

Quick Start: Get on and Ride!

(Table of Contents Begins on Following Page)

STARTING UP: Begin pedaling. The display will start up in **WORKOUT SETUP**.

QUICK START into a manual workout by pressing .

SELECT A DIFFERENT WORKOUT by pressing the program keys. Press program keys more than once for more programs.

ACCEPT EACH SETTING AND MOVE TO THE NEXT ONE by pressing . Enter your personal data — weight, age, and sex — for best results.

BEGIN YOUR WORKOUT by pressing  at any time.

DURING YOUR WORKOUT: **ADJUST YOUR EXERCISE WORKLOAD** by using the  or  keys or the numeric keys.

VIEW DIFFERENT DISPLAY DATA by pressing the Change Display key  repeatedly.

CHANGE WORKOUTS on-the-fly by pressing other program keys, or by pressing the Workout Setup key  for a completely different workout.

SELECT DIFFERENT SPEEDOMETER DATA by pressing the Speedometer key .

PAUSING YOUR WORKOUT: The bike will retain your workout data for about 15 seconds after you stop pedaling.

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Introduction

In This Chapter:

Top Features

Fancy Features

Basic Features



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INTRODUCTION

Your new Z8.1 bike console, the Z-Console, is the most sophisticated exercise computer in the fitness industry. Even the simplest operation, Manual Control, works in a special and useful way. But the Z-Console is also extremely easy to use; the rider can ignore all the fancy stuff and use it with just one or two keystrokes.

TOP FEATURES: YOU'RE GOING TO LIKE THESE THE MOST

PDA-like Data Display: Clear and flexible display of workout data, and high-resolution progress graphics.

Smart Start: Intelligently picks useful workout settings — every workout, even an advanced one, is easy to set up.

Form-fill Data Entry: During workout setup, you see every piece of data at the same time, tabbing through the entry fields just like filling out an on-line form.

Always-available Workout Setup: Switch to this at any time in any workout. Adjust your current workout settings, or set up a whole new workout.

Thermometer Speedometer: Intuitive and entertaining graphic feedback of a user-selectable data readout, including speed, heart rate, calories per hour, watts, and METs.

Personal Power: Adjusts workload to compensate for different body weights, so the bike feels the same to each rider. Uses a new next-generation formula.

Fancy Features

INTRODUCTION

INTRODUCTION

Calorie Goal: Tell the bike how many calories you want to burn and how long you want to work out, and the bike figures out what workloads you need to maintain — including warmup and cool down.

Constant Heart Rate Control: The bike takes you to your target heart rate within five to eight minutes, then keeps you there.

Interval Heart Rate Control: Pick both a work target HR and a rest target HR, and the bike will take you back and forth between those two targets.

Fitness Test: An enhanced version of the YMCA protocol to estimate maximum oxygen uptake ($VO_2\text{max}$).

Bicycle Simulation: An accurate simulation of a 21-gear road bike, including precise pedal cadence-to-speed response and body weight compensation.

Advanced Custom Programming: Create up to three different program profiles, up to 60 segments long, using any of four different programming methods, including a Record mode.

Custom Intervals: Choose your own interval workload and duration.

HRC Ultra: Both continuous and interval heart rate control workouts, with gradually increasing target heart rates that replicate real-world maximum-intensity workouts.

**FANCY
FEATURES:
YOU'VE NEVER SEEN
THESE BEFORE**

Improved Maximum Heart Rate Estimates: Instead of the “220 - age” formula, the Z-Console uses a newer, more accurate formula created by exercise physiologists in 1994.

Medical and Ergometer Modes: Feature-restricted modes suitable for rehabilitation and informal testing environments, with user-selectable pedal rpm limiting.

Happy Workout: Exaggerated power input allows the bike to be demonstrated at world-class speeds without the tough workload.

Gender-compensated Workload Control: Uses ACSM-documented gender differences to allow men and women to compare workouts fairly.

ECG Waveform Display: Graphically display your actual heart rate signature, just for fun.

Long Pause: Optionally stop a workout, then return within an hour, and begin right where you left off.

Running Speed Equivalent: An optional way to report workout intensity that is more familiar to some users.

Easy Software Upgrades: Use the CSAFE port to upgrade your software.

Basic Features

INTRODUCTION

Three-mode Manual Control: MET-based, bicycle simulation, or 10-watt increments.

Four Pre-set Programs: Easy intervals, speed intervals, rolling hills, and one big hill.

CSAFE Network Communications: Full Level 3 compliance to work with CSAFE hosts.

CSAFE Audio Control: Volume and channel remote control of compatible systems.

CSAFE Power: Supply power to an external audio remote control.

Fully Configurable Setup Mode: Choose default operational mode, metric or U.S. units of measure, maximum workout time, default workout time, pause time, wireless or contact heart rate priority, sound on or off, and default manual workload control.

Multiple Odometers: Miles, hours, total starts, and program selection counters.

Test Mode: Monitor raw rpm, target vs. actual workload, LCD performance, and keypad function.

BASIC FEATURES:
FUNCTIONS YOU'D EXPECT TO GET



For your maximum safety and comfort, make sure you read Chapter 9, Important Safety Instructions.

FOR YOUR SAFETY



Riding Your Bike

In This Chapter:

Workout Program Basics

Heart Rate Monitoring

HRC Chest Strap Use

Contact Heart Rate Use

Getting the Most From HRC

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Getting Started on Your Bike

RIDING YOUR BIKE

SETTING YOUR WEIGHT

Set your weight before every workout. This allows the Z8.1 Bike to control your workout more effectively. See the *Personal Power* section in Chapter 4 for more information.

The body weight setting does not affect the calorie expenditure calculation. Unlike treadmills or other weight-bearing exercises, calories burned during exercise biking does not change with different body weights. (See *ACSM's Guidelines*, Bibliography.)

Variations in human exercise efficiency are a potential source of error when estimating calorie consumption, with differences of plus or minus 10% common in the population.

SEAT ADJUSTMENT



Adjust the seat so that your knee is slightly bent when your leg is fully extended with your feet in the pedals.



UPRIGHT BIKE SEAT ADJUSTMENT PROCEDURE

While standing next to the bike, pull out the seat adjust knob and lower the seat to the lowest position. Next, get onto the bike with one leg fully extended in a pedal, supporting most of your weight. Grasp the horn of the seat and pull it up under you to a snug fit, letting the ratcheting mechanism lock the knob and pin in place.



Heart Rate Monitoring

RIDING YOUR BIKE

Riders are most efficient if they place the ball of their foot in the center of the pedal.



FOOT POSITION



Other riders are more comfortable if the arch of their foot is against the pedal. Riders are encouraged to be as efficient as possible, but use your own judgement in the comfort/efficiency trade-off.

Most riders will find a comfort/efficiency sweet spot at a pedal cadence around 80 rpm. More serious riders desiring maximum performance typically pedal at around 100 rpm. For electromechanical and safety reasons, the bike will not provide the fully requested workload when your pedal cadence falls below 55 rpm. It will, however, accurately display the workload it does provide. For additional safety, cadence is workload-limited to 130 rpm.

PEDAL CADENCE

Breathe in a regular and relaxed manner. Many exercisers do not breathe enough, which reduces their exercise capacity and comfort. You might want to try breathing deeper and more frequently to see if it helps your exercise regime.

BREATHING

MONITORING YOUR HEART RATE

The Z8.1 Bike has two ways of monitoring your heart rate:

...By using a chest strap that transmits your heart rate to the bike via radio...



...or by using the metal contact heart rate pads on the handlebars.



Upright Upper HRC Pads



Upright Lower HRC Pads



Recumbent HRC Pads

Although your bike functions fine without using the heart rate monitoring feature, this kind of monitoring gives you valuable feedback on your effort level. Chest strap monitoring also allows you to use Heart Rate Control, which is the most advanced exercise control system available.

HRC Chest Strap Use

RIDING YOUR BIKE

When you wear a Polar or compatible transmitter strap, the bike will display your heart rate as a digital beats-per-minute (bpm) readout. This monitoring is very accurate, typically to within one beat per minute.

The transmitter strap should be worn directly against your skin, about one inch below the pectoral muscles/breast line (see picture below). Women should be careful to place the transmitter below their bra line.

RIDING YOUR BIKE



Some moisture is necessary between the strap and your skin. Sweat from your exercise works best, but ordinary tap water may be used prior to your workout if desired.

CHEST STRAP HEART RATE MONITORING

Examples of Heart Rates Found in Daily Life

*An average 30-year-old might have a resting heart rate, when sitting totally still for several minutes, of **65**. During hard exercise that can be sustained for 10 to 15 minutes it might be around **140** continuously. A maximum heart rate that requires maximal exercise for several minutes to attain is **185**.*

*A 30-year-old in good shape might have a resting heart rate near **55**, and might exercise for 20 minutes at a heart rate of **160**.*

*A world-class distance runner or professional cyclist might have a resting heart rate near **45**.*

CONTACT HEART RATE (CHR)

The contact heart rate system lets you monitor your heart rate without wearing a strap.

A Note on CHR Accuracy

CHR monitoring may be a bit less accurate than a chest strap, since the heart rate signals are much stronger at the chest.

The Z8.1 Bike uses the most advanced CHR system available. It converts your heart rate waveform to a digital signal, then analyzes the digitized waveform to pick out the electrocardiogram shape and thus the heart rate.

About 5% of the population cannot be picked up by any CHR system. This is because their heart is positioned in a more up-and-down manner in their chest, as opposed to leaning over to one side.

Gently grasp the contact heart rate pads as shown below.



When the system detects your hands, a heart will appear in the Heart Rate field of the data display and will flash in time with your heart beat. During this time, the system is analyzing and locking in your heart rate. Within about 10 seconds, your digital heart rate in beats per minute (bpm) should be displayed.

Getting the Most From CHR

RIDING YOUR BIKE

1. Exercise with smooth body motions. Avoid excessive body motion, especially in your arms and upper body.
2. Breathe smoothly and regularly, and avoid talking. (Talking will cause unrepresentative heart rate spikes of 5 to 10 bpm.)
3. Grip the pads lightly, not tightly.
4. Make sure your hands are clean, free of both dirt and hand lotions.

When using a Heart Rate Control (HRC) workout or the Fitness Test, it is best to use chest strap monitoring. These workouts work best with the extra accuracy gained from a chest-contact heart rate monitoring system.

FOR BEST RESULTS

A wall transformer external power option is available which gives the Z8.1 Bike some additional capabilities:

- The bike's display is always lit. This can make the bike more friendly and interesting to prospective riders.
- Test Mode diagnostics are easier to use (*see Chapter 16*).
- The bike's minimum workload is lower, which is required by the Medical and Ergometer modes (*see Chapter 12*) and recommended for the Fitness Test (*see Chapter 11*).

EXTERNAL POWER OPTION

The Display

In This Chapter:

Keypad Layout

What the Keys Do

Data Display Options

How to Read Your Display

Workout Setup Display

ECG Waveform Display

Understanding the ECG Signal

For Your Own Edification

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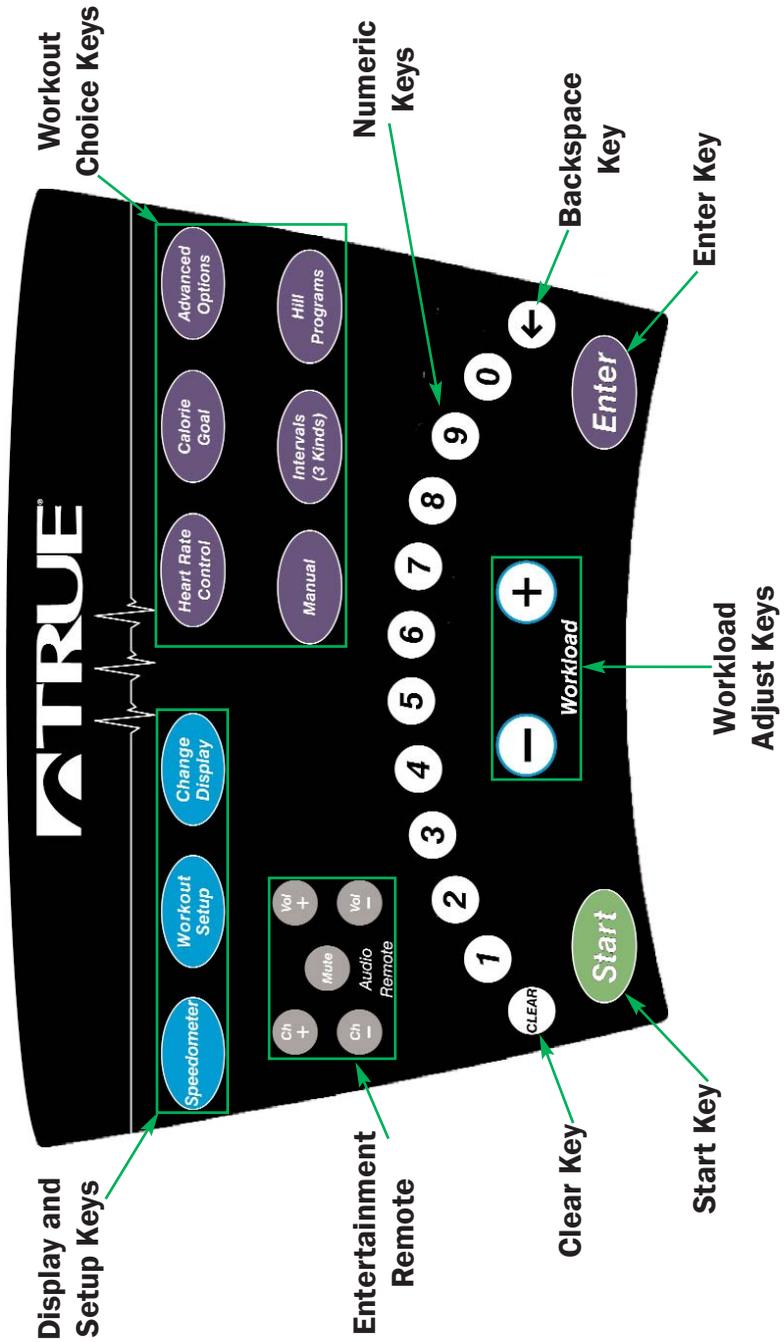
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What the Keys Do

THE DISPLAY

THE KEYS

 **Speedometer:** Changes data assigned to thermometer speedometer. Any non-accumulating data can be assigned.

 **Workout Setup:** Switches into Workout Setup mode. Workload is reduced and all data accumulation is paused while in Workout Setup.

 **Change Display:** Changes data display format.

 ,  **Workload:** Adjusts workload higher and lower. Keys repeat if held down.

 through  **Numeric Keys:** Used for data entry in Workout Setup. During a workout, used to change workload by entering a numeric value and pressing  .

 **Backspace:** Deletes your last data keystroke, just like your computer keyboard's backspace key.

 **Clear:** Zeros-out current data entry. Press and hold to completely clear and reset display.

 **Heart Rate Control:** Cycles through Constant, Interval, HRC Ultra, and HRC Ultra Interval. *See Chapter 8.*

 **Calorie Goal:** Selects the Calorie Goal workout. *See Chapter 9.*

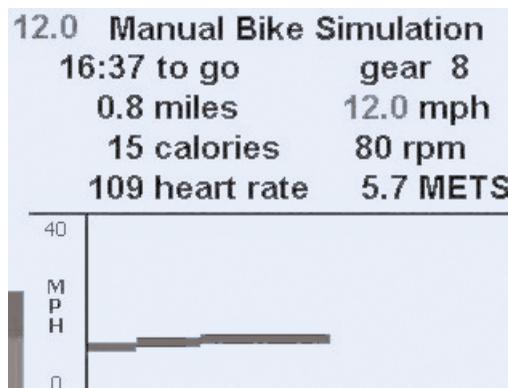
 **Intervals:** Cycles through Easy, Sport, and Custom. *See Chapter 7.*

 **Hill Programs:** Cycles through Rolling and One Big Hill. *See Chapter 7.*

 **Advanced Options:** Cycles through Custom Programs, and Fitness Test. Medical, Ergometer, and Happy modes are accessed through Setup Mode only. *See Chapters 10 and 11.*

     **Audio Remote:** If the console is connected to an entertainment controller via the CSAFE port (see *Chapter 13*), these keys can be used to change channels and adjust headphone volume.

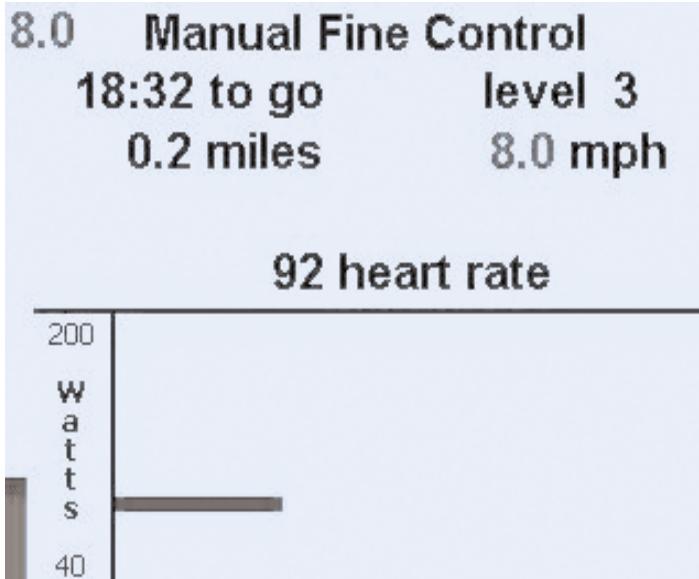
THE STANDARD DISPLAY SCREEN



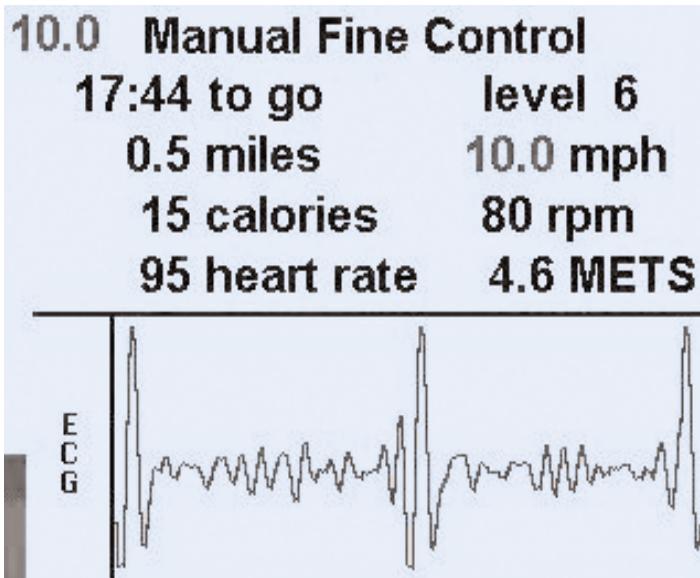
Data Display Options

THE DISPLAY

DATA DISPLAY



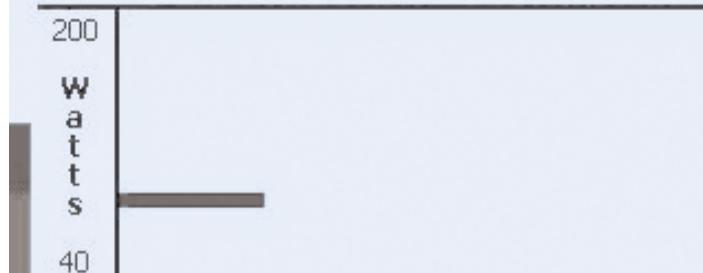
Easy



ECG

THE DISPLAY

12.0 Manual Fine Control
15:22 to go **level 3**
0.6 miles **12.0 mph**
4:38 elapsed **75 watts**
95 heart rate **4.6 METS**



Expert One

12.0 Manual Fine Control
15:22 to go **level 3**
0.6 miles **12.0 mph**
18:38 running eq. **74 watts**
95 heart rate **5.5 METS**



Expert Two

How to Read Your Display

THE DISPLAY

HOW TO READ YOUR DISPLAY

Speed: In any workout mode, the bike estimates how fast you would be traveling on an outdoor road bike, using your pedal power, cadence, and body weight to make this calculation. See *Chapter 4* for more details.

Gear: In Bike Mode, indicates which of 21 gears is selected.

Level: In all other workout modes, indicates which workout level is selected.

Time To Go: Shows the amount of time remaining in your workout.

Elapsed: Shows how long you've been working out.

Miles: Shows an estimate of how far you would have traveled on an outdoor road bike.

Calories: Displays an estimate of your calories burned. This doesn't include your basal metabolic rate, which is about 72 calories per hour for a 150-pound person.

RPM: Shows your pedal cadence.

Watts: The amount of mechanical power the bike is receiving from your exercise. This is not the same as the amount of power your body is using, since the average person is only about 20% efficient at generating mechanical power.

Heart Rate: In beats per minute (bpm).

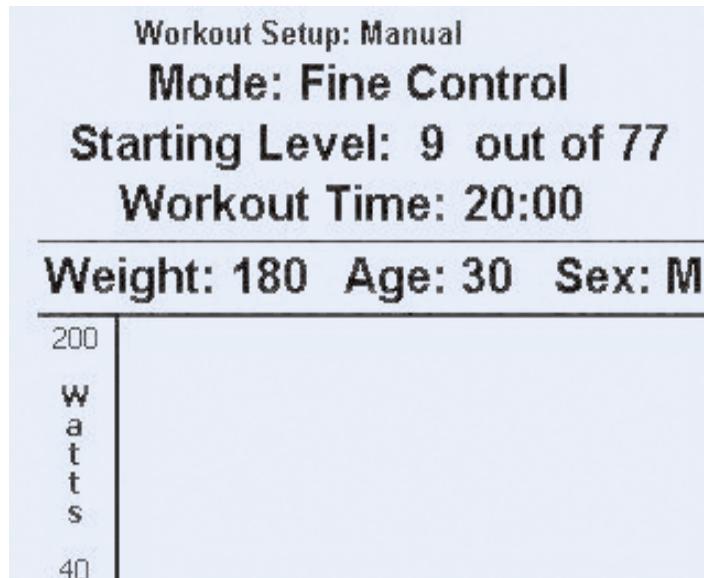
METs: Your METs rate. See *Appendix B*.

Running Equivalent: If your exercise work were being used for running or walking, this would be your pace in time per mile.

Thermometer Speedometer: This simulates an analog vertical speedometer. It always starts out displaying speed, but you can switch it to display many other readouts, such as heart rate, calories per hour, watts, METs, and equivalent running speed. (For some reasons behind this design, see Tufte, *Visual Explanations*, 1997.)

WORKOUT SETUP DISPLAY

The current editable setting is in gray and has a blinking cursor. Press **Enter** to accept this setting and move to the next editable parameter.



ECG Waveform Display

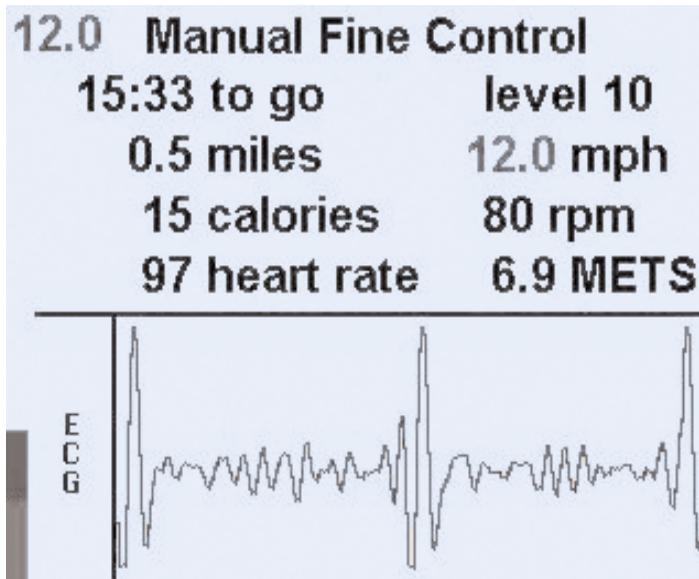
THE DISPLAY

The Z-Console's ECG waveform display is fun and interesting feedback of your heart's actual electrical signature, called an electrocardiogram (ECG). It's not as smooth and fancy as the waveform you would see on expensive, 12-lead medical systems, and it cannot be used for analysis or diagnosis. It's just fun to look at.

The waveform display is generated by the Z-Console's state-of-the-art contact heart rate system, accessed by gently gripping the contact heart rate pads on the handlebars. The ECG display takes the place of the progress display in the lower half of the screen. Pressing  changes to a normal progress display.

*The vertical size (amplitude) of the Z-Console waveform is **NOT** indicative of heart strength or health. This amplitude is simply an effect of the position of the heart in the chest cavity. In most people, the heart is tilted to one side (from upper-right to lower-left in the chest), which creates a noticeable voltage difference between the right and left hands. Some people's hearts are in a more upright position, which results in lower voltage and lower amplitude.*

ECG WAVEFORM DISPLAY



UNDERSTANDING THE ECG SIGNAL

The various shapes in an ECG are a side-effect of the electrical control signals the heart generates to fire its muscles in the right sequence. The signals start in the upper-right part of the heart known as the sinoatrial node, then travel down to the lower-left part of the heart known as the Purkinje fibers. In between these two points, the electrical signals are received, paused, modified, or forwarded by three other important control nodes: Bachmann's bundle, the bundle of His, and the left & right bundle branches.

This complex electrical signal causes the atriums (small chambers) and ventricles (large chambers) to contract in a controlled rhythm to pump blood to the body and lungs. This rhythm and the repeating ECG waveform associated with it are measured as the heart rate.

Why not E "K" G?

The electrocardiograph (the device which produces the electrocardiogram) was invented by Dutch physiologist Willem Einthoven between 1895 and 1903, for which he received the Nobel Prize in Medicine in 1924. Since all his scientific papers were published in German, the ECG concept was introduced to the world as the German construct "electroKardio-gramm," and thus the abbreviation "EKG." The correct English terms are electrocardiograph (graph is "diagramm" in German) and ECG.

"EKG" was common in English communication for many decades after the introduction of the electrocardiograph, especially in informal use. It appears that around the early 1980s the correct "ECG" became more common.

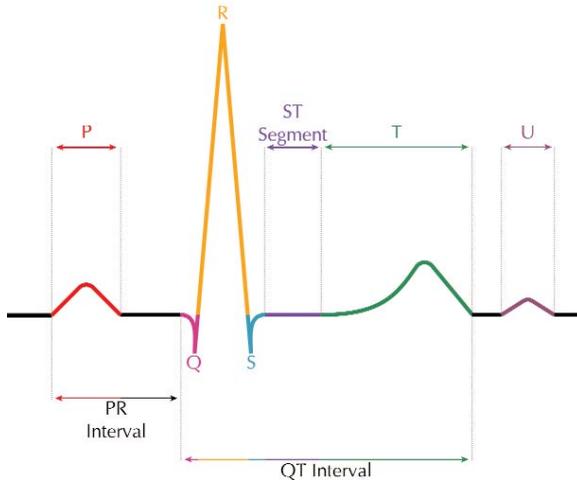
<www.ecglibrary.com/ecghist.html>

For Your Own Edification

THE DISPLAY

FOR EDUCATIONAL PURPOSES ONLY:

The ECG waveform has a predictable shape, and professional ECG analysts give each part of that shape a letter-name. The names go in alphabetical order across the waveform, from P to U.



The most visible part of the waveform is the combination of the Q, R, and S waves, technically called the QRS complex. Most people think of this shape when they think of an ECG.

This sample waveform is highly simplified and unnaturally pristine. It is presented only as a theoretical example from which to learn to identify the waveform components in a real ECG.

See Chapters 1, 2, and 3 of Huszar's *Basic Dysrhythmias* (see *Bibliography*).

FOR YOUR
OWN
EDIFICATION

FOR MORE
INFORMATION



How the Bike Controls Your Exercise

In This Chapter:

Personal Power

Workload Control Details

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PERSONAL POWER

On average, bigger people can produce more power. Also, it's desirable to have the same workout program or workout level feel the same to riders of different sizes.

Personal Power is a new kind of control system that makes the Z8.1 Bike feel the same to every rider. This system is used in almost every workout program.

Personal Power works by adjusting workload for each level based on body weight entered by the rider. It does so in a unique way, not a simple METs-based formula. (See *Appendix B* to learn about METs and *Appendix C* for more about Personal Power.) For example, Level 9 for a 150-pound rider is 100 watts. For a 200-pound rider, it's 122 watts.

All this takes place without the rider's knowledge. The new mathematics used to do this were developed by True Fitness.

WORKLOAD CONTROL DETAILS

The Z8.1 Bike closely controls how hard you're working, so that you get just the workout you want. It does this by keeping track of both how fast you're pedaling and how hard you're pressing on the pedals. At any given level in a workout program, the Z8.1 Bike will keep your exercise intensity constant, no matter how fast you pedal. Technically, this kind of workload control is called *constant power*.

For comfort reasons, if your pedaling speed goes below 55 rpm, the Z8.1 Bike reduces the resistance on the pedals, so they won't feel like they are "locking up."

The only exception to the use of constant power is Bike Mode. It works just like a real outdoor bike: if you pedal faster, you work harder. This is also called *constant torque + compensations*. See *Appendix C* for more details.

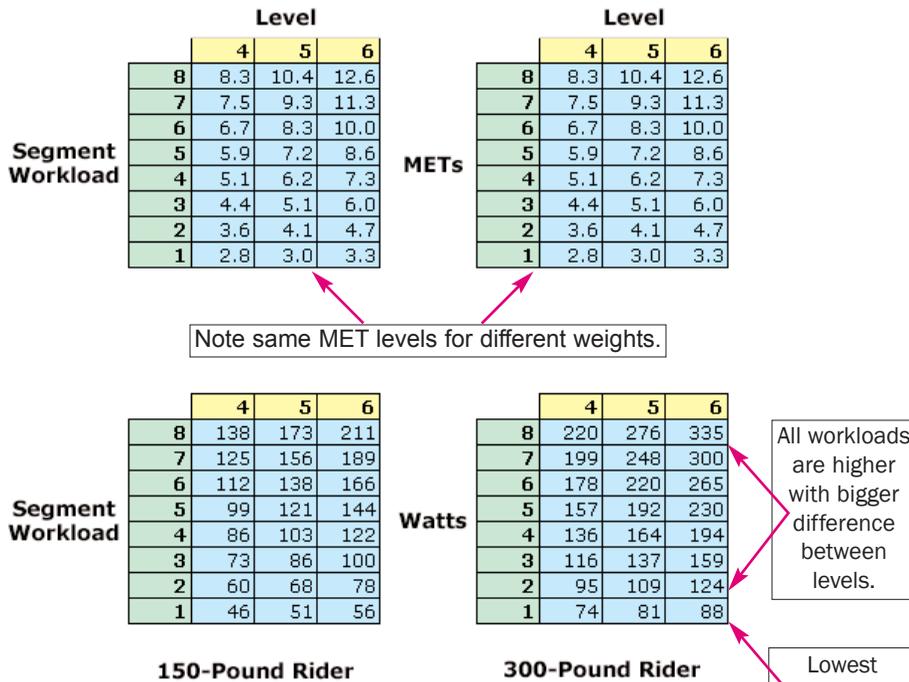
Workload Control Details

HOW THE BIKE CONTROLS YOUR EXERCISE

HOW PERSONAL POWER AFFECTS LEVEL NUMBERS

Different size riders cause Personal Power to shift the workload value for each level (in Manual) or the entire program profile (in pre-set programs) up or down. This means the lowest available workload for a 300-pound rider is higher than a 150-pound rider. Also, the differences between levels are greater for a larger rider (also see *Chapter 7*).

Pre-Set Program Workload Tables



The bike's full capabilities are never restricted. At the highest workloads, the bike can always produce its maximum workload. Larger riders will reach this maximum at numerically smaller levels compared to smaller riders, but the bike will still be maxed out.

HOW THE BIKE CONTROLS YOUR EXERCISE



Workout Setup

In This Chapter:

*Setting Up Your Workout
During Your Workout
Smart Start*

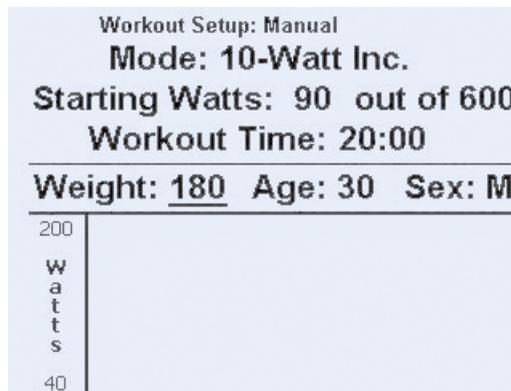
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SETTING UP YOUR WORKOUT

Workout Setup is available both before and during your workout. In Workout Setup:

- You can easily edit all the available options of each workout.
- You see a Workout Preview graphic with a representation of how your workout progress will look.
- Smart Start makes intelligent suggestions for settings that are useful to most riders, and changes its suggestions to adapt to your own settings.
- Helpful tips are displayed if you get stuck.



Use either the **-**, **+** or numeric keys to change settings. Press **Enter** to accept the current parameter and move to the next one. Press **Start** when you're done and ready to begin your workout.

The **←** key deletes your last data keystroke. The **CLEAR** key completely clears out the current entry. If you hold the **CLEAR** key down for one second, the default Smart Start settings will be restored.

Compose your workout at your leisure. Your workout begins only when you press **Start**.

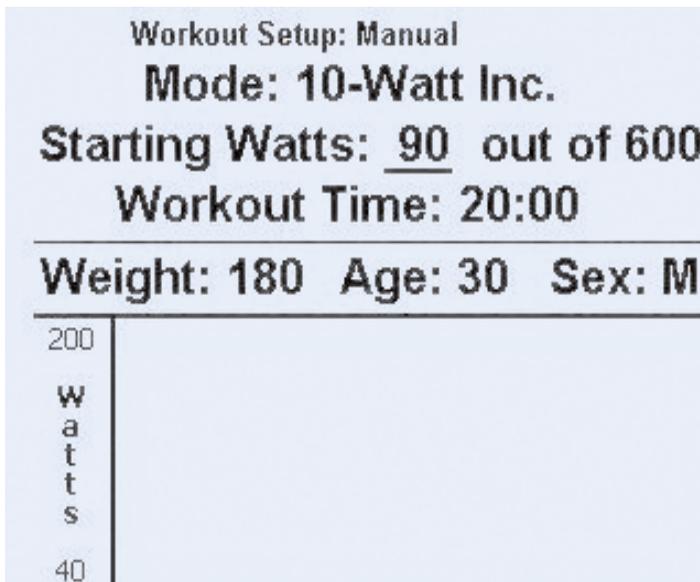
During Your Workout

WORKOUT SETUP

During your workout, press  to go back to Workout Setup as often as you like to change settings or even set up an entirely different workout. While in Workout Setup, pedal resistance is reduced.

If you change programs during your workout, Workout Setup assumes you want to enter the new program at the same place you left the old one. The exceptions to this are Heart Rate Control, Custom Programs, and Fitness Test programs.

DURING YOUR WORKOUT



SMART START

Smart Start works in the background during Workout Setup, assisting you by suggesting useful settings for each workout parameter. Some of the advanced workouts have quite a few options, and it's not always obvious what values to choose, especially your first time in that workout.

Some of the things that Smart Start uses to make its suggestions are: your age, sex, and body weight; your desired workout time; and in some cases your work interval length and intensity.

Any parameters you change will no longer be affected by Smart Start; it assumes if you changed it, you've picked what you want.

WHY "SEX" AND NOT "GENDER" IN THE WORKOUT SETUP SCREEN?

*Most usage guides say that **sex** refers to biological and physiological differences, while **gender** refers to cultural or social differences. The Z-Console uses your sex entry to adjust Smart Start suggestions and other workload control parameters, so labeling this entry "Sex" is the correct choice.*

Manual Control

In This Chapter:

*Personal Power Fine Control
Bike Mode*



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- CHAPTER 10: Designing Your Own Workout
- CHAPTER 11: Fitness Test
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Personal Power Fine Control

MANUAL CONTROL

INTRODUCTION

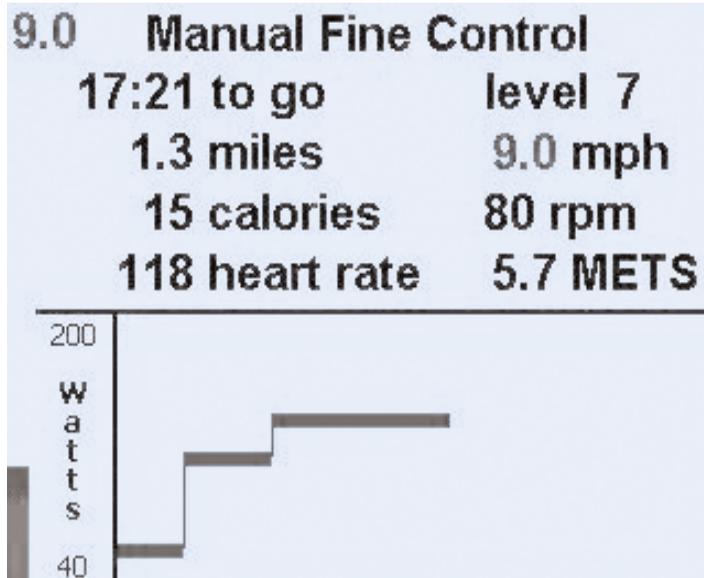
Manual control can operate three different ways: Personal Power fine control, Bike Mode, and 10-watt mode.

In all modes, change levels either by using the **-**, **+** keys, or entering a workload level with the numeric keys and pressing **Enter**.

MANUAL CONTROL

PERSONAL POWER FINE CONTROL

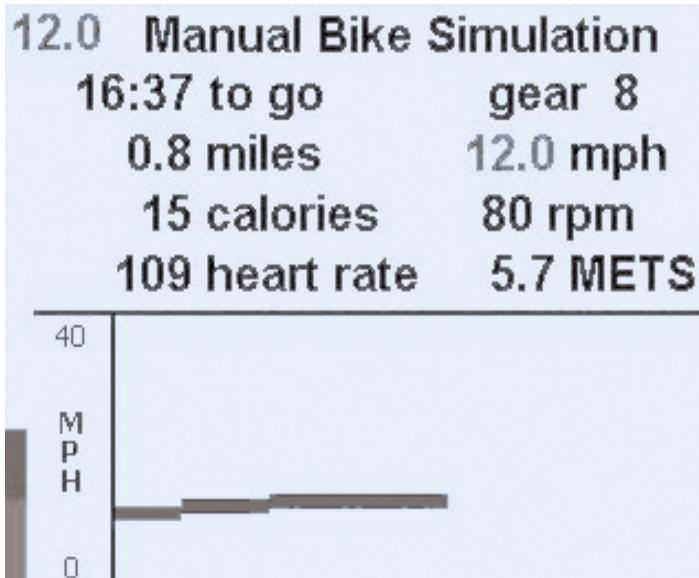
This default manual control has 77 different levels (for a 150-pound rider), allowing you to fine-tune your workout. Since Personal Power is used, the number of levels available decreases for larger riders (see *Chapter 4, How the Bike Controls Your Exercise*). This mode uses constant power workload control (see *Appendix C*).



Bike Mode

MANUAL CONTROL

The second mode is Bike Mode, which simulates a 21-speed road bike, compensating for body weight with Personal Power, simulating air resistance, and computing speed correctly for the selected gear and cadence. The 21 "gears" are like that of a bike that has gearing from 50 to 105 inches.



Bike mode uses constant torque (see *Appendix C*), then adds additional workload for the simulations and compensations. The calculations are adapted from the power formulas in *Bicycling Science*, the leading reference in this field (see *Bibliography*).

BIKE MODE

The final mode is a conventional 10-watt increment constant power mode.

10-WATT MODE

Pre-Set Programs

In This Chapter:

Program Choices

Hill Program Profiles

Interval Program Profiles

How Program and Segment Levels Affect METs

How Your Weight Affects Workload

How Program Level Affects Range of Workload

Custom Intervals

CHAPTER 1: Introduction
CHAPTER 2: Riding Your Bike
CHAPTER 3: The Display
CHAPTER 4: How the Bike Controls Your Exercise
CHAPTER 5: Workout Setup
CHAPTER 6: Manual Control
CHAPTER 7: Pre-Set Programs
CHAPTER 8: Heart Rate Control
CHAPTER 9: Calorie Goal Workout

CHAPTER 10: Designing Your Own Workout
CHAPTER 11: Fitness Test
CHAPTER 12: Medical and Ergometer Mode
CHAPTER 13: Other Functions
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CHAPTER 16: Test Mode
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CHAPTER 18: Important Safety Instructions

HILL AND INTERVAL PROGRAMS

Just like manual control, the hill and interval programs compensate for different body weights.

The two hill programs are:

- **Rolling Hills**, a series of gently changing workloads.
- **One Big Hill**, with the workload gradually increasing to a maximum at the halfway point, then decreasing gradually to the end.

The three interval programs are:

- **Easy intervals**, with a moderate change between work and rest intervals.
- **Sport intervals**, with a large change between work and rest intervals.

Each workout segment can have a value between 1 and 8. The overall workout can be adjusted to 16 possible levels. The workload level of a workout segment is calculated by the formula

$$\text{METs} = (\text{scaler1} * \text{segment}) * (\text{scaler2} * \text{level}) + 2$$

METs are then converted to T-Mets.

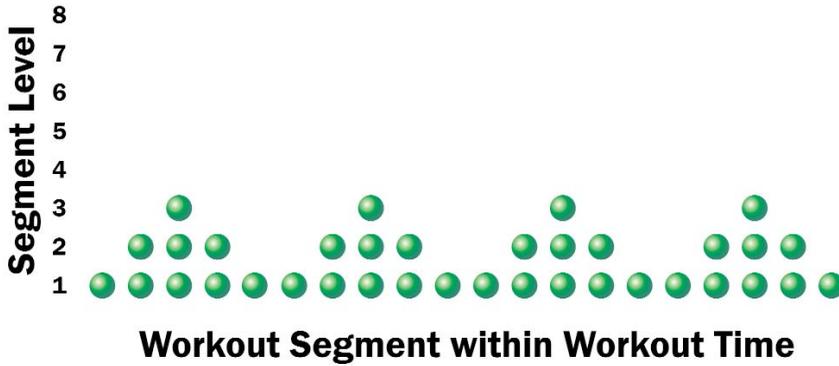
Scaler1 and scaler2 are mathematical formulas which subtly change the scale and magnitude of both the segment and level variables.

The constant "2" is simply the minimum METs level controllable by the bike.

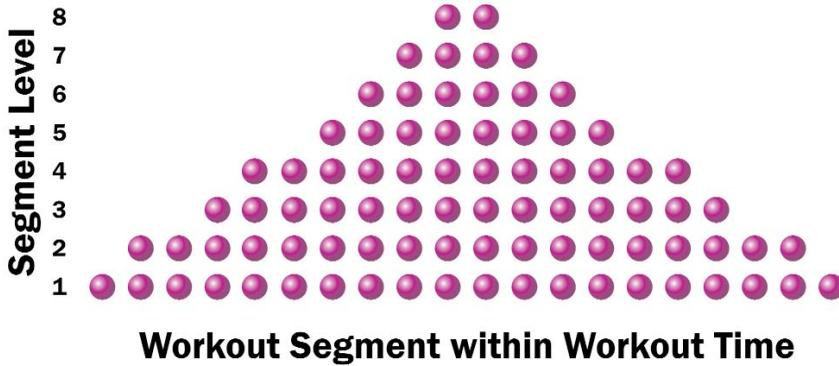
Hill Program Profiles

PRE-SET PROGRAMS

HILL PROGRAM PROFILES



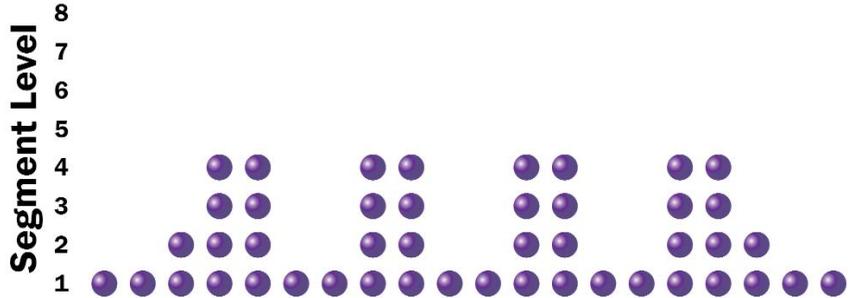
Rolling Hills



One Big Hill

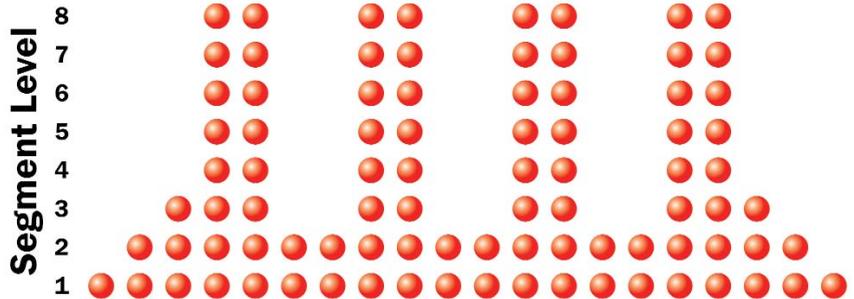
PRE-SET PROGRAMS

INTERVAL PROGRAM PROFILES



Workout Segment within Workout Time

Easy Intervals



Workout Segment within Workout Time

Sport Intervals

How Program and Segment Levels Affect METs

PRE-SET PROGRAMS

How PROGRAM AND SEGMENT LEVELS AFFECT METS

METS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8	3.0	4.5	6.3	8.3	10.4	12.6	15.0	17.4	20.0	22.6	25.3	28.1	31.0	33.9	36.9	40.0
7	2.9	4.2	5.8	7.5	9.3	11.3	13.4	15.5	17.7	20.0	22.4	24.9	27.4	30.0	32.6	35.3
6	2.8	3.9	5.2	6.7	8.3	10.0	11.7	13.6	15.5	17.5	19.5	21.6	23.8	26.0	28.2	30.5
5	2.6	3.6	4.7	5.9	7.2	8.6	10.1	11.6	13.2	14.9	16.6	18.3	20.1	22.0	23.8	25.8
4	2.5	3.3	4.2	5.1	6.2	7.3	8.5	9.7	11.0	12.3	13.7	15.1	16.5	18.0	19.5	21.0
3	2.4	3.0	3.6	4.4	5.1	6.0	6.9	7.8	8.7	9.7	10.8	11.8	12.9	14.0	15.1	16.3
2	2.3	2.6	3.1	3.6	4.1	4.7	5.2	5.9	6.5	7.2	7.8	8.5	9.3	10.0	10.7	11.5
1	2.1	2.3	2.5	2.8	3.0	3.3	3.6	3.9	4.2	4.6	4.9	5.3	5.6	6.0	6.4	6.8

Program Level

Segment Level

Sixteen different levels are available to change the difficulty of a program. The workload intensities expand and contract depending on the level.

How Your Weight Affects Workload

PRE-SET PROGRAMS

How Your Weight Affects Workload

Workload in Watts



Segment Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8	51	76	105	138	173	211	250	291	334	378	423	470	518	567	617	668
7	49	71	96	125	156	189	223	259	296	335	375	416	457	500	544	589
6	46	65	87	112	138	166	196	227	259	292	326	361	397	434	471	509
5	44	60	78	99	121	144	169	195	221	249	277	306	336	367	398	430
4	42	55	69	86	103	122	142	162	184	206	228	252	276	300	325	351
3	40	49	60	73	86	100	115	130	146	163	180	197	215	234	252	271
2	38	44	51	60	68	78	88	98	109	120	131	143	155	167	179	192
1	36	39	42	46	51	56	60	66	71	76	82	88	94	100	106	113

For a 150-Pound Rider

Workload in Watts



Segment Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8	71	107	148	194	244	297	352	410	470	532	596					
7	68	99	136	176	219	266	314	365	417	472	528	585				
6	65	92	123	158	195	234	276	319	364	411	459	508	559	611		
5	62	84	110	139	170	203	238	274	311	350	390	431	474	517	561	606
4	59	77	98	121	146	172	200	229	259	290	322	355	388	423	458	494
3	56	69	85	102	121	141	161	183	206	229	253	278	303	329	355	382
2	53	62	72	84	96	109	123	138	153	168	184	201	218	235	253	271
1	50	55	60	65	72	78	85	92	100	108	116	124	132	141	150	159

For a 250-Pound Rider

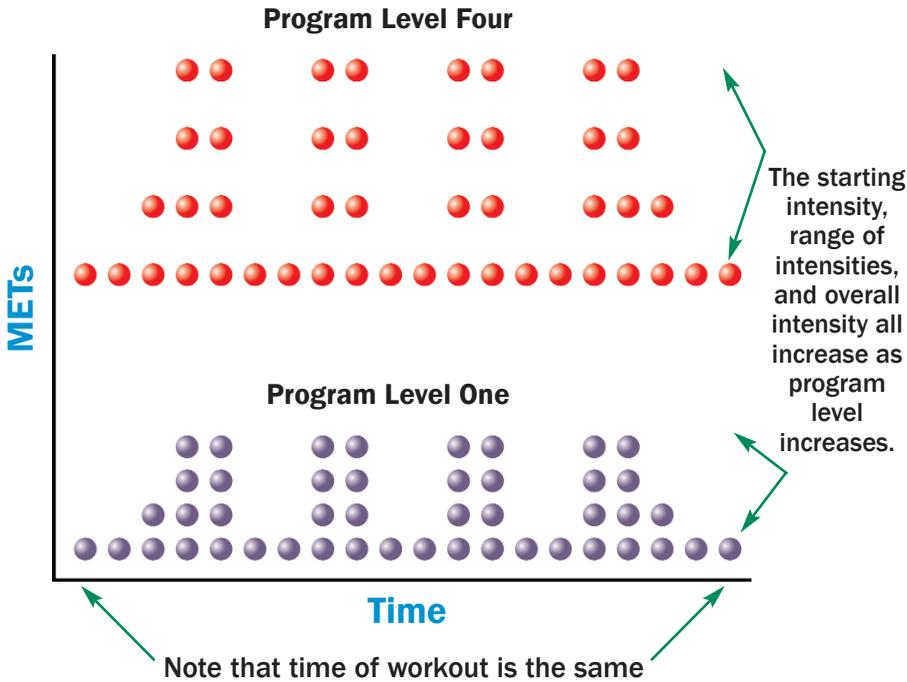
PRE-SET PROGRAMS

How Program Level Affects Range of Workload

PRE-SET PROGRAMS

PRE-SET PROGRAMS

HOW PROGRAM LEVEL AFFECTS RANGE OF WORKLOAD



Since interval training is a common type of workout, the Z-Console has an extra-easy way to create a custom interval program. After selecting Custom Intervals, pick the work segment and rest segment durations, then pick the work and rest segment exercise levels.

CUSTOM INTERVALS

(ALSO DESCRIBED IN CHAPTER 10)

When you use the program, the segments repeat over and over until you reach the end of your workout time. Or, you can have the program last for a certain number of work intervals.



Heart Rate Control

In This Chapter:

Introduction to HRC

Types of HRC

Constant and Interval HRC

Intro to HRC Ultra

HRC Ultra Workout

Interval HRC Ultra Workout

Cruise Control

Important Points About HRC

CHAPTER 1: Introduction

CHAPTER 2: Riding Your Bike

CHAPTER 3: The Display

CHAPTER 4: How the Bike Controls Your Exercise

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WHY HRC IS SO USEFUL

True's heart rate control (HRC) workouts let the bike monitor your relative exercise intensity by way of your heart rate, then automatically adjust the workload to keep you at your target heart rate and thus your desired exercise intensity.

Your heart rate is a good measure of your body's exercise stress level. It reflects differences in your physical condition, how tired you are, the comfort of the workout environment, even your diet and emotional state. Using heart rate to control workload takes the guesswork out of your workout settings.

Consult your physician before using heart rate controlled workouts for advice on selecting a target heart rate range. Also, it is important to use the bike for several workouts in the manual mode while monitoring your heart rate. Compare your heart rate with how you feel to ensure your safety and comfort.

See *Appendix A* for a chart that may help you pick a target heart rate.

You need to wear a heart rate monitoring chest strap to use heart rate control. See the "Monitoring Your Heart Rate" section in *Chapter 2* for a guide to proper usage. It is not recommended that you use the contact heart rate system for heart rate control workouts.



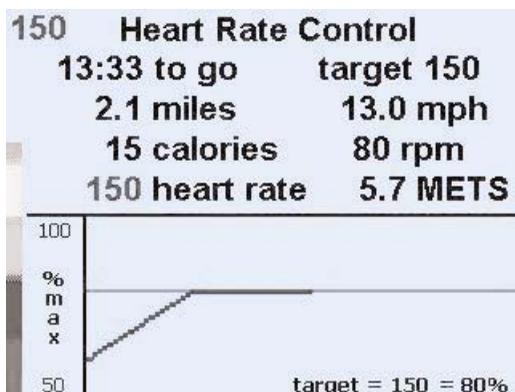
Types of HRC

HEART RATE CONTROL

The Z8.1 Bike has five types of heart rate control:

- **Constant:** pick a target heart rate, and the bike will control your workout from the very beginning so that you reach your target within 5 to 7 minutes.
- **Interval:** pick both a work target and a rest target heart rate. The bike will take you back and forth between these two targets.
- **HRC Ultra:** simulates a real high-intensity workout by automatically raising your target heart rate as you proceed through the last half of your workout.
- **Interval HRC Ultra:** simulates a real interval workout, with progressively higher targets for each work and rest interval.
- **Cruise Control:** while in any program, set your current heart rate as your target by pressing a single key.

TYPES OF HRC



CONSTANT HRC

This is the best-known type of HRC, and is the easiest to use. The bike will gradually raise your heart rate so that you reach your target within five to seven minutes. It keeps you there until 2.5 minutes before the end of your workout time, then reduces workload by half for a cooldown.

Note that as you tire during your workout, especially in the last third, workload will usually have to be reduced to keep you at a steady target heart rate.

To change your target heart rate, press the ,  keys to change one bpm at a time, or enter a new target with the numeric keys and press .

Interval HRC

HEART RATE CONTROL

INTERVAL HRC

This allows you to do a classic interval workout with the bike controlling all workloads, including the rest segments. After reaching your work target just like in Constant HRC, the workload is immediately reduced by 65%, then controlled so you reach your rest target within about three minutes.

As soon as you reach your rest target, the workload is immediately increased to the last workload attained in the work segment, then controlled to reach your target within about two minutes.

This pattern repeats until 2.5 minutes before the end of your workout time, then reduces workload to the last rest segment workload.

To change your work or rest targets, press the **-**, **+** keys to change one bpm at a time, or enter a new target with the numeric keys and press **Enter**.

Workout Setup: Interval HRC	
work level: 80%	148 bpm
rest level: 60%	111 bpm
Workout Time: 20:00	
Weight: 115 Age: 25 Sex: F	
100	
% m a x	
50	

WHY USE HRC ULTRA WORKOUTS?



Do not attempt these workouts unless you are certain you are in good medical and physical condition. Failure to observe this warning may result in shortness of breath, dizziness, or death.

As mentioned in the Constant HRC section, as you tire in the last third of your workout, your heart rate has a tendency to rise, which Constant HRC addresses by reducing workload.

However, exercisers who are really serious and in very good condition always let their heart rates rise during the last third of their workouts, usually to very high levels. The HRC Ultra heart rate control workouts are designed to simulate this kind of high-intensity workout.

HRC Ultra Workout

HEART RATE CONTROL

Unlike Constant and Interval HRC, you don't pick a target heart rate, but you **must** enter your age correctly.

For the first fifth of your workout time, HRC Ultra tries to increase your heart rate to 70% of your maximum heart rate (HRmax) within three to four minutes.

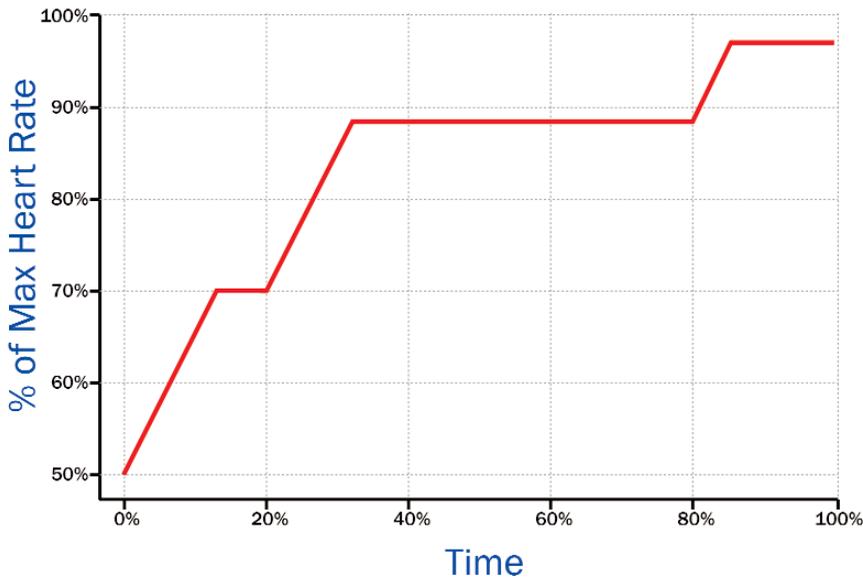
In the middle three-fifths of your workout, HRC Ultra increases your heart rate to 88% HRmax within three to four minutes, then holds it there.

During the final fifth of your workout, HRC Ultra tries to raise your heart rate to 97% HRmax. The goal is to get to 97% just before your workout ends.

Note: if you prefer lower ("less Ultra") heart rate targets in either Ultra workout, you can reduce the targets across the board by pressing the  key.

HRC ULTRA WORKOUT

HEART RATE CONTROL



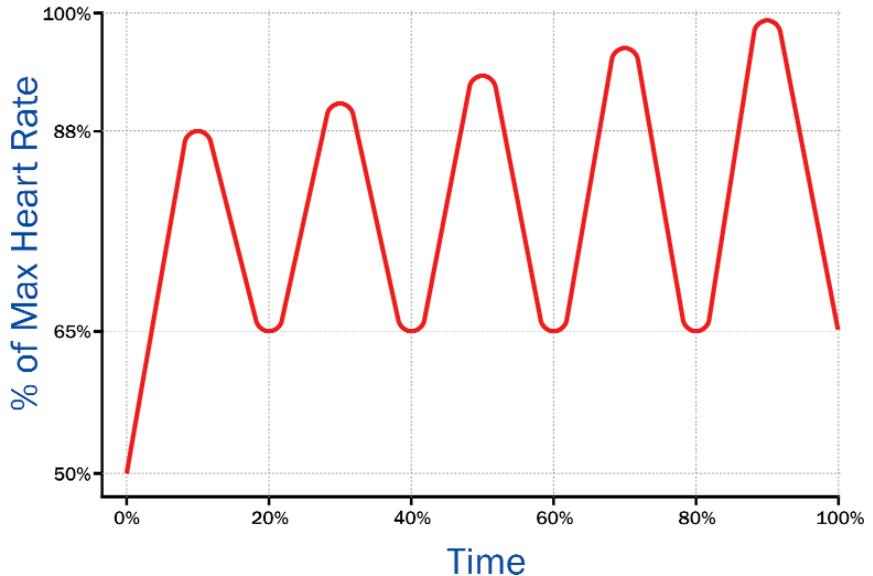
Interval HRC Ultra Workout

HEART RATE CONTROL

INTERVAL HRC ULTRA

Interval HRC Ultra works similarly to Interval HRC, but the work target heart rates gradually increase through your workout. The first work segment target is 88% HRmax, and the last work segment target is 97% HRmax.

The rest segment target is 65%. Note that workload usually has to be greatly decreased to allow you to reach this low a heart rate within a desirable time.



HEART RATE CONTROL

Workout Setup: Interval HRC Ultra
20:00 W/O Time Max%: 97
You MUST enter your age correctly.
Warning: you must be in good medical and physical condition, otherwise you may experience health difficulties.

Weight: 109 Age: 22 Sex: F

100			
% m a x			
50	work1=168	work2=185	rest=124

Cruise Control

HEART RATE CONTROL

This is the simplest way to enter Constant HRC training. While in manual or any program you can enter Constant HRC by simply pressing the Heart Rate Control key. Your current heart rate will be set as the target.

For best results, you should be at least five minutes into your workout and warmed up. This will allow Cruise Control to more accurately control your heart rate.

Remember, you must be wearing a chest strap, and your heart rate should be displayed in the Heart Rate window.

To change your target heart rate, press the ,  keys to change one bpm at a time, or enter a new target with the numeric keys and press .

**CRUISE
CONTROL**

IMPORTANT POINTS ABOUT HEART RATE CONTROL

The heart rate monitor transmitter strap should be worn according to the guidelines in *Chapter 2*.

If the transmitter strap is adjusted or moved while exercising, heart rate monitoring may be temporarily affected.

The transmitter strap sends a low-level radio signal to the bike, so interference from other radio and sound waves (including everything from cordless telephones to loudspeakers) is possible. The good news is that interference is usually quite brief. If you continue to have intermittent heart rate display problems, consult your local service technician, as the transmitter strap batteries may be low.

Make sure you breath smoothly and regularly.

Talking during your workout usually causes heart rate spikes of five beats per minute or more, so avoid talking as much as possible.

Maintain a smooth pedaling motion.

Two users wearing the same kind of transmitter at the same time and in close proximity may cause false heart rate display readings.



Calorie Goal Workout

In This Chapter:

Setting Up a Calorie Goal Workout

CHAPTER 1: Introduction
CHAPTER 2: Riding Your Bike
CHAPTER 3: The Display
CHAPTER 4: How the Bike Controls Your Exercise
CHAPTER 5: Workout Setup
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CHAPTER 7: Pre-Set Programs
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CHAPTER 9: Calorie Goal Workout

CHAPTER 10: Designing Your Own Workout
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Setting Up a Calorie Goal Workout

CALORIE GOAL WORKOUT

SETTING UP A CALORIE GOAL WORKOUT

Calorie Goal lets you pick a total number of calories and workout time, then calculates a steady-state exercise at a work level (*Cruising Watts*) so that you reach your target total calories at the end of a 2.5-minute cooldown. There is a 2.5-minute warmup prior to Cruising Watts.

Calorie Goal is especially useful if you exercise to help with weight loss or weight control. You might have a specific number of calories you wish to burn in each exercise session. Also, you sometimes have different amounts of time available to exercise. Calorie goal is the easiest way to achieve your exercise goal, no matter what your schedule.

To change your calorie goal, press the **-**, **+** keys to change one calorie at a time, or enter a new calorie goal with the numeric keys and press **Enter**.

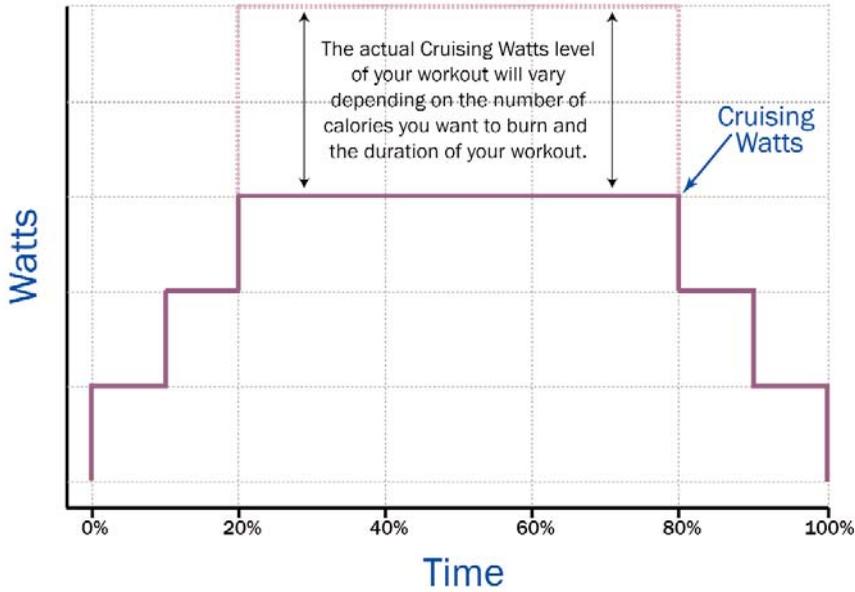
Some guidelines: Your workout time must be at least six minutes. If Cruising Watts are 400 or more, a warning will be displayed. The program will not accept a workout setup if Cruising Watts are above 600.

See the graphic on the next page for a visual explanation of a Calorie Goal workout.

Workout Setup: Calorie Goal		
Calorie Goal: 180		
Cruising Watts: 123		
Workout Time: 20:00		
Weight: 180 Age: 32 Sex: M		
8		
7		
6		
5		
4		
3		
2		
1		

Visual Explanation

CALORIE GOAL WORKOUT



CALORIE GOAL WORKOUT GRAPH



Designing Your Own Workout

In This Chapter:

*Creating Your Own Workout
Custom Intervals*

CHAPTER 1: Introduction
CHAPTER 2: Riding Your Bike
CHAPTER 3: The Display
CHAPTER 4: How the Bike Controls Your Exercise
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CREATING YOUR OWN WORKOUT

There are two basic ways to create your own custom workout: have the Z8.1 Bike record your level settings during a manual workout, or enter the workout levels directly with the keypad. The maximum number of segments in each custom program is 60. You can store three different custom programs. Segment intensity is recorded with Personal Power, so that your custom program can be properly used by others (see *Chapter 4*).

To program an interval workout, see Custom Intervals (below).

In *Record* mode, 60 changes in workload are recorded during your workout.

For direct entry of a workout program using the keypad, you can set as few or as many of the parameters as you wish. The default (called *Scale*) is for you to pick the total workout time, then enter up to 60 equal length segments. Each segment can have up to 77 different intensities, depending on body weight.

If you want to directly control the length of each segment, use *Fixed*.

If you select *Repeat*, you set a workout time, and the segment pattern you enter repeats over and over until the workout time is reached.

When you select a stored custom workout program as your workout, you can change the suggested workout time. This will simply stretch or shrink the program to fit the new workout time.

As you use a custom program, if you use the \oplus , \ominus keys, the workload intensity for *the current segment only* is shifted.

Creating a Custom Program

DESIGNING YOUR OWN WORKOUT

- Press Advanced Options until Custom Program 1, 2, or 3 is displayed.
- Use the \oplus , \ominus keys to select the type of custom program: scale, fixed, record, or repeat. Press **Enter**.
- Enter your personal information.
- Enter your desired workout time. (*This step does not apply to the Fixed Custom Program. See Below.*)
- Use the \oplus , \ominus or numeric keys to adjust each parameter. Remember, you can use the \leftarrow and **CLEAR** keys, too. Press **Enter** to accept each parameter. When you are entering the final parameter or workout segment in a custom program, press **AND HOLD** the **Enter** key to accept the last parameter and save the program. (*This step does not apply to the Record Custom Program. See Below.*)
- To completely delete a custom program: while in Edit mode, press **CLEAR**, then press **AND HOLD CLEAR** again.

CUSTOM PROGRAMS STEP-BY-STEP

Type	Workout Time	Number of Segments	Segment Time	What to Do and What Happens
Scale	Set by User	Auto	Auto/Scale	Set workout time, then enter up to 60 segments; auto-scales to workout time
Fixed	Auto	Auto	Set by User	Set segment time, then enter up to 60 segments; workout time is the segment time multiplied by the number of segments
Record	Record	60	Auto	Begin working out in default Manual mode
Repeat	Set by User	Auto/Repeat	Set by User	Set workout and segment time, then enter up to 10 segments; pattern repeats

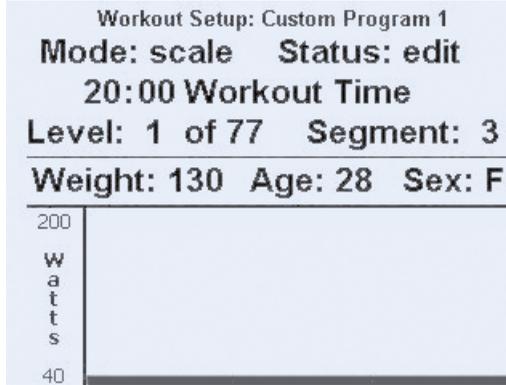
CUSTOM PROGRAMS AT A GLANCE

Custom Programs in Depth

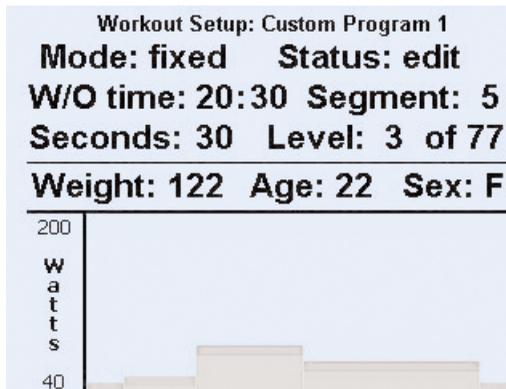
DESIGNING YOUR OWN WORKOUT

CUSTOM PROGRAMS IN DEPTH

Scale: simply enter the work level for any number of segments between 1 and 60. The progress display shows you how it is scaling each segment to span the entire workout time.



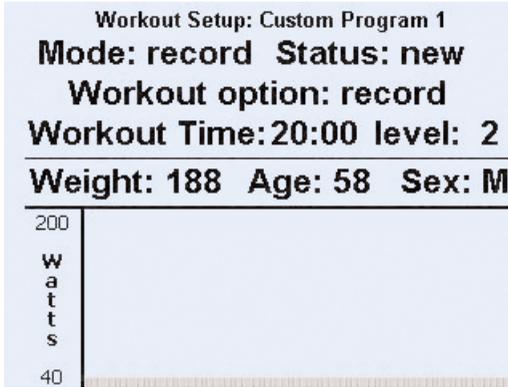
Fixed: for each segment, enter the segment length (between 5 and 90 seconds) and segment workload, up to 60 segments. The workout time will accumulate each segment time after you enter it. You cannot save a program until you have entered enough segments to add up to the minimum program time of 5 minutes.



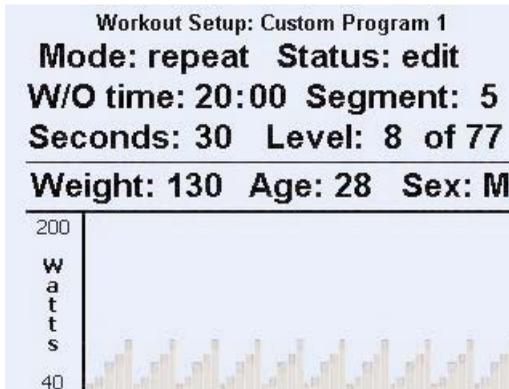
Custom Intervals

DESIGNING YOUR OWN WORKOUT

Record: enter your desired workout time and starting workload. Press **Start** when you are ready to record; you do not need to press and hold the **Enter** key. A custom Record program is only saved if the entire workout time is completed.



Repeat: for each segment, and a maximum of ten segments, enter the segment length (between 5 and 99 seconds) and segment workload. When you finish by pressing and holding **Enter**, the segments pattern will be repeated and appended until the workout time is reached.



Editing a program after it is saved: simply go to the program you wish to change and start changing any of the parameters or segments. As usual, press and hold **Enter** to save the program.

CUSTOM INTERVALS

(ALSO DESCRIBED IN
CHAPTER 7)

Since interval training is a common type of workout, the Z-Console has an extra-easy way to enter a custom interval program. After selecting Custom Intervals with the Intervals button , pick the work segment and rest segment durations, then pick the work and rest segment exercise levels.

When you use the program, the segments repeat over and over until you reach the end of your workout time. Or, you can have the program last for a certain number of work intervals.

Fitness Test

In This Chapter:

Introduction and How to Test Yourself

Proper Preparation and Behavior

How to Use Your Results

How the Test Works

Test Specific Issues



CHAPTER 1: Introduction
CHAPTER 2: Riding Your Bike
CHAPTER 3: The Display
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INTRODUCTION

The Z8.1 Bike fitness test is an improved implementation of the YMCA protocol fitness test, as described in the *ACSM Guidelines*, Chapter 4. (See *Bibliography*.) The bike must monitor your heart rate accurately throughout, so you should use a wireless transmitter strap instead of the contact heart rate pads (see *Chapter 2*). It works best with the external power option.

The result of the test is an estimate of your maximal oxygen uptake, or $VO_2\text{max}$ (see *Appendix B*).

HOW TO DO IT

- Press Advanced Options  until Fitness Test appears, then press .
- Fill out all the parameters.
- Press .

Make sure the bike is reading out your heart rate, then pedal in a smooth and relaxed manner for the 12 minutes of gradually increasing workload. Your $VO_2\text{max}$ estimate will be displayed when you finish.

Proper Preparation and Behavior

FITNESS TEST

PROPER PREPARATION AND BEHAVIOR

You should:

- Stay as relaxed as possible during the test, breathing smoothly and regularly.
- Be dressed in comfortable workout clothes and riding in a room with comfortable air temperature and humidity.

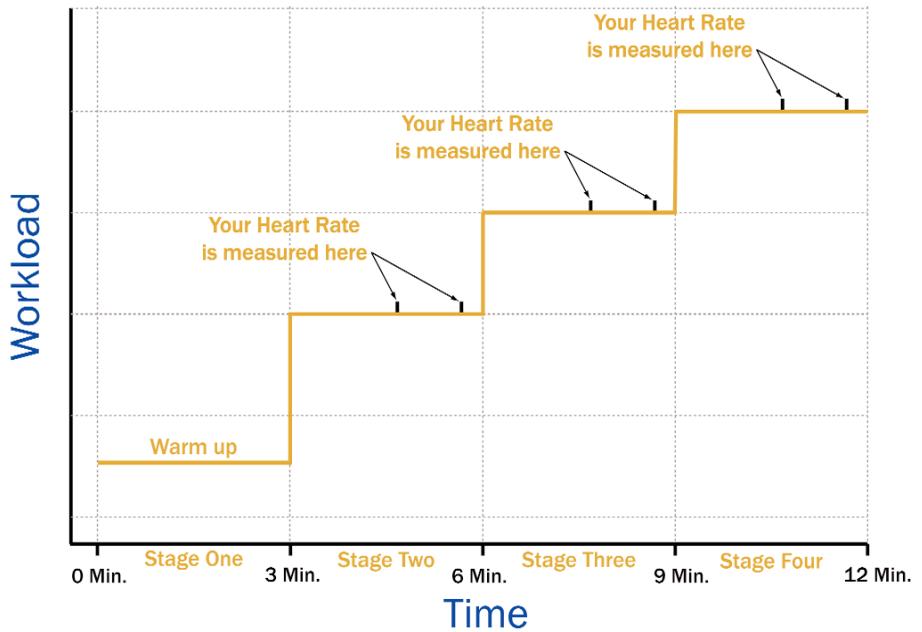
You should not:

- Eat within three hours prior to testing, but you should not be hungry, either.
 - Consume caffeine within three hours prior.
 - Smoke within three hours prior.
 - Exercise vigorously within 24 hours prior.
 - Make any unnecessary movements of arms, head, or torso.
 - Talk at all.
-

HOW THE TEST WORKS

The test consists of four three-minute stages. Stage one is a warmup stage. Stages two, three, and four are at ever-increasing workloads, with your heart rate measured during the second and third minute of each stage. (If the two heart rate samples in a given stage are separated by more than 6 bpm, that stage is extended for an additional minute.)

The heart rate measured during the last minute of each stage is compared mathematically with workload, and then extrapolated to your age-predicted maximal heart rate (see *Appendix A*). The workload corresponding to this heart rate is converted to milliliters of oxygen per kilogram of body weight.



How to Use Your Results

FITNESS TEST

The best way to use the results of a fitness test is to track your progress in an exercise program. Test yourself about every two weeks, under closely similar conditions.

You can also use the results of a fitness test to find how you compare with an average population. Find your score in the chart below in the proper column for your age group. (Data is from *ASCM Guidelines*, from 1994 research from the Institute for Aerobics Research in Dallas, Texas.)

Percentile Values for $VO_2\max$

Percentile	Age				
	20-29	30-39	40-49	50-59	60+
Men					
90	51.4	50.4	48.2	45.3	42.5
80	48.2	46.8	44.1	41.0	38.1
70	46.8	44.6	41.8	38.5	35.3
60	44.2	42.4	39.9	36.7	33.6
50	42.5	41.0	38.1	35.2	31.8
40	41.0	38.9	36.7	33.8	30.2
30	39.5	37.4	35.1	32.3	28.7
20	37.1	35.4	33.0	30.2	26.5
10	34.5	32.5	30.9	28.0	23.1
Women					
90	44.2	41.0	39.5	35.2	35.2
80	41.0	38.6	36.3	32.3	31.2
70	38.1	36.7	33.8	30.9	20.4
60	36.7	34.6	32.3	29.4	27.2
50	35.2	33.8	30.9	28.2	25.8
40	33.8	32.3	29.5	26.9	24.5
30	32.3	30.5	28.3	25.5	23.8
20	30.6	28.7	26.5	24.3	22.8
10	28.4	26.5	25.1	22.3	20.8

HOW TO USE YOUR RESULTS

TEST SPECIFIC ISSUES

Note that the absolute accuracy of this test is approximately $\pm 15\%$ compared to a laboratory maximal test. (See Swain and Leutholtz, *Metabolic Calculations*, page 63). The results on the Z8.1 Bike should be somewhat better since it uses an improved maximum heart rate formula (see *Appendix A*).

The repeatability accuracy, from test to test with the same test subject, should be much better, probably within $\pm 7\%$.

Personal Power is used to calculate work levels that are more appropriate than in the standard YMCA protocol.



Medical and Ergometer Mode

In This Chapter:

What These Modes Do

How These Modes are Different

Using These Modes

CHAPTER 1: Introduction

CHAPTER 2: Riding Your Bike

CHAPTER 3: The Display

CHAPTER 4: How the Bike Controls Your Exercise

CHAPTER 5: Workout Setup

CHAPTER 6: Manual Control

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WHAT THESE MODES DO

These modes require the use of the external power option, and are accessed by changing the default operation mode in Setup Mode (see *Chapter 15*). They differ from normal operation in several ways.

These modes:

- Restrict operation to just manual and custom programs.
- Replace the normal workload control modes to modes more common in the rehabilitation and testing environments.
- Provide a unique pedal rpm limiting feature for cases where excessively rapid motion is of concern.
- Work in constant power mode and, since precise workload control is of prime importance all the time, torque is not rolled off at low rpms (see *Appendix C*).
- Have lower than normal minimum workload, because of the use of external power.

How These Modes are Different

MEDICAL AND ERGOMETER MODE

The two modes differ in the way they control workload:

Ergometer Mode: This emulates a popular cycle ergometer whose workload settings are in kiloponds (see side bar) and are adjusted by changing the amount of weight (in kilograms) at the end of a brake belt wrapped around a flywheel.

Many testing protocols are written especially for such an ergometer. These protocols can now be run on the Z8.1 Bike, either programmed into a custom program or run manually.

Medical Mode: This uses either METs or watts, instead of kiloponds, for workload control. (Although that's just like normal operation mode, Medical mode adds the previously mentioned useful functions like no torque roll-off and rpm limiting, and doesn't allow riders to play around with other exercise modes.) Most exercise prescriptions are in either METs or watts, so this mode is useful for that.

What's a kilopond?

This is an obsolete unit of force, equivalent to the gravitational force on one kilogram at the Earth's surface, or about 9.8 newtons. Sweden made the kilopond its official unit of force in 1945, and thus it ended up being used in an ergometer made in Sweden. It is essentially equivalent to the force on a kilogram at the Earth's surface.

HOW THESE MODES ARE DIFFERENT

These modes restrict operation to manual and custom programs. Refer to *Chapter 6* for manual operation and *Chapter 10* for custom program operation.

OPERATION RESTRICTIONS

Change the pedal RPM limit in Setup Mode.

SETTING PEDAL RPM LIMIT

Other Functions

In This Chapter:

Other Fun Stuff



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- CHAPTER 2: Riding Your Bike
- CHAPTER 3: The Display
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HAPPY WORKOUT, AND ELECTRONIC IN/OUT

Happy Workout: This allows riders to perform a virtual (i.e., imaginary) world-class workout. The bike thinks the rider is generating six times as much power as he really is, and all the related workout data like speed and calories are accelerated as a result. One use of Happy Workout is to allow easier demonstration of the bike to serious riders.

Enable Happy Workout under the Advanced Options key after enabling it in Setup Mode.

Electronic Input and Output: The Z-Console provides two communication ports, labeled “Comm” and “Aux.” They use the CSAFE standard, typically to provide power to and communicate with a channel- and volume-control device for a sports club entertainment system such as BroadcastVision® or Cardio Theater®. The Audio Remote keys generate these control signals.

The Comm port also supports the full CSAFE Level 3 communications specification for use with fitness equipment networks. (See <fitlinxx.com/csafe/specification.htm>.)

The Video In port is not currently used.

Creating an Exercise Plan

In This Chapter:

The F.I.T. Concept Defined

Utilizing the F.I.T. Concept

Beginning Your F.I.T. Program

Establishing and Maintaining Fitness

Weight Management

A Sports Training Program

- CHAPTER 1: Introduction
- CHAPTER 2: Riding Your Bike
- CHAPTER 3: The Display
- CHAPTER 4: How the Bike Controls Your Exercise
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- [CHAPTER 14: Creating an Exercise Plan](#)
- CHAPTER 15: Setup Mode
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- CHAPTER 17: Care and Maintenance
- CHAPTER 18: Important Safety Instructions

WHAT IS THE F.I.T. CONCEPT?

The workout portion of your exercise program consists of three major variables: Frequency, Intensity, and Time.

Frequency: How Often You Exercise

You should exercise three to five times a week to improve your cardiovascular and muscle fitness. Improvements are significantly smaller with less frequent exercise.

Intensity: How Hard You Exercise

Intensity of exercise is reflected in your heart rate. Exercise must be sufficiently rigorous to strengthen your heart muscle and condition your cardiovascular system. Only your doctor can prescribe the target training heart range appropriate for your particular needs and physical condition.

Start with exercise that stimulates you to breathe more deeply.

Alternate days of moderate and easy exercise to help your body adapt to new levels of exertion without unnecessary strain.

If you are just beginning an exercise program, you may be most comfortable using your bike at low workloads. As you use your bike regularly, higher workloads may be more comfortable and more effective.

If you feel out of breath before you have exercised 12 minutes, you are probably exercising too hard.

As your fitness level improves, you will need to increase your workout intensity in order to reach your target heart rate. The first increase may be necessary after two to four weeks of

More F.I.T. Concept Overview

DESIGNING AN EXERCISE PROGRAM

regular exercise. Never exceed your target heart rate zone. Increase the workload on the bike to raise your heart rate to the level recommended by your doctor.

METs

One MET is the amount of energy your body uses when you're resting. If a physical activity has an equivalent of 6 METs, its energy demands are six times that of your resting state. The MET is a useful measurement because it accounts for differences in body weight. See *Appendix C* for more details.

Time: How Long You Exercise

Sustained exercise conditions your heart, lungs, and muscles. The longer you are able to sustain exercise within your target heart range, the greater the aerobic benefits.

To begin, maintain two to three minutes of steady, rhythmic exercise and then check your heart rate.

The initial goal for aerobic training is 12 continuous minutes.

Increase your workout time approximately one or two minutes per week until you are able to maintain 20-30 continuous minutes at your training heart rate.

USING THE F.I.T. CONCEPT

The F.I.T. concept is designed to help you begin a program tailored to your needs. You may wish to keep an exercise log to monitor your progress.

YOUR FITNESS PROGRAM

You can get valuable fitness benefits from your Z8.1 Bike. Using the bike regularly may increase the ability of your heart and lungs to supply oxygen and nutrients to exercising muscles over an extended period of time. The bike will also help you develop added muscle endurance and balanced strength throughout your body.

DETERMINING YOUR NEEDS

Calculate your maximum heart rate as a first step in developing your fitness program. The formula to calculate average maximum heart rate for one minute is:

$$205.8 - (0.685 * \text{age})$$

See *Appendix A* for the source of this formula.

To find your pulse, locate a vein on your neck or inside your wrist, then count beats for 10 seconds, then multiply by six.

It's also important to know your target training zone or target heart rate. The American College of Sports Medicine (ACSM) suggests 55% to 65% for lower-conditioned users, 75% to 80% for moderately conditioned users, and up to 90% for well-conditioned users. (See *Appendix D*.)

Beginning Your F.I.T. Program

DESIGNING AN EXERCISE PROGRAM

In addition to monitoring your heart rate as you exercise, be certain of how quickly your heart rate recovers. If your heart rate is over 120 beats per minute five minutes after exercising, or is higher than normal the morning after exercising, your exertion may be too strenuous for your current level of fitness. Reducing the intensity of your workout is recommended.

The age-adjusted target heart rates indicated in *Appendix A* reflect averages. A variety of factors (including medication, emotional state, temperature, and other conditions) can affect the exercise heart rate appropriate for you.

Warning: Consult your doctor to establish the exercise intensity (target heart rate zone) appropriate for your age and condition before beginning any exercise program.

Warm-Up: Slow and Deliberate Exercise

You are not warmed up until you begin to perspire lightly and breath more deeply. Warming up prepares your heart and other muscles for more intense exercise and helps you avoid premature exhaustion. Start slowly, exploring different workloads until you can comfortably sustain your exercise level. A good suggestion is a minimum of three minutes. Perspiration on your brow is a good indicator of a thorough warm-up. The older you are, the longer your warm-up period should be.

BEGINNING
YOUR
EXERCISE
PROGRAM

Workout: Brisk and Rhythmic Exercise

The workout trains and conditions your heart, lungs, and muscles to operate more efficiently. Increase exercise in response to your heart rate to train and strengthen your cardiovascular system. Concentrate on exercising smoothly.

Cool-Down: Slow and Relaxed Exercise

Cooling down relaxes your muscles and gradually lowers your heart rate. Slowly reduce your workload until your heart rate is below 60 percent of your maximum heart rate. The cool down should last at least five minutes, followed by some light stretching to enhance your flexibility.

Beginning a Fitness Program

If you cannot sustain 12 continuous minutes in your target heart rate zone, exercise several times a day to get into the habit of exercising.

Try to reach and maintain 60-65 percent of your maximum heart rate. Alternate exercise with periods of rest until you can sustain 12 continuous minutes of exercise at 60-65 percent of your maximum heart rate.

Begin exercising in three to five minute sessions.

Establishing and Maintaining Fitness

DESIGNING AN EXERCISE PROGRAM

If you can sustain 12 but not 20 continuous minutes of exercise in your target heart rate zone:

Exercise three to five days a week.

Rest at least two days per week.

Try to reach and maintain 60-75 percent of your maximum heart rate with moderate rhythmic exercise.

Begin with 12 continuous minutes. Increase your time by one to two minutes per week until you can sustain 20 continuous minutes.

ESTABLISHING
AEROBIC
FITNESS

If you can sustain 20 continuous minutes in your target heart rate zone, begin to increase the length and intensity of your workout:

Exercise four to six days a week or on alternate days.

Try to reach and maintain 70-85 percent of your maximum heart rate with moderate to somewhat hard exercise.

Exercise for 20-30 minutes.

MAINTAINING
AEROBIC
FITNESS

MANAGING WEIGHT

Consistent aerobic exercise will help you change your body composition by lowering your percentage of body fat. If weight loss is a goal, combine an increase in the length of your workouts with a moderate decrease in caloric intake. For weight control, how long and how often you exercise is more important than how hard you exercise.

- Exercise four to five times a week.
- Try to reach and maintain 60-75 percent of your maximum heart rate with moderate exercise.
- Exercise for 30-45 minutes at 60-65 percent of your target heart rate.

Here are some tips to achieving your weight management goal:

- Consume most of your dietary calories at breakfast and lunch, and eat a light dinner. Do not eat close to bedtime.
- Exercise before meals. Moderate exercise will help suppress your appetite.
- Take exercise breaks throughout the day to help increase metabolism (calorie expenditure).

A Sports Training Program

DESIGNING AN EXERCISE PROGRAM

SPORTS TRAINING

When you are training to improve strength and performance:

- Exercise four to five days a week. Alternate exercise days and intervals of hard to very hard exercise with easy to moderate exercise.
- Exercise for 30 minutes or longer.

Warning: these strategies are intended for average healthy adults. If you have pain or tightness in your chest, an irregular heartbeat, shortness of breath or if you feel faint or have any discomfort when you exercise, **STOP!** Consult your physician before continuing. Remember, every workout should begin with a warm-up and finish with a cool-down.

TABLE

Setup Mode

In This Chapter:

*How to Get Into Setup Mode
Customizable Options*

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CHAPTER 2: Riding Your Bike
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HOW TO GET INTO SETUP MODE

- Press and hold **Enter**.
- Begin pedaling the bike, or power up with external power.
- At the five-digit “Pass Code” prompt, enter 1 0 1 0 1 . If you make a mistake, start entering the code from the beginning. Press **Enter**.
- The first Setup Mode screen will be displayed. Pressing **Change Display** will switch to the second screen.
- Press **Enter** to accept each parameter and move to the next one.
- When you're done making changes, let the bike power all the way down (the orbiting LEDs on the front overlay will go out). The changes will take effect the next time the bike powers up.

Customizable Options

SETUP MODE

Manager Setup (page 1 of 2)	
Contrast: 360	
Language: English	Units: English
Max Time: 99	Default Time: 20
Pause Time: 15 seconds	Pulse priority: polar
Ops Mode: Normal	RPM Limit: 50
Def Manual: mets	Sound: ON
CSAFE Enable: ON	CSAFE Auto: ON
Happy: OFF	Attract: OFF
Cal/hr slope: 1.000	Cal/hr offset: 0.00
Def Weight: 150 lbs	Display Options: 7
SRAM Pause: OFF	Reset defaults: OFF

CUSTOMIZABLE OPTIONS

Contrast: Adjust with **+**, **-** keys or numeric keys, with useful values from 200 to 450. 360 is the default.

Language: Currently, only English is supported.

Units: English (default) or metric.

Maximum Workout Time: From 1 to 98 minutes, and unlimited. Thirty minutes is the default.

Default Time: This is the workout time Workout Setup first suggests. From 1 to 98 minutes, never greater than maximum time. Twenty minutes is the default.

Pause Time: Fifteen seconds (default), 30, 60, and 120 seconds and unlimited. Pauses longer than 15 seconds are available only with external power.

Pulse Priority: If the Z-Bike sees both transmitter belt and contact heart rate signals, this setting determines which one it will pay attention to. The default is wireless priority.

CUSTOMIZABLE OPTIONS (CONT.)

Ops Mode:

- *Normal* (default), where you can access most of the features.
- *Medical* or *Ergometer*, the two special modes for rehab or testing.

RPM Limit: If Medical or Ergometer mode is selected, RPM will be limited by a significant workload increase.

Default manual: Personal Power-based, or bicycle simulation, or constant power with 10-watt increments.

Sound: Tones are on (default) or off.

Happy: Adds Happy Mode under Advanced options key.

CSAFE Enable: Turns on CSAFE network communications.

CSAFE Auto: Bike will auto-announce itself to the network when it powers up.

Def. Weight: Suggested body weight.

Display Options: The number of different data readout sets. Setting a value of "3" will allow two normal screens and the ECG waveform display. Setting a value of "5" will allow two additional screens with more advanced readouts like watts and running speed equivalents.

SRAM Pause: Enables special retention of workout data even after console powers off with no external power. Recommended for residential use only.

Reset: Restore factory default settings.

Odometers

SETUP MODE

ODOMETERS

Miles: Accumulated "miles," which is simulated road bike miles. Even though this is just a simulated number, it actually is a good measure of stress and wear on the bike mechanism and braking system. Higher mileage results from higher braking power, more pedal revolutions, or both.

Hours: Total hours the bike has been in use. If the bike is idle or in attract mode, hours do not accumulate; in general, the pedals have to be moving for hours to accumulate.

Total Starts: The total number of times the bike awakens from either sleep mode or attract mode.

Program Selection Counters: For each different workout, how many times a new workout was initiated.

```
Manager Information (page 2 of 2)
Odometer: 0.0 miles      Op Hours: 0.0
Total Starts: 0         Version: DND2T V0.02
Program Selection Counters
Fine Control: 0         10 Watt Inc: 0
Bicycle: 0              Target HRC: 0
Int HRC: 0              HRC Ultra: 0
Int HRC Ultra: 0       Easy Int: 0
Sport Int: 0            Custom Int: 0
Rolling Hill: 0        Ramp Hill: 0
Medical: 0              Ergometric: 0
Calorie Goal: 0        Custom Scale: 0
Custom Fixed: 0        Custom Record : 0
Custom Repeat: 0       Fitness Test: 0
Happy mode: 0
```




Test Mode

In This Chapter:

How to Get Into Test Mode

How to Use Test Mode

What the Data Readouts Mean

More Data Readouts

Diagnostic LEDs

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HOW TO GET INTO TEST MODE

- Press and hold .
 - Begin pedaling the bike, or power up with external power.
 - At the five-digit “Pass Code” prompt, enter 2 0 1 7 3 . If you make a mistake, start entering the code from the beginning. Press .
 - The first Test Mode screen will be displayed. Pressing  will switch to the other screens.
-

How to Use Test Mode

TEST MODE

It is highly recommended you have the optional external power supply. This wall-wart transformer allows the bike to be powered up without you having to pedal it, and bypasses the need for the self-generating systems to be working.

HOW TO USE THESE FUNCTIONS

The most useful things to check:

Diagnostic LEDs: LEDs 5, 6, and 7 should all be lit.

Pedal RPM: Pedal at a moderate rate, and RPM should read between 60 and 80.

Watts: While pedaling, this should match Targ PWR. Move the cursor to Prog PWR using the Start key, then change this value up and down between 50 and 200 watts. Watts should track your changes.

```
Diags (page 1 of 8) VER: DND2T V0.02  CHK: 0000
CONTACT HR: 0          GRIPS DETECTED: OFF
POLAR HR: 0
PEDAL RPM: 80         BRAKE RPM: 0
PWM TARGET: 0        PWM DRIVE: 11000
LOAD TARGET: 0.00    LOAD SENSE: 0.00
LOAD ON/OFF: OFF     EXT. SRAM:
KEYPRESS: NO KEY
C-PUMP: 0.00  S-CAPS: 0.00  CONTRAST: 0.00
STRIDE POSITION:0.00  STRIDE OFF
WATTS: 75   PROG PWR: 60   TARG PWR: 75
CSAFE CHK: OFF  CSAFE1: ----  CSAFE2: ----
```



TEST DATA READOUTS

Press  to tab to editable entries.

Polar HR: If a Polar-compatible wireless heart rate transmission is present, the bpm signal is displayed here. Example value: 122.

Ver: Motherboard and software version. Example value: DND1T v1.02.

CHK: Checksum verification from software download. Example value: 5422.

Contact HR: If the contact heart rate system has locked in on a heart rate, the bpm signal is displayed here. Example value: 122.

Grips Detected: ON signifies the contact heart rate system has detected the minimum three points of contact: right hot, left hot, and common. This should go to ON immediately upon minimum contact achieved, and only confirms an intact circuit; it does not imply an adequate signal-to-noise ratio. Example value: OFF.

Pedal RPM: Calculated rpm from the magnetic rpm sensor. Example value: 70.

Brake RPM: Calculated rpm from the electromagnetic brake coil. Should be about 12.5 times the pedal RPM value. Example value: 875.

PWM Target: (editable): Pulse width modulation value desired by the workload control system. Range is from 0 to 64K. Example value: 12000.

More Data Readouts

TEST MODE

Ext SRAM: Confirms static RAM system is operating. Example value: PASS.

PWM Drive: Actual pulse width modulation value. When cursor is under PWM target, should be close to or match PWM Target. Example value: 12157.

Load Target: Not used.

Load Sense: Current in amperes from the electromagnetic brake load coil. Example value: 0.85.

Load ON/OFF: Enables or disables LCB load feedback control. Should always be ON. If OFF, the LCB will ignore the PWM drive signal and remove the load current feedback. Example value: ON.

C-Pump: Unregulated voltage from charge pump circuit for contrast control. Example value: 30.11.

S-Caps: Voltage level of super capacitors, which provide power for the bike during workout pause. About 45 seconds of pedaling should result in a full charge of 4.82 volts. Example value: 4.82.

Contrast: Regulated voltage for contrast control. Example value: 24.50.

Stride Position: Not used on bikes.

Stride: Not used on bikes.

Watts: Actual watts as measured from the electromagnetic brake. Example value: 125.

Prog PWR: (editable): The power requested by the user or workout program. Example value: 130.

Targ PWR: The adjusted power requested of the electromagnetic brake. Will typically be the same as Prog PWR, except when pedal RPM falls below 60, when torque roll-off occurs. Example value: 110.

CSAFE CHK CSAFE1 [and] CSAFE 2: Initiates CSAFE port loopback test. All CSAFE networks must be disconnected, and correctly-wired loopback cables installed for this test to work. Press + to start test, which should take a few seconds. Example values: PASS/FAIL/----.

Individual Key ON/OFF tests: Pressing each key will play a tone and identify the key on the display.

Diagnostic LEDs

TEST MODE

Diagnostic LEDs on back of console just above CSAFE ports:

LED 1 - 4: used to indicate errors if main display is not lit.

LED 5: +5V from lower control board (LCB) for digital logic. Only lit if receiving power from LCD, not supercap power.

LED 6: +10V from LCB for motherboard main operation.

LED 7: +10V from LCD for LCD backlight.

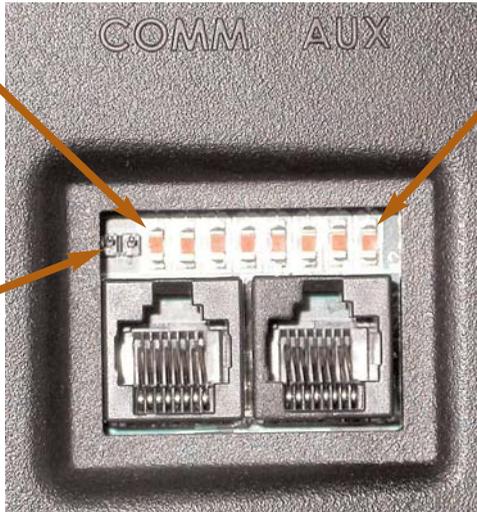
LED 8: lit when programming jumper is installed.

DIAGNOSTIC LEDs

LED 1

LED 8

Programming Jumper



Care and Maintenance

In This Chapter:

How to Care for Your Bike



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HOW TO CARE FOR YOUR BIKE

Your Z8.1 Bike doesn't require any routine maintenance, not even lubrication. Keeping it clean is the most important task.

After every workout: Perspiration should be wiped from the control console, contact heart rate pads, shrouds, and seat.



Weekly. Wipe down your Z8.1 Bike once a week with a water-dampened soft cloth. On the contact heart rate pads, use a glass cleaning solution. Be careful not to get excessive moisture between the edge of the overlay panel and the console, as this might create an electrical hazard or cause the electronics to fail.



Expert service and maintenance at a reasonable cost are available through your factory-trained, authorized True Fitness dealer. The dealer maintains a stock of repair and replacement parts and has the technical knowledge to meet your service needs.



Important Safety Instructions

In This Chapter:

Review for Your Safety

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When using this exercise bike, basic precautions should always be followed, including the following:

Read all instructions before using this exercise bike.

Consult your physician before beginning any exercise program.

Do not use if you have an acute cold or fever.

Warning: to reduce the risk of burns, fire and electric shock and injury to persons, follow these instructions:

If the bike is plugged in:

Danger: To reduce the risk of electric shock, always unplug it immediately after use and before cleaning.

Unplug it from the outlet when not in use and before any service is performed.

Keep the power cord away from heated surfaces.

Never operate this exercise bike if it has a damaged power cord or plug, if it is not working properly, if it has been damaged or dropped, or if it has been submerged in water. In these cases, the exercise bike should be examined by a qualified service technician.

Review for Your Safety

IMPORTANT SAFETY INSTRUCTIONS

Other safety precautions:

Close supervision is necessary when this exercise bike is being used by or near children, or disabled persons.

Use this exercise bike only for its intended use as described in this manual.

Do not use attachments not recommended by the manufacturer.

Never drop or insert any object into any opening.

Do not allow animals on or near your exercise bike.

Use the exercise bike indoors only.

Never use your exercise bike near water or while wet. Using the exercise bike around a pool, hot tub or sauna will void the warranty.

Do not operate where aerosol (spray) products are being used or where oxygen is being administered.

Allow only trained personnel to service this equipment.

Avoid the possibility of bystanders being struck or caught between moving parts by making sure that they are out of reach of the exercise bike while it is in motion.

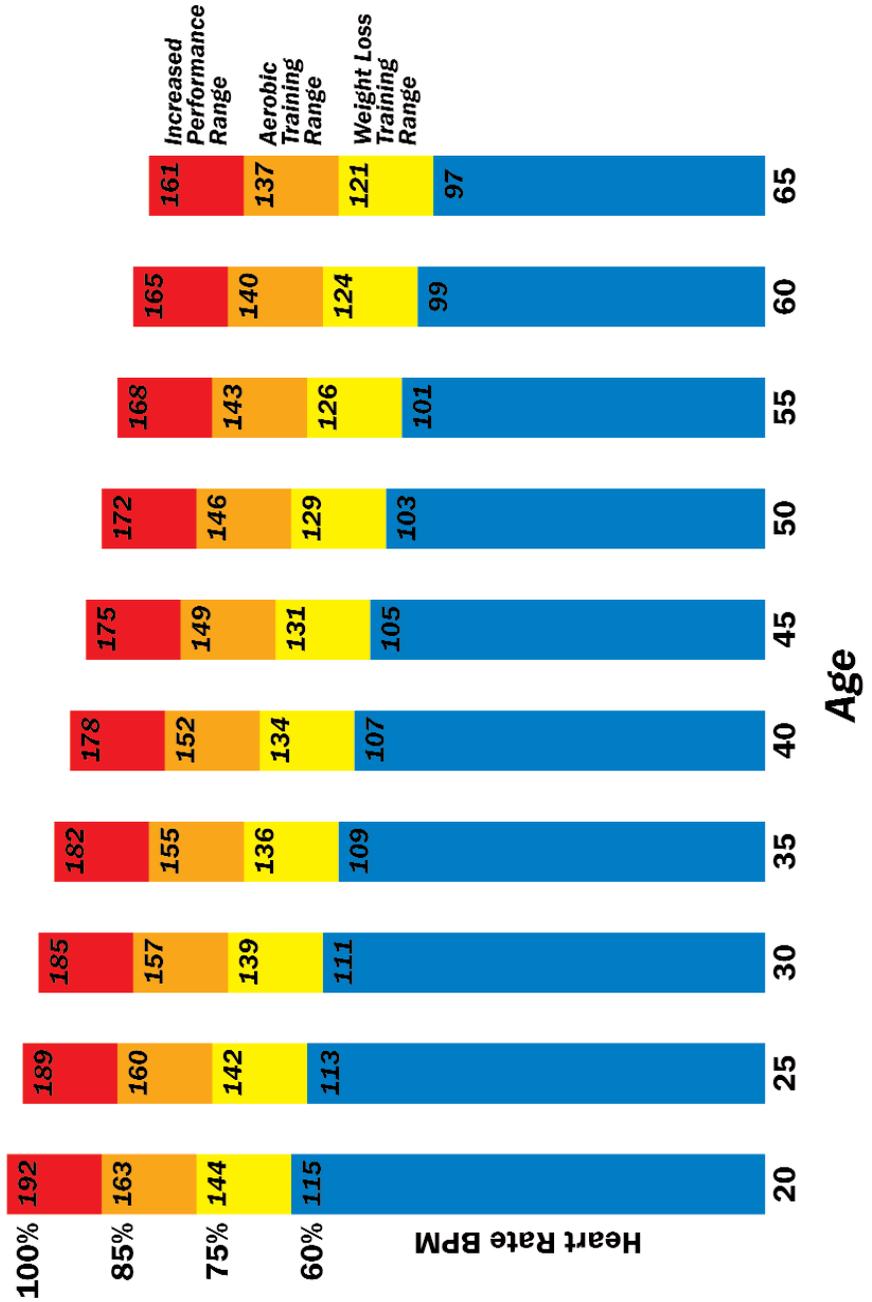
Allow only one person at a time on your machine.

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Appendix A

Maximum Heart Rate and Target Heart Rate

TARGET HEART RATE CHART



Appendix A

Remember to check with your physician before beginning any exercise program. She can help determine an appropriate target heart rate. Medications often affect heart rate.

**CHECK WITH
YOUR
PHYSICIAN**

Robert Robergs, editor of the prestigious Journal of Exercise Physiology, conducted a study in 2002 of the maximal heart rate equation $220 - \text{age}$. He found this equation "has no scientific merit for use in exercise physiology and related fields."

**A NEW
HRMAX
EQUATION**

In his survey of research in this area, Robergs found several other simple equations that were significantly more accurate. The best equation he found was derived in 1994 by Oten Inbar:

$$205.8 - (0.685 * \text{age})$$

The Z-Console uses the Inbar equation. Even though this is the best available equation, it still has a possible range of error of ± 6 beats per minute.

Other similar equations that are also more accurate than $220 - \text{age}$ are:

$$206.3 - (0.711 * \text{age}) \text{ (Londeree, 1982)}$$

$$206.0 - (0.700 * \text{age}) \text{ (Tanaka, 2001)}$$

$$208.8 - (0.734 * \text{age}) \text{ (Robergs meta study, 2002)}$$

Robergs' paper can be found here:

<http://www.asep.org/Documents/Robergs2.pdf>

WILTRIDE

Appendix B

Maximal Oxygen Uptake and METs

VO₂MAX Maximal oxygen uptake, or VO₂max, is considered the best single measurement of cardiovascular fitness. It represents the peak rate of your body's oxygen consumption capability, which is important because this is one of the two biggest factors in endurance performance.

(The other big endurance factor is the *lactate threshold*, which is the exercise level at which blood lactate begins to accumulate above resting levels. The lactate threshold is much more difficult to measure than VO₂max, which is why VO₂max is the accepted standard.)

The only accurate way to measure VO₂max is to use a laboratory-grade respiratory diagnostic system during a maximal exercise test. All other methods produce an estimate with varying degrees of accuracy.

Serious training results in an average improvement in VO₂max of 20%, and all this takes place in 8 to 12 weeks. Additional performance improvement after this time is a result of a higher lactate threshold and, to a lesser degree, increased biomechanical efficiency.

(See Wilmore & Costill, *Physiology of Sport and Exercise*, pages 140-141, and *ACSM Guidelines*, page 68).

VO₂max is expressed in milliliters of oxygen per minute per kilogram of body weight, or ml/min/kg.

Appendix B

METs are defined as the ratio of the current body energy expenditure rate compared with basal metabolic rate (BMR):

$$\text{METs} = (\text{VO}_2 \text{ rate of current state}) / 3.5$$

where 3.5 represents BMR. VO₂ (oxygen uptake) and 3.5 are in units of ml/kg/minute of oxygen consumed by the body. This oxygen consumption rate corresponds to about 72 calories per hour for a 150-pound person.

MET EXPLANATION

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Appendix C

Details on How the Z8.1 Bike Controls Your Exercise Intensity

**CONSTANT
POWER AND
CONSTANT
TORQUE**

As you ride the Z8.1 Bike, your exercise intensity is best measured as the amount of power received by the bike from your pedaling. This power is usually expressed in watts. The watts measurement is calculated from your pedaling speed (called *cadence*) multiplied by the amount of resistance on the pedals (called *torque*). (See Feynman, *Lectures on Physics*, 1971.)

In most cases it is desirable to keep the exercise intensity constant, no matter what the pedal cadence, since it allows accurate control of the rider's workout. This kind of workload control is called *constant power*. If you pedal faster, the resistance on the pedals (torque) is reduced by the same amount. If you pedal slower, the resistance is increased.

If, instead, the amount of resistance on the pedals stays the same when your cadence changes, your workload intensity will vary directly with your cadence. If you pedal twice as fast, your exercise intensity doubles. This kind of workload control is called *constant torque*.

Constant power is used by the Z8.1 Bike in most cases, in order to provide the most accurate workload control. This is especially important in heart rate control workouts and the Calorie Goal program.

A negative side-effect of constant power is that at very low cadences, such as below 55 rpm, the amount of extra torque applied to the pedals to keep power constant is so great that the rider may not be able to keep the pedals moving. To reduce this problem, the bike changes to constant torque at cadences below 55 rpm, preventing any further increases in torque. The computer will also warn you that it is no longer able to control exercise intensity.

Appendix C

Constant torque is used in a modified way in Bike Mode. In addition to constant resistance for a given "gear," additional torque is applied to simulate wind and road resistance, as well as to compensate for different body weights.

Personal Power was initially designed to vary workload at a 1:1 ratio with body weight, just like a METs-based exercise prescription. However, it turns out that human endurance and power generating capability varies with the $^{2/3}$ root of body weight, not straight body weight. This relationship can be seen in everything from weightlifting world records to distance running competitions. (See McMahon and Bonner, *On Size and Life* (1985), page 55).

Since METs do not work the way they're supposed to, Personal Power is based on a new unit of measure that correctly accounts for body weight. This new unit of metabolic measure, called the T-MET, is defined as:

$$\text{T-MET} = \text{watts} / (\text{kg})^{2/3}$$

where *watts* is power applied to an external machine from the exerciser, and *kg* is the exerciser's body weight in kilograms.

THE PERSONAL POWER CALCULATION



Appendix D

*American College of Sports
Medicine Position Stand on Exercise
and Fitness*

INTRODUCTION In 1998, the American College of Sports Medicine completed their most important position stand, titled, "The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults." The ACSM is recognized as the premier authority in this area, so this document describes the current consensus among exercise physiologists and coaches.

(Also note that the ACSM is a fairly conservative body, so they only make recommendations when there are compelling reasons.)

The following is a summary of the document. The full document can be found on the ACSM's journal's website:

<<http://ipsapp006.lwwonline.com/content/getfile/2320/20/1050/fulltext.htm>>

THE SUMMARY OF THE POSITION STAND The variables of frequency, intensity, and duration of exercise quantify the degree of overload stimulus in an exercise program. In general, the greater the stimulus the greater the training effect. All three types of exercise (cardiovascular, resistance, and flexibility) should be included in a training program.

Cardiovascular training is especially sensitive to frequency and intensity; the minimums for developing and maintaining fitness are at least 10 minutes per day at a minimum of 50% VO_2 max at least two days per week. Proper warmup and cooldown, including flexibility, are recommended.

Appendix D

Training should be three to five days per week at between 55% and 90% maximum heart rate. Deconditioned individuals should stay between 55% and 64%. Total duration of training should be between 20 and 60 minutes, with the time varying inversely with intensity. High-intensity, short duration exercise is generally only recommended when training for non-athletic competition.

**SPECIFIC
RECOMMENDATIONS
FOR
CARDIORESPIRATORY
FITNESS AND BODY
COMPOSITION**

Adequate exercise intensity requires the use of large muscle groups, which typically means legs and buttocks. In some cases, shoulders and upper back muscles used in rigorous swimming will be adequate.

Resistance training should consist of one set of 8 to 10 exercises that stimulate all the major muscle groups, two to three days a week. Multiple sets will not necessarily provide greater benefits, especially considering the significantly increased time requirements and adherence difficulties.

**SPECIFIC
RECOMMENDATIONS
FOR MUSCULAR
STRENGTH AND
FLEXIBILITY**

Flexibility exercises should stretch the major muscle groups a minimum of two to three times a week, and should include both static and dynamic techniques.

WILTRUDE

Appendix E

Specifications

SPECIFICATIONS

Workload Range: 30 - 600 watts.

Weight: Recumbent, 180 pounds. Upright, 160 pounds.

Maximum User Weight: 350 pounds.

Workload Control System: Self-generating electromagnetic braking.

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Other ACSM position stands are found here:

<www.acsm-msse.org>

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