

# GETTING STARTED

## COMPLETE THE CTS FIELD TEST

The CTS Field Test should be completed before you begin any Carmichael Training Systems program. When you view the programs, you'll notice that the CTS Field Test is not included in the schedule. Rather than work it into the program itself, I want you to complete it a few days before you begin one of the training programs.

The Field Test itself is two eight-minute efforts, but when you get on the bike, you'll need time to complete the warm-up, the Field Test and a good cooldown, so budget a total of an hour for the whole Field Test workout.

## CTS FIELD TEST INSTRUCTIONS

When performing the CTS Field Test, collect the following data:

- AVERAGE HEART RATE FOR EACH EFFORT
- MAX HEART RATE FOR EACH EFFORT
- AVERAGE POWER FOR EACH EFFORT (IF YOU USE A POWER METER)
- AVERAGE CADENCE FOR EACH EFFORT
- WEATHER CONDITIONS (WARM VS. COLD, WINDY VS. CALM, ETC.)
- COURSE CONDITIONS (INDOORS VS. OUTDOORS, FLAT VS. HILLY, POINT-TO-POINT VS. OUT AND BACK, ETC.)
- RATE OF PERCEIVED EXERTION (RPE, OR HOW HARD YOU FELT YOU WERE WORKING) FOR EACH EFFORT.

**Step 1: Find A Suitable Course** The CTS Field Test can be completed on an indoor trainer, or you can find a relatively flat course or a course that is a consistent climb of about a 6 percent grade. (A course with steep climbs or descents will dictate your effort more than you will.) Above all, find a course that's safe, without stop signs or traffic lights. For the sake of being able to compare one test to another, complete the test in weather conditions that are reasonably common for your area.

**Step 2: Begin Your First Effort** Begin the effort from a standing start. Resist the urge to

start too fast; you should reach your top speed about 45 to 60 seconds after you start, but not before that.

**Step 3: Find Your Pace And Gear** Keep accelerating and shifting until you reach a speed you feel you can barely maintain for the length of the effort. Focus entirely on completing this effort at the highest power output you possibly can. Try to maintain a cadence above 90 rpm on flat ground or on an indoor trainer, and above 85 rpm if you're completing the test on a climb. When you get to the final minute of the time trial, really open the throttle.

**Step 4: Recover And Prepare For Effort #2** When you reach the end of Effort #1, you should be completely drained, but keep pedaling for the whole 10 minutes of recovery.

**Step 5: Complete Effort #2** After the 10-minute recovery, begin Effort #2 from your start point. Gradually increase your speed for 45 to 60 seconds, just like the first effort. Avoid the temptation to pace yourself based on your first effort.

**Step 6: Cool Down And Record Your Data** All that's left is to cool down with easy spinning for 15 to 30 minutes. Record your CTS Field Test data, and use the charts on the next page to calculate your training intensities.

## CALCULATING TRAINING INTENSITIES FOR CTS WORKOUTS

To calculate your individual training intensities for CTS Workouts, you need to

know either the higher of the two average power outputs or the higher of the two average heart rates from your CTS Field Test. If you have both pieces of information, you should calculate both power and heart-rate training intensities, but use the power ranges to gauge your interval efforts whenever possible.

## WORKOUT DESCRIPTIONS

The workouts described below are used in the training programs in this guide.

**EnduranceMiles (EM)** This is your moderate-pace endurance intensity. The point is to stay at an intensity below lactate threshold for the vast majority of any time you're riding at EM pace. The heart rate and power ranges for this intensity are very broad in order to allow for widely varying conditions. It is okay for your power to dip on descents or in tailwinds, just as it is expected that it will increase when you climb small hills. One mistake some riders make is to stay at the high end of their EM range for their entire ride. As you'll see from the intensity ranges for Tempo workouts, the

***One mistake some riders make is to stay at the high end of their EnduranceMiles range for the entire ride—you're better off staying in the middle of your range.***

upper end of EM overlaps with Tempo. If you constantly ride in your Tempo range instead of using that as a distinct interval intensity, you may not have the power to complete high-quality intervals when the time comes. You're better off keeping your power and/or heart rate in the middle portion of your EM range and allowing it to fluctuate up and down from there as the terrain and wind dictate. Use your gearing as you hit the hills to remain in the saddle as you climb. Expect to keep your

### INSTRUCTIONS FOR CALCULATING CTS TRAINING INTENSITIES

1. Find the higher of the two average power outputs, and/or the higher of the two average heart rates from your CTS Field Test.
2. Multiply this power output and/or heart rate by the percentages listed in the table below to establish the upper and lower limits of your training ranges.

WORKOUT NAME	PRIMARY TRAINING GOAL	PERCENT OF CTS FIELD TEST POWER	PERCENT OF CTS FIELD TEST HEART RATE
ENDURANCE MILES	Basic aerobic development	45-73%	50-91%
TEMPO	Improved aerobic endurance	80-85%	88-90%
STEADY STATE	Increased power at lactate threshold	86-90%	92-94%
CLIMBING REPEAT	Increased power at lactate threshold	95-100%	95-97%
POWER INTERVAL	Increased power at VO2 max	Max effort (101% at absolute minimum)	100%-max

### SAMPLE: TRAINING INTENSITIES FOR JOE ATHLETE

Let's say Joe Athlete completed the CTS Field Test and recorded average power outputs of 300 watts and 296 watts. During the same efforts, his average heart rates were 172 and 175, respectively. He would use the 300 watts and the 175 heart rate to calculate his training intensities, even though they came from different efforts during the CTS Field Test.

The lower limit of Joe's SteadyState intensity ranges would come out to  $300 \times 0.86 = 258$  watts. The upper limit of his SteadyState intensity range would come out to  $300 \times 0.90 = 270$  watts. So Joe should complete SteadyState intervals at a power output between 258 and 270 watts. The table below has been filled out with all of Joe Athlete's intensity ranges.

WORKOUT NAME	PRIMARY TRAINING GOAL	PERCENT OF CTS FIELD TEST POWER	CTS POWER INTENSITY RANGE (WATTS)	PERCENT OF CTS FIELD TEST HEART RATE	CTS HEART RATE INTENSITY RANGE (BPM)
ENDURANCE MILES	Basic aerobic development	45-73%	135-219	50-91%	88-159
TEMPO	Improved aerobic endurance	80-85%	240-255	88-90%	154-158
STEADY STATE	Increased power at lactate threshold	86-90%	258-270	92-94%	161-165
CLIMBING REPEAT	Increased power at lactate threshold	95-100%	285-300	95-97%	166-170
POWER INTERVAL	Increased power at VO2 max	Max effort (101% at absolute minimum)	300+	100%-max	175-max

### YOUR CTS TRAINING INTENSITIES:

WORKOUT NAME	PRIMARY TRAINING GOAL	PERCENT OF CTS FIELD TEST POWER	CTS POWER INTENSITY RANGE (WATTS)	PERCENT OF CTS FIELD TEST HEART RATE	CTS HEART RATE INTENSITY RANGE (BPM)
ENDURANCE MILES	Basic aerobic development	45-73%		50-91%	
TEMPO	Improved aerobic endurance	80-85%		88-90%	
STEADY STATE	Increased power at lactate threshold	86-90%		92-94%	
CLIMBING REPEAT	Increased power at lactate threshold	95-100%		95-97%	
POWER INTERVAL	Increased power at VO2 max	Max effort (101% at absolute minimum)		100%-max	

pedal speed up into the 85 to 95 RPM range. Note: When a workout calls for “60 minutes EM with three 8-minute SteadyState Intervals,” the 60 minutes is your total ride time. Your warm-up, SteadyState Intervals, recovery periods between intervals and cooldown are all to be included within that 60 minutes.

→ **RATE OF PERCEIVED EXERTION (1=EASY, 10=AS HARD AS YOU CAN GO): 5 HR: 50-91% OF HIGHEST FIELD TEST AVERAGE POWER: 45-73% OF HIGHEST FIELD TEST AVERAGE**

**FastPedal (FP)** This workout should be performed on a relatively flat section of road. The gearing should be light, with low pedal resistance. Begin slowly and increase your pedal speed, starting out with around 15 or 16 pedal revolutions per 10-second count. This equates to a cadence of 90 to 96 RPM. While staying in the saddle, increase your pedal speed, keeping your hips smooth with no rocking. Concentrate on pulling through the bottom of the pedal stroke and over the top. After one minute of FastPedal, you should be maintaining 18 to 20 pedal revolutions per 10-second count, or a cadence of 108 to 120 RPM for the entire amount of time prescribed for the workout. Your heart rate will climb while doing this workout, but don't use it to judge your training intensity. It is important that you try to ride the entire length of the FastPedal workout with as few interruptions as possible, because it should consist of consecutive riding at the prescribed training intensity. → **RPE: 7 HR: NA POWER: NA**

**Tempo (T)** Tempo is an excellent workout for developing aerobic power and endurance. The intensity is well below lactate threshold, but hard enough so that you are generating a significant amount of lactate and forcing your body to buffer and process it. The intervals are long (15 minutes at a minimum, and they can last as long as two hours for pros), and you'll want your gearing to be relatively large, with a goal of having your cadence come down to about 70 to 75 RPM. This helps increase pedal resistance and strengthen leg muscles. Also, be sure and try to stay in the saddle when you hit hills during your tempo workouts. It is important that you try to ride the entire length of the tempo workout with as few interruptions as possible—tempo workouts should consist of consecutive riding at the prescribed intensity to achieve maximum benefit. → **RPE: 6 HR: 88-91% OF HIGHEST FIELD TEST AVERAGE POWER: 81-85% OF HIGHEST FIELD TEST AVERAGE**

**SteadyState Intervals (SS)** These intervals are great for increasing a cyclist's maximum sustainable power because the intensity is below lactate threshold but relatively close to it. As you accumulate time at this intensity, you are forcing your body to deal with a lot of lactate for a relatively prolonged period of time. These intervals are best performed on relatively flat roads and small rolling hills. If you end up doing them on a sustained climb, you should really bump the intensity up to ClimbingRepeat range, which reflects the grade's added contribution to your effort. Do your best to complete these intervals without interruptions from stoplights, etc. and maintain a cadence of 85 to 95 RPM. In this case, maintaining the training zone intensity is the most important factor, not pedal cadence. SteadyState intervals are meant to be slightly below your individual time trial pace, so don't make the mistake of riding at your time-trial pace during the SteadyState intervals. Recovery time between SteadyState intervals is typically about half the length of the interval itself. → **RPE: 7 HR: 92-94% OF HIGHEST FIELD TEST AVERAGE POWER: 86-90% OF HIGHEST FIELD TEST AVERAGE**

**ClimbingRepeats (CR)** This workout should be performed on a road with a long, steady climb. The training intensity is designed to be similar to that of a SteadyState interval but reflect the additional workload necessary to ride uphill. The intensity is just below your lactate threshold power and/or heart rate and it's critical that you maintain this intensity for the length of the CR. Pedal cadence for CR intervals while climbing should be 70 to 85 RPM. Maintaining the training intensity is the most important factor, not pedal cadence. It is very important to avoid interruptions while doing these intervals. Recovery time between intervals is typically about half the length of the interval itself. → **RPE: 8 HR: 95-97% OF HIGHEST FIELD TEST AVERAGE POWER: 95-100% OF HIGHEST FIELD TEST AVERAGE**

**OverUnder Intervals (OU)** OverUnder Intervals are a more advanced form of SteadyState Intervals. The “Under” intensity is your SteadyState range, and the “Over” intensity is your ClimbingRepeat range. By alternating between these two intensity levels during a sustained interval, you develop the “agility” to handle changes in pace. This workout can be performed on a flat road, rolling hills or a sustained climb that's relatively gradual (3 to 6% grade). Your gearing should be moderate

and pedal cadence high (100 RPM or higher) if you're riding on flat ground or rolling hills. Pedal cadence should be above 85 RPM if you're on a gradual climb.

To complete the interval, bring your intensity up to your SteadyState range over the first 45 to 60 seconds. Maintain this intensity for the prescribed “Under” time and then increase your intensity to your “Over” intensity for the prescribed time. At the end of this “Over” time, return to your “Under” intensity range and continue riding at this effort level until it's once again time to return to your “Over” intensity. Continue alternating this way until the end of the interval. OverUnder Intervals always end with a period at “Over” intensity. Recovery periods between intervals are typically about half the length of the work interval. Note: A more advanced version of this interval would alternate between SteadyState and PowerInterval intensities instead of SteadyState and ClimbingRepeat intensities. → **RPE: 9 HR: 92-94% OF HIGHEST FIELD TEST AVERAGE (UNDER) ALTERNATING WITH 95-97% (OVER) POWER: 86-90% OF HIGHEST FIELD TEST AVERAGE (UNDER) ALTERNATING WITH 95-100% (OVER)**

**PowerIntervals (PI)** These short efforts are the way you're going to apply the concepts of high-intensity training to your program in order to make bigger aerobic gains in less time. These intervals are maximal efforts and can be performed on any terrain except sustained descents. Your gearing should be moderate so you can maintain a relatively high pedal cadence (100 or higher is best).

During these intervals you should try to reach and maintain as high a power output as possible for the duration of the interval. Ideally, these efforts should look like flat plateaus when you view your power files. Take the first 30 to 45 seconds to gradually bring your power up and then hold on for the rest of the interval. The point here is to accumulate as much time as possible at a relatively constant and extremely high output.

The rest periods between PowerIntervals are purposely too short to provide complete recovery, and completing subsequent intervals in a partially recovered state is a key part of what makes these efforts effective. Typically, recovery times are equal to the interval work time, which is sometimes referred to as a 1:1 work-to-recovery ratio. → **RPE: 10 HR: 100-MAX POWER: 110+ OF HIGHEST FIELD TEST AVERAGE (SOME INTERVALS MAY BE HIGHER THAN THIS RANGE)**