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SANDIA NATIONAL LABORATORIES
CHEMICAL & DISPOSAL ROOM PROCESSES DEPARTMENT 6748
WASTE ISOLATION PILOT PLANT PROJECT

TOP-542

CALIBRATION, USE, AND MAINTENANCE OF THE METTLER MODEL AE163 BALANCE

Revision 0

Effective Date: 1/5/96

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SP 12-18-95

1.0 REVISION HISTORY

This document replaces TOP-6119-08 draft 1. The only reason for this revision is to comply with SNLA-WIPP QA requirements.

2.0 PURPOSE

This procedure provides for the calibration, operation, maintenance of balances in building 823, rooms 2079 and B45, as part of the laboratory geochemistry research activities in support of the Waste Isolation Pilot Plant (WIPP) Project.

3.0 SCOPE

This procedure is applicable only for the balances in building 823, rooms 2079 and B45.

This document is not meant to substitute for the manufacturer's instruction manuals for the balances. The user is responsible for reading and understanding the appropriate manuals.

4.0 SAFETY

This document does not address ES&H issues. Laboratory ES&H procedures described in the SOPs in which the equipment is used shall be adhered to.

5.0 RESPONSIBILITIES

The Principal Investigator (PI), or designee, whose activities warrant the use of this procedure is responsible for implementing the requirements of this procedure.

The Project Scientist (PS), or designee, is responsible for performing the calibrations and measurements following the requirements of this procedure, documenting calibrations, and assuring that the latest revision of this document is followed.

6.0 CONTROLS

Controls are established by written procedures or instructions prepared in accordance with QAP 5.3,. PREPARING, REVIEWING, AND APPROVING TECHNICAL OPERATING PROCEDURES (Revison 1, effective date: 7/31/95) of the Sandia National Laboratories WIPP Quality Assurance Program. Procedures are issued in accordance with QAP 6.1, DOCUMENT CONTROL SYSTEM (Revision 1, effective date: 7/31/95) of the Sandia National Laboratories WIPP Quality Assurance Program.

6.1 STANDARDS

Calibration will be verified using commercially obtained weights that are traceable to NIST or other nationally recognized standards. The serial numbers and expiration dates (if any) of the certifications of the weights used shall be recorded in the laboratory notebook.

The weights shall not be used past the expiration date listed on the container by the certifying organization.

6.2 FREQUENCY

The balance will be recalibrated upon failure of a performance test, this calibration will be noted in the balance' scientific notebook.

The instrument's calibration shall be verified with performance tests immediately prior to use.

6.3 PERFORMANCE TEST CRITERIA

Use at least three NIST-traceable weights, two of which bound your expected "unknowns". Record each weight number and associated "indicated" balance reading in the scientific notebook.

Performance tests will be done by weighing the NIST-traceable weights. The maximum acceptable deviations from the nominal values for each weight are as follows:

100g:	plus or minus 0.0020g
50g:	plus or minus 0.0010g
30g:	plus or minus 0.0008g
20g:	plus or minus 0.0007g
10g:	plus or minus 0.0005g
5g:	plus or minus 0.0004g
3g:	plus or minus 0.0003g
2g:	plus or minus 0.0002g
1g:	plus or minus 0.0002g
500mg:	plus or minus 0.0001g
300mg:	plus or minus 0.0001g
200mg:	plus or minus 0.0001g
100mg:	plus or minus 0.0001g
50mg:	plus or minus 0.0001g
30mg:	plus or minus 0.0001g
20mg:	plus or minus 0.0001g
10mg:	plus or minus 0.0000g
5mg:	plus or minus 0.0000g
3mg:	plus or minus 0.0000g
2mg:	plus or minus 0.0000g
1mg:	plus or minus 0.0000g

When using a weight (or combination of weights) not listed above, use the next lowest value as your maximum allowable deviation.

Any one measurement's deviation in excess of the maximum allowable deviation listed for that weight constitutes a failed performance test.

6.4 CORRECTIVE ACTION

Check the balance and work area for interferences, correct the problem, if any, and repeat the weighing. If the performance check still fails, recalibrate the balance as per its manual's instructions (see section 6.5) and repeat the performance check. If the instrument still fails, it shall be tagged and taken out of service until repaired.

6.5 CALIBRATION

Calibrations will be performed as per instructions on page 7 of the operator's manual (see Appendix 1).

7.0 PROCEDURE

Analyses shall be performed as per instructions on pages 4 through 9 of the operator's manual (see Appendix 1).

When handling weights, always use tweezers. Never touch the weights with your hands. Delicately remove chemicals, dust, and debris from the balance pan before you place the weights on it. Minimize dust accumulation on the weights by keeping them in their container with the lid closed. Be careful to prevent weight-set mix-ups, move only one weight at a time from its box.

Always weigh samples on weighing paper or in an appropriate container. Do not weigh objects heavier than those recommended by the manufacturer. Keep weighing pans/platforms clean of debris and spills.

8.0 MAINTENANCE

Maintenance and routine calibrations will be performed every 6 months by Jay Hagerman of QA Balance Services, Inc., or his equilivent.

9.0 QA RECORDS

Calibrations and performance test results will be recorded in the laboratory notebook in accordance with Sandia National Laboratories WIPP Quality Assurance Program Procedure 20-2, "PREPARING, REVIEWING, AND APPROVING SCIENTIFIC NOTEBOOKS" (Revision 1, effective date 7/31/95).

10.0 REFERENCES

Mettler Instrument Corporation, 1984. *Mettler Model AE163 Operating Instructions Manual*, Mettler Instrument Corporation, Hightown, NJ

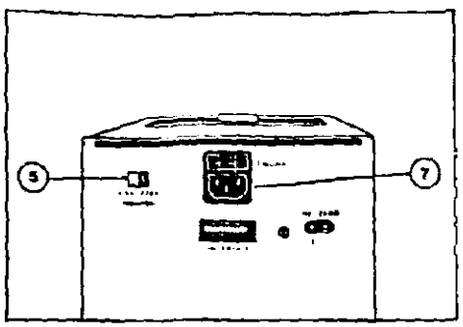
QAP 5.3, PREPARING, REVIEWING, AND APPROVING TECHNICAL OPERATING PROCEDURES (Revison 1, effective date: 7/31/95)

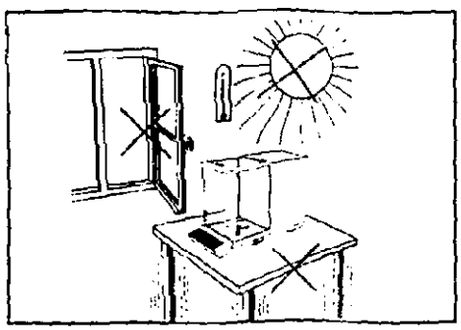
QAP 6.1, DOCUMENT CONTROL SYSTEM (Revision 1, effective date: 7/31/95)

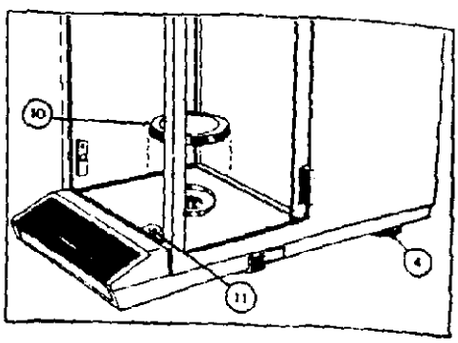
QAP 20.2, PREPARING, REVIEWING, AND APPROVING SCIENTIFIC NOTEBOOKS (Revision 1, effective date 7/31/95).

PREPARATIONS: How to check the voltage setting and set up the balance.

Before the balance is set up for the first time, the operating voltage must be set to conform to the line voltage to which the balance will be connected.
Select a suitable location for your balance; this helps increase operating efficiency.
Install the pan on the balance.
Level the balance and check leveling on a regular basis.







Checking the voltage setting

At the factory, a tag is placed over the power connector (7); the voltage setting is printed on this tag.

If the voltage setting printed on the tag does not agree with the power supply voltage, or if the tag is missing, the setting of the voltage selector switch (5) on the rear wall must be checked, and if needed, changed.

Admissible power supply voltages with switch positions:

115 V: 92 V...132 V
220 V: 184 V...265 V

Location

- Stable location; as free from vibration as possible.
- Make sure there are no large temperature fluctuations.
- Avoid a location where there is direct sunlight or drafts.
- Once location is selected, connect the power cable.

If no ideal location can be found using the above criteria, the balance can still provide good results. This can be achieved by following the instructions listed under "Integration time setting and stability detector".

Install pan on balance; level balance

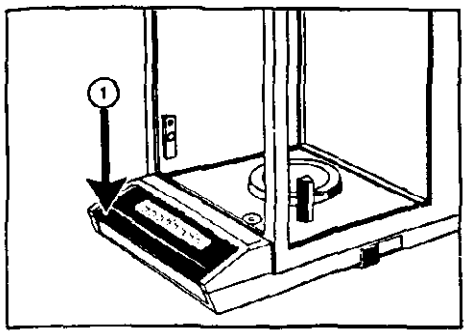
- Install pan (10) on balance: the conical peg is centered in the middle of the opening on the weighing chamber floor.
- Adjust the two leveling screws (4) so that the bubble in the spirit level (11) is in the middle of the circle.

Any time the balance location is changed, recheck the leveling.

For weighings in the 30 g range, it is recommended that the centering disk and draft shield (see accessories) be used.

OPERATION: How to switch the balance on, and how to tare

The balance is tared by pressing the single control bar; this bar also turns the display on and off. When switching the balance off by means of the control bar, only the display is turned off. The electronic components are on as long as the power cable is connected (standby). This allows the balance to be operational at all times and eliminates the need for a warm-up time.

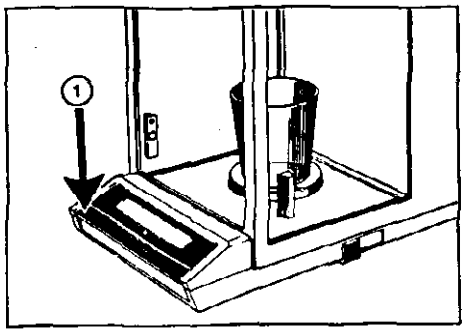


Switching the balance on/off

Switching on:
- Briefly press control bar (1). All display elements light up for several seconds: 88888888 This permits a functional check of the display. Then, 00000 is displayed.

Switching off:
Briefly lift control bar.

If the balance displays OFF the control bar must be pressed again briefly

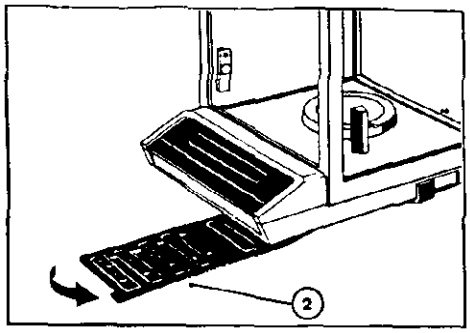


Taring

- Place a container on the pan. Weight is displayed.
- Briefly press control bar (1). Display is blanked out, then 00000 appears.

The container weight is now tared out.

The selected weighing range is now available for weighing-in, minus the tared-out container weight.



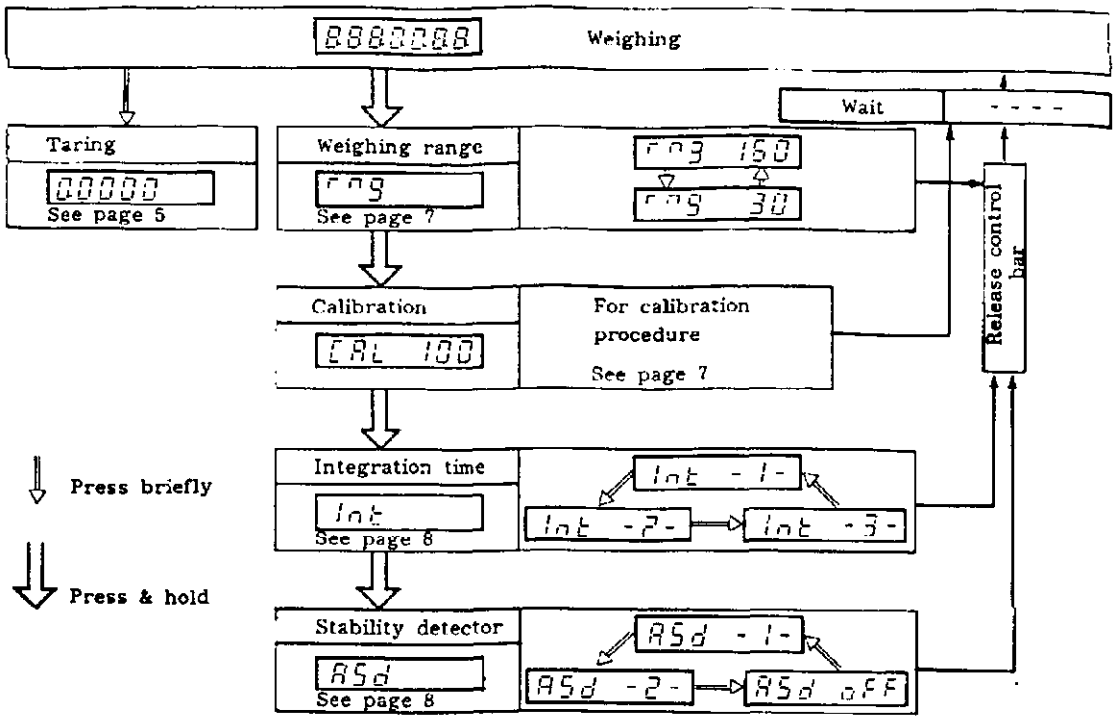
Brief Operating Instructions

Located beneath the balance is a swing-out card (2) on which an abbreviated form of the Operating Instructions are printed.

A detailed procedure (configuration cycle) is illustrated on the next page

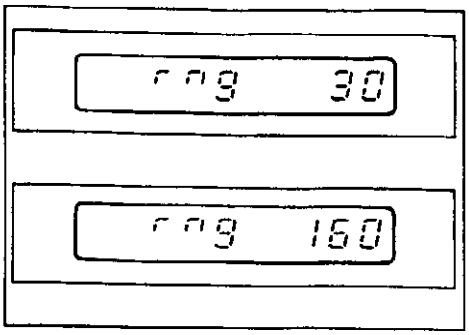
OPERATION: How the single control bar operates.

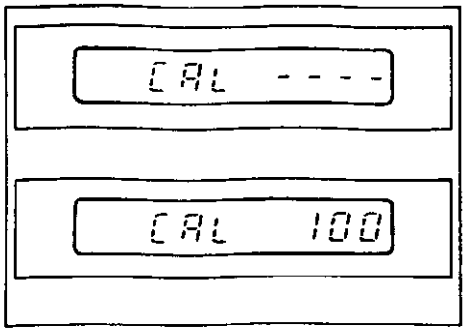
Your balance is equipped with only one operating bar. This control bar permits the display to be switched on/off, the balance to be configured and weight to be tared. In order to have the balance operate under the most ideal conditions, it must be configured accordingly. The configuration cycle is started by pressing and holding the control bar. The individual configuration modes appear in the display in abbreviated form. After releasing the control bar and then briefly pressing it again, a selection can be made between different steps. (exception: calibrating)

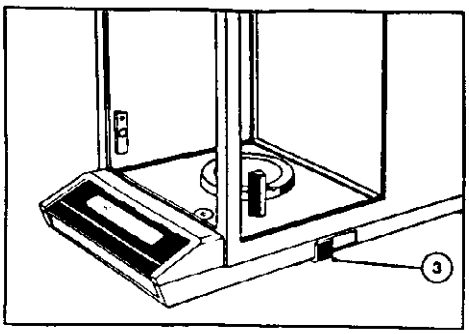


OPERATION: How to switch from one weighing range to the other and how to calibrate the balance.

Switching from one weighing range into the other is done by using the single control bar.
Before working with the balance for the first time, it must be calibrated.
Calibration means setting the balance to the correct weight display.
The balance is equipped with a built-in calibration weight (for specifications, see "Technical specifications").
NOTE: to achieve stable results, it is recommended that the balance be left connected to the power supply for 60 minutes prior to calibrating.
Irrespective of the selected weighing range, the calibration procedure applies to both weighing ranges at the same time.







Switching weighing ranges

- Press single control bar (1) until the balance displays rng . (rng = range).
- Releasing and then briefly pressing the control bar again, allows you to switch between the 30 g range and the 160 g weighing range.

When the weighing range wished has been selected, wait: Display " - - - -", then "0.0000".

The balance is now in the weighing mode.

Preparations for calibrating the balance

- Remove all objects from the pan.
- Close the sliding windows.

Set the balance to the calibration mode:

- Press control bar (1) until "CAL" is displayed.
- Release control bar. "CAL - - - -" will appear in the display.

Calibrating the balance

The calibration weight is placed in position by means of the calibration lever (3).
As soon as "CAL 100" appears (the 100 blinks), slowly move the calibration lever towards the rear.
First, "CAL - - - -" appears, then "100.0000". When the display "CAL 0" appears (0 blinks), move lever back to original position. Wait: display "- - - -" followed by "0.0000" appears.

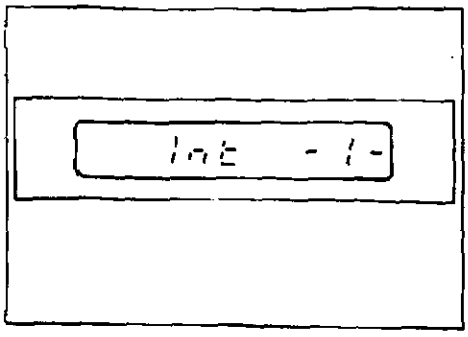
The balance is now calibrated in both weighing ranges.

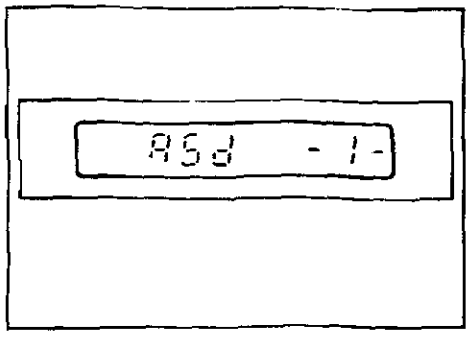
OPERATION: How to set the integration time and the stability detector.

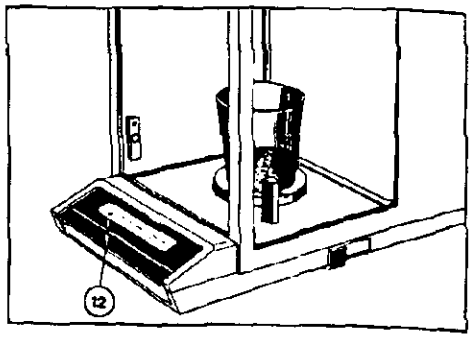
The AE163 is capable of providing excellent results in spite of unfavorable weighing conditions. The stability detector (ASd: automatic stability detection) provides an added measure of reliability to the results.

Setting criteria:	Standard setting	Increased weighing cycle speed	Increased weighing accuracy
	Int : Step 2	Int : Step 1	Int : Step 3
	ASd: Step 2	ASd: Step 2	ASd: Step 1

If the integration time setting or stability detector setting is changed, any previously displayed weighing result will remain unchanged.







Integration time (Int)

- Press single control bar (1) until balance displays Int.
- Choice can be made between Steps 1, 2 and 3 by briefly pressing the control bar.

  Step 1: shortest time

Once the desired step has been selected, wait until the balance is again in the weighing mode.

If the standard setting is too slow, select Step 1.

If the display is too unstable, select Step 3.

Stability detector (ASd)

- Press single control bar (1) until the balance displays ASd.
- Choice can be made between Steps 1, 2 or OFF by briefly pressing the single control bar.

  Step 1: greatest sensitivity

If use of the stability detector is not wished, it can be turned off ("OFF" position), whereby DeltaDisplay is also switched off.

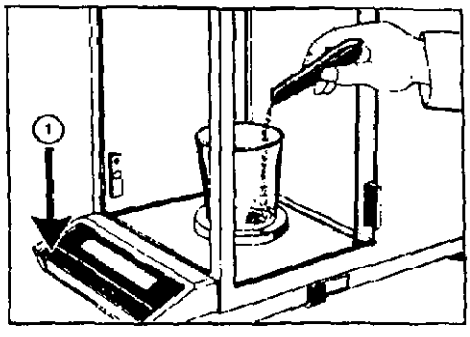
The green pilot light (12) in the left of the display goes off when the balance has achieved stability.

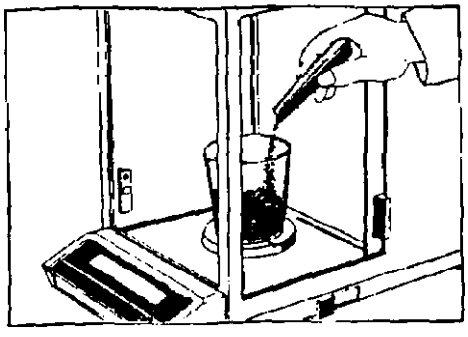
When the pilot lamp is on, the data interface is blocked.

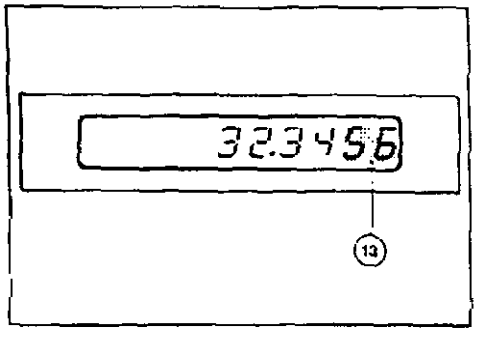
The result should always be read only after the pilot lamp goes out.

OPERATION: How to weigh-in using DeltaDisplay

The AE163 is equipped with DeltaDisplay; this is a display mode which can be switched on and off, and which is especially suitable for weighing-in. When weighing-in, the increasing weight is displayed almost without delay by rapidly changing numbers. In addition, when there are fast weight changes, the last two digits are blanked out to enable you to follow the increasing weight. The stability detector is switched on together with the DeltaDisplay. This permits only stable weight results to be released to the data interface







Weighing-in

- Place container on the weighing pan.
- Press control bar (1) to tare: zero display appears.
- Weigh-in up to desired target weight.

If different components must be weighed in, one after the other, tare can be pressed after each component is weighed in, and the next component can be weighed in from zero until the container and all components equal the capacity of the weighing range selected.

If the weighing range is exceeded, the upper portions of all digits appear: - - - - - -

DeltaDisplay

As the component is being filled in quickly, the DeltaDisplay automatically switches in: the last two decimal places (13) are blanked out and the display change is speeded up. This allows the weight increase to be followed better.

DeltaDisplay is switched off when the stability detector (ASd) is configured "OFF".

When filling in is slowed down to approach the target weight, the last two digits automatically reappear. The display change continues to be speeded up.

Only when very small weight changes are made, does the balance switch back to the normal display rate.

In this way, a stable weighing result is displayed with full accuracy.