



HEARTBEAT FITNESS REPAIR

BIOMEDICAL DIVISION • CLINICAL CALIBRATION & SAFETY PROTOCOL

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

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Clinical Calibration & Safety Protocol

Standard Operating Procedure for Rowing Ergometers in Rehabilitation Settings

DOCUMENT ID: HFR-SOP-BIO-007

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

Rowing ergometers are widely prescribed in cardiac and orthopedic rehabilitation for their low joint-impact, full-body resistance profile. A damper or drive-chain system delivering inconsistent resistance mid-stroke alters the patient's prescribed workload and introduces a balance-loss fall risk for exactly the population these machines are chosen to protect. Undetected chain elongation compounds this risk: it produces no reliable auditory or visual warning before a skip or failure at full stroke tension. Heartbeat's Biomedical Division enforces rigid dual-reading resistance tolerances and measured chain-condition checks.

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 damper resistance curves, chain tension specification, and monitor pace-calculation calibration.

STEP 2 Multi-Point Operational Dynamic Verification

Perform dynamic physical testing across graduated resistance/damper settings: verify actual measured resistance against monitor-displayed pace and watt output at low, medium, and high damper settings.

STEP 3 Dual-Reading Calibration & Mechanical Alignment

Where resistance or pace output has drifted beyond permissible clinical thresholds ($\pm 3\%$ watt accuracy), recalibrate the monitor's flywheel sensor pickup and verify drive chain length against OEM spec.

STEP 4 Clinical Audit Trail & Certification Sign-Off

Affix tamper-evident calibration certification tags with asset ID, technician initials, and due date. Generate a digital service report cataloging chain condition, seat rail wear, and flywheel bearing play.

CRITICAL CLINICAL ACCEPTANCE TOLERANCES

- **Resistance / Pace Accuracy:** $\pm 3\%$ of monitor-indicated watt output across full damper range
- **Chain Elongation:** $< 1.5\%$ deviation from OEM specified chain length
- **Seat Rail Play:** Zero measurable vertical or lateral play at full slide extension

SAFETY CONDEMNATION CRITERIA: Any device exhibiting a drive chain measuring beyond 1.5% elongation from OEM spec, a cracked or delaminating seat rail, or a non-functional emergency handle release must be immediately tagged CONDEMNED / OUT OF SERVICE.

- **Flywheel Bearing Play:** Zero measurable radial play at flywheel axle
- **Emergency Handle Release:** Immediate, unobstructed handle release under load at any stroke position
- **Monitor Pace Calibration:** Sensor pickup verified against manual stroke-count reference

● 3. STEP-BY-STEP TECHNICAL CALIBRATION SEQUENCE (ROWING ERGOMETERS)

STEP	PROCEDURAL ACTION & CONSOLE INTERACTION	VERIFICATION PARAMETER	TECHNICAL TOLERANCES & NOTES
1	Isolate & Inspect: Power down monitor (if electronic). Remove chain guard for direct chain access.	Chain fully visible along its entire length.	Never measure chain tension under active stroke load.
2	Measure Chain Length: Use a calibrated tape measure across a fixed link count; compare to OEM spec.	Measured length within 1.5% of OEM specification.	Elongation beyond spec is a condemnation trigger, not a lube fix.
3	Inspect Sprocket Wear: Visually and tactilely check drive sprocket teeth for hooking or rounding.	Teeth show square profile with no visible hooking.	Worn sprockets accelerate chain wear even after chain service.
4	Verify Seat Rail Condition: Slide the seat through full travel by hand; check for play or cracking.	Smooth, uniform travel with zero play at either end.	Rail cracking is most common at the forward stop bracket.
5	Calibrate Monitor Pace Sensor: Enter monitor service mode; verify flywheel sensor pickup against manual stroke count.	Monitor stroke count matches manual count exactly over 20 strokes.	Document As-Found reading before any sensor adjustment.
6	Resistance / Watt Verification: Apply calibrated test pulls at low, medium, and high damper settings.	Displayed watt output within ±3% of measured value at all settings.	Record both As-Found and As-Left readings in the compliance log.
7	Emergency Handle Release Check: Simulate release under load at multiple stroke positions.	Handle releases immediately and cleanly at every position tested.	A delayed or snagged release is an immediate condemnation trigger.

● 4. CLINICAL FIELD VERIFICATION CHECKLIST & EQUIPMENT AUDIT LOG

ASSET ID / TAG	EQUIPMENT MAKE & MODEL	SERIAL NUMBER	CHAIN CONDITION	SEAT RAIL PLAY	AS-FOUND WATT	AS-LEFT WATT	CLINICAL STATUS
PT-RW-01	Concept2 Model D RowErg	C2-MD-51190	✓ PASS (0.4%)	✓ PASS	24W / drift +7%	25W / ±2%	CERTIFIED
PT-RW-03	WaterRower Club	WR-CLB-2207	✓ PASS	✓ PASS	N/A (Water)	Tank level verified	CERTIFIED
PT-RW-06	Concept2 Model E RowErg	C2-ME-60215	1.8% elongation	Minor play	30W / drift +11%	Chain replaced	TAGGED / OK
[Blank Log]			___% elong.	[] PASS [] FAIL	___ W	___ W	[] 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.

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