



DEDER GENERAL HOSPITAL

GENERAL SERVICE EQUIPMENT CALIBRATION PROTOCOL

BY: HSQU

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SMT APPROVAL SHEET

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1. Introduction

Calibration is a critical process in ensuring the reliability, accuracy, and safe operation of hospital infrastructure and general service equipment. While biomedical equipment is covered under separate protocols, this document focuses on the calibration of **non-biomedical, non-patient-contact hospital equipment** and **general service utilities** such as boilers, electrical systems, water pumps, gauges, and environmental monitoring devices.

Uncalibrated or poorly adjusted systems can lead to inefficient operations, safety risks, and costly failures. Establishing a structured calibration protocol helps Deder General Hospital guarantee that all equipment operates within specified tolerances and regulatory standards.

2. Purpose

The purpose of this protocol is to:

- 1. Ensure Safety and Accuracy** – Keep all service equipment functioning at safe and reliable operational parameters.
- 2. Maintain Efficiency** – Reduce energy wastage and operational disruptions caused by faulty readings or controls.
- 3. Standardize Calibration** – Provide clear step-by-step procedures for calibration across different equipment categories.
- 4. Assign Responsibility** – Define who performs calibration, reviews results, and approves documentation.
- 5. Support Compliance** – Ensure calibration practices meet Ethiopian hospital infrastructure standards, WHO requirements, and manufacturer guidelines.

3. Scope

This protocol applies to all **general service equipment and systems** at Deder General Hospital, excluding biomedical and patient-contact equipment.

Included Systems:

- ☞ Electrical: distribution panels, circuit breakers, grounding systems, UPS, and generators.
- ☞ Water Supply: pumps, flow meters, pressure gauges, tank level indicators.
- ☞ Sanitation & Sewerage: pressure/flow gauges, sump pumps, septic level indicators.
- ☞ Ventilation & Air Systems: AC thermostats, temperature controllers, exhaust fans.
- ☞ General Hospital Equipment: movable non-patient-contact items (trolleys, sterilizers, water boilers, kitchen equipment).
- ☞ Building & Compound Systems: structural measurement tools, load-bearing test devices.

4. General Principles

- ☞ **Authorized Personnel Only:** Calibration is performed only by trained maintenance staff or certified external contractors.
- ☞ **Preventive First:** Calibration is conducted on a scheduled basis, preferably during preventive maintenance.
- ☞ **Traceability:** All calibration must reference manufacturer standards or national/international measurement standards.
- ☞ **Documentation:** All calibration activities must be logged in official calibration logbooks and signed by the responsible technician.
- ☞ **Verification:** The Maintenance Head verifies and approves calibration results.

5. Calibration Procedure

Calibration ensures that all hospital non-biomedical, non-patient service equipment functions within acceptable accuracy and reliability levels. This procedure applies to all facility equipment requiring calibration (e.g., water boilers with thermostats, sterilizers, pressure gauges, electrical panels with meters, ventilation control gauges, etc.).

Step 1: Preparation

1. Identify equipment due for calibration according to the hospital's calibration schedule.
2. Collect equipment manuals, reference standards, and calibration tools.
3. Verify that the equipment is clean, operational, and safe to calibrate.
4. Inform relevant departments of temporary unavailability if calibration requires downtime.

Step 2: Reference Standard Verification

1. Select certified reference standards suitable for the equipment type (e.g., thermometer for boiler calibration, voltage tester for electrical meters, pressure gauge for sterilizers).
2. Ensure that the reference standards themselves are up-to-date, certified, and traceable to national or international calibration standards.

Step 3: Performing Calibration

1. Compare the equipment's reading/output against the reference standard.
2. Record any deviations between the observed reading and the standard.
3. Adjust the equipment according to manufacturer instructions or operational specifications.
4. Test at multiple points (minimum, midpoint, and maximum operating range) to ensure accuracy across the full functional spectrum.

Step 4: Documentation

1. Record details in the **Calibration Logbook**, including:
 - ❖ Equipment category & ID
 - ❖ Date of calibration
 - ❖ Staff performing calibration
 - ❖ Reference standard used
 - ❖ Initial vs. corrected readings
 - ❖ Observed deviations
 - ❖ Actions taken (adjustment/replacement/repair)
 - ❖ Next scheduled calibration date
2. Report any equipment that cannot be calibrated or shows persistent deviation to the Maintenance Head for further corrective action.

Step 5: Verification & Follow-Up

1. Conduct a **functional test** after calibration to confirm proper operation.
2. Update preventive maintenance and calibration schedules in the **maintenance records**.
3. Monitor calibrated equipment closely during subsequent operation to verify reliability.

6. Calibration by equipment Components and Procedures

5.1 Electrical Systems

Components: Distribution panels, circuit breakers, grounding systems, UPS, generators.

Procedures:

1. Verify circuit breaker trip settings against manufacturer specifications.
2. Use a multimeter or clamp meter to check load balance and voltage accuracy.
3. Test generator output frequency and voltage against calibrated instruments.
4. Inspect UPS output and battery health with calibration tools.
5. Record deviations and make adjustments or replacements as required.

5.2 Water Supply Systems

Components: Pumps, flow meters, pressure gauges, tank level indicators.

Procedures:

1. Compare pressure gauge readings with calibrated reference gauges.
2. Check tank level indicators against manual dip-stick or calibrated electronic sensors.
3. Measure pump flow output using a calibrated flow meter.
4. Adjust or replace inaccurate gauges or sensors.
5. Document calibration results.

5.3 Sanitation & Sewerage Systems

Components: Pressure/flow gauges, sump pumps, septic tank level indicators.

Procedures:

1. Verify pressure gauges with calibrated reference instruments.
2. Calibrate septic tank level indicators using manual measurement cross-checks.

3. Test sump pump activation levels and float switches.
4. Adjust or replace faulty indicators.

5.4 Ventilation & Air Systems

Components: AC thermostats, temperature controllers, exhaust fans, environmental sensors.

Procedures:

1. Compare AC thermostat readings with calibrated thermometers.
2. Adjust thermostats until deviation is within $\pm 2^{\circ}\text{C}$.
3. Measure airflow using an anemometer and compare with design specifications.
4. Replace faulty sensors or recalibrate controllers.

5.5 Hospital Equipment (Non-Biomedical, Non-Patient Contact)

Components: Water boilers, sterilizers, kitchen equipment, trolleys with mechanical indicators.

Procedures:

1. **Water Boilers**
 - ☞ Test thermostat accuracy against calibrated thermometer.
 - ☞ Check pressure gauge calibration with a reference gauge.
 - ☞ Verify safety valve activation at specified limits.
2. **Sterilizers (non-patient-contact)**
 - ☞ Compare pressure and temperature readings with calibrated standards.
 - ☞ Adjust control dials to correct deviations.
3. **Other Movable Equipment**
 - ☞ Verify balance levels, mechanical adjustments, and load indicators.

5.6 Building & Compound Structures

Components: Structural measurement tools, load-bearing test devices, levels, and distance measuring devices.

Procedures:

1. Calibrate spirit levels and measuring tapes against standards.
2. Test load-bearing devices with known weights.
3. Record deviations and adjust or replace inaccurate tools.

6. Documentation & Reporting

☒ Each calibration must be recorded in the **Calibration Logbook** with:

- ☒ Equipment ID
- ☒ Calibration date
- ☒ Results (before/after)
- ☒ Technician signature
- ☒ Verification by Maintenance Head

☒ Equipment must be labeled with a **Calibration Status Tag** (Calibrated / Due Date).

☒ Quarterly reports must summarize all calibrations, deviations, and corrective actions.

7. Roles & Responsibilities

- ☞ **Maintenance Head:** Approves calibration schedule, verifies results, and reports to management.
- ☞ **Electrician:** Calibrates electrical systems and electronic components.
- ☞ **Plumber:** Calibrates water system gauges, pumps, and flow meters.
- ☞ **Compound & Building Maintenance Technicians:** Calibrate structural and general facility equipment.
- ☞ **External Contractors:** Handle specialized calibration beyond hospital staff capacity (e.g., generator synchronization, AC system calibration).

8. References

1. Ethiopian Hospital Infrastructure Guidelines (MoH)
2. WHO Calibration & Maintenance Standards
3. Manufacturer manuals for hospital equipment
4. National Safety and Measurement Regulations