CONTROL & CALIBRATION OF MEASURING EQUIPMENT

PROCEDURE ID: YMP-LBNL-QIP-12.0	REV.1, MOD. 1	EFFECTIVE: 1/17/97

1. PURPOSE

This quality implementing procedure (QIP) describes the methods and documentation required for selecting, operating and handling, calibrating, maintaining, and storing equipment used to take measurements.

2. SCOPE

This procedure covers equipment that is utilized specifically for the Yucca Mountain Site Characterization Project - Lawrence Berkeley National Laboratory (YMP-LBNL) and must be known as accurate to a specified range.

This procedure describes specific requirements for selecting, measuring, checking performance and calibrating measuring equipment (including equipment that contains software or programmable hardware), disposition of faulty measuring equipment, and documenting the traceability of performance or calibration standards used on that equipment. Software developed or modified by the user shall be controlled in accordance with the requirements of YMP-LBNL-QIP-SI.0, *General Software Quality Assurance*.

Note: Although rulers, tape measures, levels, and other commercial equipment may be used in the characterization of a repository, the results obtained are considered to provide adequate accuracy for their "appropriate use." They are therefore NOT covered by this procedure and do NOT require documentation of their use or accuracy.

3. PROCEDURE

3.1 Selection of Measuring Equipment

3.1.1 The **Principal Investigator (PI),** or designee**,** shall assure that appropriate measuring equipment is selected for project use, based upon anticipated measurement range capabilities, environmental considerations under which the equipment will be expected to perform, and other project-specific considerations.

3.1.2 The **PI** or designee shall maintain a list of measuring equipment, add to the list when new equipment is used, and delete from the list equipment that has been removed from YMP-LBNL service.

3.1.3 For each piece of measuring equipment, the PI or designee shall document, as appropriate:

A. preliminary information (safety issues, special handling and storage conditions, etc.);

B. purpose (processes monitored by, data collected by, items inspected by, etc.);

C. unique identification (manufacturer's serial number, inventory number, assigned YMP-LBNL equipment number, or other); and

D. performance check or calibration requirements, including standards, traceability, methodology and intervals between calibrations.

The above information shall be maintained in a log book kept beside the measuring equipment when in use and stored with it when not in use. Log books may be combined for equipment groups or systems when appropriate.

3.1.4 The **PI** or designee shall assure that measuring equipment requiring periodic performance checks or calibration is labeled, tagged, or otherwise suitably marked to indicate:

A. the equipment's next calibration due date and

B. the equipment's unique identification number to allow traceability to its performance check or calibration data.

3.2 Performance Checks, Use and Care of Measuring Equipment

3.2.1 Prior to using any calibrated measuring equipment, users shall assure current calibration status of the equipment by reviewing its calibration due date (found on the equipment's calibration sticker and/or within its logbook). Any equipment found with outdated calibration status shall not be used, and handled per the requirements of Paragraph 3.4 of this procedure.

3.2.2 Between calibrations of a measuring equipment unit, staff members shall document each usage of the equipment in its equipment logbook. Entries shall include date of use, name of user, project name, and reference(s) to the scientific notebook(s) where the activities supported by the measurement data are documented.

3.2.3 When required, users shall check measuring equipment performance prior to and after use for data collection, per methods appropriate for the individual unit and conditions of use such as equipment used in one-time-only applications. These performance checks can range from simple operational checks to verification of calibration against known standards. Performance checks shall be documented in the equipment log book.

3.2.4 Equipment shall be handled and stored appropriately, per the requirements documented in section 3.1.3.A of this procedure, to maintain its accuracy for its intended use.

3.3 Calibration of Measuring Equipment

For equipment that requires periodic calibration, the **PI** or designee shall assure that the calibration:

3.3.1 is traceable to the standard or physical constant used, or if no nationally recognized standard or physical constants exist, a documented basis for calibration;

3.3.2 is performed according to:

A. the applicable schedule; or
B. individual needs based on out-of-calibration status of the equipment;

3.3.3 is traceable to the calibrator;

3.3.4 is performed to a documented method (by either a notebook procedure in accordance with YMP-LBNL-QIP SIII.0, *Scientific Investigation*, reference to an equipment manual, a technical implementing procedure, or otherwise);

3.3.5 is performed within the specified calibration interval (based on Project requirements, equipment stability characteristics, and other conditions that might affect measurements), OR after completion of each update to any software contained within or controlling the equipment, and affecting its calibration;

3.3.6 includes documentation of the calibration methodology and procedure (including revision level) used, the results of the calibration and a statement of acceptability or unacceptability; and,

3.3.7 includes documentation of action(s) taken for measuring equipment found to be out-of-calibration.

3.4 Out-of-Calibration and Lost Measuring Equipment

3.4.1 Measuring equipment is considered to be out-of-calibration and not to be used until calibrated if:

A. it fails a performance check;

B. the calibration due date has passed; or

C. the device produces results known or suspected to be in error.

3.4.2 The **PI** or designee shall control out-of-calibration devices by tagging, segregating, or other means to prevent their use until proper calibration in accordance with YAP-15.1Q, *Control of Nonconformances*, and Section 3.3 of this procedure.

3.4.3 When measuring equipment is found to be out of calibration or when measuring equipment has been lost or irreparably broken after use, the PI or designee shall initiate an evaluation of any data generated, or processes monitored by the subject equipment since its last known date of being in calibration, and the acceptability and disposition of that data. The evaluation shall include the determination of acceptability for previously collected data, processes monitored, or items previously inspected or tested. The evaluation shall be documented by the PI or designee in the equipment logbook. If data is found to be unacceptable based on the evaluation, a nonconformance report shall be initiated per YAP 15.1Q, *Control of Nonconformances*, and any necessary corrective action shall be taken per AP 16.1Q, *Performance / Deficiency Reporting* or AP 16.2 Q, *Corrective Action and Stop Work*.

3.4.4 The **PI** or designee shall ensure that timely repair or replacement of measuring equipment consistently found to be out-of-calibration during the re-calibration process is performed.

3.5 Documenting the Traceability of Standards

Ideally, the performance of equipment is checked against standards prior to, and following, the measurements of unknowns. In this manner, high confidence in the measured value of the unknown is achieved.

3.5.1 The **PI** or designee shall select nationally-recognized standards that have greater accuracy than required for measurments made by the equipment that is being checked or calibrated (the PI or designee determines the accuracy needed for the particular project); or

3.5.2 If the calibration standards with a greater accuracy than required of the measuring and test equipment being calibrated do not exist or are unavailable, calibration standards with accuracy equal to the required calibration accuracy may be used if they can be shown to be adequate for the requirements.

3.5.3 The **PI** or designee shall document the criteria for the performance check and/or calibration.

4. RECORDS MANAGEMENT

4.1 Lifetime

4.1.1 A current measuring-equipment list that includes:
A. unique identification numbers for each equipment and
B. dates of new additions to, and deletions from the list.

4.1.2 Equipment-specific information as appropriate:
A. preliminary information (safety, handling, storage, etc.),
B. equipment purpose (processes monitored, data collected, etc.),
C. performance check and calibration due dates or intervals,
D. required equipment accuracy,
E. standards used in performance checks and calibrations,
F. calibrator identification and dates of calibration,
G. acceptable performance check or calibration criteria,
H. dates of acceptability or unacceptability of checks or calibrations,
I. evaluations of data suspected to have been taken by out-of-calibration equipment, and
J. identification of the procedure or methods used in the performance check or calibration.

4.1.3 Equipment Logbooks

4.2 Non-Permanent

None.

4.3 Controlled Documents

None.

4.4 Records Center Documents

Records associated with this procedure shall be submitted to the YMP-LBNL Local Records Processing Center, in accordance with YMP-LBNL-QIP-17.0, *Submitting Records to the YMP-LBNL Records Processing Center*.

5. RESPONSIBILITIES

5.1 The **Principal Investigator (PI)** is responsible for overseeing fulfillment of this procedure.

5.2 **Staff Members** involved in any part of this procedure are responsible for turning over related documentation to the Principal Investigator or QA office for records processing and transfer to the Yucca Mountain Site Characterization Office (YMSCO) in Las Vegas.

6. ACRONYMS AND DEFINITIONS

6.1 Acronyms.

None.

6.2 Definitions

Calibrate: Establish the accuracy of a standard or measuring device, which may require resetting parameters on the device to improve its accuracy.

Measuring Equipment: Devices or systems used to calibrate, measure, or gage in order to control or acquire data to verify conformance to specified requirements.

Performance Check: A process or procedure that establishes the performance of equipment or a service.

7. REFERENCES

AP-16.1Q, *Performance/Deficiency Reporting.*

AP-16.2Q, *Corrective Action and Stop Work.*

DOE/RW/0333P, *Quality Assurance Requirements and Description,*

YAP-15.1Q, *Control of Nonconformances*

YMP-LBNL-QIP-17.0, *Submitting Records to the YMP-LBNL Records Processing Center.*

YMP-LBNL-QIP SI.0, *General Software Quality Assurance*

YMP-LBNL-QIP SIII.0, *Scientific Investigation*

8. ATTACHMENTS.

None.

9. REVISION HISTORY.

9/22/95 - Revision 0, Modification 1:
Added references to YMP-LBNL-QIP SIII.0 for notebook procedures and YAP-15.1Q for out-of-calibration equipment. Clarifies methods of addressing calibration standards that only equal (rather than exceed) requirements, or are non-existent. Added statement that no controlled documents are created by performance of this procedure.
10/21/96 - Revision 1, Modification 0:
Revised procedure to reflect requirements changes in QARD, Rev. 5.

10. APPROVAL

Preparer:	Date
Technical Reviewer:	Date
Technical Reviewer:	Date
QA Reviewer:	Date
Quality Assurance Manager:	Date
Project Manager:	Date