



## Goddard Procedures and Guidelines

**DIRECTIVE NO.** GPG 8730.1H                      **APPROVED BY Signature:** Original Signed by  
**EFFECTIVE DATE:** August 15, 2003                      **NAME:** A. V. Diaz  
**EXPIRATION DATE:** August 15, 2008                      **TITLE:** Director

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**Responsible Office:** 300/Office of Systems Safety and Mission Assurance  
**Title:** Calibration and Metrology

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### PREFACE

#### P.1 PURPOSE

This procedure establishes the process for ensuring that Inspection, Measuring and Test Equipment (IMTE) is properly calibrated, maintained, and identified.

#### P.2 APPLICABILITY

This procedure applies to all IMTE.

#### P.3 AUTHORITY

NPD 8730.3, NASA Quality Management System Policy (ISO 9000)

#### P.4 REFERENCES

- a. [GPG 5340.2](#), Control of Nonconformances
- b. [GPG 8700.4](#), Integrated Independent Review
- c. NASA WI-710, (Wallops Island) Metrology Task Order Request for Service Quality Verification Laboratories Form
- d. GSFC Form 4-34, Nonconforming IMTE Do Not Use

#### P.5 CANCELLATION

GPG 8730.1G, Calibration and Metrology

#### P.6 SAFETY

None

#### P.7 TRAINING

Refer to the Training Module at <http://ohr.gsfc.nasa.gov/DevGuide/ISO/home.htm>.

**P.8 RECORDS**

<b>Record Title</b>	<b>Record Custodian</b>	<b>Retention</b>
Auto Recall System Records	Calibration Laboratory	Maintain current list of Type 1 IMTE
IMTE Type 1 List	Calibration Laboratory	* <u>NRRS 8/41.5</u> Handle as Permanent pending retention approval
Calibration and Repair Records including WI-710	Calibration Laboratory	* <u>NRRS 8/41.5</u>
Records of test software verification used as IMTE	IMTE User	* <u>NRRS 8/41.5</u>
Calibration and Repair Records of IMTE calibrated or repaired by other laboratories	IMTE User	* <u>NRRS 8/41.5</u>
Calibration and Repair Records of IMTE calibrated or repaired by user	IMTE User	* <u>NRRS 8/41.5</u>

\*NRRS – NASA Records Retention Schedules ([NPG 1441.1](#))

**P.9 METRICS**

Calibration Task Order metrics include Turn Around Time, number of IMTE calibrated and number of IMTE repaired. User satisfaction is measured by number of complaints.

**P.10 DEFINITIONS**

a. Inspection, Measuring, and Test Equipment (IMTE) – IMTE includes all devices, systems and standards that are used or available to be used, to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements or where accuracy in measurement is important or prevention of damage is a concern. IMTE includes diagnostic and prognostic equipment, semiautomatic and automatic test equipment (with issued software), calibration test or measurement equipment and bench set ups used as standards. IMTE is divided into three types as follows:

- (1) Type 1, Calibration Required - IMTE, which is used, or planned to be used to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements of a product, or an element of a product, within the Quality Management System (QMS). This includes IMTE used in tests leading to new product development such as; engineering models/ test units, product dependent support equipment, research and development and proof-of-concept. Any measurements where accuracy of measurement is important to ensure results are meaningful or where IMTE malfunction may cause damage requires use of Type 1 IMTE. In

no case shall uncalibrated IMTE be used on flight hardware or for flight software verification. Type 1 IMTE will bear a Calibration Label with an expiration date and initials of the calibration technician. Additionally, Limited Use Calibration labels will be used to identify IMTE in which a complete calibration has not been performed or which does not meet all specifications for a full calibration but are still usable. (See Appendix)

- (2) Type 2, Calibrate Before Use (CBU) - IMTE that may be used as Type 1 but on an infrequent basis so as not to justify keeping the equipment in calibration at all times. Type 2 IMTE will bear a CBU label. IMTE so labeled may have two labels affixed at one time: a Calibration Label, when within calibration, and a CBU Label. It is optional for the user to remove the Calibration Label upon expiration. Use of the IMTE, to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements, after the calibration due date has expired is prohibited (See Appendix). Use of Type 2 IMTE that is out of calibration shall require reclassification as Type 3.
  - (3) Type 3, Calibration Not Required (CNR) - IMTE not used to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements. Type 3 IMTE will bear a CNR Label. IMTE so labeled may have two labels affixed at one time: a CNR label and an expired Calibration label (See Appendix). Type 3 IMTE may be used on QMS product when the measurement is not being made to demonstrate conformance with requirements or where the use of Type 3 IMTE will not impact product quality, and only when the measurement does not require quantitative precision. Any IMTE found to be non-functional or out-of-tolerance shall be excessed or sent for repair so that the IMTE may be returned to a functional state and/or labeled with a limited calibration sticker.
- b. Calibration - A comparison between two instruments or devices, one of which is a standard of known accuracy, to detect, correlate, report, or adjust deviations in the accuracy of the instrument being compared.
  - c. Calibration Interval - The established time interval between calibrations of IMTE. The interval may be determined and adjusted periodically by reviewing tolerance data, usage, historical data, vendor specifications, and other relevant information.
  - d. Calibration Label - A small decal affixed to IMTE to readily determine its calibration status. See Appendix for examples of calibration labels commonly used by the Center's calibration laboratories.
  - e. Calibration and Metrology Laboratory - A specialized laboratory that is staffed and equipped to perform calibrations, inspections and repair of IMTE. The term Calibration Laboratory used in this document refers to the Center's primary calibration laboratories managed by Code 540 at Goddard's Greenbelt Facility and Code 800 at the Wallops Flight Facility.
  - f. Calibration Laboratory Recall System - A system that, as a service to IMTE users, reminds IMTE users when calibration is due on a Type 1 item of IMTE in accordance with the predetermined calibration interval.

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- g. IMTE User – The responsible individual that employs an item of IMTE to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements.
- h. National Standards - Standards maintained by the National Institute of Standards and Technology, or based on intrinsic or natural phenomena that constitute the basis for the national measurement system.
- i. Standards - Devices or instruments that provide the basis for the calibration of IMTE. Standards are defined in terms of their derivation and use.

## PROCEDURES

1. The Mechanical Systems Center of the Applied Engineering and Technology Directorate (Code 540) at Greenbelt and the Suborbital and Special Orbital Projects Directorate at Wallops shall each establish, at their respective sites, the principal Calibration Laboratories for IMTE containing the appropriate standards with traceability to the National Institute of Standards and Technology. Other calibration laboratories may exist on the respective sites to handle specific IMTE. Each such laboratory will have documented calibration and equipment control procedures.
2. The Calibration Laboratories shall:
  - a. Provide calibration and repair of IMTE, including the maintenance of related records including an IMTE list. Calibration and repair at Greenbelt, performed under the calibration and repair task order managed by Code 540, is initiated by issuance of a task order by the task monitor. In the event the Code 540 task order is to be used for calibration and repair of specific IMTE, submit a request to the task monitor to add IMTE to the IMTE inventory if not listed in the inventory.
  - b. Establish and maintain a document control system for Calibration Laboratory manuals, procedures, equipment certifications, and other calibration documents to ensure proper controls and traceability for the calibration process.
  - c. Establish, document, maintain, and operate an IMTE labeling system that indicates the calibration status of equipment.
  - d. Establish and document calibration intervals for IMTE that shall be traceable to manufacturer's instructions, industry practices, and its history and use.
  - e. Establish and operate a Calibration Recall System that sends, as a service, written or email calibration due notices to IMTE Users 30 - 45 days prior to the calibration expiration date. A notice will also be sent to the IMTE point of contact if one is designated by the IMTE User's organization. A second notice will be sent upon calibration expiration if no response is received. If no response is received thirty days after the second notice, calibration of the item will become the responsibility of the owner, flagged as inactive, but retained in the Calibration Recall System list. This will allow Directorate Management the ability to obtain status on potentially non-calibrated equipment and/or to have the equipment removed.

- f. Notify users of anticipated IMTE pickup and anticipated return dates. Notify users when unexpected or extraordinary delays occur that prevent timely completion of the calibration or repair.
- g. Notify the IMTE user and calibration task monitor in writing if IMTE is found to be significantly out of tolerance (i.e. more than twice the specified tolerance). This notice will become part of the calibration and maintenance history of the IMTE.

**3. IMTE Users shall:**

- a. Ensure that the calibration status of IMTE is understood before use and that IMTE used to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements is properly calibrated.
- b. Ensure that IMTE used is appropriate for the measurements to be made and is used in a manner which ensures that measurement uncertainty is known and is consistent with the required measurement.
- c. Properly store, handle and maintain IMTE.
- d. Ensure that only authorized personnel make adjustments to IMTE that may affect its calibration.
- e. Determine whether the IMTE is Type 1, Type 2 or Type 3 and affix Type 2 or Type 3 labels as appropriate.
- f. Determine method of calibration support to be obtained. The IMTE User may elect to use other on-site or external calibration resources or may develop documented procedures to ensure proper calibration. Calibration support must comply with the IMTE control requirements of ISO 9001.
- g. Affix the appropriate calibration status labels to the storage containers of IMTE that is too small or otherwise unsuitable for direct labeling. In the case of Type 1 the Calibration Laboratory will affix the label. The user shall develop and document procedures for the handling of such IMTE to ensure that tracking and traceability of calibration status is maintained and to prevent the inadvertent use of uncalibrated IMTE.
- h. Use the Center's Calibration Laboratories as follows:

In the event the Code 540 calibration and repair task order is used at Greenbelt, enter the calibration request at <http://www.simco.com/>. For help with the Code 540 task order, contact Felicia Donnell at 301-286-2517. At the Wallops Flight Facility (WFF), use the [Task Order Request for Service Quality Verification Laboratories Form WI-710](#). If the request is to make an item of IMTE Type 1 and add it to the Calibration Recall System list, an organizational IMTE point of contact may be designated in addition to the IMTE User.

- i. If sources other than the Center's Calibration Laboratories are selected for support, be responsible for developing, documenting, and implementing procedures for the control of IMTE to reflect specific and unique requirements. The procedures shall be compliant with the requirements of ISO 9001 for the control of IMTE. This IMTE shall not be included in the Calibration Recall System.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT  
<http://gdms.gsfc.nasa.gov/gdms> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

- (1) In cases where support is from a non-GSFC supplier of calibration services, the User shall have documented procedures for obtaining the support and shall ensure that the procedures and the supplier meet ISO 9001 requirements for control of IMTE. The User shall ensure that the IMTE is labeled in a manner equivalent to the labels defined in the Appendix. The user is responsible for the calibration and the calibration performer shall provide all necessary labels and documentation.
  - (2) IMTE Users can develop and document procedures for the calibration of specific items of IMTE, including test software and bench test setups related to product testing. The procedures shall meet the ISO 9001 requirements for control of IMTE.
  - (3) IMTE users that purchase new equipment that is received with calibration stickers or certification from the manufacturer will notify the Center's Calibration Laboratory and provide evidence from manufacturer of calibration. The Calibration Laboratory will provide appropriate calibration stickers.
- j. Assess the validity of work done with any IMTE subsequently found to be out-of-tolerance and develop, document, and implement additional testing if required. Product that was inspected or tested by IMTE subsequently found to be out-of-tolerance shall be controlled as nonconforming product in accordance with GPG 5340.2. A Nonconformance Report (NCR) will be prepared documenting the impact of the out-of-tolerance condition on all products or services processed with the IMTE in question since the last acceptable assessment by the Calibration Laboratory.
- k. Ensure IMTE is properly labeled with an Equipment Control Number (ECN) or a NASA 1517 silver property sticker (Property Management Code 235).
- l. Periodically review IMTE list for accuracy, ensuring correct type identification and removing and adding equipment as appropriate.
- 4.** When personnel responsible for areas or facilities where GSFC product is processed find IMTE that is not in compliance with this procedure, they shall tag this IMTE with a GSFC Form 4-34, NONCONFORMING IMTE Tag (see Figure 1) and indicate on the Tag the reason for the nonconformance. Nonconforming IMTE shall not be used on GSFC product. The IMTE user is responsible for ensuring nonconforming IMTE is properly dispositioned.
- 5.** At Greenbelt, the Logistics Management Division shall notify the Calibration Laboratory of any IMTE that is excessed, providing either the ECN number, users control number, or model and serial number.

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**NONCONFORMING IMTE  
DO NOT USE**

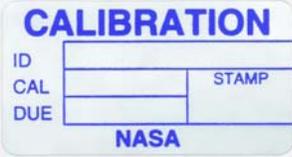
No Calibration System Label per GPG 8730.1  
 Type I IMTE with expired calibration  
 Other (explain) \_\_\_\_\_  
\_\_\_\_\_

GSFC 4-34 (7/99)

**Figure 1**

## APPENDIX CALIBRATION SYSTEM LABELS

Labels - All instruments, devices, and artifacts serviced are to be labeled with the appropriate calibration label(s). The labels shown below are the commonly used labels by the Metrology and Calibration Laboratories.

	<p><b>Calibration</b> - This NASA Metrology label identifies by ECN, or MCN, the test equipment, device, or artifact calibrated, the date calibrated, and the date due for next calibration. This label is used when the test equipment was compared with calibrated standard(s) or test equipment and determined to perform within specifications over all ranges/parameters/functions.</p> <p>Blue lettering on a silver background in sizes 0.9" x 1.5" and 0.5" x 0.9".</p>
	<p><b>Calibrate Before Use</b> - This NASA Metrology label identifies test equipment, devices, or artifacts which: (1) must be calibrated before using, (2) are not included in the GSFC Calibration Recall Program and are out-of calibration and not expected to be used for a period of time, or (3) are included in the GSFC Calibration Recall Program and are put in a hold status.</p> <p>Red lettering on a silver background in size 0.9" x 1.5".</p>
	<p><b>Calibration Not Required</b> - This NASA Metrology label identifies test equipment, devices, or artifacts that, because of their specific non-accuracy sensitivity or non-hazardous measurements, do not require calibration. Signature by authorized management designee is optional. Such requirements may be addressed in the user's procedures.</p> <p>Red lettering on a silver background in sizes 0.9" x 1.5" and 0.5" x 0.9".</p>
	<p><b>Limited Use Calibration</b> - This NASA Metrology label identifies the test equipment, devices, or artifacts for which a complete calibration has not been performed or which does not meet all specifications for a full calibration but are still usable. The label identifies the limitation for use, the ECN, MCN, or serial number, the date calibrated, and the date due for next calibration.</p> <p>Green lettering on silver background in sizes 1" x 1.5" and 0.6" x 0.9".</p>

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### CHANGE HISTORY LOG

Revision	Date	Description of Changes
Baseline	8/12/98	Initial Release
A	9/4/98	<ul style="list-style-type: none"> <li>• Format changes to add document number and page number to header and correct version warning to footer.</li> <li>• Added a Calibration Laboratory responsibility to investigate the cause of out of calibration conditions, report findings to the User, and to use such findings to modify calibration procedures as appropriate (2.1.f)</li> <li>• Added Calibration Laboratory responsibility to establish and maintain a facility-wide Master List of IMTE (2.1.g).</li> <li>• Added a Calibration Laboratory responsibility to submit a notice of expiration of calibration to the Audit Office when no acceptable response is received for a Calibration Due Notice (2.1.h).</li> <li>• Deleted requirement for directorate-level procedures regarding calibration of IMTE, making Users responsible for applying requirements of this GPG to IMTE in their laboratory (2.2).</li> <li>• Added explanation of acceptable responses to a Calibration Due Notice (2.2.f).</li> <li>• Added a requirement for Users to ensure that IMTE information is submitted for inclusion on the IMTE Master List and that notice of IMTE disposal is submitted to delete items from the Master List (2.2.i).</li> <li>• Added an Audit Office responsibility to initiate a Nonconformance Report for expiration of calibration notices, with the "found by" code to be Item d. In-Process/Final Inspection/Test (non-operational) and the Item Type in Block 7a to be Item 9. QMS Element (2.4).</li> </ul>
B	5/21/99	GPG rewritten in its entirety to simplify process and description.
C	8/19/99	<ul style="list-style-type: none"> <li>• Deleted requirement for IMTE list.</li> <li>• Added sentence to allow for Type 3 IMTE to be used on product for certain conditions in paragraph 1.a.(3).</li> <li>• Added description for Limited Use Calibration Labels in paragraph 1. <i>DEFINITIONS, (1) Type 1, Calibration Required.</i></li> <li>• Changed paragraph to show that the IMTE can have two labels instead of only one in paragraph <i>PROCEDURE, 1. DEFINITIONS, a, (3) Type 3, Calibration Not Required.</i></li> <li>• Added reference to Appendix for examples of calibration labels in paragraph <i>PROCEDURE, 1. DEFINITIONS, d.</i></li> <li>• Deleted requirement for mandatory response by user to recall system notices.</li> <li>• Added requirement for Non Conformance Tags. Added paragraph 2.4</li> <li>• Changed to have signature optional on Calibration Not Required Label in Appendix.</li> </ul>

**CHANGE HISTORY LOG** *Continued*

<b>Revision</b>	<b>Date</b>	<b>Description of Changes</b>
D	11/09/99	<ul style="list-style-type: none"> <li>• Deleted definition of "Code"</li> <li>• Corrected name of Code 800</li> <li>• 2.2.e - Added requirement for second Calibration Due Notice and for removal of IMTE from Recall list 30 days after second notice if no response is received.</li> <li>• 2.3.h - Removed references to Attachments. Added embedded hyperlink to GDMS Forms section for Greenbelt and Wallops calibration lab support request forms</li> <li>• Delete Attachments 1 and 2 (calibration lab support request forms)</li> </ul>
E	09/01/00	<ul style="list-style-type: none"> <li>• P6. - Records Retention schedules corrected.</li> <li>• 2.2f -- Paragraph rewritten to eliminate verbiage related to cause investigation.</li> </ul>
F	10/22/01	<ul style="list-style-type: none"> <li>• P4 - Added references for forms referenced in the document.</li> <li>• 2.1 - Requires use of the principal Calibration Laboratories unless not practical</li> <li>• 2.2.a - Added requirement that calibration and repair be initiated on receipt of CO approved Task Order.</li> <li>• 2.2.e - Added calibration notices by email Equipment entry in IMTE database to be made inactive versus removal so that Directorates can identify and address equipment out-of-calibration and so that history information on last calibration will be kept and not lost. Out-of-cal still becomes the responsibility of the owner.</li> <li>• 2.2.h - Adds equipment to ETCR contract if request for calibration or repair is for IMTE not on the contract.</li> <li>• 2.3.h - Changes from old calibration request form to task order required by new ETCR contract. Identifies web page at Greenbelt. Reformats to eliminate sub sections.</li> <li>• 2.3.k - Identifies user responsibility for proper property labeling.</li> <li>• 2.3.l - Identifies user responsibility for periodic review of IMTE list for accuracy and addition or inactivation of equipment in list.</li> <li>• 2.5 - Identifies responsibility of Logistics Management Division to notify the Calibration Laboratory of any IMTE that is exceeded.</li> </ul>
G	08/15/02	<ul style="list-style-type: none"> <li>• P2 - Procedure applies to all IMTE</li> <li>• P10.a – Include engineering models, R&amp;D leading to product, flight software verification and other instances where accuracy is important to ensure results are meaningful.</li> </ul>
H	08/15/03	<ul style="list-style-type: none"> <li>• Minor corrections for punctuation and ease of reading throughout.</li> <li>• Changed references to organization responsible for calibration laboratory from Code 300 to Code 540.</li> <li>• Amended process description to reflect the Code 540 process.</li> <li>• P4 – Deleted Davis Calibration Task Order Request Form 214.4-1845.</li> </ul>