Integrity CLST Treadmill

Service Manual

Life Fitness
WHAT WE LIVE FOR

Table of Contents

Integrity CLST Treadmill

This is the Integrity CLST Treadmill **service manual**.

Introduction

Using this Manual

This service manual provides safe and efficient test and service procedures for the Integrity CLST Treadmill. The service manual is arranged in the following sections:

- Introduction
- Preparation
- Maintenance
- System Modules
- Diagnostics
- Integrity Treadmill Error and Information Messages
- Glossary
- Index

Introduction

This section is an introduction of various sub-sections. It also contains location of the serial numbers, contact information, and system-level troubleshooting.

Preparation

This section provides the list of service tools required to perform various service operations described in this manual.

Maintenance

This section describes a suggested preventive maintenance schedule for the equipment.

System Modules

This service manual has been organized by several operational modules of treadmill. Each module contains its own **troubleshooting guides** (symptom tables and flow diagrams), **electrical wiring diagrams** (if required) and a **How To** section.

Diagnostics

This section describes the in-product available diagnostic modes (a.k.a. diagnostic states).

Integrity Treadmill Error and Information Messages

This section is a list of error and information messages that can be seen on the console.

The messages are presented in a table format which columns are:

- MESSAGE
- DESCRIPTION
- POSSIBLE CAUSE
- REMEDY

Glossary

This section explains the vocabulary used throughout this document.

Index

This section allows to search for information based on keywords.

NOTE:

To find information when a service problem occurs:

- Use the top-level troubleshooting guideline to determine the module.
- Check the corresponding module section's troubleshooting to zoom in to the root cause.
- Follow the service procedures described using the How To's section for the module.

Refer to Electrical Wiring Diagrams section for various block diagrams and connector locations. Unless otherwise specified, standard tools listed in the Preparation section should be used.

Contact Information

To speed Life Fitness Customer Support Service's response, please provide the following information to the customer support technician:

- Model number
- Serial number (a 3-letter, 6-number sequence)
- Symptom of problem
- How to Reproduce the problem, If Possible

Model number on voltage tag

Front View

Serial number label

Remove plastic cover to find large model number and serial label

Rear View

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Also check www.lifeftness.com[1] for local representation

or distributor dealer information

System Level Troubleshooting

Symptom	Possible Cause	Section
Belt not moving	Treadmill not powered	Base Frame Electronics
	Console operation	Console and Activity Zone
	Motor does not start upon workout start	Base Frame Electronics
Noise and vibration	From the general striding belt area	Stride System
	From the front end of the base	Drive Motor
	During incline / decline	Lift System
	Structural noise from the base	Lower Frame
	Structural noise from the upper frame	Upper Frame
Structural failure	Console	Console and Activity Zone
	Upper structure	Upper Frame
	Base	Lower Frame
Appearance Issue	Console	Console and Activity Zone
	Upper structure	Upper Frame
	Base	Lower Frame
Error messages	Error message displayed on the console	Error/Info Message Table
Heart rate issue	Polar or LifePulse®	Heart Rate System
Networking issues	CSAFE connected devices	Console and Activity Zone
iPod®, USB and headphone issues	Option panel	Console and Activity Zone
Audio and video issues	Console & console connections	Console and Activity Zone
	Base external connections	Base Frame Electronics
User interface Issues	Console interface (display, touch screen, etc.)	Console and Activity Zone
Software issues	Installed software version is not the latest released	Console and Activity Zone

Preparation

Required Service Tools

Unless otherwise specified, these tools are required to perform the service procedures in this manual:

1. Screwdrivers (Phillips and fat blade)
2. Torx bits and drivers
3. Pliers (regular and needle nose)
4. Rubber or dead blow mallet
5. Snap ring pliers (internal and external)
6. E-ring tools
7. Socket wrenches (English and metric)
8. Ratchet wrenches (English and metric)
9. Combination, open-end, or box wrenches (English and metric)
10. Allen head wrenches (English and Metric)
11. Strap wrench
12. Mini fashlight
13. Scribe or ink pen
14. Straight edge
15. Nut driver (1/4" drive socket set)
16. Removable thread locking compound – e.g. Loctite® 242 or 243
17. Break Free®
18. Cord or twine
19. Diagonal cutters (small and medium)
20. 2 blocks (e.g., scrap 4" X 4" [101mm x 101mm] wood)
21. Multimeter with test leads
22. Tape measure
23. Telescoping magnet
24. Stethoscope
25. Calibrated torque wrenches
26. Light lubricating oil (i.e. 3-in-1)
27. TF-1000 grease (White Lithium)
28. Grease gun
29. Grab tool
30. Center punch
31. Anti-static strap
32. Outlet tester
33. Dremel®
34. Drill and extractor (easy-out) Bits
35. Soft cloth

> Specialized tools may be required to complete some service procedures safely. Using tools improperly can result in damage to equipment or personal injury.

Specialty Tools

Life Fitness Tools:

1. USB to Serial Converter
2. DB9 to RJ45 Converter

> Part numbers are subject to change.

Maintenance

Preventive Maintenance Schedule

Display Console/Activity Zone Assembly

Item	Weekly	Monthly	Quarterly	Bi-Annually	Annually
Hardware			Inspect for loose or damaged hardware. Replace if necessary. Reapply Loctite 242/24 as needed. Tighten torque bolts to recommended specifications in the Service Manual.		
Console/Activity Zone overlay	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended.				
Accessory cups	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended.				Inspect for damage, cracking, color fading, etc. Replace if necessary.
iPod® connector/ cable	Clean with dry cloth. Inspect cable and connector for damage.				
Emergency switch/key	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended. Inspect for damage. Replace switch if necessary.				

Ergo™ Front Handlebar Assembly

Item	Weekly	Monthly	Quarterly	Bi-Annually	Annually
Hardware			Inspect for loose or damaged hardware. Replace if necessary. Reapply Loctite 242/243 as needed. Tighten torque bolts to recommended specifications.		
Handlebar				Inspect for cracking, color	

				fading, etc. Replace if necessary.	
Side handrails including shrouds				Inspect for cracking, color fading, etc. Replace if necessary.	
Bridge cover	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended using a damp towel, follow up another damp cloth rinsed with clean water to remove any residue. DO NOT scrub or use brushes on the shrouds.			Inspect for cracking, color fading, etc. Replace if necessary.	
LifePulse® sensors	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended. Inspect for damage. Replace if necessary.				

Frame Assembly

Item	Weekly	Monthly	Quarterly	Bi-Annually	Annually
Hardware			Inspect for loose or damaged hardware. Replace if necessary. Reapply Loctite 242/243 as needed. Tighten torque bolts to recommended specifications.		
Uprights and bolts to mount to the lower frame	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended. Inspect for damage. Replace if necessary.	Inspect for loose or damaged hardware. Replace if necessary. Reapply Loctite 242/243 as needed. Tighten torque bolts to recommended specifications.			
Motor Cover	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended using a damp			Inspect for cracking, color fading, etc. Replace if necessary.	

	towel, follow up another damp cloth rinsed with clean water to remove any residue. DO NOT scrub or use brushes on the shrouds. Inspect for cracking, color fading, etc. Replace as needed.				
Motor Electronic Compartment		Vacuum interior		Inspect flywheel, drive pulleys cables, connectors, Lift Motor, motor control board, etc. for damage. Use a nylon brush to remove debris. Replace components as needed.	
Drive Belt			Inspect for excessive wear, e.g. cracking, belt debris. Replace as needed.		
Machine Level/ Leg Levelers		Inspect for any rocking on the unit. Adjust as needed.			
Front Roller				Inspect for excessive bearing axial and radial play. Inspect roller for excessive wax buildup. Remove excessive wax buildup. Inspect the plastic drive pulley for cracks, warpage, or missing grooves. Replace components as needed.	
Rear Roller				Inspect for excessive bearing axial and radial play. Remove excessive wax buildup. Replace components as needed.	
End Caps	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended.	Inspect to see if end caps are damaged, cracked, faded, or loose. Replace if necessary.			
Side Shrouds	Clean with a mild soap and water, Original				

	Dawn® dish-washing liquid recommended. Inspect for loose hardware.				
Side Frame	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended. Inspect for loose hardware.				
Anti-slip Pads	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended. Inspect signs of peeling off.				
Walking Belt	Inspect for belt alignment/tracking and correct accordingly. Inspect the edges of the belt between the belt barriers. Refer to Stride System Module.		Inspect for excessive wear on the walking/ running surface and edges for excessive fraying. Replace as needed		
Roller Guards	Inspect for damage usually caused by users stepping on them. Replace as needed.				
Visible Deck Surface	Clean with a mild soap and water, Original Dawn® dish-washing liquid recommended. Inspect for damage. Replace if necessary.				

System Modules

Drive Motor (DM)

Theory of Operation

The drive motor is a three-phase alternating current (AC) motor driven off of a 300-volt bus supplied by the motor controller.

The motor converts electrical energy to mechanical energy.

The mechanical energy is transferred to the main roller by means of a drive belt. The drive belt couples the motor pulley with the front roller pulley. It is tensioned by a spring-loaded tensioner.

The motor is equipped with the thermal cut-off switch. Should the motor start to overheat the switch will open to prevent heat-related damage to the motor components.

System Components

Drive Belt

Set Screw Over Key
(51-71 in-lbs)
[59-82 kg-cm]

Motor

Flat Washer
QTY 4

Idler
Assembly

Threaded
Shaft

Idler Support
Bracket

Motor Pulley

Insulating Pad
QTY 2

Clip
(-03 models or higher)
QTY 4

Idler Assembly

Clevis Pin

Idler Support
Bracket

The flywheel is balanced and installed on a tapered shaft.

Problem Symptoms Table

Symptom: Driver Motor doesn't operate

Possible Cause	Corrective Action	Section
Drive motor cable connection to controller faulty	Check drive motor cable connection to controller.	BE
Wrong motor controller for power source (220 volt or 120 volt).	Install proper motor controller.	BE
Failed motor controller.	Verify all connections. Replace motor controller if required.	BE
Thermal switch on motor may be open or defective.	Inspect across thermal switch leads with ohmmeter (verify not open, and resistance less than one ohm).	BE
Is there an error message on the console?	See the list of error messages for more details.	Integrity Treadmill Error and Information Messages

Symptom: Excessive vibration

Possible Cause	Corrective Action	Section
Motor flywheel unbalanced.	Replace flywheel	DM
Motor Shaft bent	Replace motor	DM
Flywheel bolt loose	Tighten flywheel bolt	DM
Motor mounting hardware loose	Check hardware and tighten accordingly	DM

Symptom: Squeaking noise when drive belt moves

Possible Cause	Corrective Action	Section
Worn or damaged main drive belt	Inspect main drive for damage or wear. Replace if necessary	DM
Drive motor pulley and front roller pulley misaligned.	Alignment Procedure: • Push one of the sides of the idler bracket assembly in either direction to start. • In whichever direction pushing on the idler assembly eliminates the noise, is the direction to move the motor drive pulley to. • Note the distance that you push on the bracket. • Loosen the drive motor pulley and adjust position based on direction and the distance that you pushed the idler bracket.	DM

Symptom: Noise from Drive Motor

Possible Cause	Corrective Action	Section
Motor bearings bad	Replace motor	DM
Flywheel bolt loose and flywheel rubbing	Tighten flywheel bolt	DM

Howtos

Replacement of the Drive Motor Belt

1. Turn the unit power OFF at the Switch, and then unplug the line cord at the wall outlet.
2. Remove the inside Upright Covers, Front Cover, and Motor Cover.
3. Loosen the Rear Roller Adjusting Screws to slacken the Striding Belt enough to allow side-to-side movement of the Front Roller.

> Index the initial position of the Adjusting Screw or count the number of rotations when loosening the Roller Adjusting Screws for proper Striding Belt re-tensioning.

4. Remove two screws securing the Anti-Static Brush Bracket just behind the Front Roller Pulley to avoid being damaged during roller removal.
5. Remove the mounting bolt securing the end of the Front Roller Shaft on the left side of the Frame.

Anti-Static Brush   Mounting Screws

Anti-Static Bracket

Lock
Washer   Washer   Bolt

Front Roller LT   Left End

6. Loosen the tension on the Drive Motor Belt by inserting a flat blade screwdriver into the slotted end of the Idler Arm. Raise the Idler Arm just enough to install an Allen wrench into the Access Hole in the Idler Arm to keep it in a raised position.

☞ DUE TO EXTREME SPRING TENSION, DO NOT RAISE THE IDLER ARM ANY HIGHER THAN NECESSARY.

7. Move the left side of the Front Roller Shaft end into the left side of the Frame so that the Pulley Shaft end clears the Access Hole in the right side.
8. Remove the old Drive Belt from the Front Roller Pulley and Motor Pulley.
9. Install a new Drive Motor Belt in the reverse order.
10. Re-tension the Striding Belt.
11. Re-install Covers.

Idler Arm   Screw driver   Drive Belt   Front Roller

Allen Wrench   Idler Pulley

Access Hole   End of Shaft

Removal of Drive Motor

1. Turn the treadmill power switch off
2. Unplug the line cord from the wall outlet.
3. Disconnect the cables between the drive motor and the motor controller.
4. Insert a flat blade screwdriver into the slotted end of the idler bracket.

Idler Arm | Screw driver | Drive Belt | Front Roller | Allen Wrench | Idler Pulley

5. Raise idler bracket just enough to insert a screwdriver or an Allen wrench into the access hole of the idler bracket. This will keep it in a raised position.

> ☞ DUE TO EXTREME SPRING TENSION, DO NOT RAISE THE IDLER ARM ANY HIGHER THAN NECESSARY.

6. Remove the drive belt from around motor pulley.
7. With the flat blade screwdriver in the slotted end of idler, hold the screwdriver and slowly remove the locking screwdriver or Allen wrench.
8. Slowly lower idler bracket with the first screwdriver.
9. Remove the spring, the clevis pin and the idler bracket. Now you are ready to remove motor.
10. Remove and save the 4 hex nuts, the 4 washers and the 4 plastic shoulder washers that secure the drive motor to the motor mounting studs in the frame.
11. Lift the drive motor assembly up and off the studs and out of the motor pan.
12. Loosen the set screws on the drive motor pulley (sheave).
13. Remove the pulley from the drive motor.
14. Remove the flywheel by removing flywheel bolt and set aside. Use Tool # AK58-00632-0000 (Part of Tapered Flywheel Removal Kit # GK65-00002-0014).
15. Install the previously removed flywheel and drive pulley (sheave) onto the new drive motor. Do not tighten the drive pulley set screws until the roller pulley and drive pulley have been aligned as shown in the steps that follow.

Line up hole in idler and hole in support bracket and insert Allen wrench or screwdriver

Drive Sheave

Key   Drive Sheave Set Screws (2)

16. Install the new drive motor. Slide motor towards the front roller before tightening motor hardware in crisscross pattern. Reuse any hardware removed and saved in the previous steps.
17. Slide the drive motor pulley onto the motor shaft and install key into pulley and motor shaft keyway.
18. To align the drive motor pulley (sheave) with the front roller pulley:
    a. Using a straight edge, align the outer face of the drive motor pulley with the outer face of the front roller pulley. Make sure to have 2 points of contact with each pulley on the straight edge.
    b. Slide the drive motor pulley (sheave) in or out on the shaft during alignment.
    c. Tighten set screw over the key on the drive motor pulley first. Rotate motor pulley 3 times by pushing on the flywheel to make sure pulleys have been properly aligned and belt is running true.
19. Tighten second set screw. Re-install the Idler bracket and drive belt.
    NOTE: When installing the idler bracket, make sure the bracket is set at 90 degrees from the motor pulley so that the idler is not pushing the belt off of the motor pulley.

> 📋 Drive Sheave Set Screws Torque: (51-71 in-lbs), [59-82 kg-cm]

Roller Pulley   Straight Edge

Motor Pulley (sheave)

Base Frame Electronics (BE)

Theory of Operation

Overview

The electronics in the base of Intergrity Series treadmills control the main motor and the lift motor, provides power to the console and monitors the stride sensor. All the circuitry is contained on a single printed circuit board (PCB) assembly which consists of the PCB plus heatsink and bracket. This DSP Board assembly is known as the "DSP controller" since a Digital Signal Processor (DSP) is at the heart of all the control functions of this board. There are four versions of DSP controller used on Intergrity series treadmills, low voltage (100-120 VAC) and another for high voltage (Commercial / Consumer) input power. The input power connector, P7, and the lift actuator connector, P6, are different on the low and high voltage DSP controllers in order to help prevent installing the wrong controller. Another distinguishing feature between the two versions is that FUSE2 and FUSE3 are replaced with jumper wires on the low voltage version since they are only required for European 230 VAC.

Input Power

The input power comes in from the line cord attached to an IEC connector and is routed through a power switch. After the switch an Electromagnetic Interference (EMI) filter is added to reduce radio frequency conducted emissions. A different flter is used on models meeting European requirements versus models design to meet US requirements. A cable assembly containing transient suppression devices called metal oxide varistors (MOV) is attached to the line filter. These devices help prevent high transient voltage spikes originating from lightning from damaging internal circuitry. The power cable from the filter and MOV is connected to connector P7 on the DSP controller. P7 is a three position connector for 100-120 VAC treadmills and a two position connector for 200-240 VAC treadmills.

On the DSP controller the input power goes through an inrush limiting circuit and an input power relay. The inrush limiting circuit adds series impedance to limit high peak currents when the large DC bus capacitors are being charged at turn on. The input power relay is part of the emergency stop switch system and will remove power to the motor controller stopping striding belt movement when the Emergency Stop Switch (ESS) lanyard is pulled by the user. Both the console and the DSP have control of this relay to turn off power to the motor controller. The power supply remains on and the console will still be powered when this relay is opened.

Motor Control

The AC power is rectified by BR2 which is mounted to the heatsink and filtered by four large electrolytic capacitors. In the case of the 100-120VAC low voltage DSP controller, a voltage doubler configuration is used so the bus voltage for the motor controller is the same for both high and low voltage versions. The DC bus voltage goes to the IGBT module which is mounted on the heatsink and is the main power stage. This module is configured as a three phase bridge inverter which converts the DC bus voltage to three phase AC voltages at the appropriate amplitude and frequency to run the motor at the correct speed. The motor controller senses the IGBT bridge phase currents and uses this information to calculate the motor speed so a speed sensor is not required.

Lift Control

The Lift actuator which controls treadmill incline is powered from the DSP controller. The line voltage is switched to either the incline or decline windings of the AC motor depending on which direction is commanded.

On the non-decline units, the DSP motor controller reads the Home Switch which tells the DSP if the incline is at 0% -- a transition from OPEN to CLOSED denotes that the treadmill is at 0% incline. The Home Switch remains OPEN if the incline is greater than 0.0%. The Home Switch closes at 0.0% incline. The Home Switch is mounted on the frame.

On the decline units, the DSP motor controller reads the Home Switch **and** the Negative Incline (Decline) switch. Both of the switches are needed for proper treadmill incline/decline operation.

> **IMPORTANT:** The switch mounted on the frame is the Negative Incline (Decline) switch -- it looks identical to the Home Switch on non-negative incline units, but it's used to indicate that the treadmill's incline bottomed out. This variation is depicted below.

Non-Decline Units	Decline Units
Home Switch = Closed	Negative Incline (Decline) Switch = Closed

	Lift mechanism different than on the non-decline units, HOWEVER, the switch is actuated when the treadmill bottoms out.
FRAME = 0.0% COM NO	FRAME > -3.0% COM NO

The transition from OPEN to CLOSED indicates that the treadmill reached its maximum decline.

The switch mounted on the incline motor remains OPEN from just above 0.0% to 15% incline. At 0.0% incline the switch toggles from OPEN to CLOSED and remains closed throughout the remaining range of decline.

Decline Unit Home Switch OPEN	Decline Unit Home Switch CLOSED
Home SW OPEN (decline unit) (Incline < 0.0%) Lift Motor Decline Units COM NC	Home SW CLOSED (decline unit) (Incline > 0.0%) Lift Motor Decline Units COM NC

Home Switch (decline units) details:
1. Switch OPEN = Depressed (Incline < 0.0%)
2. Switch CLOSED = Not Depressed (Incline > 0.0%)
3. LED 10 of the DSP motor controller is ON if switch is closed
4. Switch closed if not depressed (because the wires at the switch connected to the Normally Closed, NC, terminals)

The below picture shows the state of the decline-unit's home switch at 0% incline.

Lift Motor

Frame > 0.0%

COM

NC

The below table describes the behavior of switches.

📓 The system automatically configures itself as an non-decline or a decline-capable unit. This is accomplished by recognizing the wiring of the Home/Decline switches.

Non-Decline Units			Decline Units		
% Incline	**Home Sw**		**% Incline**	**Home Sw**	**Negative Sw**
+15.0	OPEN		+15.0	CLOSED	OPEN
15.0	OPEN		15.0	CLOSED	OPEN
1.0	OPEN		1.0	CLOSED	OPEN
0.5	OPEN		0.5	CLOSED	OPEN
0.0	OPEN/CLOSED		0.0	OPEN/CLOSED	OPEN
-0.5	CLOSED		-0.5	OPEN	OPEN
-3.0	CLOSED**		-3.0	OPEN	OPEN
-4.0	CLOSED**		-4.0	OPEN	CLOSED***

CLOSED = switch depressed

** Can't go below negative 1%

CLOSED = switch NOT depressed; inverse of the non-decline units

*** Switch depressed

The on-time of the Lift Motor is controlled to provide the commanded incline. A frequency detect circuit on the DSP controller detects whether the input AC line frequency is 50 Hz or 60 Hz and adjusts the on time to obtain the correct incline.

Power Supply

The DSP controller contains a flyback power supply that powers the console circuitry as well as all circuitry on the DSP controller. The flyback power supply provides 6 VDC and 12 VDC to the console. These voltages are isolated from the AC line voltage. The same flyback supply also provides supply voltages to the rest of the DSP controller. These voltages are not isolated from AC line but are referenced to the motor controller bus voltage. The power supply is a universal input supply and will operate from 85 VAC to 264 VAC.

Stride Sensor

The Stride sensor is a piezoelectric sensor placed under the deck which senses movement of the deck. The voltage coming out of the piezoelectric sensor goes to the DSP controller which has an opto-isolator isolating the stride sensor from the DSP. The DSP monitors this voltage and sends the information to the console where it is used to determine the presence of a user.

Console Interface

The DSP communicates to the console processor via a single wire serial communications. (Note: JW3 should be present for Integrity treadmills. Other treadmills which use two wire communication will have JW3 on the DSP controller). Opto-isolators are provided on the DSP controller to isolate the transmit line and receive line since the ground reference for the DSP circuitry is not the same as that of the console. DSP controller software updates can be performed by using it's built in field re-programmability capability directly or via the console Csafe interface.

An additional optically isolated signal the DSP controller receives from the console is the Emergency Stop Signal which controls the input power relay.

DSP Controller Software

The Life Fitness motor controller uses proprietary control algorithms to control the ac induction motor to allow for maximum effciency, noise control and smoothness over the full range of operation.

Onboard sensors monitor bus voltage, motor current and power module temperature ensuring component limits are not exceeded.

Line voltage compensation allows wide voltage fluctuations to be transparent to the exerciser.

Maximum average power is regulated allowing short term peaks while still controlling average power.

Motor Controller diagnostics keep track of 34 parameters and maximums to aid in appraising the health and performance of the system. These combined with indicator LED's help the service technician diagnosing and correcting any system issues.

A serial communication link between the motor controller and Console provides seamless operation of the whole Treadmill system.

Indicators and Displays

There are ten LED's on the 92343 Polar Board.

- LED1 12V indicator
- LED2 6V indicator
- LED3 Tx Communication indicator
- LED4 Lift (Up) direction
- LED5 Lift ON
- LED6 V bus indicator
- LED7 +Vd indicator
- LED8 3.3V indicator
- LED9 Incline 0 position indicator
- LED10 Incline Bottom position indicator

Connector

Connector P1 is a six position female Mate-N-Lock connector for motor.

Pin#	Description
P1-1	Frame
P1-2	Phase W
P1-3	Phase V
P1-4	Phase U
P1-5	Not Used
P1-6	Not Used

Connector P4 is a four position Micro-ft connector for limit switches.

Pin#	Description
P4-1	Zero Position Switch
P4-2	Zero Position Switch return (GND)
P4-3	Bottom Limit Switch
P4-4	Bottom Limit Switch return (GND)

Connector P5 is a ten position Mini-ft jr. for console power and signals.

Pin#	Description
P5-1	GND
P5-2	GND
P5-3	6VDC (Integrity); 8VDC (Classic)
P5-4	6VDC (Integrity); 8VDC (Classic)
P5-5	12V (Integrity); N.C. (Classic)
P5-6	RXD
P5-7	TXD
P5-8	N.C.
P5-9	12VDC
P5-10	ESS

Connector P6 is four position Mate-N-Lock connector for lift actuator.

Pin#	Description
P6-1	Down
P6-2	Hot
P6-3	Up
P6-4	N.C

Connector P7 is a three position Mini-ft Senior connector for input power 2pos-230V.

Pin#	Description
P7-1	Line
P7-2	Neutral
P7-3	Not Used

Connector P8 is a 2 position Mini-ft Jr. for motor thermal switch.

Pin#	Description
P8-1	Therm1
P8-2	Therm2

Connector P9 is a fve position Mini-Fit Jr. connector for console voltage select.

Pin#	Description
P9-1	8V
P9-2	6/8V
P9-3	6V
P9-4	12V
P9-5	12V (ESS)

Connector P10 is a 3 position C-grid connector for Stride Sensor interface.

Pin#	Description
P10-1	GND
P10-2	Stride Sensor
P10-3	+12VDC

Connector P14 6 position KK100 Test connector.

Pin#	Description
P14-1	N.C
P14-2	N.C (key)
P14-3	Gnd
P14-4	+Vd (15Vdc) Internal Supply
P14-5	3.3V Internal Supply
P14-6	Reset

Notes regarding the P11, P12, and P13 fast-on connectors of the 230V motor controller:
A) P11 & P13: 0.250" fast on for auto transformer input(230Vac);
B) P12: 0.250" fast on for auto transformer output(120Vac)

System Components

Straight Edge

Motor Controller

Retaining Bracket

Line Cord

On/Off Switch

Problem Symptoms Table

Symptom: No Power

Possible Cause	Corrective Action	Section
Insufficient power source.	Plug treadmill into a proper electrical configuration. Refer to the Operations Manual.	BE
Circuit breaker, if equipped.	Verify that circuit breaker is not open. If open, reset circuit breaker, if equipped.	BE
Motor controller not working	Replace the motor controller if after powering it up any one of the following LEDs is off: LED 1 (12V) LED 2 (8V) LED 6 (V BUS, bus voltage) LED 7 (+15V, driver voltage) LED 8 (3.3V, microcontroller (DSP) voltage) If LED 6 is lit, DO NOT remove the motor controller. This LED may remain lit even after power is removed from the motor controller.	BE

Symptom: Maximum speed is reduced

Possible Cause	Corrective Action	Section
User is pushing striding belt.	Instruct users not to push striding belt in either direction.	
Striding belt/deck malfunction. The deck laminate worn through or the underside of striding belt glazed over (hard, glossy).	Replace belt and deck. See How To…Replace Striding Belt.	SS
Insufficient power source.	Plug treadmill into a proper electrical configuration. Refer to the Operations Manual.	BE

Symptom: Unit resets randomly or pauses

Possible Cause	Corrective Action	Section
Intermittent in line cables, stop switch circuit.	Insufficient power source: plug into a proper electrical configuration. Refer to the Operations Manual. Check for loose power connections inside the unit.	BE

Electrical Wiring Diagram

DSP Controller Block Diagram

DSP Controller Block Diagram

DSP Controller Functional Description

LED8: 3.3VDC
LED9: VD

JW10 on P17
Welded Frame:In
Classic Frame:Out

P4: Home
SW LED
9 & 10

P7: AC Input
120V: 3POS
230V: 2POS

P10: Stride Sensor

P9: PS Jumper
LED: 8V & 12V
LCD: 6V & 12V

Relay 2
AC Input
Power Rly

P5: Console Cable
1. Console Power
2. Communication
3. Emergency Stop

IGBT Module
(underneath
board)

P1 Motor Plug

LED 6
DC Bus Voltage

LED1:12VDC
LED2: 6V OR 8V
LED3:
Communication

JW3: Communication
Jumper
Elevation: Out
Classic: In

P8:
Motor Thermal Switch
Low Voltage Power
SupplyTransformer

DC Bus
Capacitor

LED 4 & 5
Lift Up & Down

P6: Actuator
120V:4POS
230V:3POS

Fuses present
on high voltage
boards only

Inrush Limiter

CBL 1

CBL 2

TO LCD TV (OPTIONAL)

COAX

TV POWER

FACILITY COAX

+VDC
GND

CBL 9
CBL 11

GREEN/YELLOW

AC INPUT
LINECORD

TV POWER BRICK 12V (OPTIONAL)

GND

BLACK
WHITE

CBL 10

AC POWER FOR LCD TV POWER SUPPLY

CBL 18

ON/OFF SWITCH

BROWN
BLUE
GREEN/YELLOW

CBL 11

GREEN/YELLOW

CBL 25

FILTER

CBL 12

GREEN/YELLOW

MOV

MINI-FLTR. 2 PCS.

BLACK
WHITE

ZERO SWITCH

N.C. N.O.
COM

LIFT

CBL 13

RED
WHITE
BLACK

GREEN/YELLOW

CBL 14

AUTO-XFRMR
(HIGH VOLTAGE UNITS ONLY)
220 VOLT CABLE SHOWN

2 AMP
CIRCUIT BREAKER

120V OUT
240V IN
220/230V IN
200V IN
100V IN
COM

RED

CBL 15

RED
BLACK
WHITE

P13 LINE_PS_RELAY
P12 AC HOT
P11 NEUTRAL_PS_RELAY
COM

GID TERMINALS 3 PCS.

1 AC LINE
2 AC NEUTRAL
3
P7 MINI-FLTR. CONN. (3 PCS. 100-120V) (2 PCS. 200-240V)

1 DOWN
2 AC HOT
3 UP
P6 HAL CONN. (4 PCS. 100-120V) (3 PCS. 200-240V)

F4 MICROFT 4 PCS.

CBL 4

GND
GND
BOTTOM
ZERO POSITION

WHITE
RED
BLACK

N.O. COM
HOME SWITCH

DSP CONTROLLER
92343

CBL 24

CONSOLE POWER JUMPER 6 VOLTS

+6VDC
+4VDC

F9 MINI-FLTR. 5 PCS.

ZERO POSITION
GND
GND
BOTTOM LIMIT

RED
BLACK
BLACK
RED

N.O. COM
DECLINE SWITCH

CBL 17

F4 MICROFT 4 PCS.

97T ONLY

CONSOLE
(SEE NEXT PAGE)

ESS
12VDC IN
NC
TXD
RXD
NC
6VDC IN
6VDC IN
GND
GND

BLACK
WHITE
GRAY
GREEN
VIOLET
BLUE
RED
BROWN
ORANGE
YELLOW

P1 MINI-FLTR. 10 POS.

ESS
+12VDC-OUT
NC
TXD
RXD
GND
GND

CBL 6

P5 MINI-FLTR. 10 POS.

JM1

PTC

1 MΩ

CBL 16

12VDC
ST-SENSE
GND

RED
WHITE
BLACK

P10 CGRID 3 PCS.

STRIDE SENSOR

NC
NC
PHASE U
PHASE V
PHASE W
GND

ESS_S
ESS

P1 HAL CONN. 4 POS.

P8 MINI-FLTR. 2 POS.

DRIVE MOTOR

WHITE
RED
BLACK
GREEN/YELLOW

BLUE
BLUE

Howtos

Replacement of the Main Wire Harness

1. Turn the unit power OFF at the switch, and then unplug the line cord at the wall outlet.
2. Remove the Inside Upright Covers, Front Cover, and Motor Cover.
3. Remove the Console Assembly.
4. Disconnect the Main Wiring Harness from the Motor Controller, and then pull out the Main Wiring Harness.
5. Install new Main Wiring Harness through the top of the Left Upright (Upright), and connect to the Motor Controller.
6. Reconnect to the Console Assembly.
7. Install Covers.

Main Wiring Harness

HR& Smart Stop Cables

Replacement of the Line Cord

1. Turn the power off at the on/off switch.
2. Unplug the line cord at the wall outlet.
3. Remove the Access Cover on the right side of the frame, then tilt the unit over on its right side.
4. Remove the Clamp Screw securing the line cord.
5. Remove and discard the line cord.
6. Secure the new line cord in place with the clamp.
7. Turn the unit upright.
8. Reinstall the access cover.

Line Cord   Retaining Bracket

Replacement of the Motor Controller Assembly, Wax Lift Assembly, and Capacitor PCB

CAUTION! Before beginning the following steps, ALL LEDs on the Motor Controller MUST BE OUT.

1. Turn the unit power OFF at the switch, and then unplug the line cord at the wall outlet.
2. Remove the Inside Upright Covers, the Front Cover, and the Motor Cover. See "How to…" in this section.
3. Depending on which is being replaced, disconnect the appropriate wiring from the Motor Controller Assembly or from the Wax Lift Assembly.

Capacitor PCB — Capacitor Board Cable — Motor Controller PCB — Wax Lift Bracket — Wax Lift Board

4. To remove the Motor Controller Assembly: Disconnect the Capacitor Board Cable from the Motor Controller Assembly. Next remove a total of five mounting screws which secure the Motor Controller Assembly to the base of the Unit. Remove two screws in the front of the Unit and three at the base of the Unit, then lift out the Motor Controller Assembly.

Motor Controller

5. To remove the Wax Lift Assembly: Disconnect the Capacitor Board Cable from the Motor Controller Assembly. Remove two screws at the base, and then lift it out.

Wax Lift
Board Bracket

Capacitor
Board Cable

Wax Lift
Board Assembly

Replacement of the On/Off Switch

1. Turn the treadmill power switch OFF.
2. Unplug the line cord from the wall outlet.
3. Remove the top motor cover.
4. Record the location of wire connections to the on/off switch.
5. Disconnect the wires. Use needle nose pliers if necessary.
6. Squeeze the tabs on the top and bottom of the on/off switch and push out from inside the frame.
7. Install the new on/off switch.

On/Off Switch

Replacement of the Line Filter

📝 If equipped with a Transformer, it must be removed first in order to access the Line Filter below it. Before removing the Transformer, tag and identify all wires.

📝 The Line Filter is located directly in front of the Drive Motor, and if equipped, just below the Transformer. Before removing the Line Filter, tag and identify all wires.

1. Turn the treadmill power switch off.
2. Unplug the line cord from the wall outlet.
3. Remove the inside upright covers, front cover, and motor cover.
4. If equipped with a transformer, remove it in order to access the line filter. Before removing any wires tag and identify them.
5. Tag and identify all wires connected to the line fileter. Remove the wires.
6. Remove and save the two Philips screws that secure the line filter to the motor pan assembly. *Torque Values: (12-18 lb-in), [13.8-20.7 Kg-cm]*
7. Remove the line filter.
8. Install the new line filter in reverse order.

Replacement of the IEC Receptacle

1. Incline the Treadmill
2. Turn the treadmill power switch off.
3. Unplug the line cord from the wall outlet.
4. Remove the top motor shroud cover.
5. Remove and save the two screws that secure the line cord retaining bracket to the motor pan. Set the retaining bracket aside. *Torque Values: (12-18 lb-in), [13.8-20.7 Kg-cm]*
6. Remove the wires from the IEC Receptacle.
7. Install the new Receptacle in reverse order.

IEC Receptacle

Lift System (LS)

Theory of Operation

The Lift Motor System is comprised of the Lift Motor, the Lift Frame, the Home Switch, and the Negative Incline switch (decline units only).

For details on the utilization of switches see Base Frame Electronics (BE) section.

In order for the lift system to be operational, the Emergency Stop Switch located on the console area must be properly engaged. The Lift Motor is pinned to the Lift Motor Support Bracket on the treadmill frame on one end and is pinned on the other end to the Lift Frame. The Lift Frame is also pinned to the treadmill frame.

The Lift Motor consists of a gear box, a steel ACME screw and a steel tube. The steel tube has an engineered plastic nut that is fixed on one end of the tube. The ACME screw is pinned to the output gear on the gear box on one end and screws into the nut on the steel tube on the other end. As the ACME screw rotates the steel tube extends or retracts which raises or lowers the treadmill. There are internal limit switches on the gearbox to prevent over-travel.

The Lift Motor is programmed to incline the treadmill in 0.5% increments. The desired incline is commanded through the incline up or down arrows or through the keypad on the console. When a user first starts the treadmill the Lift Motor will lower the treadmill until the Home Switch is activated (this is 0% incline or level) unless the treadmill is already at 0% incline. If the Home Switch cannot be activated, the console will display a message after a given duration, stating "incline inoperative continue if desired."

One way of determining if a Lift Motor or a Home Switch and/or the cable leading to it is electrically defective is by observing whether or not certain LED's on the motor controller light up. Similarly, knowing that both the Lift Motor and the Home Switch are electrically good and the LED's do light up but the treadmill is not able to be inclined or lowered may be an indication that the Lift Motor is mechanically defective or the controller is bad. Electrical troubleshooting of base electronics is described in the Base Frame Electronics (BE) section.

System Components

Lift Motor   Clevis Pin

Lift Frame

Wheel and E-Ring
(2 places)

Lift Motor Tube

Bolt, Nut, Washer
(2 Places) (16-20 ft-lbs)
[21.7 - 27.1 N-m]

Bolt, Nut, Washer
(2), Nut (4-8 ft-lbs)
[5.4 - 10.8 N-m]

Lift Motor
Support Bracket

Clevis Pan

Problem Symptoms Table

Symptom: Lift Motor does not raise or lower unit

Possible Cause	Corrective Action	Section
Broken internal components in Lift Motor gear box (motor runs but ACME screw does not).	Replace Lift Motor.	LS
Thermal cutout switch open due to overheating of Lift Motor.	Allow Lift Motor to cool for 15 minutes and confirm proper operation, Otherwise replace Lift Motor.	
Broken/worn plastic nut on Lift Motor tube (ACME screw rotates but does not raise unit).	Replace Lift Motor.	LS
Emergency stop switch is removed.	Install emergency stop switch.	CN
Motor controller lift circuit failure.	Perform test on motor controller by observing LEDs #4 and #5 and replacing the Motor Controller if LED's do not light up.	BE

Symptom: Lift Motor does not raise unit

Possible Cause	Corrective Action	Section
Unit cannot find Home Switch due to improper installation which causes Lift Motor to bottom out before activating Home Switch.	Remove and re-install Lift Motor at proper extended length.	BE
Home Switch not connected.	Connect Home Switch cable.	BE
Faulty Home Switch (non-decline units).	When Home Switch is manually pressed the LED 9 on the controller should be ON. If not check cable and replace Home Switch if required.	BE
Faulty Negative Incline Switch (decline units)	When the frame-mounted Negative Incline Switch is manually pressed the LED 10 on the controller should be ON. If not check cable and replace Negative Incline Switch if required.	BE

Symptom: Lift Motor operates intermittently

Possible Cause	Corrective Action	Section
Overheating of the Lift Motor.	The Lift Motor could have overheated due to excessive use in the Manual or Quick Start program. If this was the case, make sure to instruct the customer that the motor is not a continuous duty motor. Allow Lift Motor to cool for 15 minutes and confrm proper operation, Otherwise replace Lift Motor. If the incline (lift) motor had overheated outside of the Manual and the Quick Start workout then replace the Lift Motor.	
Broken internal components in Lift Motor gear box (ACME screw rotates intermittently while motor is running).	Replace Lift Motor.	LS
Failed clevis pin or mounting bolt causing Lift Motor to sit at an angle.	When Home Switch is manually pressed the LED 9 on the controller should be ON. If not check cable and replace Home Switch and/or Home Switch cable if required.	LS

Symptom: Difficult to move unit with lift frame wheels

Possible Cause	Corrective Action	Section
Lift frame wheels developed flat spots due to wear, or had cracked.	Replace Wheels	LS

Howtos

Removal of the Lift Motor

1. Turn the treadmill power switch off.
2. Unplug the line cord from the wall outlet.
3. Disconnect Lift Motor connector from motor controller.
4. Disconnect Lift Motor ground wire.
5. Turn unit on its side.
6. Remove Lift Motor lower pivot hardware. *Torque Values: (4-8 ft-lbs), [5.4-10.8 N-m]*

    Do not remove any other frame brackets

7. Remove Clevis Pin. Remove Lift motor.
8. Install new Lift Motor and hold in place with Clevis Pin.
9. Align hole in Lift Motor Tube with pivot hole in lift frame so that Home Switch is actuated. (Listen/feel for actuation of Home Switch)

10. Install Lift Motor lower pivot hardware.
11. Turn unit upright.
12. Connect ground wire and plug in Lift Motor connector to motor controller.
13. Power up unit and test travel.

    a. When unit is powered up, unit must find Home Switch and then stop.
    b. Command 15% incline and wait until inclining stops. Depress Home Switch. Unit should incline momentarily and quickly stop. If this occurs, the Lift Motor has reached its internal limit switch and is operating properly. If unit does not incline momentarily implies that internal limit switch was reached before unit was able to reach 15% incline.

Go back to Step 10 and adjust Lift Motor tube pivot to lift frame pivot by turning Lift Motor tube clockwise and repeat above test steps.

Removal of the Lift Frame

1. Turn unit on its side and lay against upright frame.
2. Remove Lift Motor lower pivot hardware.
3. Remove Lift Frame pivot hardware.
4. Remove E-Ring to remove wheels.
5. Install new lift frame.

Lift Frame Pivot

Lift Motor Lower Pivot

Lift Frame Pivot

Lift Motor Lower Pivot

Wheel

E-Ring

Removal of the Home Switch (non-decline units)

1. Operate incline and raise unit to 15 percent incline.
2. Turn the treadmill power switch off.
3. Unplug the line cord from the wall outlet.
4. Remove top motor cover.
5. Disconnect cable from Home Switch leads.
6. Remove bracket with Home Switch.
7. Remove cable from Home Switch leads

Torque: (25-34 in-lbs), [22-30 kg-cm]

8. Remove Home Switch by pushing on tabs.
9. Install new Home Switch in bracket and connect cable to Home Switch leads.
10. Install Home Switch with bracket to treadmill frame
11. Install Frame Tie Bar.

Tabs on Home Switch

Removal of the Home Switch (decline units)

1. Operate incline and raise unit to 15 percent incline.
2. Turn the treadmill power switch off.
3. Unplug the line cord from the wall outlet.
4. Remove top motor cover.
5. Disconnect cable from Home Switch leads.

6. Push on Home Switch tabs and push switch down and out to remove.
7. Install new Home Switch and connect cable.

Console and Activity Zone (CN)

Theory of Operation

General Console

The 14 segment LED Message Center Integrity series consoles share a lot of the same basic functionality. The console provides all user interface functions, user workout programs, entertainment processing, and control messages to the base. The Activity Zone is functionally a part of the console; the keypads and emergency stop are directly wired to the console PCB.

Main PCB

The main PCB is responsible for the following functions:

1. Provide 3.3Vdc and +5Vdc for console PCB circuits
2. Support iPod® (communication with the iPod®, audio / video input, charging)
3. Receive Audio inputs (from Attachable TV, iPod®, CSAFE port)
4. Provide Audio output to headphones
5. Interface with Apple Authentication Chip
6. Interface with Attachable TV (receive audio, issue commands, route iPod® video to TV)
7. Process LifePulse® (LP) Heart Rate signal from sensors
8. Receive Telemetry (Polar) Heart Rate signal
9. Calculate Heart Rate (LP & Polar)
10. Interface to membrane switch keypad
11. Respond to Emergency Stop Switch
12. Redundant CSAFE ports (for Serial Comm or accessory power)
13. Drive speaker (monotone beep)
14. Drive all LEDs
15. Generate IR commands for attachable TV

On-board LEDs' function:

Message Center Display

1. Provides 14-segment display matrix.
2. Profile Display

Side Console Display Workout Button LEDs Enter key LED

Apple Authentication

This chip allows for positive authentication of Apple devices like iPod® and iPhone® (collectively known as an i-product) in order to access audio and video play lists.

This functionality is implemented via I2C communication between the console microprocessor and the authentication co-processor and between the console microprocessor an the i-product.

Coded Receiver

This board receives Telemetry Heart Rate pulses from chest strap. This board implements variable gain control to ensure coded operation with the intended transmitter.

System Components

Console Assembly

Emergency Stop Switch

Activity Zone

Problem Symptoms Table

Symptom: Display overlay keys are not responding when depressed.

Possible Cause	Corrective Action	Section
Loose ribbon connection(s).	Test the Key Pad function. Use Diagnostics. Verify that the two ribbon connections are attached to the display PCB.	CN
Worn or defective overlay assembly.	Replace overlay-switch assembly.	CN

Symptom: Unit resets randomly or pauses.

Possible Cause	Corrective Action	Section
Insufficient power source.	Plug treadmill into a proper electrical configuration. Refer to the Operations Manual.	BE
Damaged ground prong on line cord.	Replace line cord.	BE
Line cord improperly seated in electrical outlet.	Inspect power connection at electrical outlet and at machine for proper contact.	BE
Emergency stop magnet not engaged.	Re-engage the emergency stop magnet.	CN
Towel or magazine may be making contact with stop switch while user is running.	Move all possible obstructions off display console and handlebar.	
Loose connections at display console.	Secure all connections at display console PCB.	CN
Stop Switch is activated with very light pressure or returns very slowly after being pressed.	Replace Stop Switch.	CN
Stop switch cable not making proper contact.	Re-seat cable from stop switch and verify the operation.	CN
Pinched main wire harness.	Replace the main wire harness.	BE
Open ground path.	Using ohmmeter, check all points for continuity: console pan screws, console mounting screws, handlebar screws, and handrail mounting screws to frame with respect to ground. Ground must be a non-painted surface.	BE

Symptom: Channels or Sound do not change.

Possible Cause	Corrective Action	Section
Key Pad malfunction.	Run Key pad test in diagnostics.	Diagnostics -> System Test -> Display/ Keypad Test

Symptom: No sound (headphones)

Possible Cause	Corrective Action	Section
Faulty headphones.	Replace headphones.	
Faulty headphone jack assembly.	Replace headphone jack assembly.	CN

Faulty cable to Headphone jack assembly.	Replace Headphone jack assembly.	CN
Problem with the console PCB board.	Replace the console PCB.	CN

Symptom: Display does not illuminate when machine is powered on.

Possible Cause	Corrective Action	Section
Insufficient power source.	Plug treadmill into a proper electrical configuration. Refer To The Operations Manual.	BE
Loose 10-pin connection at display console or motor controller board.	Check all electrical connections for proper attachment.	CN / BE
Damaged main harness wire connection.	Replace wire harness.	BE
No power delivered to the motor controller.	Check the electrical connections to the motor controller. Check of the circuit breaker in the building tripped.	BE
No power to console due to faulty main cable or bad cable connection.	Check for the +6Vdc, and 12Vdc at the cable's end next to the console. Check for the above voltages at the motor controller P5 connector. Make sure that the proper jumper cable is used at the P9 connector.	BE

Symptom: iPod does not work.

Possible Cause	Corrective Action	Section
Defective iPod® cable.	Replace iPod cable	CN
Defective iPod®	Verify iPod® function	
Defective main board – Authentication fails.	Replace main board	CN

Symptom:Ghost HR.

Possible Cause	Corrective Action	Section
Console PCB	Check frame grounding and grounding at the electrical outlet.	BE

Symptom:Emergency stop not working.

Possible Cause	Corrective Action	Section
Console PCB defective, magnet misplaced in holder	Check that the magnet is properly located on the Console. Replace Console PCB if cable and magnet good. Check e-stop cabling.	CN

Symptom:iPod® not charging.

Possible Cause	Corrective Action	Section
Defective iPod® cable.	Check cable and connections, replace, repair as appropriate.	CN

Symptom:Activity Zone buttons not registering.

Possible Cause	Corrective Action	Section
Damage to switches	Check the Activity Zone in keypad diagnostics.	CN
Damage to connectors	Check connections.	CN
Not Connected	Connect the Activity Zone.	CN

Electrical Wiring Diagram

Classic Treadmill Board Physical Outline

Console Wiring Diagram

insert wiring diagram

Connectors

Connector P1: This connects the CLASSIC Console Board to the treadmill motor controller in the Base unit. This is a 10 pin Molex 44472-1053 Mini-Fit Jr.

P1			
Pin#	Signal Description	Pin#	Signal Description
1	Ground	6	Console TXD to Base
2	Ground	7	Console RXD from Base
3	+6Vdc Power from Base	8	Not Used
4	+6Vdc Power from Base	9	+12Vdc Power from Base
5	Not Used	10	Emergency Stop Power

Connector P2: This is a 12 pin Low Insertion Force type connector located on the lower edge of the board, used to connect the main membrane switch to the board.

P2

Pin#	Signal Description
	Ground - ESD Ring
	Switch strobe 0
	Switch return 0
	Switch strobe 1
	Switch return 1
	Switch strobe 2
	Switch return 2
	Switch strobe 3
	Switch return 3
	Switch strobe 4
	Switch return 4
	Ground - ESD Ring

Connector P3: This is a 10 pin Low Insertion Force type connector located on the lower edge of the board, used to connect the membrane switch to the board.

P3		
Pin#	**Signal Description**	
1	Ground - ESD Ring	
2	Switch return 6	
3	Switch strobe 2	
4	Switch return 3	
5	Switch strobe 1	
6	Switch strobe 4	
7	Switch return 5	
7	Switch return 1	
9	Switch return 7	
10	Ground - ESD Ring	

Connector P4: This is a 18 pin KK-100 connector located on the right upper edge of the board used to connect the side console to the board.

P4	
Pin#	**Signal Description**
1	'DP' Segment Data
2	'G' Segment Data
3	'F' Segment Data
4	'E' Segment Data
5	'D' Segment Data
6	'C' Segment Data
7	'B' Segment Data
8	'A' Segment Data
9	Digit Strobe 5
10	Digit Strobe 6
11	Digit Strobe 7
12	Key
13	Digit Strobe 8
14	Digit Strobe 9

15	Digit Strobe 10
16	Digit Strobe 11
17	Side Console Detect
18	Ground

Connector P5: This connects the Classic console to the optional 17" attachable TV. This is a 10 pin Molex 43045-1012 Micro-Fit.

P5			
Pin#	**Signal Description**	**Pin#**	**Signal Description**
1	TV Audio - Left	6	TV Audio - Right
2	Audio Ground	7	iPod Ground
3	TV Detect	8	TV IR Remote
4	Audio Ground	9	iPod Ground
5	iPod Chromi	10	iPod Lumi

Connectors P6: This is the Polar heart rate interface. This is a 6 pin Molex 43045-0612 Micro-Fit connector. Pins 1, 2 and 3 are interconnects for the Polar Receiver. Pins 4 and 5 are interconnects the Stop Switch and Pin 6 is for board testing.

P6			
Pin#	**Signal Description**	**Pin#**	**Signal Description**
1	Polar Power	4	Stop Switch Plus
2	POLAR Input	5	Stop Switch Input
3	Ground	6	TEST_MODE

Connector P7: This is a 4 pin Molex Micro-fit connector located at the lower, Right edge of the board. It supplies the connections for the Lifepulse electrodes.

P7			
Pin#	**Signal Description**	**Pin#**	**Signal Description**
1	Left Hand +	3	Right Hand -
2	Left Hand -	4	Right Hand +

Connector P8: This is a 4 pin, in-line Molex Micro-fit connector located at the Left, lower edge of the board. It supplies the connections for the optional Activity Zone.

P8	
Pin#	**Signal Description**
1	Ground
2	Activity Zone V+
3	Activity Zone Clock
4	Activity Zone Data

Connectors P9 & P10: These connectors supply the connections for the CSAFE / MyE. They are 8 pin RJ45 connectors.

P9	
Pin#	**Signal Description**
1	CSAFE Audio In - Left
2	CSAFE Audio In - Right
3	Receive Data (Rxd)
4	Transmit Data (Txd)
5	V_Cardio
6	Not Used

7	Ground
8	Vsys_In

P10	
Pin#	**Signal Description**
1	CSAFE Audio In - Left
2	CSAFE Audio In - Right
3	Receive Data (Rxd)
4	Transmit Data (Txd)
5	V_Cardio 6Vdc
6	Not Used
7	Ground
8	Vsys_In

Connector P11: This is a 2 pin, in-line Molex Micro-fit connector located at the Left, lower edge of the board. It supplies the connections to the Emergency Stop Switch.

P11	
Pin#	**Signal Description**
1	+V_to_Estop_Red_Sw
2	ESTOP

Connector P12: Classic Console Board to the Background Debug Module – A cable connects to the Classic Console Board to the Background Debug Module for software development. This is a 26 pin Molex 10-89-7261 connector.

P12	
Pin#	**Signal Description**
1	No Connect.
2	TMS / BKPT
3	Ground.
4	TRST / DSCLK
5	Ground.
6	Ground through 10KΩ pull down resistor.
7	RSTI
8	TDI / DSI
9	3.3Vdc
10	TDO / DSO
11	Ground.
12	ALLPST
13	ALLPST
14	ALLPST
15	ALLPST
16	No Connect.
17	No Connect.
18	No Connect.
19	No Connect.
20	Ground.
21	No Connect.
22	No Connect.
23	Ground.

24	TCLK
25	3.3Vdc
26	No Connect.

Connector P13: This connects the Classic console to an optional Apple Authentication processor. This is a 12 pin, dual row, Right angle connector.

P13			
Pin#	**Signal Description**	**Pin#**	**Signal Description**
1	No Connect.	7	AUTHEN_RESET
2	I2C_SDA	8	Ground
3	No Connect.	9	I2C_SDA
4	I2C_SCL	10	I2C_SCL
5	No Connect.	11	Vcc
6	No Connect.	12	Mode

Connector P14: This is a 22 pin, Right angle, KK-100 type connector located on the Left, lower edge of the board, used to connect the Entertainment membrane switch to the board.

P14	
Pin#	**Signal Description**
1	Ground - ESD Ring
2	Switch return 7
3	Switch return 0
4	Switch return 3
5	Switch return 1
6	Switch return 4
7	Switch return 5
8	Switch return 6
9	Switch strobe 6
10	Switch return 2
11	Switch strobe 7
12	Switch return 3
13	Switch return 5
14	Switch return 4
15	Switch return 1
16	Switch return 7
17	Switch return 3
18	Switch strobe 5
19	Switch return 0
20	Switch return 6
21	Switch strobe 1
22	Ground - ESD Ring

Connector P15: This is an optional 22 pin, Right angle, 1mm, FFC type connector located on the Left, lower edge of the board, used to connect the Entertainment membrane switch to the board.

P15	
Pin#	**Signal Description**
1	Ground - ESD Ring
2	Switch strobe 1

3	Switch return 6
4	Switch return 0
5	Switch strobe 5
6	Switch return 3
7	Switch return 7
8	Switch return 1
9	Switch return 4
10	Switch return 5
11	Switch return 3
12	Switch strobe 7
13	Switch return 2
14	Switch strobe 6
15	Switch return 6
16	Switch return 5
17	Switch return 4
18	Switch return 1
19	Switch return 3
20	Switch return 0
21	Switch return 7
22	Ground - ESD Ring

Connector P17: This is a 20 pin, dual row, 2mm connector. This connects the Classic console to the replaceable Apple iPod cable.

P17			
Pin#	**Signal Description**	**Pin#**	**Signal Description**
1	Head Phone Left	2	Head Phone Right
3	Audio Ground	4	Shield GND
5	Access_ID	6	GND
7	iPod_Txd	8	iPod_Vcc
9	iPod_Rxd	10	ACC_Power
11	iPod_Detect_In	12	GND
13	Audio_GND	14	GND
15	iPod_Lumi	16	iPod_Chromi
17	iPod_GND	18	GND
19	iPod_Audio_Right	20	iPod_Audio_Left

Connector P18: Optional 10 pin, KK-100 style connector. This connector supplies the connections for an optional SPI or I2C device.

P18	
Pin#	**Signal Description**
1	Vcc
2	GND
3	Mode
4	SCK – I2C_SCL
5	MOSI – I2C_SDA
6	SPI_CS1
7	MISO

8	Audio_GND
9	CSAFE Audio Left
10	CSAFE Audio Right

Troubleshooting Flow Diagrams

No Power

```
START → Check power to the unit → Treadmill Base Plugged In? → No → Plug in the power cord into the power outlet

                                         │Yes

Check if the power switch at the base toggled to the ON position → Power switch on? → No → Troubleshoot Base Electronics

                                         │Yes

Remove cover to reveal motor control board → Base Powered Up? → No → Troubleshoot Base Electronics

                                         │Yes

Check Main cable to the console for power → Power present on cable connector? → No → Replace Cable,

                                         │Yes

Replace console PCB → Beeps heard on power-up? → No → Call Life Fitness

                                         │Yes

                                      Finished
```

Distortion/Noise in Audio

```
┌─────────┐        ┌──────────────────────┐       ╱╲            ┌──────────────────┐
│  START  │───────▶│ Try a proven-good    │──────▶╱  ╲─── No ──▶│ Issue could not  │
└─────────┘        │ pair of earphones    │      ╱Noise╲        │ duplicated.      │
                   └──────────────────────┘      ╲  in ╱        │ Finished.        │
                                                  ╲ear╱         └──────────────────┘
                                                   ╲╱
                                                   │ Yes
```

START → Try a proven-good pair of earphones → Noise in earphones?
- No → Issue could not duplicated. Finished.
- Yes ↓

Check power outlet if wired correctly (no flowting ground in particular) → Operation corrected?
- Yes → Done
- No ↓

Check grounding in the treadmill (green wire mounted to the chassis) → Operation corrected?
- Yes → Done
- No ↓

Switch between TV audio and iPOD audio → Both Noisy?
- No → TV only noisy→ console to TV cable
  iPOD only noisy→ consider replacement of the iPod cables:
  1. external to the console
  2. internal to the console
- Yes ↓

Investigate audio output wiring from the console ↓

Replace headphone jack → Noise issue solved?
- Yes → Done
- No ↓

Replace internal iPod/audio cable → Noise issue solved?
- Yes → Done
- No ↓

Call Life Fitness

Telemetry HR Not Working

Keypad Not Responding

Lifepulse® HR Not Working

```
START  →  Check power outlet if wired        →  Operation corrected?  —Yes→  Done
          correctly (no flowting ground in                    |
          particular)                                         No
                                                              ↓
          Check grounding in the treadmill   →  Operation corrected?  —Yes→  Done
          (green wire mounted to the                          |
          chassis)                                            No
                                                              ↓
          Clean the Lifepulse sensors        →  Operation corrected?  —Yes→  Done
                                                              |
                                                              No
                                                              ↓
          Open Heart Rate Test in            →  Left Hand-on        —No→  Replace sensor
          Diagnostics, Place Left hand on       indicated?                cables
          Contacts                                            |
                                                              Yes
                                                              ↓
          Place Right hand on                →  Right Hand-on       —No→  Replace sensor
                                                indicated?                cables
                                                              |
                                                              Yes
                                                              ↓
          Place both hands on the sensors    →  Stable HR shown on  —Yes→  Finished
                                                HR test page?
                                                              |
                                                              No
                                                              ↓
          With both hands on the sensors     →  Stable HR and GAIN < 40,  —Yes→  Finished
          observe GAIN, CONFIDENCE,             CONFIDENCE > 10, TIMER < 10
          and TIMER values                      sec?
                                                              |
                                                              No
                                                              ↓
          Replace console PCB                →  Correct HR shown   —Yes→  Finished
                                                on HR test page?
                                                              |
                                                              No
                                                              ↓
                                                Unexpected error,
                                                Contact LF
```

iPod® Does Not Work

START

If possible try iPod with another machine

iPod works with other machines

No → Problem in iPod

Yes

Change iPod cable(s): external to console and/or internal to console

iPod Works?

Yes → Finished

No

Change console PCB

iPod Works?

Yes → Finished

No

Unexpected error, Contact LF

Audio Does Not Change

```
START  →  Run keypad diagnostics  →  ◇ Audio keys recognized?
                                          → No → See keypad troubleshooting
                                          → Yes ↓

Try TV and iPod as audio sources  →  ◇ Audio changes with iPod and TV?
                                          → Yes → Finished
                                          → No ↓

Listen for any audio noise with TV and iPod as sources  →  ◇ Audio noise detected
                                          → Yes → See Noise in Audio Troubleshooing
                                          → No ↓

Try audio with TV  →  ◇ Audio Changes?
                          → No → Replace console PCB to TV cable
                          → Yes ↓

Try audio changes with iPod  →  ◇ Audio Changes?
                          → Yes → Finished
                          → No ↓

Unexpected error, Contact LF
```

Howtos

Replace the STOP Button/Switch

There are two ways to stop the unit. The first way is to press the STOP Button/Switch, which is located on the right side of the Console. The second method is by pulling the Tether Line to the Emergency Stop Magnet, which is attached to the person by means of an Alligator Clip. When the Tether Line is pulled, the Emergency Stop Magnet breaks the magnetic field, which intern immediately stops all the power to the unit. The following procedure covers replacement of the STOP Button/Switch located on the right side of the Console.

1. Turn the unit power OFF at the switch then unplug the line cord at the wall outlet.

2. Remove eight screws from the Console Back.

3. Lift off the Overlay Bezel Assembly.
4. Remove the Micro Switch (not shown), and then the Plastic Nut securing the STOP Button/Switch at the back of the Console Front and lift out the STOP Button/Switch

5. Insert the Stop Button Switch through the opening in the front of the Bezel Assembly, and orient the Switch Body so the work "STOP" is readable from the face of the Bezel.
6. Install the Plastic Nut on to the threaded portion of the Switch Body with the flat side toward the back of the Bezel and tighten1/8 of a turn past hand tight. Do Not over tighten the Plastic Nut.

Over tightening the Plastic Nut may cause damage to the Switch Body or the Bezel.

7. Insert the Stop Switch into the STOP Button/Switch, and take special note to orient the two parts so the Switch Plungers make contact upon assembly.
Note: Verify that the plungers are making contact by pressing the STOP Button and visually ensuring they make contact with each other.
8. Reconnect the wiring being careful not to bend or break the connecting tabs.
9. Refer to Diagnostics Section to Log Maintenance Repair of the Stop Switch.

Replace the Programmed Console Board

1. Turn the unit power OFF at the switch, and then unplug the line cord at the wall outlet.
2. Remove eight screws from the Back Cover of the Console.
3. Lift off the Front Cover. Disconnect all the Cables and Ribbon Connectors from the PCB Board.
4. Remove eight screws from the PCB, and then remove the PCB. Send the PCB back to Life Fitness.
5. Install new PCB in reverse order. DO NOT over tighten mounting screws.
6. Reconnect the Cables and Ribbon Connectors to the PCB.
7. Install the back cover. DO NOT over tighten screws.
8. Refer to Diagnostics Section to Log Maintenance Repair of the Display Console Control Panel.

Note: For consoles installed in metric system countries, enter DIAGNOSTICS and change UNITS OF MEASURE from ENGLISH to METRIC.

Replacement of the Activity Zone Circuit Board

1. Turn the treadmill power switch off.
2. Unplug the line cord from the wall outlet.
3. Remove two screws from the back of the ERGO Bar securing the Smart Stop Cover Assembly, and then lift off the Activity Zone Cover just enough to disconnect the 4-Pin Connector from the Activity Zone Circuit Board.
4. Remove and discard the old Activity Zone PCB Assembly.
5. Install new Activity Zone PCB Assembly in reverse order.

Replacement of Accessory Cup Holders

Tools required: Phillips screwdriver, Estimated time required: 15 minutest.

1. Remove the four corner screws from the back of each cup holder.

2. Lift the cup holders up and out of the uprights. Be careful not to damage the cables in the left upright.
3. Install the new cup holders, again being careful not to pinch cables.
4. Secure the cup holders in place with the mounting screws.

Left Cup Holder

Right Cup Holder

Replacement of Console Assembly

To disconnect the wiring inside the console assembly, the assembly must be split.

1. Turn the unit power off at the on/off switch.
2. Unplug the line cord at the wall outlet.
3. Remove the four mounting screws from the back of each cup holder.
4. Lift the cup holders up and out of the uprights. Be careful not to damage cables.
5. Remove the eight screws from the console back.
6. Lift out the console front while disconnecting electrical connectors from the console power control board.
7. Install the new console assembly in reverse order.
8. Install the cup holders in the uprights. Be careful not to pinch any wires.

Console   Console Bracket
Console Mounting Screws
Rear Console Cover
Rear Console Cover Screws (2)

Note:

For consoles installed in metric system countries, enter DIAGNOSTICS and change UNITS OF MEASURE from ENGLISH to METRIC.

Replacement of Overlay Bezel

📓 The Overlay Bezel is part of the Console Front Assembly, however, the Console PC Board is not. Therefore, the Console PC Board must be removed from the back of the Console Front.

Console
Back Screws(8)

1. Turn the unit power OFF at the switch, then unplug the line cord at the wall outlet.
2. Remove eight screws from the Console Back.

3. Lift the Console Front off just enough to disconnect the electrical connectors from the Console PC Board.
4. Remove the screws securing the Console PC Board to the back of the Console Front, and then disconnect the Ribbon Cables from the Console PC Board. Now set the PC Board aside for re-use on the new Overlay Bezel.
5. Install new Overlay Bezel Assembly in reverse order. Make sure that all connectors and ribbon cables are securely fastened to the Console PC Board.
6. Refer to Diagnostics Section to Log Maintenance Repair of the Overlay Bezel.

Console PC Board/
Overlay Bezel Switch Assembly

Console PC Board
(Remove from back
of Console Front)

Replacement of ERGO Bar, Handrail, and Uprights

The Uprights MUST be loosened so that they can be spread apart enough to remove the ERGO Bar. Also, the Console Assembly MUST BE REMOVED.

1. Turn the unit power OFF at the switch then unplug the line cord at the wall outlet.
2. Remove the Inside Upright Covers, Motor Cover, and Front Cover. See "How to…" in this section.
3. Remove the Plug at the front of each Upright, and then remove the Mounting
   Bolt under each Plug.
4. Loosen the Inside Mounting Bolts on each Upright.
5. Remove the Console Assembly. See "How To…" in this section.
6. Remove the Left and Right Outer Handrail Shrouds.
7. Move the Inner Shrouds towards the center of the ERGO Bar.
8. Remove the Left and Right Mounting Bolts securing the ERGO Bar from the Handrails.

9. Separate the Uprights enough to remove the ERGO Bar along with the Heart Rate and Smart Stop Cables.
10. If necessary, replace the Handrails. Notice that the Handrail ends curve outward.
11. Remove the bolts securing the Uprights, and lift the Uprights out from the frame supports.
12. If necessary, install new Uprights leaving all the mounting bolts loose.
13. If installing new Handrails, make sure the curved ends face outward.
14. Install the new ERGO Bar Assembly being careful not to pinch the Smart Stop Cable or Heart Rate Cable during installation.
15. Install the Console Assembly in reverse order, making sure to route Cables through the channel guides in the Console Back Cover.
16. After all components are positioned properly, then proceed to tighten all loose hardware.

Bolt/Washer — Left Lower Upright Cover — Left Upright

Bottom Bolt at Slot — Front Mounting Bolt/Washer — Plug

Ergo Bar Assembly

Inner Handrial Shroud, LT — Inner Handrial Shroud, RT

Outer Handrial Shroud, LT — Heart Rate Cable — Outer Handrial Shroud, RT

Replacement of the Headphone Jack

> For clarity purposes some of the treadmill parts are shown removed from the Unit, which is not required to replace the Headphone Jack.

1. At the bottom of the Console remove the Phillip Screw securing the Headphone Jack Assembly and then remove the Headphone Jack.
2. Unplug the attached cable.
3. Install new Headphone Jack reverse order.

Head Phone Jack

Heart Rate System (HR)

Theory of Operation

Polar® Telemetry Receiver Theory of Operation

It is important to note that the Polar Telemetry receiver used in this generation of the product is the CODED telemetry receiver.

A coded telemetry receiver has the following characteristics:

1. Initially limited range to 2/3 of the maximum of three feet / one meter.
2. After establishing a code with a chest strap telemetry transmitter, the range gets extended to the maximum specified (three feet / one meter).
3. It may take up to a minute to establish successful coded communication.
4. This receiver works fine with the non-coded telemetry chest strap.
5. The in-chest strap battery may not be replaceable -- for troubleshooting use a telemetry simulator sold by Polar.
6. It is not immune to EMI -- the previous version was not either.
7. It does not guarantee complete protection against cross-talk, but only minimizes the chances thereof.

> On this product the telemetry receiver is mounted in the console bezel.

A brief theory of operation follows:

1. The in-console coded Polar receiver works best with the coded telemetry straps (although non coded straps are supported as well).
2. The coded chest strap, after establishing a code with the telemetry receiver, sends out user's heart rate in a form of a pulse. A non-coded chest strap sends user's heart rate in a similar fashion.
3. The performance of the telemetry heart rate system is dependent upon a number of factors:
   - conductivity of the signal from user's chest to the telemetry chest strap (sensors must be clean, moist, user's skin and electrical properties must foster electrical signal conductivity)
   - the condition of the chest strap battery must be good (often there is no method to check it, since this battery is not replaceable)
   - the condition of the chest strap electrodes (they must not be broken)
   - Electromagnetic Interference (usual EMI suspects are: fluorescent lighting, high power lines, home appliances, personal electronics)
   - proper grounding of the product at the power outlet
   - proper orientation of the Polar receiver: longer side MUST be parallel to the floor
   - proper mounting of the Polar receiver in the product: must not fall off thereby changing its antenna orintation
4. Remember to be properly grounded when replacing the Polar telemetry board.

LifePulse® Theory of Operation

The LifePulse® contact heart rate system is designed to sense the electrical signals originating from the heart as it beats and, using software, compute and display the corresponding heart rate value on the console readout. The two pairs of electrodes on the Treadmill Ergo bar (left and right) are the point of contact at which these signals are picked up and transmitted from the body to the LifePulse® circuitry. A hands-on detect circuit monitors for a change in voltage corresponding to the input for each of the left and right sensor pairs to determine if either or both are being held. Both sensors must be held in order for the electrical signal from the heart to be measured. This is similar to measuring the voltage of a battery with a voltmeter. In order to measure a battery the voltmeter must be connected across the battery terminals (one lead to the positive and one lead to the negative). Similarly, the heart can be thought of as a voltage source or battery and in order to measure it's voltage you must measure across its terminals. Essentially, when the left and right sensors are held they act like the leads of the voltmeter. Since an electrical path exists from the electrodes held in one hand, up the arm, across the body (and the heart), down the other arm and into the other hand holding the other pair of electrodes, a voltage can be measured. This is how the LifePulse® signal is measured. And just like measuring a battery, the polarity of the voltage is important so the left and right electrodes must correspond to the left and right user hands.

To pick up the heart signal LifePulse® must use a very sensitive high gain differential amplifier. This is primarily due to the signal's initial low amplitude as it originates from the heart (typically less than 2 millivolts peak to peak) and the resultant attenuation, or signal drop, as it travels through the body and into the electrodes. This type of amplifer is different from a regular amplifier in that only the differences between the inputs are amplified. In this way common signals, typically electrical noise, appearing on both inputs can be simultaneously ignored while the differences are amplified.

The output of this high gain differential amplifier, when neither or only one electrode pair is held, is meaningless because the inputs to the amplifier basically act as antenna picking up and amplifying stray electrical signals from the environment. Ideally, once both electrode pairs are held, as detected by the hands-on circuitry, the heart signal can be isolated, amplified and presented to the software for analysis. In practice however, additional unwanted signals exist. Some of these signals come from other muscles which lay along the "voltage" path to the heart being measured (such as arm and chest muscles). Similarly, hand to electrode contact problems which tend to weaken the signal or even introduce new signals which hide the actual heart signal can occur. The LifePulse® software attempts to isolate just the heart signal from all other unwanted signals and noise using complex software techniques.

Basically, the LifePulse® software samples the amplified signal picked up at the electrodes many times a second looking for the heart pulses. Depending upon the amount of noise, size of signal and/or irregularity of the heart pulse, it may take many seconds (from 4 to 20 or more) to confidently determine a value. And if a value cannot be confidently determined, a heart rate will not be displayed. To increase the detection of a heart signal, the LifePulse® software attempts to expand the sampled signal to maximize the important features. A Gain value which represents the relative amount the signal was expanded is displayed in the LifePulse® diagnostic screen and can range from 1 to 99. An assessment of the strength of the signal can be directly related to this gain value.

Input signals already at maximum levels require a low gain because their features cannot be further expanded without losing information. Very weak signals require more gain thus expanding them to full scale so their features can be easily picked out. This scaling is done dynamically over consecutive blocks of samples with each gain computed relative to the highest signal component within that block. The strength of the signal determines the effectiveness of the scaling.

In general, weak signals are less desirable than strong ones and very strong signals are less desirable than weaker ones. Obviously, weak signals requiring high gain values means that the weak heart pulses will be competing with other low level background noise when both are scaled up making it hard to determine the heart signal from the background signals. On the other hand, strong signals, usually not from the heart pulse itself, will ultimately limit the amount of scaling that can be applied. Typical gain values for low noise signals which produce good LifePulse® heart rates are generally between 10 and 30. Above 30 means the heart signal is weaker and below 10 means other noise signals are too strong thus overpowering the heart pulses. Just as the gain value indicates the strength of the heart signal the Confidence number indicates the quality of the heart rate reading when one is displayed.

The LifePulse® software uses many methods to analyze the heart signal and zero in on the heart rate reading. The Confidence number which is also displayed in the LifePulse® diagnostic display indicates the agreement in the computed heart rate number among these different methods and therefore the confidence the heart rate displayed is correct. This is important when Cardio workouts, which change the load based on the difference between the current and target heart rates, are used. If a confident heart rate cannot be determined Cardio workout programs cannot automatically adjust the load to reach the target heart rate. Confidence values can range from 0 to 9 with 0 being the least confident reading and 9 being the most confident. Cardio program load changes occur when heart rate readings have confidence values of 5 or higher.

Some factors which affect LifePulse®'s ability to determine a heart rate:

- **Hand slip and/or grip pressure changes on electrodes:** This can produce noise spikes which drives up gain values and lowers the ability to detect the features of the actual heart pulses.
- **Dry and/or calloused hands:** This can further reduce the already low amplitude heart signal picked up from the hands by the electrodes.
- **Dirty and/or contaminated hands:** This can also reduce the signal being measured.
- **Amount of upper body movement:** This can add signals which must be evaluated and fltered out in the software. Sometimes these signals can be regular enough to look like heart pulses.
- **Individual's own heart pulse amplitude:** Other noise signals compete with the low heart signals.
- **Irregular heart rhythms:** Missing, skipped or irregular heart beats require longer sample times to compute.

System Components

Coded Polar Recevier

Electrodes

Problem Symptoms Table

Symptom: Lifepulse Heart Rate System does not respond or improper heart rate reading or "Reading Heart Rate" appears in the message center for more than 2 minutes without giving heart rate reading.

Possible Cause	Corrective Action	Section
Dirty handlebar sensors.	Wipe sensors with a clean soft cloth. Verify operation. Refer to Diagnostics in Section 2.	Diagnostics -> System Test -> LifePulse Test
User running over 4.5 mph (7.5kph).	For accurate heart rate reading, user must slow down to less than 4.5 mph (7.5kph).	
User may have an unusual heart condition.	Have different people grasp sensors to detect any variance.	HR
Loose connections at display console and handlebar.	Secure connections at display console and handlebar.	CN
Faulty heart rate sensors.	Replace handlebar sensors.	HR
Faulty display console PCB.	Replace display console PCB.	CN

Symptom: Display reads a continuous heart rate reading when hands are removed.

Possible Cause	Corrective Action	Section
Harness wires pinched at handlebar or handrail.	If the wires are damaged, replace damaged cables.	HR

Symptom: No Chest Strap detected.

Possible Cause	Corrective Action	Section
Chest strap sensors not making good contact with body of user.	Adjust chest strap and moisten sensors to make better contact with skin.	HR
User is out of monitoring range.	Move within 3 ft (1 meter) of receiver.	HR
Loose connection at receiver.	Check connection.	CN
Faulty chest strap.	Replace chest strap.	
Faulty receiver.	Verify 5VDC at P6 pin 1. If yes, replace transmitter. If no, replace display console PCB.	CN
Telemetry turned OFF.	Enter Manager's Configuration mode and turn telemetry to ON.	Diagnostics -> Manager's Config. -> Telemetry On/Off
Bad connection at Telemetry cable and receiver.	Check cable jack and receiver connection.	CN

Symptom: Erratic Heart Rate readings.

Possible Cause	Corrective Action	Section
Treadmills are located less than 8" (203 mm) apart.	Position treadmills to recommended distances. Refer to the Operations Manual. Use coded telemetry transmitter if possible.	

Symptom: Abnormally elevated heart rate readings.

Possible Cause	Corrective Action	Section
Electromagnetic interference from cell phones.	Move the device away from the telemetry HR receiver.	Diagnostics -> System Test -> LifePulse Test Diagnostics -> System Test -> Telemetry Test

Electromagnetic interference from television sets and /or antennas.	Move the treadmill a few inches away from the probable cause, or move the probable cause a few inches away from the treadmill, until the heart rate readings are accurate.	See above.
Electromagnetic interference from computers.	See above.	See above.
Electromagnetic interference fromcars.	See above.	See above.
Electromagnetic interference from high voltage power lines.	See above.	See above.
Electromagnetic interference from motor driven exercise equipment.	See above.	See above.
Electromagnetic interference from another heart rate transmitter within 3ft (1m).	See above.	See above.

Electrical Wiring Diagram

See Console and Activity Zone section for the wiring diagram.

Troubleshooting Flow Diagrams

See Console and Activity Zone section for the troubleshooting flow diagrams.

Howtos

Replace The Telemetry Receiver

1. Turn the unit power OFF at the switch then unplug the line cord at the wall outlet.
2. Remove eight screws from the Console Back.
3. Lift off the Console Front and disconnect necessary wiring.

Console Front   Console Back

4. Remove the Telemetry Receiver and Cable from the inside left corner of the Console Front, which is held in place with an adhesive pad

5. Install new Telemetry Receiver with new Adhesive Pad in reverse order.

6. Re-install the Console Front to the Console Back, making sure all connectors are firmly installed

Telemetry Receiver

Telemetry Cable

Adhesive Pad

Replacement of Heart Rate Sensors

1. Turn the unit power OFF at the switch then unplug the line cord at the wall outlet.

2. Remove two screws securing the Heart Rate Sensors.

3. Disconnect the wire (black or green) from the Ground Sensor and the wire (red or white) from the Signal Output Sensor.

4. Discard the old Sensor.

5. Install new sensors in reverse order, and tighten with screws

Torque Values: (5-7 in-lb), [5.8-8 kg-cm]

6. Repeat the above steps for the remaining Heart Rate Sensor.

Ergo Bar

Signal Input Sensor

Phillips Screws (2)

Ground Sensor

Striding (Walking) System (SS)

Theory of Operation

The Stride System is comprised of the striding belt, the deck, the belt barrier, the Life Spring suspension components, the front and rear rollers, the rear roller guards and the stride sensor assembly.

The striding belt is impregnated with a lubricant. The deck is also coated with a paraffin wax on both sides. This combination allows for low friction between the striding belt and the deck which results in increased belt/deck life. The striding belt and deck are wear items and when the friction becomes large enough, the user may experience speed slowdowns. This slowdown is an indication that the belt and deck need to be replaced. The deck may be flipped over if it has never been flipped previously. In addition the console may display the message "UNABLE TO ATTAIN TARGET SPEED."

The striding belt is initially tensioned and centered about the rollers at the factory. The striding belt may have to be re-centered at the customer's site during installation because of customer for irregularities. These irregularities may also require the leveling of the treadmill by adjusting the rear leveler feet. The centering adjustment is done via two adjusting screws at the rear roller. With normal usage, the striding belt stretches over time which may cause the front roller to slip. This is an indication that the striding belt has to be re-tensioned. Re-tensioning is done by turning the adjusting screws. A simple method of determining if a belt is loose is the 2 mph stall test. This test requires the treadmill to run at 2 mph and the technician to stomp hard on the striding belt to try to stall the motor while observing whether the front roller spins when the striding belt momentarily stops.

During treadmill use and depending how a user runs on the treadmill, the striding belt may move to either side causing the belt to go off center. To aid with this the front and rear rollers are tapered at the ends. This feature helps the striding belt center itself during use. In addition, the treadmill frame has belt guides at each side known as belt barriers. The purpose of the belt barriers is to contain the striding belt from walking off the edge of the rollers and being damaged during use.

The striding belt has a Life Fitness logo on the edge of each side which identifies the belt as an authentic Life Fitness part. The purpose of the logo is a visual warning that indicates whether the striding belt is moving in the event that a user gets off the treadmill during the workout and does not press the stop button to end the workout.

On the 97T treadmill, in order to minimize how long a unit is running without a user on it, a sensor senses deck movement. It is located on the treadmill frame under the deck. This is the Stride Sensor assembly. Deck movements are sensed by the stride sensor assembly which are converted to voltage signals and sent to the motor controller. A deflected sensor indicates that the user is present on the deck. The console polls the motor controller periodically to check for the user's presence. If the controller reports the user as absent, the console will issue a "USER NOT DETECTED ON BELT -- PRESS ENTER TO CONTINUE WORKOUT" message. After issuing this message the following happens:
the treadmill's belt continues to run for the next 20 seconds, the workout continues;
if the user does not respond to the above message, the workout will pause and the "PAUSED -- PRESS ENTER TO RESUME" message is shown.

Additionally, from the software perspective, relating to the stride sensor, there are Ignore Periods and Grace Periods.

Ignore Periods (stride sensor ignored for 25 seconds):

- At the beginning of workout
- After any key-press
- After a user removes hands from the LifePulse sensors

Grace Periods (user has 60 seconds to get on belt)

- At the beginning of workout
- After continuing the workout (via pressing the Enter key during the "USER NOT DETECTED ON BELT ..." pre-pause message)
- After a user resumes from pause

If user is detected after any ignore period then the next time that the "USER NOT DETECTED ON BELT ..." message occurs will be in approximately 21 seconds after the user leaves the belt.

The Life Spring suspension system is comprised of a set of eight proprietary elastomers that work in combination with the deck to reduce stress to bones and joints by absorbing some of the impact loads associated with running.

System Components

Belt Barrier

Roller Guard
(both sides)

LifeSpring
(8 places)

Stride
Sensor

Rear Roller

Front Roller Assemblys

Belt Tensioning/
Centering Screw
(both sides)

Striding Belt
(cutaway)

Deck (cutaway)

Problem Symptoms Table

Symptom: Striding belt slips during football

Possible Cause	Corrective Action	Section
Striding belt slips on front roller during stall test.	Check striding belt & re-tension as necessary. Do the two mph stall test by stomping on the striding belt hard at two mph. If the front roller spins when the striding belt momentarily stops the belt tension must be increased.	SS

Symptom: Knocking sound

Possible Cause	Corrective Action	Section
Faulty front and/or rear roller bearings.	Inspect rollers for binding or roughness. Replace if necessary.	SS
Wax build-up on rear roller.	Run unit for 10 hours to break-in the treadmill, or clean the roller as necessary.	SS
Treadmill not leveled.	Level treadmill by adjusting the leg levelers.	LF
Lifesprings incorrectly positioned and/or have loose mounting hardware.	Inspect Lifesprings and mounting hardware and reposition or tighten.	SS

Symptom: Squeaking noise

Possible Cause	Corrective Action	Section
Drive Motor Belt tensioning pin may be squeaking.	Clean and lubricate as necessary.	DM
Drive Motor Belt may be worn or damaged.	Replace Drive Motor Belt. See How To… Replace Drive Motor Belt.	DM
Worn or damaged main motor drive belt.	Inspect the main drive belt for damage or wear and replace if necessary.	DM
Drive motor pulley and front roller pulley misaligned.	Align pulleys as described in drive motor module.	DM

Symptom: Loud groaning on footfall.

Possible Cause	Corrective Action	Section
High friction between deck and striding belt.	Set unit to 15% incline. While standing on striding belt close to the Ergo bar push off Ergo bar. If steady continuous sliding occurs down the incline, the belt/deck wear is acceptable. If sliding is not continuous replace striding belt and deck (or flip deck if deck has never been flipped before).	SS

Symptom: Selected or maximum speed is reduced during workout

Possible Cause	Corrective Action	Section
Insufficient line voltage/current at the outlet due to unit plugged into a shared (non-dedicated) outlet.	Unplug the treadmill and carefully open outlet cover and count number of conductors going to outlet. If there are more than three wires on a single outlet or more than five wires on a dual outlet the outlet is a shared outlet. Unit must be plugged into a dedicated outlet. See operation manual for power requirements.	

Possible Cause	Corrective Action	Section
Worn deck and/or worn striding belt.	Set unit to 15% incline. While standing on striding belt close to the Ergo bar, push off Ergo bar. If steady, continuous sliding occurs down the incline, the belt/deck wear is acceptable. If sliding is not continuous replace striding belt and deck (or flip deck if deck has never been flipped before).	SS
Drive motor binding.	Check drive motor shaft for binding or roughness. Replace motor if necessary.	DM
Front or rear roller binding.	Inspect rollers for binding or roughness. Replace if necessary.	SS

Symptom: Striding belt not centered or traveling close to roller edges

Possible Cause	Corrective Action	Section
Treadmill not level.	Level treadmill by adjusting the leg levelers	LF
Striding belt not within belt barriers.	Position striding belt inside belt barrier on both sides of the frame.	SS
Position striding belt inside belt barrier on both sides of the frame.	Adjust the tracking of striding belt.	SS
Striding belt tension or tracking needs to be adjusted.	Adjust and tension the striding belt.	SS
Improper walking/running.	Adjust and tension the striding belt. Notify the club manager.	SS

Symptom: Rubbing sound from under the treadmill when striding belt is moving

Possible Cause	Corrective Action	Section
Striding belt not positioned properly between the belt barrier.	Position striding belt edges to be between belt barrier.	SS
Striding belt not centered and off to the left or to the right.	Center striding belt.	SS

Symptom: Treadmill goes into pause mode during workout

Possible Cause	Corrective Action	Section
Physical damage to stride sensor.	Check stride sensor for physical damage and replace stride sensor if necessary.	SS
Stride sensor not sensing user.	Go into diagnostics and check stride sensor operation.	Diagnostics -> System Test -> Stride Sensor Test

Howtos

Replace the Rear Roller Guards

📘 The following steps are applicable to units with Configuration No. 1, Rear Roller Guards.

1. Remove the Screws securing the Rear Roller Guard Assembly to the Frame.

2. Remove the old Grommets from the Rear Roller Welded Guard Tab and Base Frame (model specific).
3. Install the new Grommets (included in kit) in the Rear Roller Guard Weldment and Base Frame locations. For the base frame holes, be sure to use the Low Profile Grommets.
4. Place new Roller Guard in position as shown with the top surface under walking belt. Align mounting holes.

5. Install Screws and fasten securely. Approx. 22-37 in/lbs.

Secure Mounting Screws

6. Repeat steps for opposite side. After completion run treadmill and check for interference or binding. If needed loosen Mounting Screws, re-align Guard, and refasten securely.

Replacement of Front Roller

1. Turn the unit power OFF at the switch, and then unplug the line cord at the wall outlet.
2. Remove the Inside Upright Covers, the Front Cover, and the Motor Cover. See "How To…" in this section.
3. Loosen the Rear Roller Adjusting Screws to slacken the Striding Belt enough to allow side-to side movement of the Front Roller.

> Index the initial position of the Adjusting Screw or count the number of rotations when loosening the Roller Adjusting Screws for proper Striding Belt retensioning.

Idler Arm   Screw driver   Drive Belt   Front Roller

Allen Wrench   Idler Pulley

4. Insert the end of a flat blade screwdriver in the slot of the Idler Arm. Raise the Idler Arm and
insert an Allen wrench in the Idler Arm Access Hole to keep it in a raised position.

> CAUTION: DUE TO EXTREME SPRING TENSION, DO NOT RAISE THE IDLER ARM HIGHER THAN REQUIRED TO INSTALL THE ALLEN WRENCH.

5. Remove two screws securing the Anti-Static Brush Bracket just behind the Front Roller Pulley to avoid being damaged during roller removal.

Anti-Static Brush   Mounting Screws

Anti-Static Bracket

6. Remove the mounting bolt, lock washer, and flat washer securing the Left Front Roller Shaft at the Left Side of the Frame.

Illustration shows striding belt removed for purposes of clarity.

Washer   Lock Washer   Bolt

Front Roller LT   Left End

7. Move the Left Front Roller Shaft end into the Left Side of the Frame so that the right side of the Pulley Shaft end clears the Access Hole in the right side of the frame to allow the Motor Belt clearance for removal. Slip the Motor Belt off the Front Roller Pulley at this time.

Access Hole   End of Shaft

8. From the right side of the frame, remove the Front Roller out from under the Striding Belt.

Striding Belt   Front Roller

Mounting Bolt
Lock Washer
Flat Washer
Front Roller
Lock Washer
Hex Bolt
Polley V Pulley
Flat Washer

9. With the Front Roller out. Remove the Pulley and Hardware and save for the new Front Roller.

10. Install Pulley on the new Front Roller.

11. Install the Front Roller into position and secure in place with the mounting bolt, lock washer, and flat washer on the left side of the roller shaft.

12. Make sure that the Motor Drive Belt is positioned on left side groves of the Front Roller Pulley.

13. Lower the Idler Arm Roller against Drive Motor Belt.

14. Refer to "How To…" Adjust Striding Belt Tracking or Tensioning in this section.

Replacement of Rear Roller

1. Turn the unit power OFF at the switch, and then unplug the line cord at the wall outlet.

2. Units with Configuration No 1: Remove four screws securing the Roller Covers and Guards, and then remove the Roller Covers and Guards from the Rear Roller. Units with Configuration No. 2:
Remove four screws securing Roller Guards, and remove the Roller Guards from the Rear Roller.

3. Index the initial position of the Adjusting Screw or count rotations, and remove the Rear Roller Adjusting Screws. See "How to…" in this section.
4. Remove the Rear Roller out from under the Striding Belt and discard.
5. Install a new Rear Roller in the reverse order of removal.
6. Reinstall Tensioning Bolts back in the Rear Roller.

Rear Roller Guard, LT   Rear Roller Guard, RT

Rear Roller Adjusting Screws (2)

Roller Guard Screw (4)

7. Refer to "How To…" Adjust Striding Belt Tracking or Tensioning in this section.
8. Reinstall the Rear Roller Guards and Covers.

Striding Belt   Rear Roller

Removal and Installation of Striding Belt and Deck

1. With the front and rear rollers and other components removed as described in the previous sections, remove the 4 deck screws and remove the deck from between the belt.

   Be careful not to damage the stride sensor with the deck .

2. Remove striding belt.
3. Install new Tinnerman clips on the 4 corner LifeSprings.

   Be careful not to damage the stride sensor when removing the striding belt.

   Deck Screw at 4 corners: (25-35in-lbs), [29-40 kg-cm]

Deck Screw at 4 corners

Be Careful Not To Damage Stride Sensor When Removing Deck.

Deck Screw at 4 corners

4. To install new striding belt, place new belt with arrow on belt pointing in the direction of belt travel.

5. Scrape off any wax build up on the front roller surface using a plastic spatula.

6. Install front roller assembly with drive belt over roller pulley. Tighten mounting bolt to 12-14 ft-lbs [16-19 N-m].

7. Scrape off any wax build up on the rear roller using a plastic spatula.

8. Position rear roller through striding belt and let it rest on rear roller brackets

9. Insert new deck through the striding belt and place on the LifeSprings carefully without damaging the stride sensor. Existing deck may be flipped if it has never been flipped before.

☞ Clean underside of deck of any debris if being flipped.

10. Secure the deck with deck screws. Line up holes in deck with Tinnerman clip holes. Push down on deck and install screw.

Apply light pressure on screw to avoid bending the Tinnerman clip.

Orientation of deck with cutout facing the rear

Deck screw at 4 corners

11. Center the striding belt about the front and rear rollers at approximately ½ inch (1.3 cm) from rear roller edge. Also position the belt edges within the belt barrier.

½ inch

Tensioning Bolt

12. To properly tension a new striding belt without the use of tension gauges, place two pieces of masking tape exactly 38.75 inches (98.4 cm) apart on the right and left edges as shown (four pieces total). Alternatively you can mark two lines 38.75 inches (98.4cm) apart on the masking tape.

13. To tension the new striding belt, rotate the tension bolts clockwise until the distance between the pieces of tape (or lines on the tape) is increased to 39 inches (99.1 cm) for a NEW striding belt (38 15/16 inches (98.9 cm) for an existing belt).

14. Start the treadmill and run it at seven mph.

Masking Tape

38 3/4" Loose Length
39" Tensioned Length
for New Belt
38 15/16" Tensioned
Length for Used Belt

15. If the striding belt moves to the right, using a 5/16 inch Allen wrench, turn the right tension bolt 1/8-turn clockwise and the left tension bolt 1/8-turn counterclockwise to start centering the striding belt about the rear roller.

16. If the striding belt moves to the left, turn the left tension bolt 1/8-turn clockwise and the right tension bolt 1/8-turn counterclockwise to start centering the striding belt about the rear roller.

17. Continue adjusting belt until it is centered and does not move to one side or the other.

18. Run treadmill at two mph and while on treadmill come down hard on the striding belt. If the front roller spins when the striding belt momentarily stops, the belt is loose.

19. If the belt is loose, tighten it by rotating each tensioning bolt 1/4 turn clockwise and repeat steps 14 to 16 until the front roller does not spin.

Pivot Point

Striding Belt

Equal   Equal

Rear Roller

Removal the Lifespring Absorbers

1. Turn the unit power OFF at the switch, and then unplug the line cord at the
   wall outlet.
2. Remove the Inside Upright Covers, Motor Cover. See "How to…" in this section.
3. Loosen the Rear Roller Tensioning Bolts so that the Striding Belt is loose enough for Deck removal.
4. Remove the Deck Screws (one at each corner of the deck).
5. Lift out the Deck from under the Striding Belt. Be careful not to disturb the unused waxed surface.
6. Remove the four Tinnerman clips and keep for the new Lifesprings

6. Remove the eight Lifespring screws and Lifesprings from the frame. Discard Lifesprings, but save the
   hardware.
7. Install new Lifesprings making sure to face each notch in the Lifesprings towards the inside of the frame. Torque 1/4-20 screws to 27-33 in lbs.
8. Re-install the Tinnerman clips on the Lifespings at each corner of the unit.
9. Re-install Deck and secure with the deck screws at each corner of the deck.
10. Re-install the Motor Cover, the Front Cover, and the Inside Upright Covers.
11. Adjust the striding belt tracking or tensioning.

Removal of Stride Sensor Assembly

1. Loosen striding belt.

> Don't forget to count the number of turns on the tensioning bolt required to loosen the belt and remove the deck. This will simplify re-tensioning the belt o f the same tension.

2. Remove deck.

> Be careful not to drop the deck on the stride sensor.

3. Disconnect stride sensor cable connector from controller in motor pan.
4. Fish cable through frame.

> Tying a cord on the end of the connector will help to fish the new cable through the frame.

5. Remove existing stride sensor.

> *Screw and Flat Washer (25-35 in-lbs), [29-40 kg-cm]*

Screw and Flat Washer

Stride Sensor Assembly

6. Install new stride sensor.

Mount stride sensor parallel to frame as shown.

Be careful not to damage the cable when fishing it through the frame.

7. Re-install the deck.
8. Re-tension the striding belt.

5/8"
[5.9mm]

Lower Frame (LF)

System Components

Left Upright

Anti Slip Pads

End Clip

Motor Cover

Right Upright

Front Cover

Frame

Problem Symptoms Table

Symptom: Knocking sound coming from deck.

Possible Cause	Corrective Action	Section
Life Springs not positioned correctly and/or loose mounting hardware.	Reposition or tighten life springs.	SS

Symptom: Rubbing sound from underneath machine.

Possible Cause	Corrective Action	Section
Foreign objects may be stuck underneath the machine.	Reposition or tighten life springs.	SS

Symptom: Loud groaning sound heard from front of machine while elevating.

Possible Cause	Corrective Action	Section
Lift mechanism pivot points are dry.	Clean and lubricate as necessary.	LS
Faulty lift motor.	Replace the lift motor. See How To…Replace Lift Motor.	LS
Obstruction.	Inspect wheels or flooring for damage.	LS

Symptom: Anti-slip pad assemblies are loose

Possible Cause	Corrective Action	Section
Pad not properly placed or damaged.	Replace anti-slip pad.	LF

Symptom: Motor shroud cover is off or loose

Possible Cause	Corrective Action	Section
Improper placement	Reattach or replace motor shroud cover.	DM
Damage	Reattach or replace motor shroud cover.	DM

Symptom: Loose inside upright covers

Possible Cause	Corrective Action	Section
Improper placement	Reposition upright covers.	LF
Damage	Replace upright covers.	LF

Symptom: Loose uprights

Possible Cause	Corrective Action	Section
Damage	Replace uprights.	CN

Symptom: Loose end caps

Possible Cause	Corrective Action	Section
Improper placement	Replace end caps.	LF
Damage	Replace end caps.	LF

Symptom: Lower Frame loose or off

Possible Cause	Corrective Action	Section
Customer abuse	Replace lower Frame.	LF

Howtos

Replace the Leveler Assembly

1. Turn the unit power OFF at the switch, and then unplug the line cord at the wall outlet.
2. Raise the back end of the treadmill, and then block up the Frame to keep the Leveler slightly off the ground.
3. Depending on the Leveler being replaced, remove the Access Cover on the side of the unit Frame to gain access to the Leveler Mounting Nuts. Remove the
four mounting nuts from the Leveler Assembly Bolts,
and then remove the Leveler.

Leveler Assembly   Mounting Bolt

4. Install new Leveler Assembly in reverse order. Note that the hole patterns in the Bracket Leveler, can only be re-installed one way.
5. Loosen the Stop Nut and turn the Leveling Foot in or out until the unit is level and rests firmly on the floor. Retighten the Stop Nut.

> Make sure the Stop Nut is properly seated against the Pivot Pin.

> It is extremely important that the Leveling Foot be correctly adjusted for proper unit operation. An unbalanced unit can cause Striding Belt misalignment.

Bracket Leveler   Bracket Leveler   Pivot Pin
Hex Bolt (4)   Stop Nut   Leveling Foot
Lock Washer(4)

Adjust the Lift Actuator

1. Verify that the home switch is functioning. Enter Lift Motor Diagnostics. Follow description in section Diagnostics -> System Test -> Lift Motor Test.
2. Drive the Lift System down until the actuator's internal limit switch stops the lift function. Disconnect power from the treadmill.
3. Measure and record the space between the top of the lift wheels and bottom of the unit frame.
4. Turn the treadmill over on its side.

Measure Space

5. Remove the 3/8-16 nut and bolt from the Lift Arm Weldment.
6. Turn the actuator tube clockwise (in towards the motor) in half-turn increments to approximately equal the space measured in Step 3. One-half turn of the actuator tube shortens the operating length by 1/16". Make sure the bolt holes align.

Example: If the space between the top of the wheel and the bottom of the frame is 3/16", turn the actuator tube 1-1/2 turns clockwise (in towards the motor). If the space is 5/32", turn the actuator tube 1 turn clockwise.

Be careful not to turn the actuator screw while turning the actuator tube.

Liftarm Weldment

Actuator Tube   Bolt   Nut

7. Install the Actuator tube back into the Lift Arm weldment and secure with nut and bolt.
8. Verify orientation of switch. If backward, remove and reinstall to proper orientation as shown.
9. Turn the treadmill over and restore power.
10. Test the lift function in a user program. Note: If necessary, balance the unit and adjust striding belt tracking.

Liftarm Weldment

Actuator Tube   Bolt   Nut

Replacement of Upright Covers, Motor Cover and Front Cover

1. Turn the power off at the on/off switch.
2. Unplug the line cord from the wall outlet.
3. Remove the mounting screws that secure the left and right inside upright covers then remove them.
4. Remove the four front cover screws.
5. Remove the front cover.

Torque: (25-35 lb*in), [29-40 kg*cm]

Front Cover

Upright, LT

Inside Upright Cover, Left

Upright, RT

Motor Cover

Inside Upright Cover, Right

6. Remove the four motor cover screws.
7. Lift the cover out from between the support uprights.
8. To reassemble the unit, install the motor cover.
9. Install the front cover.
10. Install the inside upright covers.

Motor Cover

Replacement of End Caps

1. Remove and save the two Phillips screws that secure the right or left rear end cap to the frame.
2. Install the new rear end cap using the screws saved in Step 1.

*Torque: 25-35 lb*in, [29-40 kg*cm]*

Replacement of Anti-Slip Pads

1. Remove current Anti-Slip Pads from the treadmill by carefully lifting the front and rear edges. Be careful not to scratch the paint during this operation.

Lift at Front and Rear Edges

Clean top surface of Side Rails with Wipes

2. After removing the old Anti-Slip Pads, remove any remaining residue with a non-metallic scraper. Clean the entire top surface of the side rails with the cleaning wipes provided.

Tape Template in place if needed and set Anti-Slip Pad in place

Align front edge of Anti-Slip Pad and inside edge of Front Template

3. Location of the new Anti-Slip Pads is 3/4" from the inside face and 1 3/4" from the rear edge of the frame. Use the included templates for more accurate positioning of the Anti-Slip Pads.

4. Fold the templates along scored lines as shown. Fold two templates as shown and two templates in the opposite direction.

5. Position one template at the rear of the side rail as shown (Removal of roller guard might be required). Tape the template in place as needed.

6. Place one Anti-Slip Pad in position at the rear Template as shown. Position one template at the front of the side rail, as shown, aligning the inside edge of the template with the front edge of the Anti-Slip Pad. Tape the template in place as needed.

7. The Anti-Slip Pad has a split back peel-off liner. Remove one side of this liner.

8. Re-position the edges of the Anti-Slip Pad that has the back liner left on it (the non-sticky side) with the templates. Once the Anti-Slip Pad is properly aligned with the front and rear templates, press down on the Anti-Slip Pad securing it in position on the side rail. Lift on the front or rear edge of the Anti-Slip Pad without the back liner removed and peel of the remaining back liner. With all the back liner material removed, press down firmly on the Anti-Slip Pad to remove any trapped air. Carefully remove templates and repeat steps five through eight for remaining side of treadmill.

Align front and back of Anti-Slip Pad (non-adhesive side) to Templates

Completed Installation Antislip Pads

Upper Frame (UF)

System Components

Console Assembly

Ergo bar and Activity Zone Assembly

Outer Handrial Shroud

Inner Handrial Shroud

Problem Symptoms Table

Symptom: Inside handrail shroud loose or misaligned

Possible Cause	Corrective Action	Section
Improper assembly	Replace inside handrail shroud.	UF
Damaged component	Replace inside handrail shroud.	UF

Symptom: Outside handrail shroud loose or misaligned.

Possible Cause	Corrective Action	Section
Improper assembly	Replace inside handrail shroud.	UF
Damaged component	Replace inside handrail shroud.	UF

Symptom: Handrail need loose or misaligned

Possible Cause	Corrective Action	Section
Improper assembly	Replace handrail.	UF
Damaged component	Replace handrail.	UF

Howtos

Replace the Inside Handrail Covers

The Uprights MUST be loosened so that they can be spread apart enough to remove the ERGO bar. Also, the Console Assembly MUST BE REMOVED.

1. Remove and save the five plugs in the inside handrail covers that conceal the mounting bolts.
2. Remove and save the five Allen bolts that secure the inside handrail cover to the handrail.

   Allen Bolt Torque: (42 in-lb), [48 kg-cm]

3. Remove the cover by tilting it forward the inside of the unit, then pulling down.
4. Install the new Inside Handrail Cover, using the bolts removed and saved in Step 2.

Replace the Handrail

1. Turn the treadmill power switch off.
2. Unplug the line cord from the wall outlet.
3. Remove the cup holders.
4. Remove the inside handrail covers.
5. Remove the Activity Zone assembly.
6. Remove the lower bridge cover.
7. Remove the outer handrail covers.
8. Remove and save the two bolts that secure the handrail to the Ergo bar.
9. Remove and save the two Allen bolts that secure the handrail to the upright.
10. Remove the handrail.
11. Install the new handrail using the bolts removed and saved in Steps 8 & 9.

Screw Torque: (2.5 ft-lb), [3.4 N-m]

Allen Bolt Torque: (62 ft-lb), [84 N-m]

Replace the Ergo Bar

1. Turn the treadmill power switch off.
2. Unplug the line cord from the wall outlet.
3. Remove the cup holders.
4. Remove the inside handrail covers.
5. Remove the Activity Zone assembly.
6. Remove the lower bridge cover.
7. Remove the outer handrail covers.
8. Remove and save the two bolts that secure the handrail to the Ergo bar.
9. Remove and save the three bolts that secure the Ergo bar to the bridge frame.
10. Disconnect the heart rate cable from the Ergo bar to the console.
11. Install the new Ergo bar assembly using the hardware removed and saved in Steps 8 and 9.

Torque: (2.91 ft-lb), [3.97 N-m]

Ergo Bar Assembly

Inner Handrial Shroud, LT

Inner Handrial Shroud, RT

Outer Handrial Shroud, LT

Heart Rate Cable

Outer Handrial Shroud, RT

Diagnostics

Introduction

The diagnostic functionality that is built into the software supports the products listed below:

- CLST
- CST
- 97T

The console diagnostics are very similar in function and appearance from one model to the next.

The CLST overlay is shown below:

CLST overlay is shown below:

97T is shown below:

CST is shown below:

As you can tell the differences between the three overlays are relatively small.
The following parts of the Message Center will be called out:
- Calories
- Distance
- Time
- Incline
- Speed
- Heart Rate

NOTE:
In any of the below paragraphs replace "shall" or "shall be" with "has" or "is" – "shall (be)" is used when we write the specification, but after the product is done, make sure to reflect that in the proper verbiage. Utilities with the ENTER key selecting the current navigated to utility. The CLEAR key shall exit the current diagnostic utility or repeated pressing shall exit the Diagnostics Menu State.

Once Diagnostics has been entered, diagnostic selections can be made quickly by pressing combinations of program and Enter Weight keys as shown in the table below.

DIAGNOSTICS TEST		MANUAL	FAT BURN	CARDIO	RANDOM	HILL	PERSONAL TRAINER	FIT TEST	ZONE TRAINING +	SPEED INTERVAL	ENTER WEIGHT
DIAGNOSTICS TEST AND PROGRAM KEY COMBINATIONS											
EM TE	COMM TEST				ON			ON			
	SPEED AUTO				ON						
	SPEED MANUAL	ON			ON						
	INCLINE AUTO					ON					
	INCLINE MANUAL	ON				ON					
	INCLINE ERROR					ON	ON				
	BELT/DECK TEST						ON				
	LIFEPULSE TEST		ON								
	TELEMETRY TEST			ON							
	STRIDE SENSOR TEST		ON			ON					
	DISPLAY TEST	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	FRAME TAG EEPROM TEST					ON		ON			
	CONSOLE EEPROM TEST		ON					ON			
	CSAFE TEST			ON			ON				
INFORMATION	MAIN MOTOR INFO				ON	ON					
	INCLINE MOTOR INFO				ON						
	STATISTICS			ON	ON		ON				
	SOFTWARE VERSION			ON		ON					
	MAINTENANCE INFO	ON									
	SYSTEM ERROR	ON	ON								
	MAINTENANCE MENU	ON									

Navigation to the Diagnostics State shall occur by pressing and holding the COOLDOWN key while pressing the ENTER key. Pressing the CLEAR key while in the Information State select option shall exit the Service Menu.

Overall Structure

Upon entering the diagnostic functionality the following main sections of diagnostics are accessible to the technician/club manager:

- System Test (Diagnostics)
- Information
- Maintenance
- Configuration

All of the above are described in their respective sections.

> F I X M E
>
> Aurbind: Can we have links to the above listed subsections from this page to a particular subsection in this document?

Treadmill
SERVICE MENU STATE FLOWCHART

System Test

The System Test (Diagnostics) menu has the structure as depicted below:

System Comm Test

This test automatically performs a system wide module communications test. The test attempts to communicate with all of the modules within the treadmill unit. If a module does not respond to the console processor an ERROR message is displayed. The following messages may be displayed according to the error condition:

Error Condition	Message Display
All modules communicating	SYSTEM COMM OK
Initial message if the motor controller does not communicate	MOTOR CONTROLLER COMM BAD
If the motor controller has not power	CHECK POWER TO THE MOTOR CONTROLLER
If the main harness control to the motor controller board is disconnected	CHECK HARNESS BETWEEN CONSOLE AND DSP P1/P5
If the motor controller does not communicate, the controller cannot perform a loop-back test	SYSTEM CONFIGURED TO WIRE

If SYSTEM COMM OK is displayed the console will advance to the system test category.

Main Motor Test

The Main Motor Test consists of 3 diagnostic utilities. Two exercise the main drive motor and one provides motor error information.

Speed Automatic

This test allows the user to test the main drive motor and controller controlling the target speed. Upon entry into this test the letters SA (speed automatic) are displayed in the profile window. The user selects a target speed by using the Speed Arrow keys. This speed is communicated to the motor controller as the target speed. The actual speed as calculated by the speed feedback sensor is shown in the actual portion of the message center.

> **FIXME**
>
> The DSP controller does not have a feedback mechanism. Need to understand how the speed is controlled. This comment is applicable to both sections of Speed Automatic and Speed Manual.

The incline system (Lift Motor test) can be activated in this test as well. However, the display will only show the target incline for two seconds while the incline keys are being pressed. It returns to showing the speed information.

Speed Manual

This test allows the user to test the main drive motor and controller controlling the target speed. Upon entry into this test the letters SM (Speed Manual) are displayed in the profile window. This test allows the user to test the main drive motor and controller controlling the motor rpm. The user can select a target motor rpm by using the Speed Arrow keys. The actual motor rpm as calculated by the speed feedback sensor shall be shown in the actual portion of the message center.

The incline system (Lift Motor test) shall be activated in this test as well. However, the display shall only show the target incline for two seconds while the incline keys are being pressed. It shall then return to showing the speed information.

Lift Motor Test

The Lift Motor Test consists of 3 diagnostic utilities. Two exercises the lift drive motor and one provides lift motor error information.

Incline Automatic

This test allows the user to test the lift motor and switches controlling the target incline. Upon entry into this test the letters IA (incline automatic) are displayed in the profile window. The user can select a target incline by using the Incline Arrow keys. The actual incline as calculated by the time count is shown in the actual portion of the message center.

For non-decline units: The state of the level switch is displayed in the profile window. A zero "0" displayed in the profile window shows the level switch in the closed position. As the unit is inclined the zero "0" displayed disappears to indicate that the level switch is functioning.

For decline units: The state of the level switch is displayed in the profile window. A zero "0" displayed in the profile window shows the level switch in the closed position. As the unit is inclined the zero "0" displayed disappears to indicate that the level switch is functioning.

The motor drive system (Main Motor Test) is active in this test as well. However, the display shows the target speed for two seconds while the speed keys are being pressed. It returns to showing the incline information.

Incline Manual

This test allows the user to test the lift motor and to bypass the electromechanical switches that normally control the target incline. Upon entry into this test the letters IM (incline manual) are displayed in the profile window. The user moves the incline by pressing the Incline Arrow keys. The actual incline is calculated by the time count and is shown in the actual portion of the message center. The state of the level and negative incline switches is displayed in the profile window.

For non-decline units: The state of the level switch is displayed in the profile window. A zero "0" displayed in the profile window shows the level switch in the closed position. As the unit is inclined the zero "0" displayed will disappear to indicate that the level switch is functioning.

For decline units: The state of the level and negative incline switches is displayed in the profile window. A zero "0" displayed in the profile window shows the level switch in the closed position. As the unit is declined the zero "0" displayed shall disappear and a "–4" appears in the profile window.
This verifies that the negative switch is functioning (the "–4" will only appear in incline manual mode).

The motor drive system (Main Motor Test) is active in this test as well. However, the display only shows the target speed for two seconds while the speed keys are being pressed. It returns to showing the incline information.

Incline Error

Upon entry into this test the letters IE (incline errors) will be in the profile window. This test allows seeing the current lift motor error conditions. The following is a list of the current lift motor error conditions.

LIFT MOTOR ERROR CONDITIONS

- INCLINE TIMEOUT ERROR
- NEGATIVE SWITCH ERROR
- HOME SWITCH ERROR
- NO AC POWER ERROR

Belt/Deck Test

This test allows the user to check the belt and deck conditions. This test acts as a wattage meter, providing the percentage of power, wattage, bus voltage, and temperature readings while the belt is exercised.

Upon entry to this test these messages scroll:
"RELATIVE POWER METER"
"RECOMMENDED SPEED ABOVE 3.5 MPH"

This initial information is displayed:
"PERCENT XXX WATT XXX"
"XXX" are values. "PERCENT" is the percentage of available power (ranging from 0 to 100).
"WATT" is the wattage (from 340 to 1200) required by the motor controller to move the belt.

Pressing the "COOL DOWN" key displays this information:
"VOLTAGE XXX TEMP XX 'C"
"XXX" indicates real values. "VOLTAGE" is the bus voltage of the motor controller (not the input line voltage). "TEMP" is the temperature of the motor controller heat sink (in degrees Celsius).

The display locks on the current information if the PAUSE key is pressed.

The speed system and incline systems shall are active in this test. The display shows the target speed or incline for two seconds while the SPEED/INCLINE keys are being pressed. It returns to showing belt and deck information.

The following procedure shall be used to test whether the belt and deck should be replaced: Using the SPEED UP ARROW key walk on the unit at 3.5 MPH (Km/h)) for at least one minute. Then run on the unit at 7.0 MPH (Km/h) for at least one minute. If the watts display is higher than 1100, replace the belt and either flip or replace the deck.

LifePulse Test

Upon entry to this test a heart-shaped image is displayed in the profile window along with a sequence of two messages in the message center. For the treadmill products, the first message identifies the configuration state of the Lifepulse feature (On/Off). For all products, a second message follows, automatically displaying confidence and gain terms as described below.

Term	Description
GAIN	The value displayed from ("0"-"99") is proportional to the amount of signal that is being provided by the Lifepulse sensors. The higher the gain value, the lower the signal being evaluated by the Lifepulse system.
CONFIDENCE	The reading from (0-9) indicates the confidence level for the displayed heart rate. 0=low confidence, 9=high confidence

During display of the second message the LifePulse system is ready to be manually tested.

When both hands are detected on the sensors, the letters "L" and "R" are displayed in the profile window along with the heart-shaped image. For 4-Wire Lifepulse systems only, an "L" is displayed when the left hand is on the sensor, and an "R" is displayed when the right hand is on the sensor.

The gain value corresponding to the heart rate signal is displayed in the message center following "GAIN-" characters for treadmill products.
The value ranges from 0 to 99. A gain value of 99 is considered to be high and undesirable. A gain value of 0 is considered to be low and also undesirable. Gain values of between 15 and 40 are considered normal depending upon whether the user is exercising or standing still during this test.

The confidence value corresponding to the heart rate signal is displayed in the message center following the "CON-" characters for treadmill products. A confidence value of 0 is considered a low confidence reading while a reading of 9 is considered a high confidence reading. Other values from 1 to 8 reflect intermediate intervals of ascending confidence readings. For Treadmill products both the Speed and Incline systems are adjustable during this test. The display shows speed or incline information briefly when any INCLINE or SPEED keys have been pressed. The display then reverts to the Lifepulse information.

Telemetry Test

This test requires a Polar compatible transmitter (chest strap or pulse simulator; coded/non-coded pulse simulator preferred).

The ENTER key LED indicates when the value is at the default setting of TELEMETRY ON. This value is stored in EEPROM and is kept when the unit is not in use. The DOWN ARROW turns the telemetry OFF. The UP ARROW turns the telemetry ON.

This test does not function if the telemetry setting has been turned OFF.

For all products, a heart shape is displayed in the program profile window when TELEMETRY is turned ON.

If a telemetry heart rate is detected it is displayed in the message center when telemetry is set to ON. By default, the Lifecycles and Stairclimbers shall have TELEMETRY ON.

For treadmill products, the ENTER LED flashes (at the users heart rate) when the telemetry feature is ON and the receiver is receiving a signal from the Polar transmitter.

Stride Sensor Test

This test allows the user to test the Stride Sensor system.
If the Stride Sensor system detects a user, it illuminates the profile window from empty to full, depending on the percentage of detection that is occurring.
Additional Stride Sensor information shall be displayed in the Message Center window and includes the following:

Stride Sensor Unplugged
Stride Sensor Off
User Detected on Belt
User not Detected on Belt
AVG XX ADJ XX – USER RAW XX

The Time Arrow key can be used to view the stride sensor data if available.

Display/Keypad Test

The display and keypad functional tests are combined into one diagnostic utility whose default function has ALL LED's on switching to the Walking LED display test and then to the Keycode Display test upon successive keypress (other than the Clear key).

LEDs On

This test drives all annunciator and segmented LED displays fully on simultaneously for visual inspection.

Display/Walking LED

This test cycles through and illuminate all LED annunciators and display segments sequentially on a timed basis such that a faulty annunciator or display segment can be determined visually. On entry to this state, the LED segments in the MESSAGE CENTER and the PROFILE WINDOW give the animated effect of moving, henceforth, 'Walking LED."

For treadmill products, individual LEDs are activated first followed by the segmented displays.

Segmented displays when tested are activated by segment then by column. This sequence (individual LEDs on treadmills followed by segmented displays) continues until this state is exited.

Keycode Display

This test displays a string of characters in the message center display along with an audible beep corresponding to the key pressed. Multiples of similar keys with logical or functional meaning may display the same string. For example, the numeric digit keys on both the iPod/TV and Numeric keypads may display the same string. Pressing the CLEAR, START, or ENTER key exits the test and signifies correct operation of that key. Correct operation of the remaining keys IS inferred from the corresponding visual display string and audible beep.

For treadmill products, if the ENTER key has been pressed the Walking LED test will begin.
Subsequently pressing the PAUSE will halt the Walking LED test sequence until the PAUSE key is pressed again.

For treadmill products, pulling the Emergency Stop switch in this mode will result in the message "REPLACE EMERGENCY STOP SWITCH" being displayed.

Frame Tag EEPROM Test

This test performs a read/write/replace operation on all used locations in the frame tag EEPROM. If there is a failure in the operation an error shall be displayed indicating the bad location within the EEPROM.

The possible messages are:
FRAME EPROM COMM BAD
FRAME TAG UNPLUGGED

TESTING FRAME EEPROM
EEPROM TESTED GOOD
EEPROM BAD AT XX

Console EEPROM Test

This test exercises the functionality of the Console EEPROM by reading, writing, and replacing all used locations in the Console EEPROM. The EEPROM location being tested is displayed in the message center. Pressing the ENTER key on Treadmill products will initiate the EEPROM test. If the test completes successfully, the message
EEPROM GOOD will appear. If the test fails, the message EEPROM BAD AT XX will display with the bad EEPROM location.

CSAFE Test

This test exercises the CSAFE communications port by sending and responding to CSAFE commands with a Fitlinxx network device while establishing a CSAFE Network connection.

Status of the overload detection circuit for this port is displayed in this diagnostic.

For Treadmill products the network is checked as follows:

One of the following messages shall be displayed according to the current network condition:

"NULL T-XX R-XX"
"OFF T-XX R-XX"
"ON T-XX R-XX"
"WAIT T-XX R-XX"
(No message)
"T-XX" is the last transmitted message to the CSAFE card.
"R-XX" is the last received message from the CSAFE card.

Displays real time "RX- TX-" command messages

Displays EquipmentState and Frame error messages
Special Loop Back Test Mode

Activity Zone Test

Functionality of the Activity Zone keypad is testable with the standard Display/Keypad test diagnostic. Additional configuration, status and system tests is provided with the following Activity Zone Test Mode diagnostic utility:

Activity Zone Test Mode

This mode is located in the System Test Menu.

When the Enter key is pressed the console software will attempt to automatically detect if the activity zone PCB is connected. It will also report if the activity zone is disabled. It also automatically switches to the main testing section. This section is used to see the actual raw data being clocked into the console as well as other important indicators. See sections below.

Initial Entry into Activity Zone Test

On Entry to the "Activity Zone Test" Mode

Message	Meaning
"Activity Zone OFF"	This means the activity zone "On/Off" configuration item is turned "OFF". It must be turned "ON" before u can test the activity zone PCB
"Activity zone Detected"	This means the activity zone PCB is properly detected. After a few seconds the control will automatically advance to the next testing screen (Shown below)
"Please Wait"	This message means the console is in the process of attempting to detect the activity zone PCB
"Activity Zone PCB Unplugged"	This means the activity zone PCB couldn't be detected. There is a problem with th activity zone, cable or connectors, which is preventing proper detection

Main Testing Section

The main test area for the activity zone test mode shows the following data

Main "Activity Zone Test" mode:

Window	Description
1	"0x-" = no valid keycode data received else: "0x61", "0x71", "0x81", "0x91", "0xA1", "0xB 1", "0xC1", "0xD1", "0xE1", "0xF1",
2	"+ 1"= key is auto repeating. If the "+" sign isn't being shown then you are seeing key-presses (no auto repeating key -presses).
3	" DE 000"= Data Errors: count of how many keycode data bytes passed the sync and validation checks but contained invalid keycodes. Invalid keycodes=0x1 to 0x51.
4	"SE 000" = Syn Errors: count of how many extra bits had to be clocked in before the software was able to correctly sync to the keycode data byte. It is normal to see anywhere between 0 to 17 for this count when initially entering the test mode.
5	"HR---" = heart rate value. "---" =no heart rate detected. If "LPXXX" is shown then the heart rate is coming from the contact heart rate where XXX=contact heart rate value.
6	"CC"=you are in constant clock mode. The clock line is constantly clocking out pulse and sync errors will occur. This is for advanced testing only.

Special Test Modes

The following additional special test modes are supported within the Activity Zone Test.

Special Test Modes for "Activity Zone Test "

Key	Special Mode
Pause	*Bypassing initial detected / unplugged check:* Holding down this key and then pressing the Enter key while the display show's " Activity Zone Test" will cause the initial detected / unplugged check to be bypassed. This results in going directly to the main testing section.
Manual	Constant Clock Mode Toggles constant clock mode on or off. If one beep is heard, after pressing this key, then the clock line continuously clocks out clock pulses. If a burp is heard the constant clock mode is disabled and test results to normal clocking mode (9clock cycles per byte + 9msec delay period between clocked bytes).
Random	*Stopping Clock* Pressing this key allows you to stop the clock from clocking. Once stopped the "AZ Clock Off" Message is shown. If pressed again test mode toggle back to the previous clocking mode. (either normal or continuous = main testing section)
Hill	Key Detected Count Pressing this key shows you how many valid key - presses have been detected so far. The "AZ -xxx" message is shown where xxx= number of key pressed detected. After a few seconds the test returns to the main testing section.
Speed Up/Down	Allows control over belt motor
Incline Up/ Down	Allows control over incline motor
Stop	Stops the belt and the incline motor
Clear	Exit the Activity Zone Test mode- returns to System Test Menu

Attachable TV Test

This utility reports on the detection of the attachable TV.

Upon entry to this utility the present status (Detected/Not Detected) is displayed and continue to be periodically updated at least once a second.

iPod Test

This utility report on the detection status of the iPod interface and Apple Authentication Chip as well as provides the ability to turn on/off the iPod power/charge circuit.

Upon entry to this utility the status of the iPod detect circuit is displayed (Detected/Not Detected) on the message center. Pressing the Up/Down Arrow keys cycles through the display of additional status including iPod detect (Detected/Not Detected), iPod Accessory Power detect (Active/Not Active), iPod Power Error (Error/No Error), and iPod Authentication Chip detect (Detected/Not Detected).

While in this utility the ENTER key toggles the iPod Power Enable drive circuit turning it on and off. When pressed the message center temporarily displays the status of the Power Enable circuit (On/Off) and updates the presently displayed test status upon return. This allows the effects in status due to changes in the power circuit drive to be monitored.

Audio Test

This utility provides status and low level control of the audio device.

Upon entry to this utility the message center displays the results of a low level communication status check indicating if the part is responding (i.e. a simple I2C ACK as a result of a poll indicates the device is communicating). If this initial communication status check failed, the message center reports the failure and no further tests are permitted. If successful, the device is configured to select the iPod audio input channel with a default volume setting of 50% of max range. Pressing the Source Select or Enter keys on Treadmill products cycles through the input channel selections in order (iPod, TV, AUX, and TV GAIN) and wrapping at the end.

The active audio channel is the currently displayed audio selection. When the TV GAIN setting is active, temporary changes to the TV volume range are possible. In addition to the currently selected audio channel the message center displays its associated volume, or gain setting for TV GAIN. Pressing the Up/Down Arrow keys increases/decreases the setting by a minimum step supported by the device. When the TV GAIN is adjusted, the overall output volume range for the TV source is affected but not saved.

Information

The Information menu has the structure as depicted below:

Treadmill
INFORMATION FLOWCHART

System Statistics

This utility displays the number of logged occurrences of each of the following monitored system events:

- Total Hours – Total accumulated hours the product has been "used".
- Total Miles – Total accumulated miles tracked when the belt is running.
- Belt Hours – Total accumulated hours tracked when the belt is running.
- Belt Miles – Total accumulated miles tracked when the belt is running since last belt replacement logged.
- Lift Minutes – Total accumulated minutes tracked when the lift motor is running.
- Hill – Total number of times the Hill program has been started.
- Random – Total number of times the Random program has been started.
- Manual – Total number of times the Manual program has been started.
- Fat Burn – Total number of times the Fat Burn program has been started.
- Cardio – Total number times the Cardio program has been started.
- Fit Test – Total number of times the Fit Test program has been started.
- Quick – Total number of times the Quick Start program has been started.
- Custom 1-6 – Total number of times the Custom programs 1 – 6 has been started.
- Miscellaneous Custom
- Sports – Combined total number of times the Sport Training, Sport Training 5K and Sport Training 10K programs have been started.
- Speed Interval – Total number of times the Speed Interval program has been started.
- HR Zone – Total number of times the Heart Rate Hill, Heart Rate Interval and Extreme Heart Rate programs have been started.

- iPod Docks – Total number of times an iPod device has been docked.
- iPod Audio Plays – Total number of times an iPod audio track has begun.
- iPod Video Plays – Total number of times an iPod video track has begun.
- Speed vs. User Weight – Total accumulated minutes spent at a given Speed for a given user weight (only available via LF COMM interface).

Navigation through the System Statistics log entries are possible using either of the Up/Down Arrow keys on the main keypad.
Navigation beyond the end/beginning of the list cycles to the beginning/end of the list respectively.

Software Version

This utility provides the ability to display information corresponding to the version number and LF Part Number for specific programmed devices as well as version numbers corresponding to specific software sub-systems. These include the following:

	Information to Display
Programmed Device	
Console Software Image	Version Number, LF Part Number
Message Strings Software Image	Version Number & LF Part Number
Motor Controller Software Image (Treadmill only)	Version Number & LF Part Number
Software Sub-systems	
Bootloader	Version Number
Lifepulse	Version Number
CSAFE	Version Number

This information is displayed in the message center. Pressing any of the arrow keys allows the user to scroll through the information manually.
Information for each entry scrolls automatically every 3 seconds. Pressing the PAUSE key once locks the display from scrolling and pressing the PAUSE key again unlocks and resumes scrolling.
The LF Software Part Number can be displayed by pressing the COOLDOWN after locking the display on the particular device of interest.

Main Motor Information

This utility displays information related to the performance of sub-systems monitored by the DSP (i.e. motor, home switch, incline, etc).

Upon entry to this utility a series of one-time messages are displayed followed by a series of repeated cycling messages. The actual number of one-time messages
and their meanings depend upon information reported by the DSP. Use of the arrow keys during display of these messages advances through the list. Once all applicable one-time messages have been displayed the cycling message list starts. The actual number of cycling messages and their meanings also depends upon information reported by the DSP.

Use of the Up/Down Arrow keys while displaying cycling messages advances/backs up respectively through the displayed list. The list wraps appropriately at he end or beginning of the list.

The following lists all of the information from the DSP which may result in a one-time or cycling information message display:

- Motor Minutes
- Power & External Resets
- Dynamic Current Trips
- Hardware Current Trips
- Low-Voltage Trips
- Over-Voltage Trips
- Temperature Trips
- Running Errors
- Communication Trips
- EE Access Errors

- Incline No AC Errors
- Incline Negative Switch Errors
- Incline Home Switch Errors

Lift Motor Information

This utility displays information regarding the performance of the Lift Motor and report whether or not the decline option is detected (i.e. Negative incline).

A total of the time the unit has operated at each different incline level are accumulated into buckets (0 to 18) corresponding to the incline levels (-3%,-2%,-1%,0%,1%,…15%) respectively.

Navigation through the bucket entries is possible using the Up/Down Arrow keys on the main keypad to go forward or backward through the list respectively.
Navigation past the last bucket entry or before the first bucket entry resumes from the decline option information display.

System Errors

This utility displays information about the most recent 25 errors logged by the system.

Upon entry to this utility an aggregate number corresponding to the total number of unique (time ordered) system errors logged is displayed.

For example, if a motor error occurred followed by a communication error the aggregate total number of system errors displayed is 2. If another motor error occurs following the communication error the aggregate is incremented to 3 accordingly (e.g. motor error, communication error, motor error). However, subsequent occurrences of additional motor errors do not increase this aggregate unless superseded by a different type error (e.g. a motor error followed by another motor error does not increase the aggregate until a different type error is logged between them).

Following this aggregate number is a list identifying these logged system errors in order from the most recent (error #n) to the oldest/first logged (error #1). Each system error event displays a log number, date the error occurred (if the system contains a real time clock, otherwise "No DATE"), and a brief title relating to the type of error. This format allows the user to scroll through all logged system errors without seeing any error details. The list of system errors scrolls automatically every 3 seconds or can be scrolled backward in time by using any of the arrow keys. Upon scrolling past the end of the list the list wraps accordingly. Details about particular system errors are displayed if the 'ENTER' key is pressed when that system error title is displayed. Upon entry to the error detail display an aggregate total of the number of occurrences of this type of error is displayed.

For example, if the most recent error is a motor error then the aggregate corresponding to this occurrence of that error type will increment every time the error is logged. Following the aggregate display shall be a list of details pertaining to the error at the time it occurred. System error details will scroll automatically every 3 seconds or can be scrolled by using any of the arrow keys. Upon scrolling past the end of the detail list the list wraps accordingly. Pressing the Clear key while displaying error details returns to the system error list. Pressing the Clear key while viewing the system error list exits this utility.

The following table lists the possible system error information and corresponding error details displayable by this utility.

COMMUNICATION SYSTEM ERROR

System Error Information	System Error Details
No Communication	Module name: total hours and total miles
Communication Timeout	Module name: total hours; total miles;number of incline; motor controller and EEPROM controller timeouts;number of communication port overruns, noise corruption and frame errors; user data weight if entered; present speed; voltage from MC; wattage from MC; temperature from MC; speed comp value from MC;

LIFT SYSTEM ERRORS

System Error Information	System Error Details
No AC Power	Total hours; total miles; total lift minutes
Home Switch	Total hours; total miles; total lift minutes
Negative Home Switch	Total hours; total miles; total lift minutes
Lift Timeout	Total hours; total miles; total lift minutes

FRAME TAG SYSTEM ERRORS

System Error Information	System Error Details
EEPROM Write	Total hours; total miles; local RAM pointer; EEPROM frame; write offset; & next state
EEPROM Read	Total hours; total miles;

MOTOR CONTROLLER SYSTEM ERRORS

System Error Information	System Error Details
Cannot Attain Speed	Total hours; total miles; local RAM pointer; EEPROM frame; write offset; & next state
Controller Dynamic Current Trip	Total hours; total miles;
Controller Temperature Trip	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC
Controller Fault1 Trip	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC
Controller Voltage Trip	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC
Controller Drive Low Voltage Trip	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC
Controller Low Voltage Trip	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC
Controller Speed Feedback Error	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC; temperature from MC; target speed
Controller Startup Error	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC
Controller Reset	Total hours; total belt miles; number of resets from MC
Controller EEPROM Error	• Total hours; total belt miles; number of EEPROM errors from MC • Total hours; total belt miles; number of SCI checksum errors from MC
Controller SCI Checksum Error	Total hours; total belt miles;number of SCI overruns; number of SCI noise errors; number of SCI frame errors; checksum errors from MC; user weight if entered; actual speed; voltage from MC; wattage from MC; temperature from MC
Controller Unexpected Disable Error	Total hours; total belt hours; total belt miles; user weight if entered; target speed; actual speed; incline target; voltage from MC; wattage from MC

Maintenance Information

This utility displays an aggregate total number of repairs logged as well as the total number of repairs logged by category.

Navigation through the repair log is possible from most recent to the oldest repair only using either of the Up/Down Arrow keys on the main keypad.
Navigation past the oldest repair starts the display with the most recent repair entry.
Information regarding the type of repair (category), date of repair (if real-time clock available) and sequence number identifying the relative order of the repair (i.e. 1 (first repair), 2 (second repair),…, N (most recent nth repair)) is displayed.

Belt/Deck Information

This utility displays information for the current Belt/Deck (i.e. since the last Belt/Deck was replaced).

This diagnostic state allows club owner to check if any notifications exist ("Please Check Belt/Deck for Signs of Excessive Wear") and also how many events occurred (Mileage bases notifications or slowdown ("UNABLE TO ATTAIN TARGET SPEED") based notifications). Using the arrow keys allows club owner can view notifications and/or events for the following:

- Total Hours – Total accumulated hours the product has been "On".
- Total Miles – Total accumulated miles tracked while the belt is running.
- Belt Hours – Total accumulated hours tracked while the belt is running.
- Belt Miles – Total accumulated miles tracked while the belt is running since last belt replacement logged.

Events Navigation through the Belt/Deck information entries are possible using either of the Up/Down Arrow keys on the main keypad.
Navigation beyond the end/beginning of the list cycles to the beginning/end of the list respectively.

Maintenance

The Maintenance menu has the structure as depicted below:

Treadmill Maintenance Flowchart

Replacing Belt and Deck

Manually logs the fact that the Belt and Deck have been replaced and causes the proactive Belt Wear Notification feature to be reset.

Replacing Console

Manually logs the fact that the Console has been replaced.

Replacing Overlay

Manually logs the fact that the Overlay Bezel has been replaced.

Replacing Motor Controller

Manually logs the fact that the Motor Controller has been replaced.

Replacing Stop Switch

Manually logs the fact that the Stop Switch has been replaced.

Replacing Drive Motor

Manually logs the fact that the Main (belt drive) motor has been replaced.

Replacing Lift Motor

Manually logs the fact that the Lift Motor has been replaced.

Configuration

The Configuration menu has the structure as depicted below:

Treadmill
CONFIGURATION MENU STATE FLOWCHART

Manufacturer's Configuration

Access to Manufacturer's Configuration is provided on the as-needed basis.

Manager's Configuration

The Manager's menu has the structure as depicted below:

```
                    ( Managers Menu     )
                    ( (Optional Settings) )
                             |
        ┌────────────────────┴──────────────────────┐
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ User Language    │                      │ Acceleration     │
 │ Select           │                      │ Rate Set         │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Max Workout      │                      │ Deceleration     │
 │ Duration         │                      │ Rate Set         │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ English/Metric   │                      │ Erase Custom     │
 │ Units            │                      │ Workouts         │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Custom Workout   │                      │ Maximum Incline  │
 │ Entry            │                      │ Set              │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Telemery On/Off  │                      │ Start message    │
 │                  │                      │ Setup            │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Stride Sensor    │                      │ Quick Start Via  │
 │ On/Off           │                      │ Numeric Keys     │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Maximum Speed    │                      │ Fit Test Plus    │
 │ Set              │                      │ On/Off           │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Minimum Speed    │                      │ System Beeps     │
 │ Set              │                      │ On/Off           │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Pause Timeout    │                      │ Language Select  │
 │                  │                      │ On/Off           │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Watts Display    │                      │ Marathon Mode    │
 │ On/Off           │                      │ On/Off           │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ METs Display     │                      │ AZ 3-Speed Keys  │
 │ On/Off           │                      │ On/Off           │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Pace Display     │                      │ Belt Notification│
 │ On/Off           │                      │ Light On/Off     │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Cal/hr Display   │                      │ iPod Video       │
 │ On/Off           │                      │ Enable/Disable   │
 └──────────────────┘                      └──────────────────┘
        |                                            |
 ┌──────────────────┐                      ┌──────────────────┐
 │ Distance Climbed │                      │ AUX Source       │
 │ Display On/Off   │                      │ Enable/Disable   │
 └──────────────────┘                      └──────────────────┘
        |                                            |
        └────────────────────┐             ┌──────────────────┐
                                            │ TV GAIN          │
                                            └──────────────────┘
```

User Language Select

This utility display the currently selected Default User Language setting and allows for the selection of a new Default User Language setting to be used for all user messages and all Service Menu messages.

The Incline and Speed Up/Down Arrow keys scroll forward/backward respectively through the list of languages. Scrolling past the last or the first language in the list wraps accordingly. Pressing the Enter key saves the presently selected default language.

Pressing the Clear or Enter keys saves the currently entered/ displayed configuration setting and exit this utility.

Max Workout Duration

This utility displays and allows the setting of a maximum workout duration time ranging from one (1) to 99 minutes.

The default value is 60 minutes. This is used as the time limit for all workout programs except Marathon Mode.

The Incline and Speed Up/Down Arrow keys on the Treadmill products adjust the currently displayed setting by 1 minute Up/Down respectively.

Pressing the Clear or Enter keys saves the currently entered/ displayed configuration setting and exit this utility.

English/Metric Units

This utility displays the current units setting and allows for the selection of a new units setting of either Metric or English units used for workout program data entry and information display.

Note: for treadmill products changes in this state affect weight entry message, speed entry message, distance display and mi/km indicator LED being lit up appropriately.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle the units selection.

Pressing the Clear or Enter keys saves the currently selected/displayed configuration setting and exit this utility.

Custom Workout Entry

This utility allows the creation or modification of up to 6 custom personal trainer workout programs.

Upon entry to this utility a custom workout program number must be selected either via the Up/Down Arrow keys or entered directly via the Numeric keypad and pressing Enter. This number will identify the workout to be created or modified. If a workout already exists for the number entered an option to overwrite it is presented. From this point forward the steps for creating a new workout or overwriting an existing workout are the same. Creating a workout includes selecting the workout duration, either by using the Up/Down Arrow keys to increase/decrease the program time (in minutes), or by the Numeric keypad for direct entry of a time value (in minutes). The maximum time value that can be entered cannot exceed the maximum workout duration set in Managers Configuration.

Following entry of the Program time is the selection of the interval type. Two interval types are supported; Speed/Incline and Heart Rate. Interval types are selectable using the Up/Down Arrow to toggle the display between the two selections. Pressing Enter accepts the currently displayed interval type. For either interval type, the number of intervals shall be fixed at 30.

For a Speed/Incline interval selection, each of the 30 intervals are identified in the message center by the program time at which the interval starts. The duration of each Interval is computed from the program time entered divided by the total number of intervals (i.e. 30). A speed and incline are displayed in the message center and programmed using the speed Up/Down and/or Incline Up/Down Arrow keys respectively. The max/min allowable values for speed and incline are in accordance with the manager/manufacturer configuration settings currently in effect. Pressing Enter after programming an interval advances to the next interval. To facilitate quicker programming of the speed and incline values the entries from the previous interval becomes the default entry for the next interval to be programmed. The workout setup is complete once all 30 intervals have been programmed.

For a Heart Rate interval selection, each of the 30 intervals are identified in the message center by the interval number (1 to 30). A target heart rate percentage for each interval shall be displayed in the message center and programmed using the arrow keys to increase/decrease the value by 1% respectively. The range of values allowed is from 50 to 90%. Pressing Enter after programming an interval advances to the next interval. To facilitate quicker programming of the heart rate values the percentage entry from the previous interval becomes the default entry for the next interval to be programmed. The workout setup is complete once all 30 intervals have been programmed.

When a particular custom program is completed an option to begin programming the next numerical custom program is provided. After finishing programming of custom workout 6, custom workout 1 is prompted next.

Telemtry On/Off

This utility displays the current Telemetry setting and allows for the selection of a new Telemetry setting (On/Off).

The Telemetry feature enables use of the Polar receiver when reading heart rate values.

If enabled, and a telemetry signal is present, the corresponding computed heart rate will be displayed in the Message Center. The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Stride Sensor On/Off

This utility displays the current Stride Sensor setting and allow for the selection of a new Stride Sensor setting (on/off).

The Stride Sensor feature enables control of the treadmill during a workout such that if a user steps off the belt the treadmill will automatically enter the Pause Mode Workout State.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key shall save the presently selected configuration. Pressing the Clear key shall exit this utility and saves the presently selected configuration as well.

Maximum Speed Select

This utility displays the currently set maximum speed value and allows for the configuration of a new maximum speed value.

The maximum speed establishes the maximum speed selected/entered by the user during workout programming (Fitness Network State) and workout execution (Workout State). The range is between the currently selected minimum and the system maximum values.

The Incline and Speed Up/Down Arrow keys adjust the currently displayed setting by 0.1 units.

Pressing the Enter key shall save the presently selected value. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Minimum Speed Select

This utility displays the currently set minimum speed value and allows for the configuration of a new minimum speed value.

The minimum speed establishes the minimum speed selected/entered by the user during workout programming (Fitness Network State) and workout execution (Workout State).The range is between the system minimum and an upper limit of 2.0 kph (1.2 mph).

The Incline and Speed Up/Down Arrow keys adjust the currently displayed setting by 0.1 units.

Pressing the Enter key shall save the presently selected value. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Pause Timeout

This utility displays the current setting of the Pause Timeout duration and allows for the configuration of a new Pause Timeout duration.

The Pause Timeout duration controls the length of time the unit may stay in Pause Mode before exiting the Workout State. The range is between one (1) and 99 minutes.

The Incline and Speed Up/Down Arrow keys on the Treadmill products adjust the currently displayed setting by 1 minute Up/Down respectively.

Pressing Clear or Enter keys saves the currently entered/displayed value and exit this utility.

Watts Display On/Off

This utility displays the current Watts display setting and allows for the selection of a new Watts display setting (on/off).

The Watts enable setting controls the display of the "WATTS = XXX" message during a workout.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle between the On and Off settings.

Pressing Clear or Enter keys saves the currently selected/displayed setting and exit this utility.

METs Display On/Off

This utility displays the current METs display setting and allows for the selection of a new METs display setting (on/off).

The METs enable setting controls the display of the "METS = XX.X" message during a workout.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle between the On and Off settings.

Pressing Clear or Enter keys saves the currently selected/displayed setting and exit this utility.

Pace Display On/Off

This utility displays the current Pace Display setting and allows for the selection of a new Pace Display setting (on/off).

The Pace Display controls whether pace information is displayed in the message center during a workout when the user's speed is changed.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key shall exit this utility and saves the presently selected configuration as well.

Cal/hr Display On/Off

This utility displays the current Cal/Hr display setting and allows for the selection of a new Cal/Hr display setting (on/off).

The Cal/Hr setting controls the display of the "CAL/HR = XXXX" message during a workout.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle between the On and Off settings.

Pressing Clear or Enter keys save the currently displayed setting and exit this utility.

Distance Climbed Display On/Off

This utility displays the current Distance Climbed Display setting and allows for the selection of a new Distance Climbed Display setting (on/off).

The Distance Climbed Display setting controls whether or not a tally of the total distance climbed is displayed periodically in the message center during a workout.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Acceleration Rate Set

This utility displays the current setting of the Acceleration Rate and allows for the configuration of a new Acceleration Rate setting.

The Acceleration Rate controls the acceleration response of the Motor Controller when speed increases are made. The range shall be between one 1 and 5 representing fixed values of acceleration as follows:

Setting	Acceleration Response
1	0.11 MPH/Sec
2	0.16 MPH/Sec
3	0.21 MPH/Sec(Default setting)
4	0.27 MPH/Sec
5	0.32 MPH/Sec

The Incline and Speed Up/Down Arrow keys adjust the currently displayed setting by 1 Up or Down respectively.

Pressing Enter shall save the currently selected/displayed value. Pressing Clear exits this utility and saves the presently selected configuration as well.

Deceleration Rate Set

This utility displays the current setting of the Deceleration Rate and allows for the configuration of a new Deceleration Rate setting.

The Deceleration Rate shall control the deceleration response of the Motor Controller when speed decreases are made. The range is between one 1 and 5 representing fixed values of deceleration as follows:

Setting	Deceleration Response
1	0.21 MPH/Sec
2	0.27 MPH/Sec
3	0.32 MPH/Sec(Default setting)
4	0.37 MPH/Sec
5	0.48 MPH/Sec

The Incline and Speed Up/Down Arrow keys adjust the currently displayed setting by 1 Up or Down respectively.

Pressing Enter saves the currently selected/displayed value. Pressing Clear exits this utility and saves the presently selected configuration as well.

Erase Custom Workouts

This utility erases ALL 6 custom workout programs.

Pressing Enter initiate the erase process.

The utility exits upon completion. Pressing Clear exits this utility and will not clear the workouts.

Maximum Incline Set

This utility displays the currently set maximum incline value and allows for the configuration of a new maximum incline value.

The maximum incline establishes the maximum incline selected/entered by the user during workout programming (Fitness Network State) and workout execution (Workout State). The range shall be between the system minimum and maximum values.

The Incline and Speed Up/Down Arrow keys adjust the currently displayed setting by 0.1 units.

Pressing the Enter key shall save the presently selected value. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Start Message Setup

This utility displays the current Start Message text string and allow the Start Message text string to be changed.

The Start Message text string is displayed before the default message in the Attract / Program Select State.

The Up/Down Incline keys advance the current character position within the currently displayed message text string and that position shall blink indicating it is selected. The Up/Down Speed keys advance through the set of supported characters at the currently selected character position.

A maximum text string of 52 characters is permitted and supports the set of letters A through Z, numbers 0 through 9, and nine (9) font specific characters roughly representing an underscore, equal sign, forward slash, minus sign, plus sign, apostrophe, upper star, lower star and blank.

Pressing the Cooldown key shall clear the start message text string and disable the message display feature.

Quick Start Via Numeric Keys

This utility displays the current Quick Start via Numeric Keys setting and allows for the selection of a new Quick Start via Numeric Keys setting (On/Off).

This setting, when enabled using the On setting, controls whether the user can start a Quick Start program by simply entering a desired workout speed via the Numeric keypad keys.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Fit Test Plus On/Off

This utility displays the current Fit Test Plus setting and allows for the selection of a new Fit Test Plus setting (On/Off).

The Fit Test Plus On/Off setting controls whether the user can access the additional Fit Test programs (e.g. WFI Submax Protocol, Navy PRT, Army PFT, Marine PFT, Air Force PRT, and PEB – Physical Efficiency Battery).

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings. Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

System Beeps On/Off

This utility displays the current System Beeps setting and allows for the selection of a new System Beeps setting (on/off).

The System Beeps setting controls whether the system speaker beep is generated on key presses.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Language Select On/Off

This utility displays the current User Language Option setting and allows for the selection of a new User Language Option setting.

The User Language Option setting controls whether the user must choose, before each workout, the language to be used in the workout.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle between the Enable and Disable settings.

Pressing Clear or Enter keys save the currently displayed setting and exit this utility.

Marathon Mode On/Off

This utility displays the current Marathon Mode setting and allows for the selection of a new Marathon Mode setting (on/off).

The Marathon Mode setting controls whether a user can activate the Marathon Mode option during workout programming.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

AZ 3-Speed Keys On/Off

This utility displays the current AZ 3-Speed Keys setting and allows for the selection of a new AZ 3-Speed Keys setting (on/off).

If enabled, this option allows the use of the Activity Zone Walk/Jog/Run keys for quick program start or simple speed select. If disabled, this option enable the display of a message indicating the feature has been disabled when ACTIVITY ZONE buttons are pressed.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

Belt Notification Light On/Off

This utility displays the current Belt Notification Light setting and allows for the selection of a new Belt Notification Light setting (on/off).

If enabled this option will allow the display of an alert LED located in the Workout Profile Matrix if a belt notification exists.

The Incline and Speed Up/Down Arrow keys toggle between the On and Off settings.

Pressing the Enter key saves the presently selected configuration. Pressing the Clear key exits this utility and saves the presently selected configuration as well.

iPod Video Enable/Disable

This utility displays the current iPod Video Enable/Disable setting and allows for the selection of a new iPod Video Enable/Disable setting (On/Off).

This feature allows control over allowing iPod video tracks to be played on the Attachable TV, if present. If enabled by selecting the On setting, and an iPod video track is selected, the video is routed to the TV. Otherwise, the video is not.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle between the On and Off settings.

Pressing the Clear or Enter keys saves the currently selected/displayed configuration setting and exit this utility.

AUX Source Enable/Disable

This utility displays the current AUX Source Enable/Disable setting and allows for the selection of a new AUX Source Enable/Disable setting (On/Off).

This feature allows control over whether or not an optional CSAFE Compatible audio device attached to the CSAFE connector is selectable as an audio source with the Source Select key. If enabled by selecting the On setting, and the AUX audio input source is selected, the audio from that external device is routed to the console headphones. Otherwise, the AUX audio input source is skipped and not displayed in the source selections.

The Incline and Speed Up/Down Arrow keys on the Treadmill products toggle between the On and Off settings.

Pressing the Clear or Enter keys saves the currently selected/displayed configuration setting and exit this utility.

TV Gain

This utility displays the current setting of the TV Gain value and allows for the configuration of a new TV Gain value.

The TV Gain value shall control the dynamic range of the TV volume settings allowing quieter TV outputs to be amplified or stronger TV signals to be attenuated. The range of settings is between 0 and 7.

The Incline and Speed Up/Down Arrow keys on the Treadmill products adjust the currently displayed setting by 1 increment Up/Down respectively.

Pressing Clear or Enter keys saves the currently entered/displayed value and exit this utility.

Integrity Treadmill Error and Information Messages

Upon a power-up of a treadmill, the following beeps might be produced:

Beep/Burp Type	Error Type	Notes
error message + three (3) beeps	Fatal System Error	Can be seen and heard during a normal start.
error message + one (1) beep	Transient System Error	Can be seen and heard during a normal start.
four (4) burps	The board is in a LifePulse diagnostic mode	Can be heard during a normal start. Reason for the burps: LifePulse diagnostics debug via CSAFE ports enabled. If the LifePulse diagnostics debug via CSAFE port is enabled, then it will be impossible to use any other equipment that utilizes serial communication on the CSAFE ports. Examples of adversely affected functionality include: * Life Fitness reprogramming application * Fitlinxx networking * data suck application
three (3) burps	The board was places in a test mode	Can be heard when the board is booted up with the automated tester connected to it.
two (2) burps	Unable to write to the local EEPROM	Can be heard when the board booted up with an error that needed to be logged, but the write operation of the error message failed.
one (1) beep	Normal bootup mode	Can be heard when the board boots up normally (no special test modes enabled and no error conditions detected)

The following message lists out the error and information messages that can be seen on the console.

Messages in **BOLD** type are the shortened messages as shown in the System Error logs. Text in brackets "[" and "]" indicates the software "#defines" associated with the error message – the messages in the brackets and any additional notes are for the Field Engineering's internal use.

MESSAGE	DESCRIPTION	POSSIBLE CAUSE	REMEDY
"." (decimal point in message center)	Console is boot mode (see section 3.5.13 in software spec).	Software update was interrupted via a power failure or bad connection with the CSAFE port and/or PC update application.	Re-flash/update the console software
"MC IN BOOT MODE"	Motor Controller checksum error detected.	Software update was interrupted via a power failure or bad connection with the CSAFE port and/or PC update application.	Re-flash/update the motor controller software
"System Initializing"	This indicates a cold reset (i.e. power up due to power cycle or COP reset). After each workout a warm-reset is done (reset without this		

	message being shown = skips cold reset routines).		
"MESSAGES IN BOOT"	Messages/strings image is flagged as being in its boot loader mode.	Previous programming was not successful	Try to re-program messages/strings memory using PC update application (i.e. CCD Bitmap Memory button)
"NO MESSAGES"	Console can't retrieve valid part # from messages/strings serial EEPROM memory	Serial EEPROM memory on console is empty or corrupted	Try to re-program messages/strings memory using PC update application (i.e. CCD Bitmap Memory button)
"UPDATE MESSAGES"	Console has determined that the messages/strings memory contains an older/incompatible image.	Mandatory strings update wasn't completed	Try to re-program messages/strings memory using PC update application (i.e. CCD Bitmap Memory button)
"BOOT CHECKSUM XXXX"	Console failed to pass its boot loader checksum test where XXXX = numeric checksum value	Console flash memory corrupted or console flashed with development (non-released) software.	BDM console memory with release software or replace console PCB.
"INTERNAL RAM ERROR"	Console failed to pass a cold reset RAM test.	Console RAM corrupted.	Replace console PCB.
"NOTIFY MAINTENANCE MOTOR CONTROLLER COMM BAD" or "**NO COMM**"	Console is unable to communicate with the motor controller module.	Power up Comm test to base failed or lost comm. with base.	Check/replace cabling down to the m/c.
"SYSTEM COMM TWO WIRE"	Console loopback comm. test detected 2-wire comm. instead of single wire comm.	Most likely: JW3 missing DSP M/C.	Install JW3.
"NOTIFY MAINTENANCE MAX TEMPERATURE TRIP" or "**TEMP ERR**"	Motor controller shut down due to excessive temperature	M/C compartment airflow restricted, hot air is being blown on it, located in direct sunlight. Excessively worn belt/deck.	Clean the m/c compartment, insure adequate ventilation is available and it is not being heated by a heating register, move from direct sunlight. Replace belt/deck if power level is excessive.
"WARNING - STEP OFF BELT, NOTIFY MAINTENANCE, MAXIMUM VOLTAGE TRIP" or "**HI-V ERR**" [CONTROLLER_VOLTAGE_TRIP]	Excessive belt motor bus voltage detected	User is driving the belt with sufficient energy to raise the bus voltage most likely at high inclines. Input line has voltage surge problems.	Instruct the user to not drive the belt at high inclines or use a lower incline. Contact an electrician to diagnose/correct a power line problem.
"NOTIFY MAINTENANCE OVERLOAD TRIP" or "**MAX AMP**" [CONTROLLER_FAULT_1_TRIP]	Excessive motor current detected	Excessive motor current caused by a failed motor, intermittent motor or motor connection(s). A possible but unlikely cause would be a severely worn belt/deck.	Verify that all motor connections and cables are solid. If start-up power is very weak a phase may be faulty. Perform a Phase Test to verify the system or diagnose a phase problem.
"LOW VOLTAGE DETECTED" or "**LOW-V ERR**" [CONTROLLER_LOW_VOLTAGE_SHUTDOWN]	Non-Fatal error Line voltage dropped to an insufficient level to sustain proper operation	Line cord is not securely plugged into the wall or machine. Loose/intermittent receptacle wiring. Machine is not plugged into a proper dedicated line. Incoming voltage is fluctuating dipping to an insufficient level. One can reproduce this issue by: (1) unplugging the motor thermal connector (2 pin) from the m/c. Then connect up two wires and	Check that the cord is solidly plugged into the wall receptacle and also into the machine. Contact an electrician to diagnose/correct a power line problem.

<table>
<tr><td></td><td></td><td>power up tread. If you quickly touched the wires together you could get the m/c to generate a "Low Voltage Detected" error message because m/c start its low v check and it would fail because caps never got a chance to charge.

(2) Use freeze spray to cool down X1 (i.e. inline current limiting Varistor). On power up it limits the charging of the caps to such a degree that you will generate the "Low Voltage Detected" error.

If either of these conditions occur during power up then you must cycle power.

It is a non-resettable error (it's listed in the console code as a non-fatal but this is only try after power up). Unit must be power cycled to get past this error. Power cycling a few times will warm up the Varistor enough to get past this error. Emil considering lengthening his time-out time when doing this check – which is called a shorted bus error check. Time is 150mSec and Emil considering going to 200mSec.</td><td></td></tr>
<tr><td>"NOTIFY MAINTENANCE MOTOR STARTUP ERROR" or "**START ERR**"

[CONTROLLER_STARTUP_ERROR]</td><td>Non-Fatal error

No/low motor current is detected at start-up.</td><td>Motor unplugged or connector loose.

A possible but unlikely cause would be the user driving the belt at startup.</td><td>Verify that the motor connections are solid. Perform a Phase Test to verify the system or diagnose a phase problem.</td></tr>
<tr><td>"NOTIFY MAINTENANCE LEVEL SWITCH ERROR or NEGATIVE SWITCH ERROR" or "NOTIFY MAINTENANCE LIFT TIMEOUT ERROR" or "**LIFT HOME**" or "**LIFT NEG**" or "**LIFT TIME**"</td><td>Indicates the incline system has a problem but system can still be used. Occurs if DSP reports a lift home switch error or negative switch error (on 97Ti units)</td><td>Improper home or decline switch operation / adjustment / cable. Incline motor connection unplugged / loose.

A possible but unlikely cause would be incline motor overheating from excessive operation.</td><td>Verify that all motor and switch connections and cables are solid.

Verify incline switch operation using diagnostic switch LEDS (LED 9&10). Verify incline motor activation using diagnostic LEDS (LED 4&5).

Readjust or replace switches/cables.</td></tr>
<tr><td>"NOTIFY MAINTENANCE MOTOR CONTROLLER ERROR"</td><td>If seen after an initially successful power up or during a workout it can mean any of the following error conditions:

"NOTIFY MAINTENANCE MAX TEMPERATURE TRIP"

"WARNING - STEP OFF BELT, NOTIFY MAINTENANCE, MAXIMUM VOLTAGE TRIP"</td><td>Determine what individual error condition produced error by reviewing System Error logs in Diagnostics and then see individual error condition in this document</td><td>See possible causes column</td></tr>
</table>

	"NOTIFY MAINTENANCE OVERLOAD TRIP" "LOW VOLTAGE DETECTED" "MOTR-TEMP"		
"Unable to Attain Target Speed" or "**SPEED ERR**"	Reported if the motor controller was unable to attain the desired user's speed after a given amount of time. 📘 When user sees this message the belt speed will decrease automatically. If user is already at minimum speed (i.e. 0.5 mph) then workout will enter Pause mode. Else is speed is more 1 MPH/KPH below target speed then speed is reduced by ½. If speed is closer to target when an "Unattained…" even occurs then speed is decremented between 0.1 to 0.3 MPH/KPH.	Line voltage low, Unit overloaded; too much weight for speed requested. Worn Belt and/or Deck.	Check Belt & Deck for signs of excessive wear and fix accordingly.
"**MOTR-TEMP**"	Motor shut down due to excessive temperature	Faulty/intermittent thermal switch in motor. M/C compartment airflow restricted, hot air is being blown on it, located in direct sunlight. Excessively worn belt/deck.	Check motor thermal switch connections. Check Clean the m/c compartment, insure adequate ventilation is available and it is not being heated by a heating register, move from direct sunlight. Replace belt/deck if power level is excessive. Replace motor if error keeps occurring after motor has had a change to cool down and no other solution worked.
"MOTOR DISABLED" or "**MC-DISABL**"	Non-Fatal error The m/c has detected an open stop switch when operating that the console has not detected.	An intermittent console/motor controller cable or emergency stop switch.	Check that all connections are solid, all wires are properly seated into the connector and that the cable is not pinched and being shorted/open. Verify proper operation of the emergency stop switch.
"INCLINE INOPERATIVE - CONTINUE IF DESIRED"	Indicates the incline system has a problem but system can still be used. Occurs	Improper home or decline switch operation / adjustment / cable.	Verify that all motor and switch connections and cables are solid.

or "INCLINE INOPERATIVE TEST TERMINATED"	if DSP reports a lift home switch error or timeout error	Incline motor connection unplugged / loose. A possible but unlikely cause would be incline motor overheating from excessive operation.	Verify incline switch operation using diagnostic switch LEDS (LED 9&10). Verify incline motor activation using diagnostic LEDS (LED 4&5). Readjust or replace switches/cables.
"EMERGENCY STOP DRIVE TRIP" or "**ESTP-TRIP**"	Console's EStop drive circuitry detects a shorted condition	Tether / magnet loose or not installed; Poly-resettable fuse (PTC2) or Q5 on MIB are open; Over current condition on Emergency Stop Relay on motor controller.	Verify tether / magnet are properly replaced / installed. Replace Console. Replace Motor Controller.
"**VCAR-TRIP**"	Console voltage drive circuitry to CSAFE port detected a shorted condition	Faulty accessory plugged into the CSAFE port.	Remove CSAFE accessory.
"COMMUNICATION TIMEOUT" or "**COMM TIME**"	Lost communications with the motor controller (i.e. Module Communication Timeout)	Broken comm. lines, JW3 installed on DSP M/C	Remove JW3. Check/replace cabling down to the m/c. Vibration is causing intermittent operation from loose connection.
"Please Replace Emergency Stop Switch"	Emergency Stop (Tether) is replaced, but console still gives this message.	Tether / magnet loose or not installed; Poly-resettable fuse (PTC2) or Q5 on MIB are open; Over current condition on Emergency Stop Relay on motor controller.	Verify tether / magnet are properly replaced / installed. Replace MIB. Replace Motor Controller.

Glossary

The following terms are commonly used in this manual.

Term	Explanation
AC or ac	Alternating Current -- used generically it refers to the current delivered by the power utility to homes and businesses (for example 120Vac). For more information click on this link[1].
Anti-Scuff Pads	Rubber strips located on the surface of each side of the frame, and used to ensure proper footing.
Deck	A laminated particle board that is used for the running surface.
Display Console Board	Electronic board used for making direct input settings and monitoring output messages, which are displayed in the digital readout display.
DSP	Digital Signal Processor -- a highly optimized microprocessor capable of very fast mathematical operations. For more information click on this link[2].
DSP Motor Controller	A motor controller equipped with a DSP microprocessor that allows for control of the drive motor without an external speed sensor. This motor controller allows to control the incline and decline operations as well.
EEPROM	Electrically Erasable Programmable Read Only Memory -- such memory chip, when installed in the console is used to store user's and managers settings; if installed in the motor controller it is used to store some or all of the following: 1. Configuration settings, 2. Accumulated statistics, 3. Product serial number, 4. Main Motor Info, 5. Incline usage statistics, 6. Maintenance logs, 7. Belt Wear logs. For more information click on this link[3].
Front Roller	Driven by the main drive belt (see explanation below), the front roller drives the striding belt.
Heart Rate Sensor / HR Sensor / LifePulse Sensor	A stainless steel sensor, located in each handle grip and measures heart rate by virtue of a user completing the electrical circuit.
Idler Pulley Assembly	A spring-loaded bracket assembly pulley which is used to maintain constant load against the main drive belt (see explanation below).
Jumper	A short length of conductor used to close a break in or bypass part of an electrical circuit. Used to set up circuit boards for specific functionality. An example of such setup is a jumper used on the DSP motor controller that sets up the output voltage for the console. For more information click on this link[4].
LED	Light Emitting Diode -- arranged in suitable blocks and arrays LEDs provide display functionality. For more information click on this link[5].
Levelers	Adjustable supports under the rear of the treadmill, which are used to stabilize the unit.
Lift Motor	A motor that raises and lowers the unit for incline and decline operations.
LifePulse	Life Fitness' proprietary hardware and software system designed to measure user's heart rate by making electrical contact at user's palms. Part of the system are LifePulse Sensors defined above.
LifeSprings	Composite material springs installed under the deck and designed to absorb foot impact while walking or running.
Main Drive Belt	A belt used for coupling of the front roller's pulley with the motor drive pulley for the purpose of transmitting the mechanical energy from the motor to the front roller.
Overlay Bezel	A plastic covering applied over the display console with printed graphics and suitable clear-plastic (transparent) windows.
PCB	Printed Circuit Board -- a board containing electronic components designed and assembled for a specific purpose (for example a motor controller, or a console). For more information click on this link[6].
Polar Receiver	A telemetry heart rate receiver designed by the Polar company.
Rear Roller	A free spinning roller with adjusting screws at each end of the roller used for tensioning and centering of the striding belt.
Rear Roller Guards	Located at the back of each side of the rear roller, are used as protective guards.

RPM	Revolutions Per Minute -- a unit of measure of how fast and object spins around a fixed axis.
E-Stop Switch **or** **Emergency Stop Switch** **or** **ESS**	A switch used to stop the main drive motor rapidly. This is a safety device.
Striding Belt	Sometimes referred to as the 'walking belt' and used to walk or run on.
Telemetry	Technology that allows for remote measurement and reporting of information. In case of our products this term usually refers to the console's ability to receive user's telemetry heart rate measurements. For more information click on this link[7].
Telemetry Receiver	A sensor that reads Heart Rate signal from the operator's chest strap transmitter.
Walking Belt	See definition of a Striding Belt above.
Ties **or** **Zip Ties**	Plastic straps used to secure loose wiring to the main frame. For more information click on this link[8].

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