

Subject: Control of Measuring Test Equipment and Calibration	Effective Date: May 26, 2000	Initiated by: Head, Engineering & Technical Infrastructure
	Supersedes: Rev. 1, Dated January 31, 1995, TCR-ENG-002-003 TCR-ENG-002-002 TCR-ENG-002-001	Approved: Director

Applicability

This procedure applies to Laboratory Sites and personnel which use Measuring and Test Equipment (MTE) to perform calibrations, or use MTE to take measurements for which calibrated tools are required.

Introduction

This procedure defines PPPL's system to control MTE used at the Laboratory, including personally owned tools used as MTE. MTE are those items which are used to measure, gauge, troubleshoot, test, inspect, or verify conformance to specified requirements. Exclusions from this procedure are those items designated "Indicator Only" (see Attachment 1).

Calibration Labs. There are four Calibration Laboratories within PPPL: the Electrical/Electronic Calibration (EEC) Lab, the Mechanical Calibration (MC) Lab, the Health Physics Calibration and Service Lab (HP CASL), and the Health Physics Radiological Environmental Monitoring Laboratory (HP REML). Calibration methods for the tools, gauges, and electrical/electronic instruments are specified and maintained in the respective Calibration Lab Departmental Procedures Manuals, or from calibration instructions provided in the equipment manufacturers' documentation maintained in the respective Calibration Lab. Each calibration Laboratory uses reference standards which are traceable to the National Institute of Standards.

The **Electrical/Electronic Calibration (EEC) Lab [C Site, S107]** performs testing, repair, and calibration of electrical and electronic measuring devices. Categories of electrical/electronic devices submitted to the EEC Lab for calibration include: amplifiers, analyzers, bridges, counters, generators, hi-pot testers, megohmmeters, analog and digital meters, oscilloscopes, probes, and recorders. The EEC Lab maintains calibration data and calibration certificates in an EEC Calibration File for traceability of electrical and electronic measuring devices.

The **Mechanical Calibration (MC) Lab [C Site, S111]** performs calibrations of mechanical measuring devices. Categories of measuring devices submitted to the MC Lab for calibration include: gage blocks, micrometers, height gages, calipers, slot-in-groove gages, go-no-go gages, and dial test indicators. The calibration certificates are maintained in an MC Calibration File for calibration traceability of mechanical measuring devices.

The **Health Physics Calibration and Service Lab [HP CASL]** performs calibrations on all fixed and portable radiation measuring instruments at PPPL. Radiation instruments calibrated include Geiger counters, scintillation counters, ion chambers, fission chambers, neutron detectors, tritium monitors, and environmental thermoluminescent dosimeter services. Instrument calibrations are performed electronically and through the use of radioactive nuclide sources. The HP CASL maintains calibration data and calibration certificates in an HP CASL Calibration File for traceability of HP measuring devices. The HP CASL also evaluates new radiological detection equipment.

The **Health Physics Radiological Environmental Monitoring Laboratory (HP REML)** performs calibrations and maintains an MTE program for all liquid scintillation counters, analytical balances, weights, and gamma spectroscopy systems for the Health Physics group at PPPL.

Calibration Shops There are various Department, Project, and Division Calibration Shops which provide calibrating services in support of the Calibration Labs. These Calibration Shops perform specific calibration services on specialized equipment and systems, such as vacuum and pressure gauges, pressure and relief valves, valve switches, instrumentation, components within computer systems, etc. The MTE used by the Calibrating Shops are controlled by and calibrated through one of the four Calibration Labs. **The Calibration Shops can not calibrate MTE.**

PPPL authorized Calibration Shops are:

Materials Test Calibration Shop (Materials Test Lab)	Computer Division Diagnostics
D-Site Water Systems Calibration Shop	Radio Frequency (RF) Calibration Shop
Neutral Beam Calibration Shop	Facilities Calibration Shop
Vacuum Preparation Calibration Shop (Vacuum Prep Lab)	

These Calibration Shops shall have operating procedures for their calibration services including the maintenance of records as described in policy P-086.

Reference Documents

DOE O 414.1	Quality Assurance
QA-005	Control of Nonconforming Items (previously TOP 20.010)
P-086	Calibration of Measuring and Test Equipment

Definitions

See Attachment 1.

Procedure

A. New MTE Purchases

Responsibility Action

- | | |
|-------------|---|
| Requester | <ol style="list-style-type: none"> 1. Completes a Requisition for required MTE. <ol style="list-style-type: none"> a. Specifies required documentation, calibration data sheets, calibration certification, calibration procedures, performance test procedures, etc., as appropriate, on the Requisition. b. Specifies new MTE be delivered to PPPL Receiving and to one of the four Calibration Labs (EEC, MC, HP REML, or HP CASL). 2. Obtains approval and submits Requisition to Procurement. |
| Procurement | <ol style="list-style-type: none"> 3. Procures MTE specifying required documentation on the contract order. 4. Specifies delivery to Receiving and the appropriate Calibration Lab . |
| Receiving | <ol style="list-style-type: none"> 5. Notifies appropriate Calibration Lab upon delivery of MTE. |

Appropriate
Calibration
Lab

6. Performs MTE acceptance tests.
 - a. When MTE passes acceptance testing: Lab enters MTE data into Calibration Data Base System and sets up an MTE record file folder.
 - b. When MTE fails acceptance testing: Lab notifies QC and Procurement, QC issues an NCR and applies a “Hold Tag” to the MTE which is segregated from operational MTE until disposition of the NCR [typically, return to vendor].
7. Determines calibration cycle with input from user for the MTE. Enters calibration cycle information into the Lab's Calibration Data Base System.
8. Forwards accepted MTE to requisitioner.
9. Maintains MTE calibration standards, calibration records, and certificates.

Custodian

10. Maintains MTE and provides MTE to users on request.

B. MTE Requiring Calibration From Calibration Lab

Responsibility Action

Calibration Lab

1. Issues a recall notice (PM Card or other system) notifying custodian of pending due date for MTE calibration. Refer to Attachment 2 for examples of calibration due and delinquency notices.

Custodian

2. Logs out and forwards MTE to Calibration Lab for calibration.

NOTE: MTE may be forwarded to the Calibration Lab at any time if the MTE is determined or suspected to be "out of calibration" before the normal calibration cycle is due. Questionable MTE shall be tagged out of service and forwarded to the appropriate Calibration Lab. All calibrated MTE are required to be recalibrated if dropped or otherwise subjected to abusive treatment, if the accuracy is suspect, or if recalibration is due.

Calibration Lab

3. Performs MTE calibration by one of the following methods :
 - a. Uses supplier calibration instruction and data sheets (preferred method) or uses Calibration Lab internal procedures.
 - b. Sends MTE out to vendor's site for calibration [via shipping order, work order, etc., as appropriate].
 - c. Requests vendor to calibrate MTE on site at PPPL.

Refer to Calibration Lab Operating Procedures to determine method of calibration and specific MTE calibration procedures.

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| Calibration Lab | <ol style="list-style-type: none"> 4. Calibrates MTE via reference standard tests and adjustments. <ol style="list-style-type: none"> a. If the MTE failed initial calibration, adjustments or repair was performed, and passed recalibration: <ol style="list-style-type: none"> i. Notifies the custodian that the MTE failed calibration and completes the NCR Form if adjustments are two times greater than the allowed error. Notes on NCR form that adjustments or repair was performed on the MTE, and then the MTE passed calibration. ii. Forwards the NCR to QC for number and verification [QA-005]. b. If the MTE could not be calibrated: <ol style="list-style-type: none"> i. Notifies the custodian and contacts QC to issue an NCR and place a hold tag on the MTE. ii. Isolates the failed MTE in a calibration holding area pending the NCR disposition determination by the custodian with assistance from the calibration lab. 5. Removes old calibration label (and any other old calibration notices) and replaces with new calibration label containing the updated information. See Attachment 3. 6. Updates MTE calibration file in Calibration Data Base; completes and files MTE calibration certificates in MTE history file folder. 7. Notifies custodian that calibration of MTE is complete. |
| Custodian | <ol style="list-style-type: none"> 8. Places MTE in service, or forwards MTE to assigned user. |

C. Calibration Shop Services

Responsibility

Action

- | | |
|------------------|---|
| Calibration Shop | <ol style="list-style-type: none"> 1. <u>Performs calibration on equipment or system of equipment using MTE calibrated by a Calibration Lab. The Calibration Shop does not perform calibration on MTE.</u> 2. Maintains an equipment calibration file, equipment calibration standards, equipment calibration records in a Calibration Data Base System for equipment calibration history and traceability. |
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Attachments

1. Definitions
2. Calibration Due Notice Examples
3. Calibration Label Examples

Accuracy	The degree of conformity of a measurement to a standard or a true value.
Calibrated	Any device which presents or records data where the accuracy of that data is critical should be identified as a calibrated instrument, should be self contained, and have the ability to be calibrated to standards traceable to the National Institute of Standards and Technology (NIST), formally the National Bureau of Standards (NBS).
Calibration	A comparison of the performance of a piece of measuring equipment with that of a standard of higher accuracy to detect, correlate, adjust, rectify and document the accuracy of the equipment relative to the standard.
Calibration Lab	A PPPL <u>authorized facility</u> for calibrating MTE.
Calibration Shop	A <u>designated workplace</u> established to perform specific calibration services on specialized equipment and systems using the MTE tools maintained by one of the official calibration laboratories.
Custodian	An individual who is the assigned "owner" of an MTE and directly responsible for that MTE. A custodian may or may not be the user of the MTE, but is accountable for the traceability of the MTE.
Indicator Only	A measuring device used to obtain general data which will not be used to determine acceptability or verify conformance to established criteria.
Measuring and Test Equipment (MTE)	All of the measuring instruments, measurement standards, reference materials, and auxiliary apparatus that are necessary to perform a measurement. This includes measuring equipment used in the course of testing and inspection, as well as that used in calibration. (from ANSI/NCSL Z540-1-1994)
Nonconformance	A deficiency in characteristic, specification, documentation, or procedure that renders the quality of an equipment or activity unacceptable or indeterminate.
Reference Standard	A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (from ANSI/NCSL Z540-1-1994)
Tolerance	The total permissible variation in specifications or requirements. The tolerance is the difference between the limits of the specifications or requirements.
Traceability	The property of a result of a measurement whereby it can be related to appropriate standards, generally national or international standards, through an unbroken chain of comparisons. (from ANSI/NCSL Z540-1-1994)
Transfer Standard	Designated measuring equipment used in a calibration system as a medium for transferring the basic value of reference standards to a lower echelon transfer standards or measuring and test equipment.
User	An individual who requests to use an MTE for measurements.

HP EQUIPMENT DATABASE

N	O	P	Q	R	U	Y	W	X	Y	
11	MFGR.	INSTR. MOD.	INSTR. S/N	PROBE MOD.	PROBE S/N	CALIB. DUE	LOCATION	STATUS	COMMENTS	PROP.#
12	DICKSON	9H87F	221199	-	-	4/21/92	CASL	O/S	RECORDING TEMP. & RH.	
13	EBERLINE	PNR-4	3579	-	-	12/7/88	CASL	O/S	Oct-90	
14	EBERLINE	PRS-2	127	-	-	3/31/85	CASL	O/S	Dec-84	
15	EDC	E100E	6789	-	-	5/30/92	CASL		VOLT. STD.	
16	FLUKE	8050A	2664012	-	-	3/14/92	REUL		ELECTROLYSIS	
17	Home Made	BonnerSphr	BS11	-	-	10/11/91	CASL	O/S		
18	Home Made	BonnerSphr	BS4	-	-	10/11/91	CASL	O/S		
19	KETHLEY	610C	396923	-	-	4/1/92	CAL LAB.	O/S	ELECTROMETER	P23375
20	LUOLUM	12	9026	42-2	P1104	7/1/89	CASL	O/S	Jan-88	
21	LUOLUM	18	4323	44-17	P767	10/17/85	CASL	O/S		
22	LUOLUM	19	30774	-	-	7/26/91	CASL	O/S		
23	LUOLUM	19	77600	-	-	10/5/91	CASL	O/S		
24	LUOLUM	19	77638	-	-	10/5/91	CASL	O/S		
25	LUOLUM	500	24778	-	-	4/21/92	CASL		PULSER	
26	LUOLUM	2200	80841	-	-	3/12/92	CASL	O/S		
27	LUOLUM	300	47888	300/4G	PR040573	10/15/88	CASL	O/S	Apr-88	
28	LUOLUM	300	51546	300/4G	PR040574	10/15/88	CASL	O/S	Apr-88	
29	ORTEC	776	442	-	-	5/20/92	CASL		COUNTERTIMER	
30	R-S	-	-	1000mR/h	Y4318	7/26/91	CASL	O/S	⊗ FAC. FOR SERVICE	
31	R-S	-	-	1000mR/h	Z5242	5/1/92	CASL	O/S	EXPERIMENTAL DETECTOR	
32	R-S	-	-	1000mR/h	Z1016	4/22/92	CASL	O/S		
33	R-S	-	-	1000mR/h	Z5239	4/22/92	CASL	O/S		
34	R-S	-	-	1000mR/h	Z5246	4/22/92	CASL	O/S		
35	R-S	-	-	1000mR/h	Z5247	4/22/92	CASL	O/S	11/19/91	
36	R-S	-	-	1000mR/h	Z5266	4/22/92	CASL	O/S		
37	VICTOREEN	440	1022	-	-	2/11/92	CASL	O/S		
38	VICTOREEN	500	295	-	-	5/22/92	CASL		TERTIERY STD.	
39	VICTOREEN	500	1115	-	-	1/31/92	CASL		TERTIERY STD.	
40	VICTOREEN	-	-	550-3	968	5/31/92	CASL		TERTIERY STD.	
41	VICTOREEN	-	-	550-3	1667	1/31/92	CASL		TERTIERY STD.	
42	VICTOREEN	-	-	550-4	944	5/31/92	CASL		TERTIERY STD.	
43	VICTOREEN	-	-	550-4	1640	1/31/92	CASL		TERTIERY STD.	
44	VICTOREEN	440 R/Fc	3322	-	-	9/1/89	CASL	O/S		
45	VICTOREEN	470A	909	-	-	11/27/91	HP TECHS	O/S	⊗ CASL FOR CAL	
46	VICTOREEN	488A	446	-	-	8/19/88	CASL	O/S	Feb-88	
47	VICTOREEN	488A	450	-	-	8/18/88	CASL	O/S	Sep-88	
48	XETEX	415B-.1	25454	-	-	4/18/92	HP TECHS			
49										

Thursday, July 23, 1992

QUALITY CONTROL LIST

Shop	CustName	PhoneNo	ToolType	Manufacturer	ToolNo	Insp Freq	Insp pQ tr	LastCalDt	NxtCalDt	Insp Results	Notes
RF Section			12" Caliper	Mitutoyo	Q00425	C	4	10/4/91	10/31/92		4" and 5" rods are missing from this set.
			8" Digital Caliper	Mitutoyo	Q00426	C	4	10/4/91	10/31/92		
			0-6" Depth Mic	Mitutoyo	Q00427	C	4	10/4/91	10/31/92		
			8" Digital Caliper	Mitutoyo	Q00431	C	4	10/14/91	10/31/92		
			24" Caliper	Kanon	Q00432	C	4	10/14/91	10/31/92		
			Dial Indicator	Starrett	Q00433	C	4	10/14/91	10/31/92		
			1" Mic	Mitutoyo	Q00434	C	4	10/14/91	10/31/92		

PLASMA PHYSICS LABORATORY**Health Physics Instrumentation**

Cal. Date: _____ Initials: _____

Unit S/N _____ Det. S/N _____

Cal. Factor: _____

Ck. Source: _____

CPM: _____ mR/HR: _____

CALIB. DUE: _____

INDICATOR ONLY**CALIBRATION**

DUE _____ DATE _____

ID# _____