Z5 Series

Owner's Guide

TRUE

Thank You For Selecting A True Treadmill

In 1981, Frank Trulaske launched True Fitness Technology, Inc. and began manufacturing hand-crafted treadmills.

His team's obsession with quality has propelled True to the top of the industry and has created one of America's oldest, largest and most respected fitness equipment manufacturers.

Over the years, True has designed, developed, patented and fabricated many new and cutting-edge innovations for their products: including advanced features, manufacturing components and technological breakthroughs.

Intensive quality control standards guarantee excellence in every phase of production, resulting in the finest products available in the marketplace.

"Our original goal was to build the world's best treadmills, and today we believe we're doing it!"

-Frank Trulaske

True is rapidly becoming the choice for workouts among beginners, rehab patients and top athletes world-wide.

True treadmills are consistently rated #1 for their smooth, quiet and comfortable performance. Today, True is the choice for workouts among beginners, rehab patients and top athletes world-wide.

Today True offers a full line of treadmills, upright and recumbent bikes, elliptical trainers, strength and flexibility equipment. True is proud to "Deliver The Best!"

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Introduction

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Your new treadmill is part of the True Z5 Series treadmills, which are all built to the same heavy-duty standards. Since this owner's guide covers all five Z5 Series models, you might notice explanations of features that are different from your treadmill. The main differences are in the consoles. The following section describes the model differences:

MODEL DIFFERENCES

Z5

A manual treadmill with a simplified display.

Z5 HRC

- 7 x 20 pixel progress matrix LED display
- Four pre-set workout programs
- User programs
- Heart rate control: one target heart rate workout

Top Features

Z5.4 HRC

- Light-blue backlit LCD display with 7 x 20 progress matrix four pre-set workout programs
- User programs
- Heart rate control: one time-based heart rate workout, four distance-based heart rate workouts, and two interval heart rate workouts
- S.O.F.T. Select adjustable softness running surface

Z5.5 HRC

- Deep-blue backlit LCD display with 10 x 28 progress matrix
- Dot-matrix LCD message center
- Four pre-set workout programs
- User programs
- Heart rate control: five time-based heart rate workouts, four distance-based heart rate workouts, and five interval heart rate workouts
- S.O.F.T. Select adjustable softness running surface

Z5.5 Limited

- Same as Z5.5 HRC but with –3% decline and motorized S.O.F.T. Select adjustable softness running surface

For Your Safety

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

Where to Go From Here

Where to Go From Here

Chapter 1: Introduction. Introduces key features, as well as a guide on where to go next in this manual.

Chapter 2: The Console. Describes each console key and display window.

Chapter 3: Basic Operation. How to get the treadmill started and stopped; calorie consumption estimates; heart rate monitoring; the S.O.F.T. Select system.

Chapter 4: Operation in Greater Detail. All the details of manual and pre-set programs.

Chapter 5: Heart Rate Control Workouts. Four different kinds of treadmill-controlled heart rate feedback workouts.

Chapter 6: User Programs. You can record your workout to play back as a custom-designed workout.

Chapter 7: Desiging an Exercise Program. Advice on various ways to use your treadmill in a rewarding exercise regime.

Chapter 8: Care and Maintenance. Basic requirements, as well as a simple troubleshooting and diagnostics guide.

Chapter 9: Important Safety Instructions. Make sure you familiarize yourself with this section.

Appendix A: Target Heart Rate Chart. A guide to help you pick an initial target heart rate.

Appendix B: METs Table. How speed and incline affect workload, expressed in METs.

Appendix C: METs Explanation and Formulas. The metabolic calculations behind energy expenditure estimates.

Appendix D: Specifications.

Bibliography: References and selected readings.

The Console

In This Chapter:

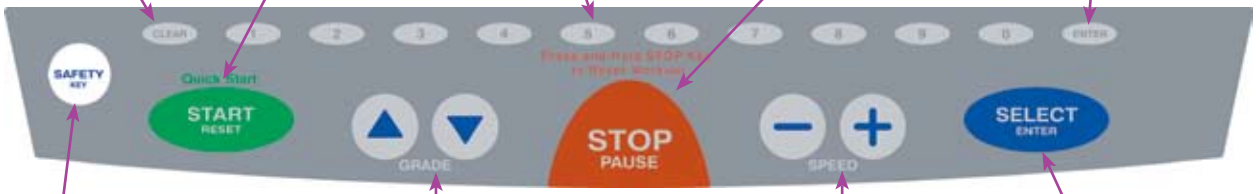
Lower Console

Limited Console

HRC Model Console

Standard Console

Lower Console - Common to all Models



Clear
Clears current numeric entry.

Start/Reset
Starts the belt in motion. Also resets workout data when held for 3 seconds.

Numeric Keys
Direct entry of numeric data.

Stop/Pause
Stops the belt and pauses workout. If held for 3 seconds, resets all workout information.

Enter
Identical to Select/Enter with additional function when changing speed or incline using numeric keys.

Safety Key
Removable magnetic key must be in place for treadmill to operate.

Grade Up/Down
Adjusts incline. Also used to choose programs.

Speed Slow/Fast
Adjusts speed in 0.1 mph increments. Also used to set weight and other workout parameters.

Select/Enter
Accepts workout parameters, and toggles the dual function displays.

Z5.5 Limited Console

Soft Select Adjustment
Changes the softness of the treadmill deck.

Matrix Display
Shows workout progress.

Message Center
Provides workout setup instructions, and data feedback during workout.

Express Keys
Instantly change from program to program.

Distance
Miles traveled in 0.01 mile increments up to 9.99 miles, or 0.10 mile increments past 10 miles. Can also be set to count down.

Grade
Incline in percent grade in 0.5% increments.

Time
Time remaining in your workout. (This is elapsed time in default Manual mode or Quick Start.)

Pace
Time per mile at current speed.

Calories
Estimated total calories burned.

METs
Energy expenditure rate. See Appendix C.

Speed
Miles per hour in 0.10 increments.

The above definitions describe workout information readouts. Those specific readouts can be toggled by hitting the Select/Enter Key.

Z5.5 HRC Console

Matrix Display
Shows workout progress.

Express Keys
Instantly change from program to program.

Distance
Miles traveled in 0.01 mile increments up to 9.99 miles, or 0.10 mile increments past 10 miles. Can also be set to count down.

Grade
Incline in percent grade in 0.5% increments.

Time
Time remaining in your workout. (This is elapsed time in default Manual mode or Quick Start.)

Pace
Time per mile at current speed.

Calories
Estimated total calories burned.

METs
Energy expenditure rate. See Appendix C.

Speed
Miles per hour in 0.10 increments.

The above definitions describe workout information readouts. Those specific readouts can be toggled by hitting the Select/Enter Key.

Z5.4 HRC Console

Distance
Miles traveled in 0.01 mile increments up to 9.99 miles, or 0.10 mile increments past 10 miles. Can also be set to count down.

Grade
Incline in percent grade in 0.5% increments.

Time
Time remaining in your workout. (This is elapsed time in default Manual mode or Quick Start.)

Pace
Time per mile at current speed.

Calories
Estimated total calories burned.

METs
Energy expenditure rate. See Appendix C.

Speed
Miles per hour in 0.10 increments.

The above definitions describe workout information readouts. Those specific readouts can be toggled by hitting the Select/Enter Key.

Z5 HRC Console

Matrix Display
Shows workout progress.

Express Keys
Instantly change from program to program.

Z5 HRC Console

Distance
Miles traveled in 0.01 mile increments up to 9.99 miles, or 0.10 mile increments past 10 miles. Can also be set to count down.

Grade
Incline in percent grade in 0.5% increments.

Time
Time remaining in your workout. (This is elapsed time in default Manual mode or Quick Start.)

Pace
Time per mile at current speed.

Calories
Estimated total calories burned.

METs
Energy expenditure rate. See Appendix C.

Speed
Miles per hour in 0.10 increments.

The above definitions describe workout information readouts. Those specific readouts can be toggled by hitting the Select/Enter Key.

Z5 Standard Console

Distance
Miles traveled in 0.01 mile increments up to 9.99 miles, or 0.10 mile increments past 10 miles. Can also be set to count down.

Grade
Incline in percent grade in 0.5% increments.

Time
Time remaining in your workout. (This is elapsed time in default Manual mode or Quick Start.)

Pace
Time per mile at current speed.

Calories
Estimated total calories burned.

METs
Energy expenditure rate. See Appendix C.

Speed
Miles per hour in 0.10 increments.

The above definitions describe workout information readouts. Those specific readouts can be toggled by hitting the Select/Enter Key.

Basic Operation

In This Chapter:

STARTING YOUR TREADMILL SAFELY

Straddle the treadbelt by placing your feet on the straddle covers.

Attach the lanyard to your clothing at roughly waist height.

Place the safety key on the key holder on the console.

Set your weight using the + and − keys or the numeric keys and press SELECT.

Press the START key for a quick start into a manual control workout, or…

Press SELECT to set up a manual workout, or…

Press the ▲ ▼ keys or an Express Command Key to begin setting up a different workout, as described in later sections.

Adjusting Speed and Incline

SPEED AND INCLINE ADJUSTMENT

Speed Control: use either the + and − keys by themselves to change speed. Or, to quickly go to a specific speed...

...enter a target speed with the numeric keys...

...then press the small Enter key...

...and then press either the + or − key to change to that speed.

Incline Control: use either the up and down keys by themselves to change incline. Or, enter a target incline with the numeric keys, then press the small Enter key ENTER, and then press either the up ▲ or down ▼ key to change to that incline.

Stopping Your Treadmill Safely

Care should be taken when using the numeric keys to control your treadmill's speed and incline, since large changes in those values are possible with just a few keystrokes.

Slow the treadmill to below 2 mph using the ▼ key. Press STOP .

Setting Your Weight

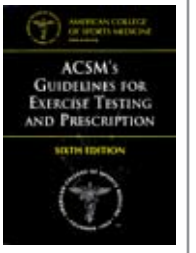
Your body weight must be entered so that the treadmill accurately estimates your calorie expenditure. This weight must include your workout clothing, too, which typically adds about three pounds. The treadmill will work fine without your weight setting, but will be unable to calculate your total calories.

The treadmill will remember the last weight you entered.

Calorie Expenditure Calculations

A NOTE ABOUT CALORIE EXPENDITURE CALCULATIONS

True treadmills use the calorie expenditure formula as described in *Guidelines for Exercise Testing and Prescription* from the American College of Sports Medicine. This is the most widely accepted formula for running and walking.



The ACSM guide says that running burns calories twice as fast as walking, e.g., a 150-pound person jogging at 5 mph requires 548 calories per hour, while walking at 5 mph requires 274 per hour. See Appendix C for more details.

(Other respected researchers such as David Costill think the ACSM overstates the energy difference between running and walking. Costill believes running requires 60% more energy than walking, not 100% as calculated by the ACSM. Using the same example, Costill's calculations result in 496 cal/hour for running 5 mph, with 313 cal/hour for walking 5 mph.)

One potential source of calorie estimate error is that the treadmill doesn't know if you are running or walking, so it has to make some assumptions. It assumes you are walking at 3 mph and slower, and running at 5 mph and faster. Between those two speeds, the treadmill combines the walking and running formulas to make its best guess.

Variations in human exercise efficiency are another potential source of error, with differences of plus or minus 10% common in the population

MONITORING YOUR HEART RATE

The Z5 Series (*except* the Z5 Non) can monitor your heart rate when you wear the transmitter strap provided. It will display it as a digital beats-per-minute readout, and it is very accurate, typically within one beat per minute.

Although your treadmill functions fine without using the heart rate monitoring feature, this kind of monitoring gives you valuable feedback on your effort level. It also allows you to use the most advanced training system available on a treadmill: True's Heart Rate Control, where the treadmill automatically adjusts your workout level based on your heart rate. See the Heart Rate Control section of this manual for details.

USING THE HEART RATE TRANSMITTER STRAP

The transmitter strap should be worn directly against your skin, about one inch below the pectoral muscles/breast line.

Women should be careful to place the transmitter below their bra line.

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.

The Heart Rate Display

THE TREADMILL'S HEART RATE DISPLAY

Before you start your workout, as you stand on or near the treadmill, you will know the treadmill is properly receiving your heart rate signal by the flashing LEDs in the Heart Rate window.

Once you start your workout, your heart rate will be displayed in beats per minute.

THE S.O.F.T. SELECT SYSTEM

One part of True's unique cushioning and stability system is the S.O.F.T. System. It cushions the initial impact of your foot plant near the front of the treadmill deck, then transitions to a firm, secure surface for push-off. The combination of softness, then firmness — right when you need it — reduces stress on ankles, knees, hips, and back.

The other part of True's comfort and performance system is the S.O.F.T. Select adjustable softness surface on the Z5.4 and Z5.5 Limited. You can adjust the deck support through a 22-inch range by moving the lever on the right side of the treadmill or, on the Z5.5 Limited model, by pressing the Softer or Firmer keys on the console. The **1** setting is softest and the **12** setting is firmest.

S.O.F.T. Select is especially useful to accommodate users of differing weights or those with special physical needs.

The Z5.5 Limited's Electronic S.O.F.T. Select:

Press and hold the 

or 

keys to change the target setting in the message center. To review your S.O.F.T. Select setting, quickly press either S.O.F.T adjustment key.

Operation in Greater Detail

In This Chapter:

Workout Setup

Pre-Set Program Operation

Tuning Your Workout

Pre-Set Program Profiles

STARTING COOL-DOWN

Confirm that the body weight setting is correct. If it is not, adjust it with the + − or numeric keys and press SELECT.

For a Quick Start, simply press START. The treadmill belt will start moving at 0.5 mph.

During your workout, the treadmill will count down from your target time. When it reaches 0:00, it will enter a 2.5-minute cool-down period, with the tread belt at the same speed it was at 0:00 and the treadmill in Manual control mode. After 2.5 minutes, the treadbelt will stop.

If you set a distance target in Manual mode, the cool-down period will begin as soon as either time or distance reach zero.

MANUAL OPERATION

To use manual control, which is the first program suggested, press SELECT. Adjust your workout parameters using the + − or numeric keys, then press SELECT to accept each parameter. You can keep adjusting your workout setup by repeatedly pressing SELECT. Your workout won't begin until you press START.

Note: if you don't choose a time or distance target, Time will be elapsed time instead of time remaining.

MAKING TIME AND/OR DISTANCE COUNT DOWN INSTEAD OF UP

After adjusting your weight if necessary, press SELECT twice or until the lights in the time and distance window flash. Press ▲ ▼ to set distance and + − to set time. When you press START, time and distance will begin counting down. When the time or distance reaches zero, the treadbelt will continue to move and whichever readout reached zero (time or distance) will begin counting up. No other readouts will reset.

Pre-Set Program Details (Not in Z5 Non)

Press any Express Command key to select a program. (To get more program options, including re-selecting Manual, use the + − keys.)...

...adjust the starting level using the + − keys...

...Press SELECT when done.

After program and level have been selected, set time using the + − or numeric keys, from 5 to 99 minutes.

To stop or pause your workout: slow machine to below 2 mph by pressing −, then press STOP. This will stop the treadmill and remain in a Pause mode, saving your workout information. To restart your workout, press START.

PRE-SET PROGRAM OPERATION

To change level during your workout, press SELECT. Press + − keys to change level, then press SELECT. If a new program is selected, it will join that program at the same point as the previously selected program.

To change to another pre-set program, press one of the Express Command Keys, then press SELECT. The treadmill joins the workout in progress at the same elapsed time as the previous workout.

To reset distance, time, and calories during your workout, press and hold START until zeros appear in the time, distance, calorie windows. To reset the treadmill back to workout setup mode, press and hold STOP for three seconds.

Note: All workouts can be set from 5 to 99 minutes, with the timer counting down from your chosen workout time. The default value (if no time entered) is 30 minutes. When the timer reaches 0:00 it will beep and begin counting up. You must press STOP to end your workout.

RUNNER'S MODE

Some users may prefer a minimal data display. When the treadbelt is moving, pressing the Advanced Options key will remove the progress matrix, speed, and grade readouts. The data readouts will then be Elapsed Time, Distance, and Pace (with heart rate displayed if available).

Pressing Advanced Options or SELECT returns the display to normal operation.

Hill Interval Workout

Green is Incline
Red is Speed

Level	Speed (MPH)		Grade (%)	
	Min	Max	Min	Max
1	2.0	2.4	1.0	4.0
2	2.2	2.8	1.5	5.0
3	2.6	3.2	2.0	6.0
4	3.0	3.6	3.0	7.0
5	3.4	4.2	4.0	8.0
6	3.8	4.6	5.0	9.0
7	4.0	5.0	6.0	10.0
8	4.4	5.4	7.0	11.0
9	4.8	6.0	8.0	12.0

Weight Loss Workout

Green is Incline
Red is Speed

Level	Speed (MPH)		Grade (%)	
	Min	Max	Min	Max
1	1.4	2.6	0.0	2.0
2	1.6	2.8	0.5	3.0
3	1.8	3.0	0.0	4.0
4	2.0	3.2	1.0	5.0
5	3.4	3.4	1.5	6.0
6	2.4	3.6	2.0	7.0
7	2.6	3.8	2.5	8.0
8	2.8	4.0	3.0	9.0
9	3.0	4.2	3.5	10.0

Cardiovascular Workout

Green is Incline
Red is Speed

Level	Speed (MPH)		Grade (%)	
	Min	Max	Min	Max
1	2.0	2.4	1.0	4.0
2	2.2	2.8	0.5	5.0
3	2.6	3.2	0.5	6.0
4	3.0	3.6	1.0	7.0
5	3.4	4.2	1.0	8.0
6	3.8	4.6	1.0	9.0
7	4.0	5.0	1.0	10.0
8	4.4	5.4	1.0	11.0
9	4.8	6.0	1.5	12.0

Speed Interval Workout

Green is Incline
Red is Speed

Level	Speed (MPH)		Grade (%)	
	Min	Max	Min	Max
1	2.0	2.4	2.0	4.0
2	2.2	2.8	3.0	5.0
3	2.6	3.2	4.0	6.0
4	3.0	3.6	5.0	7.0
5	3.4	4.2	6.0	8.0
6	3.8	4.6	7.0	9.0
7	4.0	5.0	8.0	10.0
8	4.4	5.4	9.0	11.0
9	4.8	6.0	10.5	12.0

Heart Rate Control Workouts

In This Chapter:

HRC Workout Introduction

True's heart rate control (HRC) workouts let the treadmill 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 3 for a guide to proper usage. It is not recommended that you use the contact heart rate system for heart rate control workouts.

HRC Types and a Workout Quick-Guide

FOUR BASIC KINDS OF HEART RATE CONTROL WORKOUTS

Various types of Heart Rate Control (HRC) are available on Z5 Series treadmills (except on the Z5 Non). This section may describe some types of HRC that your treadmill may not have.

Time-based constant HRC: pick a target heart rate and exercise for an amount of time you select.

Cruise Control: while in any workout, set your current heart rate as your target heart rate by pressing a single key.

Interval heart rate training (not on Z5 HRC): the treadmill alternates work intervals at your selected target heart rate with rest intervals that are at ½ workload. You set the length of both intervals.

Distance-based HRC (Z5.5 only): set a target heart rate and select one of four distances, just like running a road course: 2 miles, 4 miles, 5 kilometers, or 10 kilometers.

THE EASY STEPS TO A HEART RATE CONTROL WORKOUT

1 - Put on a Polar or compatible transmitter chest strap as described on page 25.
2 - Pick one of the HRC workouts. Use the HRC Express Command key. To select one of the distance-based workouts or one of the higher-numbered workout setups, keep pressing that HRC key.
3 - Enter your workout parameters. This includes target heart rate, maximum treadbelt speed, workout time or distance, and maximum incline. If you are using Interval HRC, pick your interval durations, too.
4 - Press START .

5 - Warm up. At the beginning of an HRC workout, the treadmill is in full Manual control mode. Gradually increase your work level to slowly raise your heart rate to within 10 beats per minute (bpm) of your target heart rate.
6 - Heart rate control stage. Now the treadmill takes control of speed and incline, keeping your heart rate within a few bpm of your target. If you are using interval HRC, the treadmill alternates between work and rest intervals.
7 - Cool-down. At the end of your workout time or distance, the treadmill reduces workload by half and goes back into Manual control mode, where you directly control your cool-down.

DURING WORKOUT SETUP

Your treadmill can remember more than one workout setup for a heart rate control workout. The Z5 has two time-based target HRC setups; the Z5.4 has five target and two interval HRC setups; and the Z5.5 has 5 target, 5 interval, and 4 distance-based HRC setups. It stores each set of workout parameters under numbered workouts, e.g., "Target HR 1," "Target HR 2," "Interval HRC 1," etc. You can select these in later workouts so you don't have to re-enter your workout parameters, which tend to stay the same from workout to workout.

During workout setup, if you keep pressing 

, you will continue to scroll through the workout setup parameters. You can press 

at any time to accept the current parameters and begin your workout.

DURING YOUR WORKOUT

Pressing any key other than SELECT or STOP will exit HRC mode.

Adjust your target heart rate at any time during your workout by pressing SELECT, using the + − keys as needed, and pressing SELECT again. If you are lowering your target, you are limited to a 5 bpm change.

The time and distance accumulated during warmup are not counted against your selected workout time or distance; those values start at zero when the treadmill reaches heart rate control mode. This time and distance are accumulated into the workout summary data, as is your cooldown exercise.

MORE DETAILS ON INTERVAL HRC

Interval HRC works just like constant heart rate control up through the first work interval.
When your workout reaches your first rest interval, your workload is reduced by half, and kept at this rate throughout the rest interval.
The next work interval is initially set at an average of the workloads in the previous work interval.

TIPS ON THE WARM UP STAGE

Increase speed and incline gradually to slowly increase your heart rate to within 10 bpm of your target. For best results, you should take about five minutes to get to that point.

The treadmill operates in a manual control mode during the warm-up stage. You control both speed and incline. You may only increase speed and incline to the preset maximum values entered.

It is important that you start at a low level of effort and gradually increase your work load over several minutes until you approach your target heart rate. This allows your body to adapt to your workout. Increasing work load gradually will allow you to enter the heart rate control stage without overshooting your target.

Warming up too fast may cause you to overshoot your target. If this occurs, it may take several minutes before the computer software can control your heart rate. You may overshoot and undershoot your target for several minutes until stable control is achieved.

HOW THE HRC SYSTEM CONTROLS YOUR HEART RATE

To raise your heart rate in HRC mode, speed will always increase until maximum speed is attained, followed by incline (if incline is used in the workout).

To lower your heart rate in the HRC mode, incline will always decrease until zero incline is reached, followed by speed (if incline is used in the workout).

Speed changes are in 0.1 mph increments. Incline changes are in 0.5% incline increments. This is equal to between 0.10 and 0.15 METs.

Examples and Cruise Control

EXAMPLES OF HRC WORKOUTS

1 - A user who physically cannot walk over 2.5 mph can safely use heart rate control by entering maximum speed of 2.5 in an HRC workout.

2 - A runner can run up to a speed of 10 mph, without hills, by entering a maximum speed of 10 mph and a maximum incline of 0%.

3 - A walker enters a maximum speed of 4.0 mph and a maximum incline of 6%. The walker is limited to a maximum speed of 4.0 mph and incline will be used if required to elevate the heart rate up to a maximum of 6%.

CRUISE CONTROL

This is the simplest way to enter target heart rate training. While in manual or any program you can enter Target Heart Rate Control by simply pressing the Target HRC/Cruise 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 SELECT. Edit the target using + − and press SELECT. If you are lowering your target, you are limited to a 5 bpm change. It is important to note that if you are raising your target, the speed and grade change safety limits (described next) may prevent the treadmill from raising your heart rate to your desired new target.

How Cruise Control Determines How to Change Your Excercise Intensity

If you enter the HRC stage below 5 mph, the speed you enter will be the maximum speed of your workout. If you like to walk at a maximum speed of 3.8 mph, you should enter HRC at 3.8 mph.

If you enter the HRC stage above 5 mph, you will have an additional 1 mph of speed. If you enter HRC at 6 mph, your maximum attainable speed in the HRC stage will be 7 mph.

If at any time you enter the HRC stage with incline, you will have an additional 4% of incline available in the HRC stage. If you enter the HRC stage at 1% incline, your maximum attainable incline will be 5%.

If you do not enter the HRC stage with incline, no incline will be available during the HRC stage of your workout. Only speed will be used to control your heart rate.

Examples of Walking Workouts Using Cruise Control

1 - Enter HRC at 3.5 mph and 4% incline to allow a maximum speed of 3.5 mph and 8% incline.

2 - Enter HRC at 4.2 mph and 6% incline to allow a maximum speed of 4.2 mph and 10% incline.

Examples of Running Workouts Using Cruise Control

1 - Enter HRC at 6 mph and 0% incline to allow a maximum of 7 mph and 0% incline.

2 - Enter HRC at 5 mph and 2% incline to allow a maximum of 6 mph and 6% incline.

Important Points About HRC

The heart rate monitor transmitter strap provided with your treadmill should be worn directly against your skin at about one inch below the pectoral muscles/breast line. Women should be careful to place the transmitter below their bra line.

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.

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

If communication is lost for 30 seconds, the treadmill will automatically shut off.

The transmitter strap sends a low-level radio signal to the treadmill, 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 walking or running motion.

A grounded outlet is critical for the HRC system to function properly. Use a dedicated 110 VAC, grounded outlet to help prevent interference.

TECHNICAL TIPS

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

Use only the transmitter provided with your True HRC Treadmill or a Polar brand standard transmitter.

True's Heart Rate Control is patented under USPTO #5,462,504.

HEART RATE CONTROL SAFETY FEATURES

If your heart rate exceeds your target by 12 beats, there will be a 30% MET reduction in workload to reduce your heart rate.

If your heart rate exceeds your target by 20 beats, the unit will automatically shut off as a precautionary measure. (Be cautious when selecting your target heart rate so the 20 beat variance will not exceed your maximum heart rate as determined by your physician).

User Programs

In This Chapter:

How to Record and Run User Programs

HOW TO RECORD AND RUN USER PROGRAMS

During a manually-controlled workout, your Z5 Series treadmill (except the Z5 Non) always "records" the changes you make in speed or incline. Up to three of these recordings can be saved as User Programs that you can "play back" to use as custom-designed workouts.

Note that this workout recording only takes place when you use the default manual mode settings; you cannot choose a target workout time or distance. Time must be counting up during your workout in order for it to be recorded.

Up to 36 changes in speed or incline can be recorded. Each speed/incline pair of changes must be separated by at least 30 seconds.

To save a manual workout, press STOP as you normally would to end your workout. Now press and hold SELECT until the display shows Save User 1.

You can save your workout in User 1, or press ▲ to select User 2 or User 3. Press and hold SELECT to save the workout program you have selected.

To use a User Program that you have saved, simply select it from the list of programs as described in "Pre-Set Program Operation" in the previous section.

Designing an Exercise Program

In This Chapter:

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 walking at a speed of 1-2 mph. As you use your treadmill regularly, higher speeds may be more comfortable and more effective.

Inability to maintain a smooth, rhythmic motion suggests that your speed and/or elevation may be too great.

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 regular exercise. Never exceed your target heart rate zone. Increase the speed and/or incline on the treadmill to raise your heart rate to the level recommended by your doctor. The incline feature can be used to greatly increase the workload without increasing speed. The chart below indicates how much the effort changes with each percent of incline at common speeds for a person weighing 155 pounds.

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 6 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 and chart are 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 True Treadmill. Using the treadmill 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 treadmill 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 220 beats per minute minus your age. To find your pulse, locate a vein on your neck or inside your wrist, then count beats for ten seconds, then multiply by six. (See chart in *Appendix A*.)

It's also important to know your target training zone or target heart rate. The American Heart Association (AHA) defines target heart rate as 60-75 percent of your maximum heart rate. This is high enough to condition, but well within safe limits. The AHA recommends that you aim for the lower part of the target zone (60 percent) during the first few months of your exercise program. As you gradually progress you can increase your target to 75 percent. According to the AHA, "Exercise above 75 percent of the maximum heart rate may be too strenuous unless you are in excellent physical condition. Exercise below 60 percent gives your heart and lungs little conditioning."

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 the chart 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

BEGINNING YOUR EXERCISE PROGRAM

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. Begin each workout by walking even if you plan to run. Start slowly, exploring different speeds until you can comfortably sustain your speed.

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.

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 moving your arms and legs smoothly. Walk naturally and avoid jerking motions that can cause pulled muscles, sprained joints, and loss of balance.

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 AEROBIC FITNESS

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.

MAINTAINING 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.

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).

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.

Care and Maintenance

In This Chapter:

Treadbelt Lubrication

Regular Cleaning

Treadbelt Adjustment

Treadbelt Tension

Lubrication and Cleaning

Your True treadmill is constructed of quality materials and manufactured to provide many years of faithful service. Simple routine cleaning and a preventive maintenance program will extend the life of your treadmill.

To prevent electrical shock, be certain the treadmill is turned off and unplugged from the electrical outlet before performing any cleaning or routine maintenance.

Treadbelt Lubrication

For average use of your treadmill, True recommends you lubricate under the treadbelt once per year. For heavy use, which is more than 10 hours per week, True recommends lubricating every six months.

Please contact your dealer to obtain the proper lubricants.

Regular Cleaning

Daily: Perspiration should be wiped from the control console and treadmill surfaces after your workout.

Weekly: You should wipe down your treadmill once a week with a water dampened, soft cloth. 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.

Important: do not clean or wipe under the running belt.

Monthly: Clean dust and dirt that might accumulate under and behind your treadmill once a month. Small rubber particles from the soles of walking shoes will accumulate alongside the belt and also behind the unit.

Treadbelt Adjustment

EXPERT SERVICE

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

TREADBELT ADJUSTMENT

Your treadmill's running belt has been properly aligned at the factory. However, when the treadmill is used on an uneven surface, please follow these instructions:

1 - Stand beside the treadmill, place the safety key onto the control panel and follow operating instructions for running the treadmill at 5 mph.

2 - If the belt is off-center to the right, turn the left roller adjustment bolt counter clock-wise 1/4 turn. If the belt is off-center to the left, turn the left roller adjustment bolt 1/4 turn clockwise.

3 - Let the machine run for several minutes to check the alignment. (Belt alignment does not need to be perfect). If more correction is needed, turn the adjustment bolt 1/4 turn and check again.

TREADBELT TENSION

To assure maximum life of the treadbelt, roller and drive motor, make sure the treadbelt tension is set correctly. (Your treadbelt has been properly tensioned at the factory.)

Turn both rear roller adjustment bolts counter-clockwise until treadbelt just begins slipping when walking on it, then turn both rear roller adjustment bolts clockwise in equal quarter turn increments until treadbelt stops slipping.

Note: Be sure to run on treadbelt to ensure that the treadbelt does not slip while under load.

Symptom/Solution Guide

SYMPTOM	CAUSE	SOLUTION
Circuit breaker on treadmill trips when the power cord is plugged into wall. Circuit breaker on treadmill trips when inputting speed and starting.	A. Damaged motor B. Damaged or defective motor power supply board C. Damaged motor control circuit board D. Restricted belt or flywheel E. Treadbelt over tensioned	**Service required** **Service required** **Service required** Check and remove obstruction or call dealer See adjustments in Assembly Guide
Computer display LED's do not illuminate.	A. No power to treadmill B. Circuit breaker tripped C. Upper wire harness not connected or completely connected.	Restore power at electrical outlet or reset circuit breaker if in "on/off" position. Reset Circuit Breaker **Service required**
Incline Motor and tread motor will not turn on	A. Upper wire harness damaged or not con nected or completely connected	**Service required**
Incline motor does not operate but the tread-belt moves	A. Incline wire harness damaged or not connected	**Service required**
Scrambled digits on computer LED's	A. Damaged computer board B. Upper wire harness damaged or partially connected	**Service required** **Service required**
Squeaking noise from motor while using the treadmill	A. Poly V-belt slipping B. Motor brush noise excessive	**Service required** **Service required**

SYMPTOM	CAUSE	SOLUTION
Treadbelt tracks left to right	A. Uneven floor	Move treadmill to even surface or level with shims. See Adjustment section.
	B. Rear roller not properly adjusted	See Adjustment section.
Treadmill trips household circuit breaker	A. Defective breaker	Replace breaker
	B. Circuit too small	Use 20 amp circuit
	C. Circuit over-loaded	Remove the other electrical appliances on same circuit
	D. May trip GFI circuit.	Have circuit checked by electrician.
Treadbelt feels unsmooth, jerks intermittently	A. Object between belt and deck	Remove object between belt and deck
	B. Object under belt	Remove object from under belt
	C. Loose tread motor drive belt	**Service required**
	D. Loose treadbelt tension	See Adjustment section.

Error Codes

E1:INCLINE	Incline moving when not commanded to.
E1:RANGE	Difference between zero position and maximum incline not sufficient.
E1:STALL	Incline not moving when commanded to.
E2:OVERSPEED	This error occurs when an acceleration of greater than 2.1 mph occurs. Error cleared by turning off power switch then turning it back on.
E2:CAL	Treadmill cannot achieve target speed. Re-calibrate treadmill.
E3:RECAL	This error occurs when a data error is detected in the EEPROM. Replace the control panel.
E4:KEY STK [stop]	Caused by pressing and holding the  key for more than five seconds.
E5:SENSOR	This message is displayed when there is no speed feedback.

All errors require service by a qualified technician. To clear the error, turn power off and back on again.

DIAGNOSTICS - SERVICE MESSAGES

The following service messages will be displayed as they occur, as well as for the subsequent six safety key insertions. These messages will be displayed until a key is pressed. Every time these messages are displayed, a tone will sound twice.

S1:LUBE	This message is displayed when lubrication of the deck is recommended.
S2:CLEAN	This message is displayed every 500 miles. Prompt to clean treadmill.
S3:MOTOR	This message is displayed every 2500 hours. Prompt to check motor brushes.

Important Safety Instructions

In This Chapter:

Review for Your Safety

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

Read all instructions before using this treadmill.

Consult your physician before beginning any exercise program.

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

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

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

This treadmill should never be left unattended when plugged in. Unplug it from the outlet when not in use and before any service is performed.

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

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

Do not use attachments not recommended by the manufacturer.

Never operate this treadmill 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 treadmill should be examined by a qualified service technician.

Use a dedicated 110 volt, alternating current, 15 amp three-prong grounded outlet.

Keep the power cord away from heated surfaces.

Never drop or insert any object into any opening.

To disconnect, turn the power switch to the OFF position, then remove the plug from the outlet.

Do not allow animals on or near your treadmill.

Make sure the power cord has enough slack to allow the treadmill to raise freely without being limited by the cord or caught in the incline rack. Do not run the power cord under treadmill.

Use the treadmill indoors only.

Never use your treadmill near water or while wet. Using the treadmill 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.

Keep the area under the treadmill free from obstruction, as the deck will return to 0% grade when the safety key is placed on the console.

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

Keep the space behind and on both sides of the treadmill clear should you lose your balance.

Allow only one person at a time on your machine.

Do not operate treadmill without the safety key attached to the console and the lanyard clipped to your clothing at approximately waist height.

Always straddle the treadbelt and allow the belt to begin moving before stepping onto the belt.

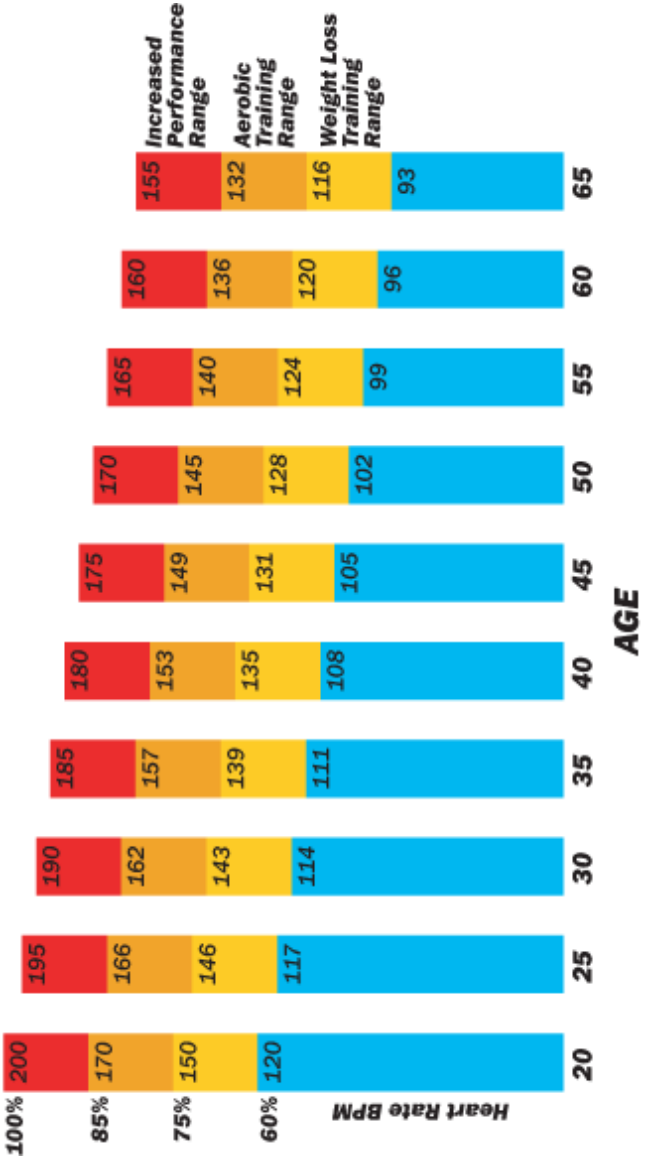
Use extreme caution when stepping onto moving treadbelt. Some programs begin at speeds as high as 4.8 mph.

Gradually slow down the belt before stopping. This will minimize the sensation of movement after you stop.

When making treadbelt adjustments, keep fingers, loose clothing, jewelry, and long hair away from moving parts.

Target Heart Rate Chart

A Guide to Help You Pick an Initial Target Heart Rate



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

METs Table

How Speed and Incline Affect Workload, Expressed in METs

Grade

Miles Per Hour

METs Table		0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
WALKING	1.0	1.8	1.9	2.0	2.2	2.3	2.5	2.6	2.7	2.9	3.0	3.1	3.3	3.4	3.6	3.7	3.8
	2.0	2.5	2.8	3.1	3.4	3.6	3.9	4.2	4.5	4.7	5.0	5.3	5.6	5.8	6.1	6.4	6.7
	3.0	3.3	3.7	4.1	4.5	5.0	5.4	5.8	6.2	6.6	7.0	7.4	7.8	8.3	8.7	9.1	9.5
IN-BETWEEN	4.0	5.6	6.0	6.4	6.8	7.2	7.7	8.1	8.5	8.9	9.3	9.7	10.1	10.6	11.0	11.4	11.8
	5.0	8.7	9.0	9.3	9.7	10.0	10.4	10.7	11.1	11.4	11.8	12.1	12.4	12.8	13.1	13.5	138
RUNNING	6.0	10.2	10.6	11.0	11.4	11.8	12.3	12.7	13.1	13.5	13.9	14.3	14.7	15.2	15.6	16.0	16.4
	7.0	11.7	12.2	12.7	13.2	13.6	14.1	14.6	15.1	15.6	16.1	16.5	17.0	17.5	18.0	18.5	19.0
	8.0	13.3	13.8	14.4	14.9	15.5	16.0	16.6	17.1	17.7	18.2	18.8	19.3	19.9	20.4	21.0	21.5
	9.0	14.8	15.4	16.0	16.6	17.3	17.9	18.5	19.1	19.7	20.4	21.0	21.6	22.2	22.8	23.5	24.1
	10.0	16.3	17.0	17.7	18.4	19.1	19.8	20.4	21.1	21.8	22.5	23.2	23.9	24.6	25.3	26.0	26.7
	11.0	17.8	18.6	19.4	20.1	20.9	21.6	22.4	23.2	23.9	24.7	25.4	26.2	26.9	27.7	28.5	29.2
	12.0	19.4	20.2	21.0	21.9	22.7	23.5	24.3	25.2	26.0	26.8	27.6	28.5	29.3	30.1	31.0	31.8

METs Explanation and Formulas

The Metabolic Formulas Behind Energy Expenditure Estimates

METs Explanation and Formulas

As stated earlier, the MET is a unit of exercise measurement that takes into account body weight. Since energy expenditure in a weight-bearing exercise such as running, walking, or stairclimbing is directly proportional to body weight, the formulas to calculate METs are a bit simpler than for, say, an exercise bike. For example, 7 mph running is always 11.7 METs, no matter who you are.

A MET is defined as 3.5 ml/min/kg of oxygen usage by the body, where:

ml is milliliters, the actual measured volume of gaseous oxygen

min is minutes

kg is bodyweight in kilograms

This energy consumption rate corresponds to about 72 calories per hour for a 150-pound person, which approximates the average basal metabolic rate of the general population.

The best formulas for treadmill energy expenditure also use oxygen usage by the body, or VO2. The two formulas are:

walking VO2 = (2.68 * speed) + (0.48 * speed * incline) + 3.5

running VO2 = (5.36 * speed) + (0.24 * speed * incline) + 3.5

To get METs, divide the result by 3.5.

(Noted exercise physiologist David Costill's speed constants for walking and running are 3.06 and 4.86, respectively.)

Specifications

The Size and Performance Attributes of Your Z5 Series Treadmill

SPECIFICATIONS

Maximum speed: Z5 & Z5.4: 10 mph. Z5.5: 12 mph.
Incline range: Z5, Z5.4, & Z5.5: 0 to 15%. Z5.5 Limited: -3% to +12%.
Drive motor: *3 hp.*
Treadbelt area: Z5: 20" x 54"; Z5.4: 22" x 54"; Z5.5: 22" x 60".
Treadmill Weight: Z5: 255 pounds; Z5.4: 275 pounds; Z5.5: 320 pounds.

Maximum user weight: 400 pounds.

Glossary

Definitions of common terms used throughout this document

GLOSSARY

***ACSM*:** the American College of Sports Medicine, probably the single most-respected sports medicine and exercise physiology organization. This doesn't mean they're always right, however, even on important subjects, but if you don't know better, you trust the ACSM. Their *Guidelines for Exercise Test and Prescription*, now in it's seventh edition, is the universal reference handbook for the field. Their monthly journal, *Medicine and Science in Sports*, is one of the two big sports medicine journals (the other is the *Journal of Exercise Physiology*).

***aerobic capacity*:** a measurement of an individual's potential for intensity and duration of cardiovascular exercise which is primarily derived from oxygen metabolism. This distinguishes it from *anaerobic*, or non-oxygen metabolism exercise. The most common laboratory measurement is *maximal oxygen uptake*, or VO2max. The other big factor affecting aerobic capacity is the *lactate threshold*, which is very difficult to measure and thus seldom used. (Number three on the aerobic capacity factor list is *biomechanical efficiency*.) Non-laboratory measurements of aerobic capacity include submaximal fitness tests and 1.5-mile maximal runs.

***basal metabolic rate (BMR)*:** the rate of energy expenditure while at rest, but not sleeping.

***body weight*:** your unclothed weight, *except* for treadmills, where you must include your clothing weight, too (typically 3 or 4 pounds).

bpm: beats per minute measurement of heart rate.

***calorie, calorie expenditure*:** the calorie is a unit of measure of energy quantity that is commonly used for expressing human energy expended and food energy consumed. This type of calorie is technically a *kilocalorie*, or 1,000 calories of the strict physics definition. Calorie expenditure is an energy rate, often expressed in calories per hour.

***chest strap, transmitter*:** use to detect heart rate, then transmit using a 5 kHz radio signal to a receiver in fitness equipment (or wristwatch). Originally invented by the Finnish company Polar in the early 1980s, this technology is now widely available from other sources.

***CHR (contact heart rate) pads*:** stainless steel handgrips used to detect ECG signals. Typically the two top pads are "hot" or positive, while the two bottom pads are common. These pads are roughly equivalent to lead I and lead III in a standard 12-lead ECG system.

***constant power*:** a type of workload control system, most commonly found on self-generating exercise bikes. Since power = torque x rpm, a constant power system lowers torque when pedal rpm increases, and increases torque when rpms decrease.

***constant torque*:** a type of workload control system, most commonly found on ellipticals and low-end plug-in exercise bikes. Unlike constant power, torque does not change when pedal rpm does.

***contact heart rate (CHR)*:** a system to acquire ECG data from handgrips, eliminating the need for a chest strap. A better name would be *hand touch heart rate*. CHR is less accurate than chest strap monitoring, and doesn't work well during high-intensity or strong-motion exercise, such as running or upper-body exercise. Newer digital CHR systems, are greatly improved in these areas.

***CSAFE*: *C*ommunications *S*pecification for *F*itness *E*quipment.** This poorly-acronymed spec was created by a consortium of fitness equipment manufacturers back in early 1997. It is intended to be a general-purpose data communication protocol on top of RS232. Later additions to the spec included a small voltage supply to power an external controller, and commands to control volume and channel in entertainment systems. The original consortium was, in alphabetical order: Cardio Theater, Fitlinxx, On Base, Precor,

Quinton, Schwinn, Stairmaster, Star Trac, Tectrix, and Trotter. See fitlinxx.com/csafe/.

***exercise*:** the different metabolic state during any activity greater than rest. More commonly, the voluntary activity undertaken for health and conditioning reasons.

***exercise intensity*:** a measurement of the extra metabolism above basal metabolic rate (BMR). Sometimes this measurement includes BMR, but this is less desirable. This measurement is usually using standardized formulas for different exercises. Direct measurement requires oxygen uptake monitoring equipment. Typical units of measurement are watts, calories per hour, METs, and VO2. Note that this is not the same as the amount of power being applied to an external machine, due the body's efficiency of between 20% and 30%.

***exercise, weight-bearing*:** where the body's full weight must be lifted and moved. With exercise equipment, only treadmills and stairclimbers meet this requirement. (Ellipticals are not true weight-bearing exercise, although riding style does affect this somewhat.) The reason weight-bearing exercise is important to distinguish from non-weight-bearing exercise is because in the former, calorie consumption varies directly with body weight, whereas in the latter (which includes exercise bikes) body weight does not affect calorie consumption.

APPENDIX E - GLOSSARY

***fitness test, maximal*:** the only valid way to accurately determine maximal oxygen uptake, using VO_2 monitoring. Several protocols exist, but in general a treadmill is used and the exercise intensity is gradually increased over a five to eight minute period. The subject is strongly encouraged to run to absolute exhaustion which, given the psychological and safety difficulties of this, creates inevitable variations in test results. This maximal effort is supposed to contain within it some point where the subject is consuming the maximum amount of oxygen.

***fitness test, submaximal*:** a safer, easier, and more convenient way to estimate maximal oxygen uptake, at the expense of a great deal of accuracy. The best results from such tests is typically +/- 15% compared with "true" VO_2max. These tests are usually staged extrapolation protocols, such as the YMCA bike protocol and some treadmill protocols. Non-extrapolation protocols include the Astrand-Ryhming bike protocol and the Gerkin treadmill protocol.

***heart rate, maximum (HRmax)*:** the heart rate at which the body will allow no further increase. For healthy people, reaching maximum heart rate is not unsafe. HRmax is usually an estimate based on age, as it decreases with age.

***heart rate reserve (HRR)*:** the range of heart rate values between maximum and resting heart rates. This is useful because it corresponds very closely to the VO_2 range from resting to maximum. %HRR reserve thus is a very good estimate of % VO_2max.

***heart rate, resting*:** most accurately measured when laying down in the morning, with no food or caffeine ingestion for at least the previous three hours.

***interval workout*:** consists of alternating periods of widely different exercise intensities, usually called the work and rest intervals. (In the origin of the phrase, *interval* referred only to the rest interval.)

Interval workouts are popular because they are superior training for sports activities, which almost always involve highly varying exercise intensities. Interval workouts are not optimal for weight loss or weight control, since steady-state exercise is most efficient for maximal total energy expended for a given effort.

METs*:** unit of energy expenditure used for exercise prescriptions, defined as the current energy expenditure rate divided by the basal metabolic rate (BMR). In the case of METs, BMR is defined as a VO2 of 3.5, meaning it varies directly with body weight. This is incorrect, as BMR varies with the $^{2}/_{3}$-root of body weight. ***See T-MET.

***oxygen uptake*:** also referred to as VO_2, the rate of consumption of oxygen, usually expressed as a rate per unit of body weight, or milliliters per kilogram per minute, or ml/kg/min, or ml/kg*min^{-1}. This is the best way to accurately measure energy expenditure during aerobic exercise.

***RJ-45*:** an 8-conductor locking connector used for the CSAFE system, also commonly used for Ethernet cables (where only four wires are used). The RJ-45 is typically wired using the EIA/TIA-568 twisted-pair wiring standard.

***rpm*:** revolutions per minute, the most common unit of measure of angular motion in the non-scientific world. The International System (SI) unit that is more useful is radians per second, which is equal to 0.1047 rpm.

***segment, work and rest*:** same as work and rest interval. See *interval training*.

***speed, estimated running*:** applies the measured energy expenditure to walking and running equations, producing a more friendly or familiar speed feedback.

***speed, simulated ground*:** applies the measured energy expenditure to an outdoor bike equation, producing a speed feedback more applicable to an elliptical or exercise bike rider.

T-MET*:** a replacement for METs that properly takes body weight into account. A T-MET = watts / $kg^{2/3}$, where ***watts is power applied to an external machine by the exerciser, and ***kg*** is the exerciser's body weight in kilograms. True's marketing name for the T-MET concept is *Personal Power*.

***VO_2*:** see *oxygen uptake*.

***VO_2max*:** maximal oxygen uptake, the single best way to measure *aerobic capacity* (see).

***watts*:** the International System unit of power measurement, defined as Joules per second. One watt is roughly equal to 4.2 calories per hour. Watts are commonly used to report workload on exercise bikes, less so on ellipticals, and virtually never on treadmills.

***workload*:** the amount of power being demanded of an exerciser, manifesting itself in the exerciser as exercise intensity. Common workloads are treadmill running belt speed, bike torque and pedal rpm, or stairclimber vertical climbing speed.

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