the NIST or AFMETCAL-approved sources. An AFMETCAL Program certificate of compliance is awarded when a laboratory meets assessment criteria.

Calibration Services from Non-USAF Laboratories: Some USAF owned items cannot be calibrated within the USAF calibration laboratory structure. These items represent approximately 1% of the USAF calibration workload. In order to obtain calibration support for these items, it is necessary to send them to Non-USAF calibration laboratories. Obtaining calibration service from other sources (Non-USAF laboratories) must be approved by AFMETCAL. Non-USAF calibration laboratories typically include NIST, other DoD laboratories, or commercial calibration laboratories. Traceability of calibration services to NIST or other sources as approved by AFMETCAL must be ensured when obtaining calibration services from Non-USAF laboratories. To ensure traceability from Non-USAF laboratories, the following must be satisfied:

1. AFMETCAL must approve sending the item to a Non-USAF laboratory.
2. The Non-USAF laboratory must comply with the general requirements of ISO 17025.
3. The Non-USAF laboratory must provide information on their quality system demonstrating their compliance with the general requirements of ISO 17025. This may include information regarding accreditation or audits performed by other parties.
4. The Non-USAF laboratory must provide a calibration report containing the information required by Data Item Description DI-QCIC-80798B as a minimum (see below).
5. The equipment user/owner must be informed that the calibration service was performed by a Non-USAF laboratory.
6. Information obtained regarding the Non-USAF laboratory's quality system, its compliance with the general requirements of ISO 17025, and a copy of the calibration report must be retained by the organization obtaining the calibration service until the calibration expiration date.
7. If the Non-USAF laboratory providing calibration services is a government laboratory and it is listed in TO 33K-1-100-2 (or an appropriate CMS) as having calibration responsibility, AFMETCAL has already determined that traceability requirements have been satisfied and approval is granted to obtain calibration services. The preceding steps need not be taken.



Data Item Description DI-QCIC-80798B requires the calibration certificate to include

a. title (e.g., calibration report or calibration certificate);
b. the name and address of the laboratory, and the location where the calibrations were carried out, if different from the address of the laboratory;
c. unique identification of the test report or calibration certificate (such as the serial number), and on each page an identification in order to ensure that the page is recognized as a part of the test report or calibration certificate, and a clear identification of the end of the test report or calibration certificate;
d. the name and address of the client or customer;
e. identification of the method used;
f. a description of, the condition of, and unambiguous identification of the item(s) tested or calibrated;
g. the date of receipt of the test or calibration item(s) where this is critical to the validity and application of the results, and the date(s) of performance of the test or calibration;
h. reference to the sampling plan and procedures used by the laboratory or other bodies where these are relevant to the validity or application of the results;
i. the test or calibration results with, where appropriate, the units of measurement;
j. the name(s), function(s) and signature(s) or equivalent identification of person(s) authorizing the test report or calibration certificate;
k. where relevant, a statement to the effect that the results relate only to the items tested or calibrated;
l. the conditions (e.g. environmental) under which the calibrations were made that have an influence on the measurement results;
m. the uncertainty of measurement or a statement of compliance with an identified metrological specification or clauses thereof;
n. evidence that the measurements are traceable.