



HEARTBEAT FITNESS REPAIR

BIOMEDICAL DIVISION • CLINICAL CALIBRATION & SAFETY PROTOCOL

Factory-trained biomedical engineering for hospital, clinical & commercial fitness equipment

(727) 512-5120 • service@theequipmentfixer.com • TheEquipmentFixer.com

Clinical Calibration & Safety Protocol

Standard Operating Procedure for Cardiac Rehab, Stress Labs & Clinical Gyms

DOCUMENT ID: HFR-SOP-BIO-004

REVISION: 2.1 (Clinical Grade)

EFFECTIVE DATE: August 2026

SERVICE REGION: Tampa Bay Metro

STANDARDS: Clinical PM & Audit Trail

1. CLINICAL GOVERNANCE & PATIENT SAFETY MANDATE

In healthcare, physical therapy, and cardiac rehabilitation environments, exercise machinery constitutes regulated clinical therapy equipment rather than conventional recreational hardware. A treadmill operating off-calibration by even 0.3 mph or 1.5% grade alters the patient's calculated Metabolic Equivalent of Task (MET) workload and target heart rate zone during graded exercise stress protocols. This variance introduces direct patient safety risks, unmonitored cardiovascular strain, and invalid diagnostic stress-ECG data. Heartbeat's Biomedical Division enforces rigid dual-reading tolerances (As-Found vs. As-Left) to ensure all facility assets maintain hospital-grade calibration and liability compliance.

2. FOUR-STEP BIOMEDICAL PREVENTIVE MAINTENANCE & CALIBRATION PROTOCOL

STEP 1 Baseline Specification Mapping

Identify machine OEM factory tolerance thresholds from clinical service documentation. Benchmark target parameters including speed duty-cycles, motor controller PWM feedback, elevation potentiometer voltages, and ergometer watt/workload curves.

STEP 2 Multi-Point Operational Dynamic Verification

Measure tachometer roller speed against console display across low (0.5–2.0 mph), medium (3.0–5.0 mph), and high ranges. Verify ergometer/stepper resistance braking and cable & pulley friction where applicable.

STEP 3 Dual-Reading Calibration & Mechanical Alignment

Where speed or incline has drifted beyond permissible clinical thresholds (± 0.1 mph / $\pm 0.2\%$ grade), enter console engineering mode to adjust speed sensor pickup distance, recalibrate elevation potentiometers, and tune motor controller gain. Both As-Found and As-Left readings are formally recorded.

STEP 4 Clinical Audit Trail & Certification Sign-Off

Affix tamper-evident calibration certification tags with asset ID, technician initials, and due date. Generate an exhaustive digital service report cataloging electrical leakage, grounding integrity, drive belt tension, and component wear.

CRITICAL CLINICAL ACCEPTANCE TOLERANCES

- **Belt Speed Accuracy:** ± 0.1 mph across full range (0.5 to 10.0+ mph)
- **Elevation / Incline:** $\pm 0.2\%$ grade from 0% to max deck elevation
- **Emergency Braking:** Immediate lanyard stop (< 1.5 sec shutoff response)

SAFETY CONDEMNATION CRITERIA: Any device exhibiting grounding resistance $> 0.5 \Omega$, frayed nylon cable coating with visible inner core distortion, or failing emergency tether cutoff must be immediately tagged CONDEMNED / OUT OF SERVICE.

- **Cardiac Rehab Ergometers:** $\pm 3\%$ watt accuracy across protocol stages
- **Sensor Air Gap:** 1.5 mm to 2.5 mm pickup clearance (no physical contact)
- **Electrical Grounding:** Direct dedicated circuit; strictly zero GFCI nuisance trips

● 3. STEP-BY-STEP TECHNICAL CONSOLE CALIBRATION SEQUENCE (MOTORIZED TREADMILLS)

STEP	PROCEDURAL ACTION & CONSOLE INTERACTION	VERIFICATION PARAMETER	TECHNICAL TOLERANCES & NOTES
1	Enter Calibration Mode: Remove magnetic safety key. Press & hold [Start] and [Fast (+)] buttons simultaneously, then reinsert safety key.	Console displays 'Factory Settings' or flashes engineering prompt.	Do not step on belt. Ensures board enters programming mode.
2	Configure Measurement Units: Toggle arrow keys to select English (Miles) or Metric (Kilometers).	Display shows 'Miles' (or 'KM' for clinical metric protocols).	Must match hospital cardiology stress test baseline configuration.
3	Verify Roller Diameter: Use speed keys to adjust wheel size parameter to exact factory spec.	Default typical spec: 2.30 (matches roller circumference).	Incorrect wheel entry skews all odometer and velocity calculations.
4	Set Minimum & Maximum Speed: Verify minimum startup speed (0.5 mph) and maximum threshold (10.0–12.0 mph).	Displays 'Min Speed: 0.5' then 'Max Speed: 10.0'.	Critical for low-velocity cardiac rehab ambulation safety.
5	Configure Grade & Auto-Return: Verify maximum elevation limit; confirm Grade Return: ON.	Displays 'Max Elev: 10' and 'Return: ON'.	Ensures deck automatically descends to 0% grade upon emergency stop.
6	Execute Automated Self-Calibration: Press [Start]. Step back as the treadmill cycles through speed and incline tiers.	Belt ramps through low, medium, max speed and cycles incline rack.	Takes 90–180 seconds. Microprocessor maps PWM duty-cycle to tach pulses.
7	Verify Magnetic Sensor Gap: If calibration fails (Error E-1), remove motor hood and inspect pickup magnet.	Sensor LED flashes per rotation; gap measured with feeler gauge.	Gap must be 1.5 mm – 2.5 mm. Ensure bracket is rigid with zero physical contact.

● 4. CLINICAL FIELD VERIFICATION CHECKLIST & EQUIPMENT AUDIT LOG

ASSET ID / TAG	EQUIPMENT MAKE & MODEL	SERIAL NUMBER	SAFETY TETHER / E-STOP	GROUNDING (<0.5Ω)	AS-FOUND SPEED/GRADE	AS-LEFT SPEED/GRADE	CLINICAL STATUS
CR-TM-01	Clinical Stress Treadmill	SN-982410-B	✓ PASS (0.8s)	0.12 Ω PASS	2.8 mph / 3.4%	3.0 mph / 4.0%	CERTIFIED
CR-TM-02	Rehab Track Treadmill	SN-982442-B	✓ PASS (0.9s)	0.18 Ω PASS	4.7 mph / 8.8%	5.0 mph / 10.0%	CERTIFIED
PT-ER-01	NuStep Recumbent Stepper	NS-T5XR-410	N/A (Brake OK)	0.10 Ω PASS	Level 4: -12W	Calibrated ±2W	CERTIFIED
PT-CB-03	Dual Adjustable Pulley	DAP-702-88	N/A	N/A (Mech)	Internal fraying	Replaced cable	TAGGED / OK
[Blank Log]			[] PASS [] FAIL	[] PASS	___ mph / ___%	___ mph / ___%	[] PASS [] COND

LEAD BIOMEDICAL FIELD ENGINEER

Name: _____

Certification ID: _____

Signature: _____

HOSPITAL / FACILITY CLINICAL DIRECTOR

Facility Name: _____

Authorizing Sign: _____

Inspection Date: _____

CALIBRATION AUDIT TRAIL STATUS

Compliance: Annual PM Protocol Complete

Next Due Date: _____

Emergency Dispatch: 727-512-5120

SCHEDULE CERTIFIED BIOMEDICAL SERVICE

Heartbeat Fitness Repair's Biomedical Division performs this full calibration and safety protocol on-site, with a complete clinical audit trail for facility compliance records.

PHONE
(727) 512-5120

EMAIL
service@theequipmentfixer.com

WEB
TheEquipmentFixer.com