Standard Operating Procedure (SOP) on the Use of Digital Analytical Balance

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Standard Operating Procedure (SOP) on the Use of Digital Analytical Balance

Figure 1. Digital Analytical Balance

Purpose

To describe the correct procedure for handling, operating, and maintaining a digital analytical balance to ensure accurate and precise measurement of the mass of laboratory samples.

Scope

This SOP applies to all laboratory staff, students, and researchers using digital analytical balances during practical sessions and research activities in the laboratory.

Responsibilities

- Laboratory staff and students are responsible for following this SOP.
- Laboratory supervisors are responsible for providing training and ensuring regular maintenance and calibration of analytical balances.

Parts of a Digital Analytical Balance

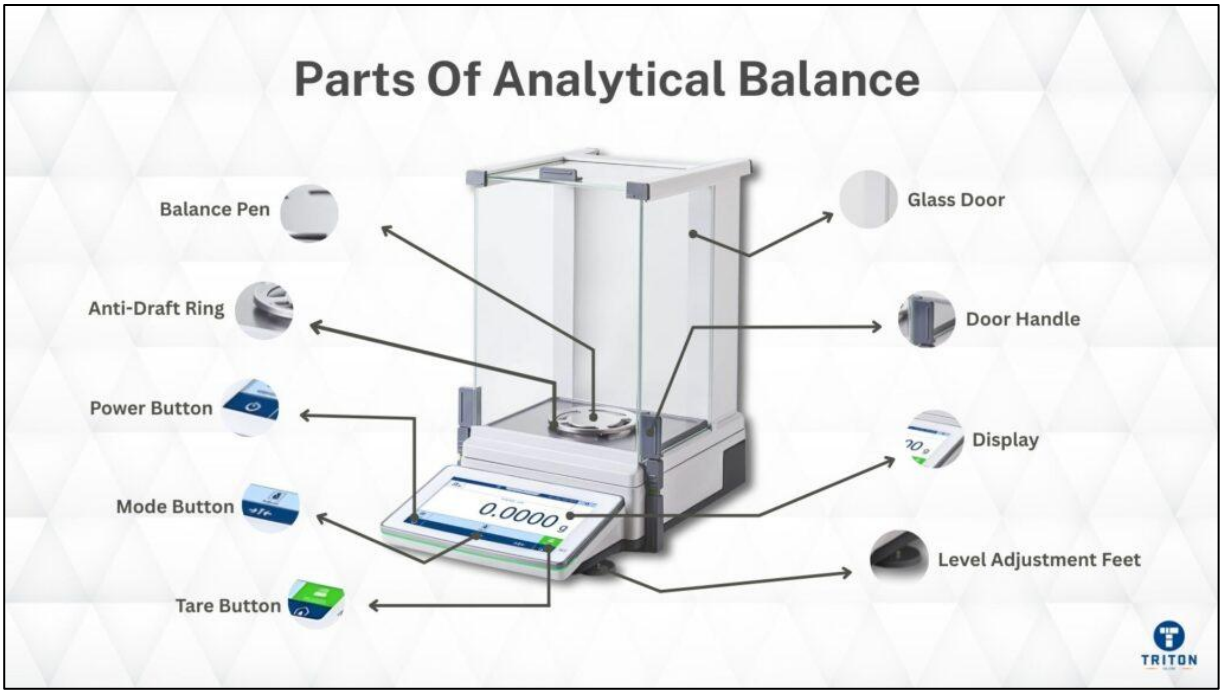

Figure 2. Parts of a Digital Analytical Balance

https://tritonstore.com.au/what-is-an-analytical-balance/

Draft Shield (Glass Enclosure)

- Protects the weighing pan from air currents, ensuring accurate measurements.

Sliding Doors

- Allow access to the weighing chamber while minimizing disturbance from airflow.

Weighing Pan

- The surface on which samples or weighing containers are placed.

Display Screen

- Displays the measured mass and instrument status.

Control Panel/Keypad

- Contains operational buttons such as ON/OFF, TARE (Zero), CAL (Calibration), UNIT, and PRINT.

Spirit Level (Bubble Level)

- Indicates whether the balance is level.

Adjustable Feet

- Used to level the balance before operation.

Principle

A digital analytical balance measures mass using an electromagnetic force restoration system. When an object is placed on the weighing pan, an electromagnetic force is generated to counterbalance the object's weight. The electrical current required to restore equilibrium is proportional to the mass and is displayed digitally.

Analytical balances are capable of measuring masses with a readability of **0.1 mg (0.0001 g)** and are used when high accuracy and precision are required.

Materials and Equipment

- Digital analytical balance
- Clean weighing paper, weighing boat, or weighing bottle
- Sample to be weighed
- Soft brush or lint-free tissue
- Forceps (if required)

Procedure

1. Preparation

1. Ensure the balance is placed on a stable, vibration-free surface.
2. Check that the balance is level using the bubble level.
3. Switch on the balance and allow it to warm up according to the manufacturer's instructions.
4. Ensure the weighing chamber and pan are clean.

2. Zeroing the Balance

1. Close the draft shield doors.
2. Press the **TARE/Zero** button.
3. Wait until the display reads **0.0000 g** before weighing.

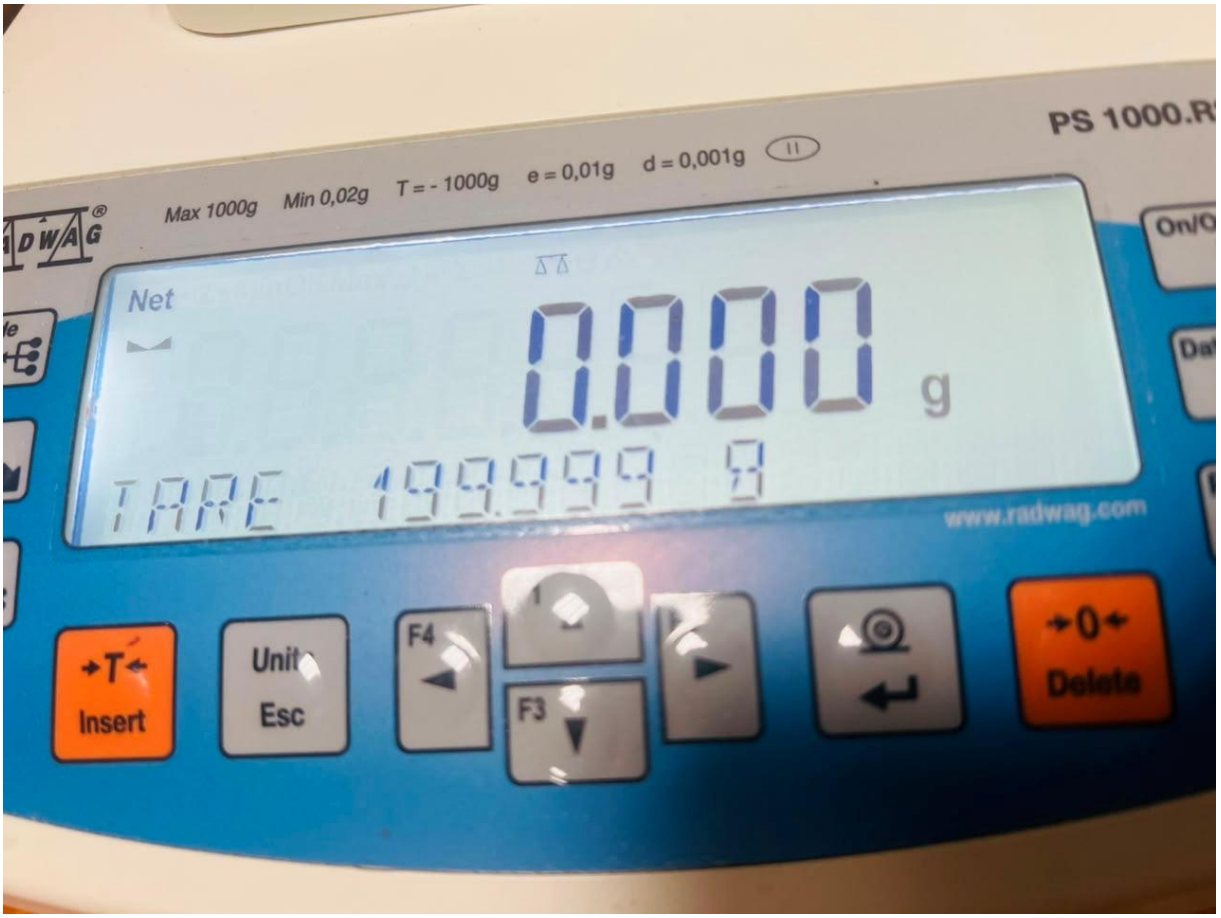

Figure 3. display reads 0.0000 g

3.Weighing the Sample

Figure 4. Weighing the Sample
https://www.americanscaleus.com/knowledge-center/analytical-balance-calibration-guide

Direct Weighing

(1) Open the draft shield carefully.

(2) Place the sample directly onto the weighing pan.

(3) Close the draft shield.

(4) Wait until the reading stabilizes.

(5) Record the displayed mass.

Weighing Using a Container

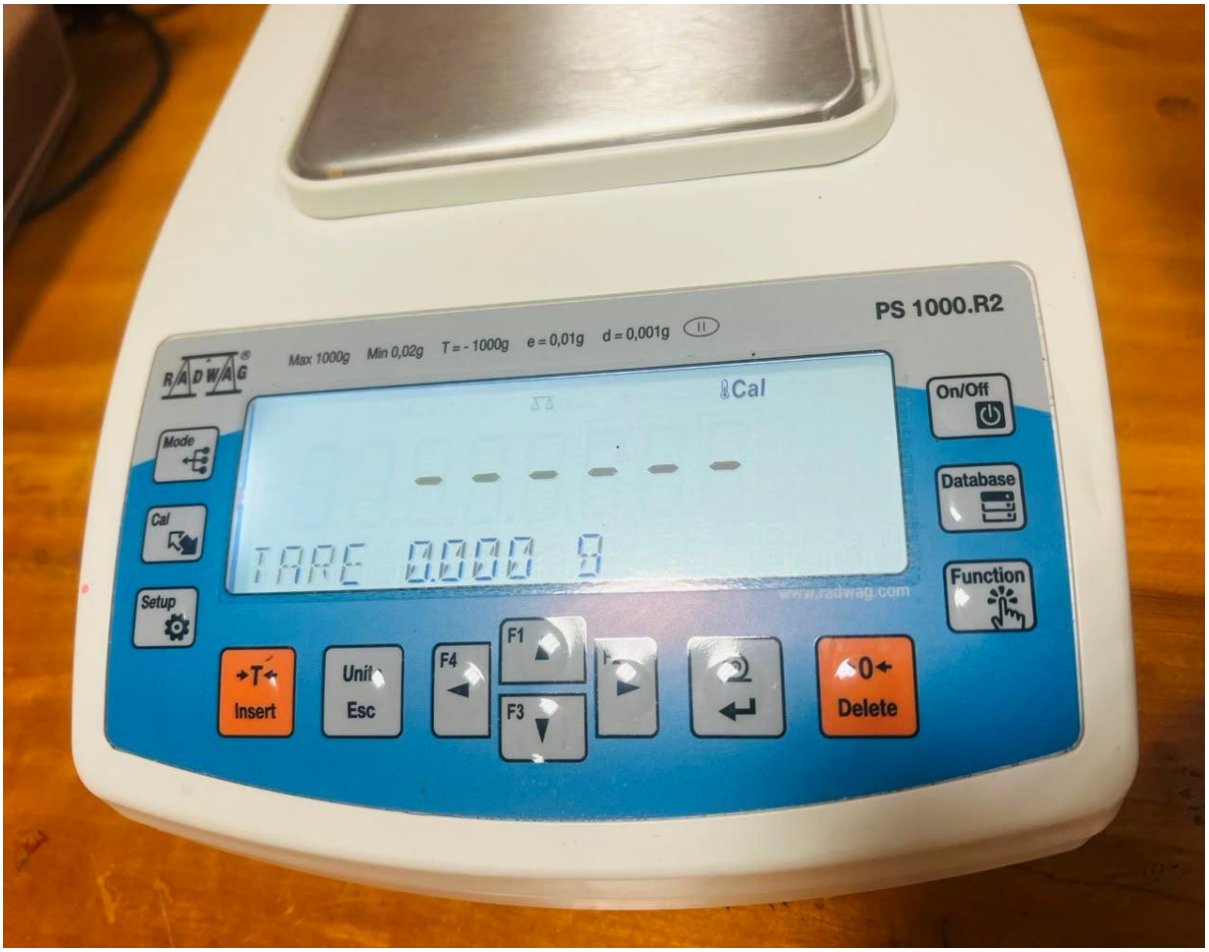

Figure 5. Press the TARE button to reset the display to zero

1. Place a clean weighing boat, paper, or container on the weighing pan.
2. Close the draft shield and allow the reading to stabilize.
3. Press the **TARE** button to reset the display to zero.
4. Add the sample into the container.
5. Close the draft shield.
6. Record the displayed mass after stabilization.

4. Removing the Sample

1. Carefully remove the sample and weighing container.
2. Ensure no material remains on the weighing pan.

(6) Switching Off

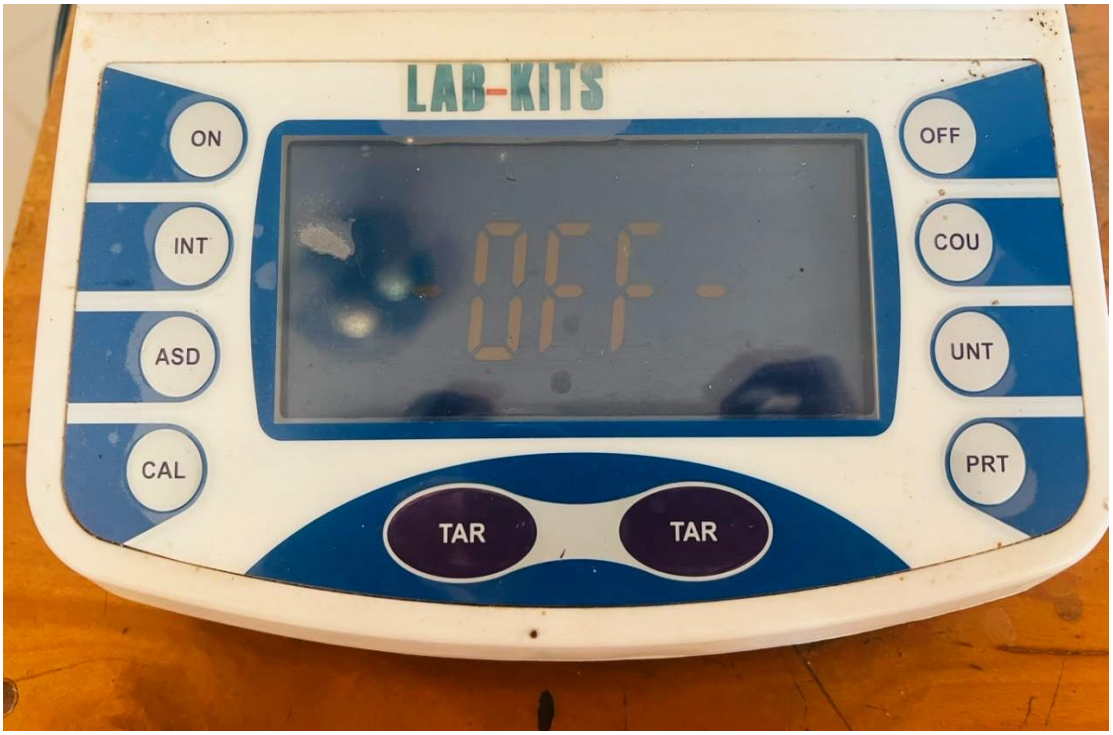

Figure 6. Switch off the balance after use

1. Clean the weighing pan and chamber.
2. Close the draft shield.
3. Switch off the balance after use if required by laboratory policy.

Precautions

- Always place the balance on a stable, vibration-free bench.
- Do not overload the balance beyond its maximum capacity.
- Never place hot samples directly on the weighing pan.
- Close the draft shield during weighing.
- Handle samples with forceps or gloves whenever appropriate.
- Avoid touching the weighing pan with bare hands.
- Allow refrigerated or heated samples to reach room temperature before weighing.
- Avoid weighing volatile chemicals without suitable containers.
- Record measurements only after the display becomes stable.

Cleaning and Maintenance

- Clean the weighing pan after each use using a soft brush or lint-free tissue.
- Remove spilled chemicals immediately.
- Never use abrasive cleaning materials.
- Verify calibration regularly according to laboratory policy.
- Perform internal or external calibration as recommended by the manufacturer.
- Report any malfunction immediately.
- Keep the balance covered when not in use.

Safety

- Wear a laboratory coat and appropriate personal protective equipment.
- Handle hazardous chemicals inside an appropriate containment system when required.
- Avoid inhalation of powders during weighing.
- Dispose of chemical residues according to laboratory safety guidelines.

References

1. Good Laboratory Practice (GLP) Guidelines.
2. World Health Organization (WHO). *Laboratory Biosafety Manual*.
3. Manufacturer's Instruction Manual for the Digital Analytical Balance.
4. ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories.

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