User Manual

We make your bike a mobile ergometer!

SRM User Manual
English Language
4th Edition

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www.srm.de

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Important Warnings

Please read the following warnings, before beginning to use your SRM Training System. Otherwise, your SRM could be damaged, or not function properly.

- These operating instructions are only valid for the PowerControl V, and not for earlier versions of the PowerControl.

- If you open up a PowerControl or PowerMeter, the warranty is no longer valid.

- Make sure that no clothes get caught in the chain or chainset, as this can lead to a fall.

- Check the condition and tension of your chain regularly, and replace it with a new one when it becomes worn. Not enough tension or a damaged chain can cause a fall.

- Never clean the PowerMeter or PowerControl with a power washer.

- Check your cranks regularly for cracks or other damage, as cracks can cause the cranks to break, which could case a fall. Replace damaged cranks immediately.

- Check before each ride that your PowerMeter and PowerControl are secured properly to your bike.

- When unplugging your PowerControl from the Sensor Cable, always pull straight down rather than sideways, or you could damage the connector pins. Never pull on the cable itself, but rather the plug.

- Carefully read through the full installation instructions before beginning, as mounting the SRM Training System incorrectly can cause a fall.

- Replace parts only with other SRM Training System components.

Finding Points of Interest

Yes, we know this manual is awfully thick. Not very many of you are going to read the whole thing cover to cover, so we've flagged up interesting or important parts with icons in the margin to help you skip straight to the parts you want.

Here are the most common ones along with what they mean. There are lots of others throughout the manual, but mostly they're just there to brighten things up!

These keys point the way to bits of information that are important for making things work the way you want them to, but that aren't life-or-death kinds of things.

This manual doesn't just cover HOW to do stuff, it covers WHY you would want to do it as well. Any ideas are pointed out by lightbulbs, skip to these if you're on the hunt for help with interpretation.

Anything terribly important is pointed out by alarm bells… It's our way of shouting "DON'T SKIP THIS BIT OR HORRIBLE THINGS WILL HAPPEN!". Ok, maybe not that horrible in the grand scheme of things, but important anyhow. Honestly.

Explanations of anything somewhat puzzling get this icon. Settings, interpretation of some of the software features, anything that might make you say "Aha! That's what that means!".

Learn about how SRMs can help you meet your goals by following the targets.

Some of the instructions are… well, fairly long. But with lots of pictures, so don't worry! These thumbs up icons point to the end of the section, when you get to finish up and move on.

Come to a complete stop and count to three… For instance, before taking a hammer to your PowerMeter to try to remove a stubborn crank arm. Not alarm bells, but enough to give you pause, we hope.

Some people really want to know how things work, and they should look out for these icons. Some people really don't want to know, so they can look out for these so they can skip quickly

Introduction

Why use an SRM? Why is SRM the best choice for power measurement?

Do you want to know how much work you did on your bike? Or how your body reacted? With SRM, you can put these two vital pieces of information together, and get the full picture – "how much power can I produce when I work that hard?". This is the basic question that lies behind all of cycling training, and it and many others can be answered.

Power measurement is the Holy Grail of most endurance sports, and people have measured all kinds of things to try to get around the inability to do it. Cyclists are among the lucky few who can accurately and reliably find out what they *actually* did in training and racing, all because of SRMs. They were the first power measurement system for bikes to be developed, and they are widely acknowledged to be the "Gold Standard" for power measurement. They are specifically designed to do "exactly what it says on the tin", since there were no patent restrictions to work around when they were being designed. They measure the power that you produce, where you produce it, in order to drive your bike forwards — elegance in simplicity.

The combination of power, heart rate, speed, and cadence data that you get from an SRM system gives you a picture of how you and the laws of physics interact, which is the guts of what competitive cycling is all about. Can you overcome that rolling resistance, that air resistance, gravity? Can you do it better than you could a month ago? Better than your competitors? Better in this skinsuit or on that bike? SRMs can tell you.

Here are some ideas about how you can use your SRM Training System, just to start you off:

- "Quality, not quantity" – make the most of your time on your bike, by using the SRM to optimise your training.

- Find out what happens to YOU when you do a given training program – everyone is an individual, and will respond differently to the same training. Make sure your program is working for you.

- Find out if changing your bike, your position, your helmet, your clothes, whatever you're curious about, makes you faster, without spending a fortune and a very chilly day in a windtunnel.

- If you've been injured or ill, track your progress back to health, and know when you're fully recovered.

- Monitor your progress day-to-day, month-to-month, and year-to-year to find out what works for you and what doesn't

- Use it to help you achieve your weight management goals, by looking at how many calories you burn on your bike and tailoring your diet accordingly
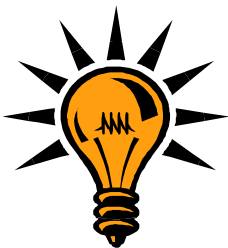
The company was started in 1986 by an avid cyclist, Ulrich Schoberer (shown on the left using the first ever "mobile ergometer"), after he realised that what you really needed to know about your training was how much power you could produce, not just how hard your heart had to work. After this "aha!" moment, he tried measuring power at different places on the bike (pedals, crank arms, bottom bracket), and found that measuring it within the crank was the best. He built his designs himself, and experimented on himself at home, on the track, and at races.

The first version of the SRM Training System had the same basic engineering as the current version, but the PowerControl was nearly the same size as the PowerMeter. If you ever wondered why your PowerControl was a "PC-V", it's because the "PC-I" (shown on the right) has been through a lot of development!

Schoberer Rad Messtechnik (literally means "Schoberer's bike technical measurement") developed from a home business into an international success story as news of his invention spread, largely through high-profile cycling professionals who used SRMs to revolutionise their training. Greg Lemond, Chris Boardman, Lance Armstrong, and Jan Ullrich, just to mention a few, all put the SRM system to good use on their way to success. Now, SRMs are a common sight in the professional peleton, as well as with many national teams.

The company strives to stay current in the constantly changing environment of bike technology, and does this by maintaining close contacts within the cycling community. They also aim to develop new uses of their technology, such as transmitting live data from cyclists in the Tour de France by telemetry to broadcasting television stations. This enthusiasm for development is matched by the staff team's attention to detail, assembling each SRM Training System by hand in their workshop.

SRM is still run by Uli and a small team of dedicated staff out of offices in Germany and Colorado, and they are known for their commitment to their customers and their product. Support has always been available for free, including all software and updates, and customer and technical support is provided in many languages by phone and email. Being successful worldwide means that the Customer Service Departments at SRM are of the utmost importance, and they aim to provide the best level of service to all of their customers.

How to Get Support

Can't figure out how to put that power sensor onto your bike? Having problems downloading your data? Or just want to tell us how much you like your SRMs? Whatever you need, just get in touch with us at one of the following addresses and we'll help you out.

SRM GmbH Office Germany
Rudolf Schulten Str. 6
52428 Jülich
Tel: +49 2461 69123 0
Fax: +49 2461 69123 17
Email: info@srm.de

SRM Service Centre Inc. USA
720 West Monument Street
Colorado Springs, Colorado 80904
Tel: +1 719 266 4127
Fax: +1 719 266 4284
Email: usa@srm.de

SRM Italia
Via della Rimembranza, 726
55100 Lucca
Tel: +39 0583 332036
Fax: +39 0583 331684
Email: uli@srm.de

You can also reach us through our website, www.srm.de. You will find answers to many of your questions on the website, and an online form for requesting help. You will also find the online store, where you can order everything from a full SRM Training System to replacement parts to SRM clothing.

If you do need to send your SRMs to us, please fill in a "SRM Service Repair Form" (downloadable from our website, in the Support section, or on pages 152-153) and include it in the package. You will be asked to describe the problem(s) that you are having, as well as whether or not you would like to order any new parts. There is also a section for payment details, although you will not be charged until the day we ship. You can pay by credit card, and can also chose which shipping option you prefer. Please clean your system before you send it back to us, or you may be charged to have it cleaned before any work can be done on repairs.

Warranty Details

Your SRM Training System is under limited warranty against defects in manufacturing and materials for one year in North America, or two years in Europe. The warranty does not apply to batteries, or in the case of improper use, installation, or unauthorised attempts at service. When the system is used for racing, the cranks arms are under warranty for one year only, and we recommend that new crank arms are purchased after that time. Contact your dealer for warranty instructions and details.

Both the PowerMeter and PowerControl are battery powered, but since the system is designed to be waterproof, you shouldn't try to change these batteries yourself. The normal lifetime of these rechargeable batteries is about two years (depending on use), after which you'll need to send them back to one of the service centres to get them replaced. It makes good sense to get the PowerControl and PowerMeter batteries replaced at the same time, so that you're not without your SRMs for longer than necessary.

Your SRM Training System

What's in the box?

They fit a lot into that little cardboard box, don't they? Here's what each of the parts is called for the rest of this manual (so you know what we're talking about)…

Software CD

PowerControl
PowerMeter

Universal Adapter for Charger
Left Crank Arm
USB Download Cable
Adapter parts for Charger
Handlebar Clip
Sensor Cable
Charger

Here's a closer look at what's in the bag with the sensor cable:
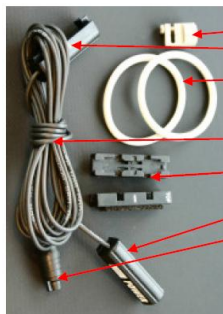
Speed Magnet
Speed Sensor
Rubber Mounting Rings
Sensor Cable
Mounting Clip
Power Sensor
Plug to PowerControl

Road Sensor

Plug to PowerControl
Rubber Mounting Rings

New Road Sensor Cable

Speed Magnet
Speed Sensor
Speed Sensor Mounting Clip
Power Sensor
Power Sensor Mounting Clip
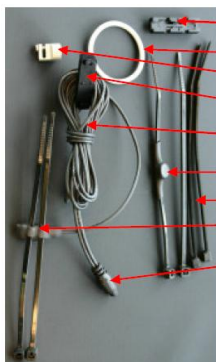
Mounting Clip for Speed Sensor
Mounting Ring for Speed Sensor
Speed Magnet
Speed Sensor
Sensor Cable
Magnet for Power Sensor
Cable Ties (also called Zip Ties)
Power Sensor
Plug to PowerControl

MTB I Sensor Cable
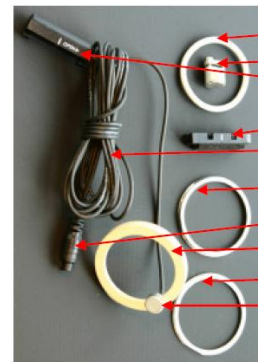
Mounting Ring for Speed Sensor
Speed Magnet
Speed Sensor
Mounting Clip for Speed Sensor
Sensor Cable
Mounting Ring for Power Sensor (1.5mm)
Plug to PowerControl
Power Sensor
Mounting Ring for Power Sensor (0.5mm)
Magnet for Power Sensor

MTB II Sensor Cable

And a close-up of the handlebar clip:
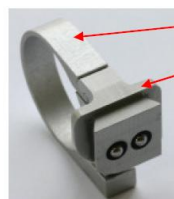
This side up
This side forwards

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Setting Up Your SRM (An Overview)

So you've opened up your newly arrived SRM System box, and are looking forward to your first ride with it on your bike. But there are more parts in there than you were expecting, and you're not too sure what to do with them...

DON'T PANIC.

Put a pot of coffee on, and then do the following:

1) Install the SRMWIN software on your computer (skip to page 34 for more detailed instructions).

2) Figure out which end of the sensor is which – one end is the speed sensor, and one is for the power (page 17 will tell you how to figure out which end is which).

3) Check that everything works BEFORE you put it on your bike (see page 16). If it does, you can start putting the system on your bike! If it doesn't, go to page 20 for help, or contact customer support.

4) Plug your PowerControl in using the charger that was included with your system, so that it will be ready to go when you're ready to set it up.

5) Put the handlebar clip for the PowerControl where you want it on the handlebars. Easy, right?

6) Put the sensor cable onto your bike frame (VERY detailed instructions on page 17. It's easiest to start with the power sensor, then run the cable up the frame, then do the speed sensor, and finally wind the remaining cable neatly up to the handlebars (not too tight, or you will break it if you have to turn sharply!).

7) Put the PowerMeter onto your bike (page 20 if you're not sure how). Make sure it's on tight, and while you're there you might as well check the chainring bolts are tight as well (they should be tight, but DON'T overtighten them or they will snap).

8) That's it for bike set-up! Now you just need to put a few settings into the PowerControl while you have your coffee...

9) Plug your PowerControl into your computer using the download cable. Click on the "PowerControl setup" icon, and fill in the settings (page 36 for full instructions). Finish your coffee, and go put your cycling kit on because you're ready to go...

11) Well, almost. One last thing. You need to set the zero offset in your PowerControl, or your data will be nowhere near accurate (more info on page 24). It's easy, just spin the pedals backwards a few times, press "mode" and "set" at the same time on your PowerControl, and when the big number settles down press "set again". All done. Honest.

Have a good ride! Be safe, you have a new gadget to play with, but stop staring at it and watch where you're going...

Part I: Put your SRMs on your bike

What tools do I need?

You'll need to have a few tools at hand, which you probably already own if you do any maintenance to your bike:

- A crank bolt wrench (usually a 14 or 15mm socket wrench, or an 8mm allen key for Shimano self-extracting bolts)

- A crank extractor to remove the old crank from the bottom bracket axle, if necessary

- A pedal wrench (15mm flat wrench, or 6mm allen key for most pedals)

- A 4mm allen key for the handle bar clip

- Tie wraps (also called zip ties) or electrical tape to fix the sensor cable to the bike frame

Check that all of the parts are working

Hold it right there. I know what you were thinking – "I don't need to do this, I'll just skip this step". This will take you two minutes, and could save you endless time and frustration later. Go ahead, skip it, but don't say you weren't warned.

What you want to check is that your PowerMeter and PowerControl will talk to each other once you put them both on your bike. All you need to do is to simulate what happens when you ride:
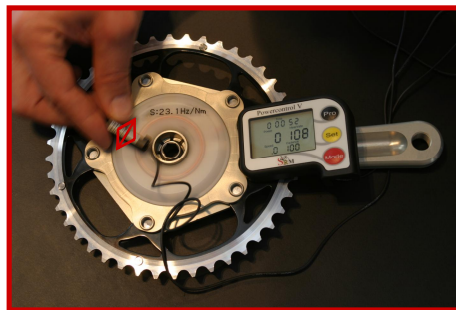
- Plug your sensor cable into your PowerControl, and turn your PowerControl on if it's not on already (just press the Mode button)

- Swipe the power sensor end past the Reed Switch (dark blob) that you can see through the plastic lid on the back of the PowerMeter.

- If you swipe the sensor about once per second, you should see a cadence on the PowerControl screen that's around 60rpm (you're simulating what happens when the crank turns when you ride).

- You might see a power as well, it doesn't matter. As long as you're getting a cadence, you know its working. Go ahead and start putting it on your bike! If it's not working, check out the troubleshooting section at the end of this chapter, or get in touch with us.

Mount the handlebar clip for the PowerControl

Open up the handlebar clip and push it onto your handlebars so that the allen key bolts are facing up and the two little metal studs are facing forward. If you've got a PC-IV, put it to the left side of the stem, and if you've got a PC-V put it to the right side of the stem. If your handlebars are less then 26mm in diameter, you can wrap a rubber insert or some tape around them under the clip to make it tight.

Do the bolts up loosely, and then slide the PowerControl downwards onto the clip until it is secure. Adjust the angle that you want to see the screen, and then tighten up the allen key bolts. The metal studs on the handlebar clip are only there to hold the PowerControl on, and don't form any other kind of connection, unlike with some other cycle computers.

Before you go for a ride, you'll need to plug the sensor cable into the port on the back of the PowerControl, so now you'll need to put the sensor cable onto your bike…

Mount the power sensor

The power sensor needs to be mounted carefully, or either the PowerMeter won't switch on or the data won't be picked up properly and you could get inaccurate power readings. It needs to be on securely, using either the L-shaped clip, rubber bands supplied, or cable ties (zip ties), so that when you go over a bump when you're riding, you don't lose your power and cadence readings. It's worth taking your time and making sure that everything's ok with the power sensor before moving on to the rest of the installation, since it's much more difficult to fix later once the PowerMeter is mounted.

We recommend using the new sensor cable whenever possible on road frames, as it makes the mounting of the sensor much easier and more secure, and will provide the best possible results.

New Road Sensor Cable
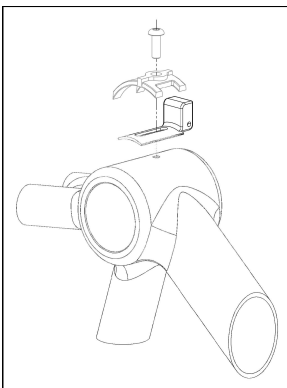
Start by getting the power sensor turned the right way around. Put the solid side of the L-shaped clip on the same side of the bike as the PowerMeter. The power sensor is bolted on under the cable guides, as shown in the diagram on the left.

Once you've bolted the power sensor on loosely under the cable guides, mount the PowerMeter and make sure it's on tightly. Then slide the power sensor until it is between 3-5mm from the PowerMeter. Once it's in place, and you've checked that it works by connecting the PowerControl and spinning the cranks for a few turns, tighten the cable guide bolt to hold the sensor in place.

Then, secure the sensor cable to the frame with tape or cable ties, and replace the derailleur cables.
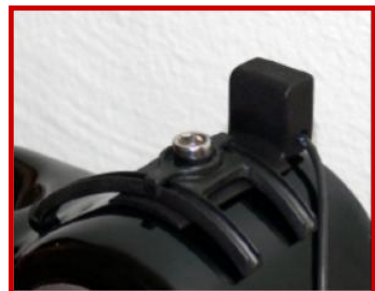
Original Road Sensor Cable

The sensor cable itself should be tucked under the mounting ring or the cable ties to keep it safe from getting caught in any moving parts (see the image to the right). It is important to keep it away from the gear cables, because they can saw through the sensor cable in time if they rub together.

Once you've got the sensor pointed the right way, the sensor cable running safely underneath, and the mounting ring or cable ties loosely attached to the frame, your goal is to get the sensor within 3 to 5mm of where the PowerMeter will be once it's mounted. Slide the PowerMeter onto the bottom bracket to get everything lined up properly. The white patch on the sensor should be lined up as closely as possible with the copper sending coil that you can see through the plastic lid of the PowerMeter, unless you have a black lid.


Specific Instructions for Brands of Road Frames

We have found ways that work well for mounting the sensors on different types of frames, both road and mountain bike. Here are a few suggestions for some common types of frames.

Cannondale

On Cannondale frames, the power sensor should be mounted on the down tube, since there is not enough room on the chainstay. The cable should come out of the sensor away from the bottom bracket, towards the outside of the PowerMeter.
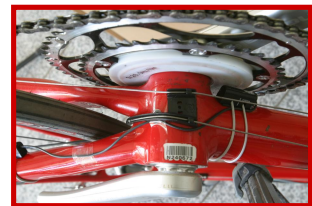
Cervelo

On the Cervelo Soloist frame, the power sensor should be mounted on the chainstay. The sensor cable should come out of the power sensor pointing towards the back of the bike, away from the bottom bracket (see image).

Attach one end of the sensor to the chainstay with a cable tie, and the other side with a long rubber ring that runs around both sides of the bottom bracket (you can order one from SRM if needed).

If the clearance between the PowerMeter lid and the frame is less than 1mm, put a 1mm spacer behind the right bottom bracket cap.

Trek

On Trek frames, the power sensor should be mounted on the down tube, since there is not enough room on the chainstay. The sensor cable should come out of the sensor away from the bottom bracket, towards the outside of the PowerMeter.
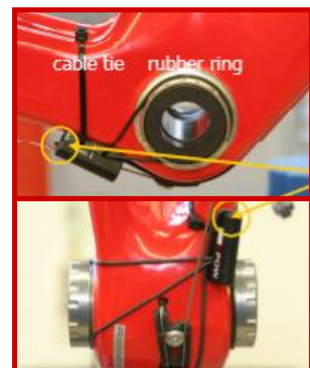
Wrap the cable ties around the down tube on either side of the seat tube to keep the sensor securely in place and close to the bottom bracket.

Mounting a Mountain Bike Power Sensor

Hardtail MTB

The mountain bike power sensor is a ring that fits around the bottom bracket, with a magnet attached. This type of sensor is designed to withstand the rough treatment of off-road riding. Place the sensor over the bottom bracket with the sensor cable pointing towards the ground.

Secure the sensor cable to the frame with a cable tie around the down tube. Before mounting the PowerMeter, run the speed cable along the bottom of the chainstay and secure that with two more cable ties.

Full Suspension MTB

For full suspension mountain bikes or hardtail bikes with a bottom bracket-mounted front derailleur, put the power sensor ring around the bottom bracket with the magnet and sensor cable at the top. Secure the sensor cable to the front derailleur clamp with a cable tie, as shown in the picture on the right. Run the speed cable in the same way as for a hardtail bike.

CHECK THE SENSOR IS MOUNTED CORRECTLY

If the sensor is mounted wrong the PowerMeter will not switch on or will pick up the data incorrectly.

A simple check is to look at the zero offset for four different crank positions, such as 12, 3, 6, and 9 o'clock. The zero offset measures should be within 10 units (Hz) of each other at each point. This shows that the data is being sent and received properly through the whole pedal revolution.

To check the zero offset, press "Mode" and "Set" together on the PowerControl, spin the cranks backwards a few times to turn on the PowerMeter, and then let go so that no load is on the chain. On a PC-V, it is the number that is higher up on the display screen, and is shown in a larger font. (Further instructions on page 24)

Mount the speed sensor

There are two different types of speed sensor cables, one for mounting on the front fork, and one for mounting on the rear chainstay. The shorter, front-mounting speed sensor is usually used on road bikes, while the rear-mounting one is used on mountain bikes, sometimes on track bikes, or for use on an indoor trainer.

The installation of the speed sensor is the same, regardless of whether it goes on the front or rear of the bike. The sensor and the magnet should pass within 1-3mm of each other as the wheel spins. If it is mounted correctly, you will a hear a small "tick" noise each time the magnet passes the sensor.

Put the wheel magnet on a spoke and tighten the set screw. Find a location for the speed sensor where the sensor and the magnet pass close to each other as the wheel spins, but don't hit each other, and secure the speed sensor to the frame using either a rubber mounting ring or cable ties, as shown above.

Finish the sensor cable installation

Once the speed and power sensors are mounted, use tape or cable ties (zip ties) to neatly run the sensor cable along the bike frame so that end with the connector plug is the only loose part, and is hanging free by the head tube. If you're using cable ties, be careful not to secure them so tightly that they cut into the sensor cable.

Wrap the plug end of the sensor cable around one of the brake cables up to the handlebar clip, leaving enough slack to turn your handlebars completely as well as to connect and disconnect your PowerControl without damaging the cable.

To check if the speed sensor is working, put the PowerControl onto the handlebar clip and plug the sensor cable into the back of it. Lift the wheel with the speed sensor of the ground and spin it. You should see speed and distance values come up on the PowerControl display screen, and you should also hear a small "tick" each time the magnet passes the sensor.
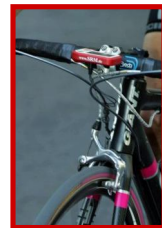
Mount the PowerMeter

9-speed, Track, and Mountain Bike PowerMeters

Grease the bottom bracket, fit the PowerMeter onto it, and tighten with an 8mm allen key. Mount the PowerMeter loosely at first while you check that both power and cadence values are being shown on the PowerControl, so that it is easy to take it off again if you need to make any adjustments.

To check that the system is working, put the PowerControl onto the handlebar clip and plug the sensor cable into the back of it. Spin the cranks backwards a few times to turn the PowerMeter

on, and then lift the rear wheel and turn the pedals forward. You should see power and cadence values come up on the PowerControl display screen.

We recommend that you use a torque wrench, so that you can be sure that the bolt is tightened to 42.5 Nm. Tightening less than that will result in less reliable power data, while overtightening may cause damage to the PowerMeter.

Shimano 10-speed Dura-Ace compatible PowerMeter

The PowerMeter that is compatible with Shimano 10-speed Dura-Ace is attached to the bottom bracket with bolts on the inside of the PowerMeter.

Grease the bottom bracket and mount the right crank by inserting the integrated axel into the bottom bracket. Then attach the left crank to the non-drive splined end of the axel, and tighten.

FSA PowerMeter

Grease the bottom bracket, and place the right crank arm onto the bottom bracket spindle. BE SURE THAT THE SPLINES OF THE CRANK ARMS AND THE BOTTOM BRACKET SPINDLE ARE PROPERLY ALIGNED, otherwise the splines could become damaged.

Install the washer and the fixing bolt, and tighten to 44.1-53.9 Nm. Ensure that the inside area of the crank arm is pressed against the spindle stopper. Finally, align the left crank arm with the bottom bracket spindle, and tighten.

Cannondale PowerMeter

Grease the bottom bracket, and place the right crank on the axle. Make sure that the teeth engage properly. Tighten the crank bolt to 38Nm, using a torque wrench. Repeat the process with the left crank.

Part 1: Troubleshooting

My system doesn't show power or cadence readings

Both of these values come from the power sensor, so this is a sign that either the power sensor is not positioned correctly, the sensor cable is damaged, or that the battery in the PowerMeter is dead.

Check that the sensor cable comes out of the power sensor pointing away from the bottom bracket for road and track systems, or towards the bottom bracket if using a traditional style sensor with a mountain bike PowerMeter. The sensor should be within 3 to 5mm of the back of the PowerMeter.

Check that there are no breaks or nicks in the sensor cable itself, since these will interrupt data transmission from the PowerMeter to the PowerControl. If your cable is damaged, you can order a new one from the SRM online shop at www.srm.de.

If your crank is relatively old, it could be that the battery in the PowerMeter is empty. The battery has a life-span of up to 1,000 hours. Fluctuations in temperature or leaving the PowerMeter unused for a long time can reduce this life-span significantly. Please send the PowerMeter in for the battery to be changed. You should clean it, leave the right crank and chainrings attached, and enclose a "Return Form" found on the SRM website.

My system shows no speed or distance data

This suggests that your speed sensor isn't passing close enough to the magnet on the wheel. Try adjusting the angle of the wheel magnet on the spoke so that it passes closer to the sensor, or adjusting the position of the speed sensor on the fork (or chainstay if using a rear-mounted speed sensor). Sometimes you may need to try different positions along the fork to get the best position.

Check as well that there is no damage to the sensor cable itself, since this will prevent data from reaching the PowerControl. Replacement sensor cables can be ordered on our website.

There could also be a broken pin on the back of your powercontrol. The pin at 11:00 is the speed pin. A broken pin can be replaced, if you send the PowerControl in for servicing.

How do I test if the power sensor is installed properly?

It is possible to get power readings that are wrong, if the sensor only picks up data for part of a pedal revolution. This can happen if the sensor is attached to the bike frame too loosely, or if it is a little bit too far from the PowerMeter lid. It can also happen if your bike frame flexes when you apply a lot of power. If this is the case, the PowerMeter will pick up a little bit of data, but not for the whole pedal revolution, and your data will be intermittent or incorrect.

To test that the power sensor is on properly, you need to check that it is picking up a signal all the way around a pedal revolution. Start with the pedal pointing upwards (12 o'clock), press "Mode" and "Set" at the same time on the PowerControl, and look to see if you are getting a zero offset reading (see page 24). Make sure that you are not touching the crank or pedal when you do this. Then rotate the crank around so that the pedal is pointing forwards (3 o'clock,) and check the zero offset again. It should be within 10 units of the 12 o'clock reading. Do this two more times, at 6 o'clock and 9 o'clock. All four values should be within 10 units of each other. If they're not, make small adjustments to the position of the power sensor, and repeat the check until you get stable readings all the way around the revolution.

My PowerControl battery ran down completely. Can I wake it up?

Charge the PowerControl for a full 12 hours. Unplug and replug the PowerControl from the charger until you are sure that they are connected properly. If it still doesn't work, then send it in for service.

Part II: Making sure your data is accurate

While it might be nice to think that you're 50 Watts stronger than your training partner, you only get to take that power with you to a race if it's REAL. Otherwise, you're just fooling yourself. So, what do you need to do to know that the power you think you're riding at is correct?

Setting the zero offset

Say your resting heart rate is 60 beats per minute. You could call this a "baseline" measurement, since you're not doing any work when you measure it. Now, say your resting heart rate is 55 beats per minute, but you haven't checked it in a month, and you think its 60 beats per minute like it was back then. Now you've got some error in your baseline measurement, and you'll think that you're not working as hard as you really are when you're out training. Not ideal, right?

Your PowerMeter has a baseline too, called the "zero offset", when the PowerMeter is on but there's no pressure on the pedals. You can check and set it using your PowerControl. You need to do this at the start of every ride, so that you don't have erroneous power data from that ride. Yes, you can go back and fix it later in the software, but how will you know what to fix it TO if you didn't check it?

The reason you need to do this every ride is that the parts measuring your power are mounted on metal, which shrinks and expands with changes in temperature, as well as tension from the chainring and crank arm bolts. So the zero offset changes with temperature and tension, too, and you need to correct for this. Other than setting it at the start of each ride, you'd want to reset it if there was a big change in the weather while you were out on your bike (started on a sunny coast road at 20°C, and then climbed a mountain where it was 5°C), or if you'd tightened any of the chainring bolts or crank arm bolts. You can set it as many times as you like during a ride, although you'll only see the first one in the file properties afterwards.

System Accuracy

If your SRM system is well-maintained, has it's calibration verified, and it's zero offset set daily, the accuracy of the system is as follows:

- Amateur (2 strain gauges) system: ±5%

- Professional (4 strain gauges) system: ±2%

- Science and Mountain Bike (8 strain gauges) system: ±0.5%

Part II: Making sure your data is accurate

Here's how you check and set the zero offset for your SRM system:

Make sure the PowerControl is in the normal display mode, with the current speed, cadence, power, and heartrate showing, by pressing and holding "Mode" for three seconds.

Press "Mode" and "Set" at the same time, and a screen will come up that shows you the current baseline measurement as well as what value the PowerControl is currently using as its zero offset.

Actual zero offset
(0 when PowerMeter is off)

Zero offset being

Turn the PowerMeter on by pedalling backwards a few times, and then leave the pedals in a horizontal position and let go of them. You need to make sure that nothing is touching them or you will end up with an inaccurate zero offset. With track systems, put forward pressure on the pedals before setting the zero offset.

Actual zero offset
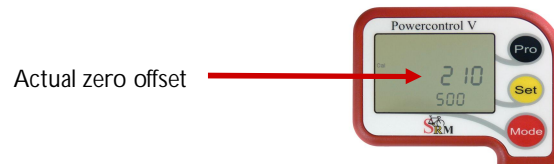
Wait until the zero offset stabilises, resting on the same number for a few seconds.
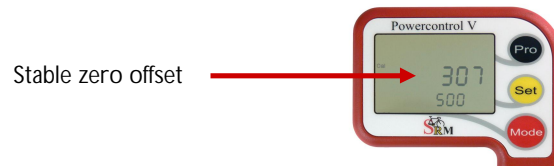
Stable zero offset

After the zero offset stabilises, press "Set" to store this value for its power calculations.

New zero offset is stored
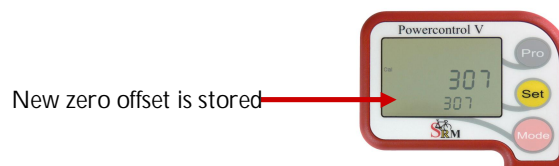
Press and hold "Mode" for three seconds to return to the Normal Mode.
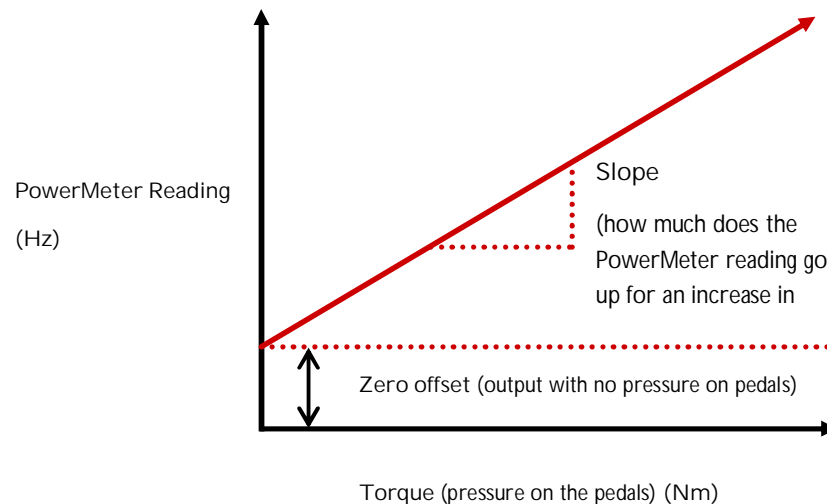
Part II: Making sure your data is accurate

Making sure you're using the right slope for your PowerMeter

Back to the heart rate analogy for this one. So, you've measured your "baseline" resting heart rate accurately, which is a good start. Now you need to know how much your heart rate goes up for a given amount of effort – this would be different for each individual. Normally, it goes up in pretty much a straight line with a constant increase in effort, so you get a nice relationship, which you could call your heart's "sensitivity" to effort.

Again, it's the same for your SRMs. The system needs to know how much to respond when you push on the pedals, how "sensitive" it is to your effort, and this is different for every PowerMeter. The figure below shows this sensitivity, which is described as the "slope" of the line, as well as the zero offset. All the figure is saying is that as the force goes up, i.e. as you pedal harder, the PowerMeter reading goes up. Your PowerControl needs to know how those two things are related, in mathematical terms what the "slope" of the line is, otherwise it will display the wrong power. The zero offset is just showing that if you don't push on the pedals at all, the PowerMeter reading will stay the same.

PowerMeter Reading (Hz)

Slope

(how much does the PowerMeter reading go up for an increase in

Zero offset (output with no pressure on pedals)

Torque (pressure on the pedals) (Nm)

The slope is measured at the factory before your SRMs are sent out to you, and is written on the back of your PowerMeter (as well as on your invoice). It's a three-digit number, usually between about 12.0 and 35.0. You only need to set this once for your system in the computer software, since it is very stable. Having said that, if you want to check the slope of your PowerMeter periodically (i.e. every six months to one year), you can send you PowerMeter back to us for a calibration,. There are also instructions at the end of the manual to help you check it yourself.

How to set the slope of your PowerMeter using your PowerControl

You can either do this in the SRM software on your computer when your PowerControl is connected (see page 36 for instructions), or you can do it on the PowerControl itself. Here's how:

Find out the correct slope, of your PowerMeter. It is written on the back of your PowerMeter, and is also on your invoice. If you can't find it, get in touch with us (info@srm.de) and tell us the serial number of your PowerMeter and we will tell you the correct slope.
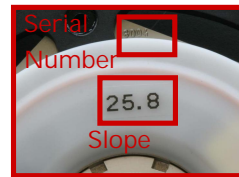
Press and hold "Mode" once to exit any other mode.

Then press "Mode", "Set" and "Pro" all at the same time to get into the Setup Mode.

Press "Mode" seven times to get to the screen that shows the slope. When the "S" is flashing, you can set the slope.

Use the "Pro" button to increase the number, and the "Set" button to decrease it.

When you are finished, press and hold "Mode" for three seconds to go back to the main screen.

I don't know what the slope of my PowerMeter is. How do I find out?

The slope should be written on the plastic lid on the back of your PowerMeter, as well as on your invoice, packing slip, and warranty card. However, if it has worn off or you can't find it, you can contact us at info@srm.de and we'll tell you what it is. We just need to know the serial number of your PowerMeter, which is stamped into the metal on the back (or sometimes the front). It's either three or four digits long.

Can I use more than one PowerMeter with my PowerControl?

Yes, you can use as many PowerMeters as you like with one PowerControl. You will just need to set the slope (see page 26) to match the PowerMeter you're using, and set the zero offset before each ride.

The zero offset of my system keeps shifting, what's wrong?

There are a few things that could be causing this, but first of all let's define "shifting". It's normal for the zero offset to vary a little bit while you're setting it, settling on one number and then going up or down by one or two digits. This just shows how sensitive the PowerMeter really is. Make sure the crank arms are level and nothing is touching the pedals, and then don't worry about these small fluctuations.

If the zero offset is shifting more than 10 digits while you are trying to set it, or when you do a couple of checks in a row, then something is probably loose. Check that the crank arm bolts are tightened to 15 Nm, but aren't damaged — if you overtighten them, it's possible to stretch the bolts so much that you can move the crank arm with the bolts done up. You can order new bolts from us if you need to. Then, check the chainring bolts, they should also be tight but not overtight. They can crack easily if overtightened, or if they aren't cleaned and greased regularly. Again, you can order these bolts from us, but you should also be able to get them from your local bike shop. If the zero offset is still jumping around and you have Shimano-compatible cranks, take the crank arms off and check that the spacer between the PowerMeter and the crank arm is in place and undamaged. You can order a replacement spacer from us if you need to.

If the zero offset is shifting more than 10 digits when you try checking the zero offset with the cranks in different positions, then your power sensor isn't picking up the data from the PowerMeter properly. You'll need to try making small adjustments to the sensor's position on the frame until the zero offset is more consistent throughout the pedal revolution.

If the zero offset shifts more than 10 or 15 digits day-to-day, this can be normal, but only if the temperature has changed or you've travelled. If the weather is the same, and the bike has been stored in the same place, then one of the bolts is probably loose — see two paragraphs up for instructions on how to fix it.

The zero offset stays zero, even when I spin the cranks backwards.

If you've spun the pedals backwards a few times and still see "0" for the zero offset, then three things could be wrong:

1.   The PowerMeter battery is dead. If you've had your system for a while, or haven't used it in a long time, this is probably the case. Send it back to a service centre to get the battery replaced.

2.   The power sensor isn't picking up a signal. Another sign of this is that you won't get a power or cadence reading when you pedal. Check the positioning of the power sensor. On some carbon frames it can be difficult to find a good position, and may take a little while.

3.   The sensor cable is damaged between the power sensor and the PowerControl. Check for any nicks or cuts on the sensor cable, and if you find any, order a replacement sensor cable from us.

The zero offset of my system is less than 100 or more than 800

This could result in inaccurate power data. Send it back to a service centre and we'll adjust it for you.

My PowerControl won't go into Zero offset Mode

Your PowerControl thinks that you are in the middle of an interval, and so won't change from the Interval screen to the Zero offset screen. You can tell if you are in Interval Mode if you have a number appearing on the very left of the middle row of your PowerControl screen, as shown on the right.

To exit Interval Mode, press the "Set" button once. Then press the "Mode" button, and while holding it down press the "Set" button. Then release both to enter Zero offset Mode. You will see "Cal" appear on the left side of the screen.

When should I set the zero offset?

You need to set the zero offset at least once every time you ride, before you set out, otherwise your power data will be inaccurate.

You need to check and set it again if the temperature changes a lot during your ride, for instance

Part III: Taking care of your SRM System

Making your SRMs last as long as possible ("care and feeding")

Think of your SRMs like you would think of a German high-performance car: A robust piece of German engineering, but if you don't change the oil and take it for a service now and then, it's your own fault when it breaks down. Look after it, though, and it'll last you longer than you thought was possible.

The biggest threat to your SRMs is the weather. While the PowerControl and the PowerMeter are designed to be waterproof, and have been race-proven in the extremes of weather and road surfaces found in professional races, they're not indestructible. A few simple precautions can help keep water out of the electronics:

- NEVER use a power-washer on your PowerMeter – the water pressure is too high, and will force moisture into the electronics. Sure, wash your bike with the jet-wash, but get the old bucket and sponge out to get the guck off of the PowerMeter. And go easy on the degreaser, it can degrade the plastic lid on the back as well as the o-rings if it gets in contact with them.

- If you have an extra port on the back of your PowerControl (for using it with the "online" software options, for example), and you're going for a ride in wet weather, put a blob of grease into the empty port to keep the water out.

- NEVER try to open up either the PowerMeter or the PowerControl. They are sealed with o-rings and silicon sealant to keep everything dry, and if you open them up you risk turning your SRM Training System into a "fair-weather only" system (and the warranty will be null and void).

- If you have a "track" PowerMeter, IT IS NOT WATERPROOF. It's meant to be used indoors only.
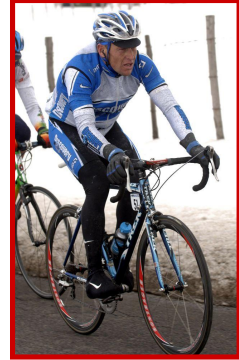
The other big threat to your SRM system, as well as to you, is impact. It's best really to avoid this wherever possible, but just in case, wear a helmet. The helmet won't help your SRMs, but here's what to do if you, and they, happen to hit the deck. Once you're ok, that is.

- Get a set of replacement crank arms. Aluminum/Aluminium, whatever you want to call it, can get stress fractures after an impact, and you don't want to find that out when you're riding.

- Check for any damage to the sensor cable, and order a replacement if there are any nicks or cuts.

- Return the PowerMeter and/or PowerControl to a service centre if anything rattles when you shake them.

- There aren't any moving parts inside the PowerControl or the PowerMeter, so if nothing is rattling, chances are your system is ok. Double-check that all of the bolts are tight, the sensors are still in place, and take it for a spin, chances are it will work. If not, get in touch with a service centre.

Travelling with your SRM

SRMs are good travellers, as long as they're packed safely. Lots of national and professional cycling teams travel extensively with their SRMs, without any problems (other than the usual lost luggage issues). Here are some tips to help you combat the brutality of the average baggage handler:

- Pack your PowerControl in your hand luggage, wrapped in bubble wrap or something else protective so that the screen doesn't get damaged. Make sure the battery is charged, so that you can turn it on if you're asked to at security.

- Leave your PowerMeter and sensor cable on your bike. Wrap the PowerMeter WELL in high-density foam or bubble wrap (or lots of extra towels, whatever you have), and tape this protective layer into place.

- Use a bike box instead of a bike bag, if you have the option.

Don't worry about the environmental conditions inside the baggage hold on the plane, these won't damage your SRMs. The temperature and pressure might cause a small shift in the "zero offset" setting of your system the first time you fly with them, but this is normal and will not affect the stability or accuracy of your system as long as you set the new zero offset when you arrive at your destination.

Check over your SRMs when you arrive at your destination, and get in touch with a service centre if you think there are any problems.

Replacing damaged parts

While the PowerMeter and PowerControl are very difficult to damage unless you crash, since they don't have any moving parts, the sensor cable and the crank arms should be replaced if they get damaged. The sensor cable is easy, just remove the old one and install the new one the same way. The crank arms need to be replaced if you have a crash, or every year if you do the number of miles a professional rider does, since the metal can fatigue with heavy use.

You can either send your PowerMeter to a service centre to get new crank arms fitted, or you can do it yourself if you have the right tools. If your PowerMeter or PowerControl is damaged, you'll need to send it to a service centre to see if it can be fixed.

PowerControl batteries should last for 29 hours or so when fully charged. Both the PowerControl and PowerMeter batteries should last approximately two years with normal use.

Don't try to do any repairs that require opening up the plastic lid of the PowerMeter or the PowerControl box. If you do, you risk damaging the electronics inside, as well as compromising the waterproof seals, not to mention invalidating your warranty. If you need batteries changed, PowerControl screens replaced, or anything else that requires opening the system up, please send it back to a service centre.

Changing crank arms

Road (9-speed) and Track systems, Octalink and Square Taper Compatible

First, take the PowerMeter off of your bike.

Then take out the crank extractor bolt.

Undo the three bolts that are holding the crank arm onto the PowerMeter, using a Torx 30 wrench.

Clean the area where the crank arm had been attached, and then grease both the centre of the PowerMeter and the inside surfaces of the new crank arm to keep the parts from fusing together.

For Shimano Octalink compatible PowerMeters, make sure that the spacer that fits between the PowerMeter and the crank arm is well greased. SRM makes two different sized spacers, make sure you are using the one that came with your new cranks.

Put the spacer back into the PowerMeter, and place the new right crank arm onto the PowerMeter so that the bolt holes line up. Put a few drops of blue Locktite or a similar removable thread lock product onto the crank arm bolts, and do them all up loosely to begin with. Then tighten them up to 10 Nm.

Mountain Bike, Road 10-speed, and FSA systems

The procedure for changing crank arms is the same as above, except that the bolts are accessed from the back of the PowerMeter. DO NOT TAKE OFF THE PLASTIC LID.

Part III: Troubleshooting

There is moisture inside my PowerControl, what should I do?

Sometimes just leaving your PowerControl to dry out will work, but usually you will need to send it back to a service centre so they can open it up and dry it out completely. Otherwise, the moisture will eventually start to corrode the electronics inside the PowerControl and it will be damaged beyond repair.

Always put a dab of grease on the connector plug on the back of the PowerControl before going out for a ride in wet conditions. If you have a PowerControl with the online option, make sure you put grease on the empty port as well to keep the water out.

I can't get the crank arm/chainrings off of my PowerMeter, they're stuck.

DO NOT HIT THEM WITH A HAMMER. Tempting as it might be, this can do irreparable damage to the PowerMeter electronics. Try to get some oil into the joint where the two parts are stuck, a good squirt of WD-40 works wonders if you let it sit for a bit. Try to gradually pry the two parts apart, each time putting a little more oil on. If you still can't get them apart, send them to a service centre.

To prevent this from happening again, clean your PowerMeter regularly with soapy water and a sponge. Undo all of the bolts (chainring and crank arm) occasionally, clean and regrease everything before you put it back together.

My sensor cable is damaged, can it be fixed?

No, these cables can't be fixed, you'll need to order a new one. Please specify front or rear speed sensor.

How often do I need to replace the crank arms for my SRM System?

If you are a professional cyclist, or doing a similar number of miles per year, you should replace them every year. Anyone else should replace them if they crash, or if there is visible damage to the metal.

I can hear something rattling in my PowerControl/PowerMeter...

There are no moving parts in either the PowerControl or the PowerMeter, so if you can hear something moving then something is broken. Send it to a service centre.

Can I get a new decal for my PowerMeter?

Yes, you can order one from us. However, it's best to send your PowerMeter back to us to have the decal changed, since the old one needs to come off first and the new one put on carefully since it protects the external circuit board. It's best to wait until your PowerMeter needs a new battery so that you only have to send it back to us once.

Part IV: Setting up the SRMWin software

The SRMWin analysis software is the computer program that allows you to get the most out of your SRM System:

- Download your SRM data onto your computer so that you can analyse your training.

- Keep a record of all of your training files in an automatic database, and look at them in different ways.

- Set up and customize your PowerControl, changing settings like time and date, metric vs. imperial units, PowerMeter slope, how often the system should record your data while you ride, and what you see on the display while riding.

- If you have a PowerControl with the Online option, watch your turbo trainer sessions in real-time on your computer screen to help you follow your intended training as closely as possible.

- If you have an SRM ergometer, control the ergo brake and run specific tests that you can program yourself.

In this chapter we'll just cover the installation of the software on your computer, and how to set up your PowerControl through it.

At the moment, the software is only available for PC computers. If you have a Mac, there are programs you can purchase on the internet that allow you to download and view your SRM files. Macs with Intel processors can run Windows programs, including SRMWin.

If you don't have a CD, or if you'd like to upgrade your older version of the SRMWIN software, you can download the program from www.srm.de/englisch/supp_downl.html. Any new software versions will be posted at this link for free downloading.
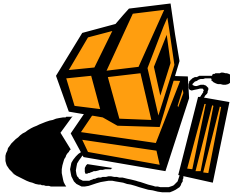
System Requirements

Before you start the installation, if you intend to use a USB download cable (as opposed to an old-style serial cable), please check that your computer is a PC with the following minimum system requirements:

- Intel-compatible 486DX-66 MHz CPU or higher

- One standard USB port (4-pin) with the symbol

- One of the following operating systems

    - Windows 98, Windows 98 SE

    - Windows ME

    - Windows 2000

    - Windows XP

    - Windows Vista

If you are going to use a serial cable without a USB converter, simply install the SRMWin software and don't worry about installing the USB driver.

Install the software

1.   Turn on your computer, and put the SRM CD-ROM into the CD or DVD driver. The CD should
        start to run by itself. Click "Next" to continue with the installation, or "Cancel" to exit.
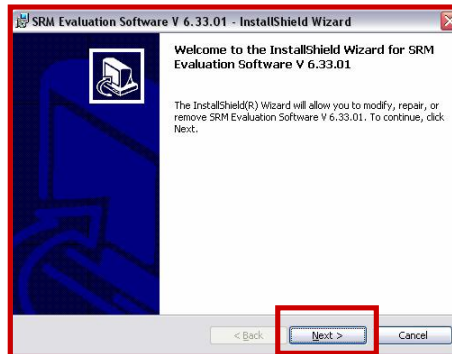
2.   If you have a Mac computer with a PC emulator, cancel the automatic installation and install the
        USB driver first. It can be found on the CD, in the folder called "USBCableDriver/Mac".

3.   If you have a PC, or if you have a Mac and have completed the USB driver installation, you may
        need to start the software installation yourself. Click on "My Computer", then click on your CD
        drive (usually D: or E:), and double-click on "Setup.exe".
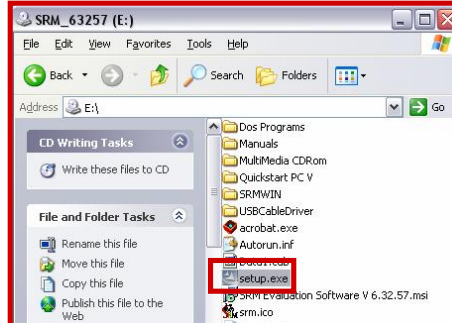
4.   Once you've clicked on "Next" to begin the installation, you will be asked to select which folder to
        install the SRMWin program into. It's easiest to leave it as it is, but if you want to you can install it
        to any folder you'd like on your hard drive. Click on the "Change" button to select a new
        destination folder, or "Next" to continue.

5. The next screen simply confirms for you which folder the software is about to be installed into. Click on "Next" if everything is ok, "Back" to go back and change the settings, or "Cancel" to quit the installation completely.
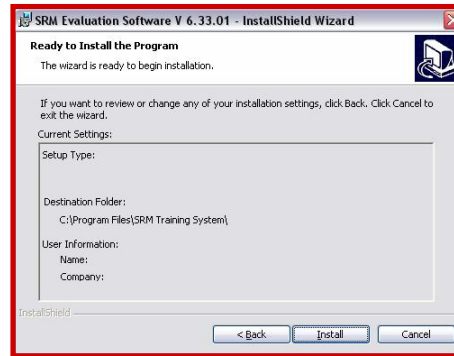
6. The program will be installed, and then the following screen will appear. Click on "Finish".
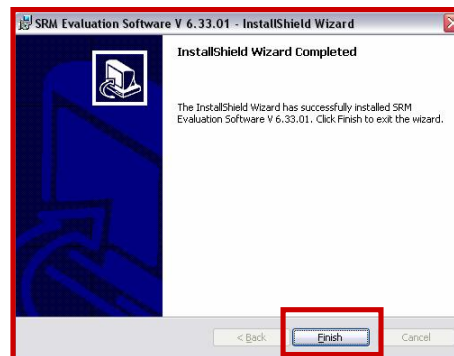
7. If there are any problems during the installation, you can install the PC USB download cable driver manually by clicking on the file called "USBSetup.exe" on the CD-ROM.
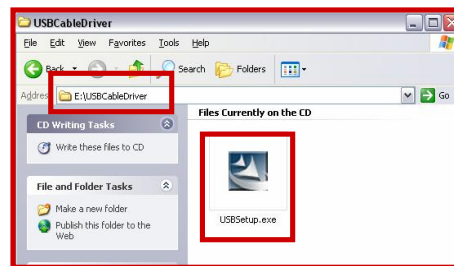
8. After the installation is finished, plug the USB cable into the USB port of your computer. Windows will detect a new USB device and will automatically recognise it as a Prolific USB to Serial cable.

You can now open your SRMWin software and connect your PowerControl.

Open the SRMWin software and set up your PowerControl

Before you go out on your first ride, you need to set up your PowerControl so that it gives you accurate power readings and knows what date and time it is. You can set up a PC-V by using the buttons on the PowerControl, but if you have a PC-IV you'll need to do this through the software. It can be easier to do the setup through the software for a PC-V as well, so this is recommended if you have your computer with you. Plus, it'll get everything ready for when you come back from your ride and want to download your file.

1. Connect your PowerControl to your computer using your download cable, and then press the "Mode" button on your PowerControl once to make sure it is turned on.

2. Double-click on the SRMWin icon on your computer desktop to launch the SRMWIN software.

3. The main screen of the SRMWin software will appear, as seen below. Press the "Mode" button on your PowerControl once to make sure it's turned on, and then click on the "PowerControl Setup" icon in the software.
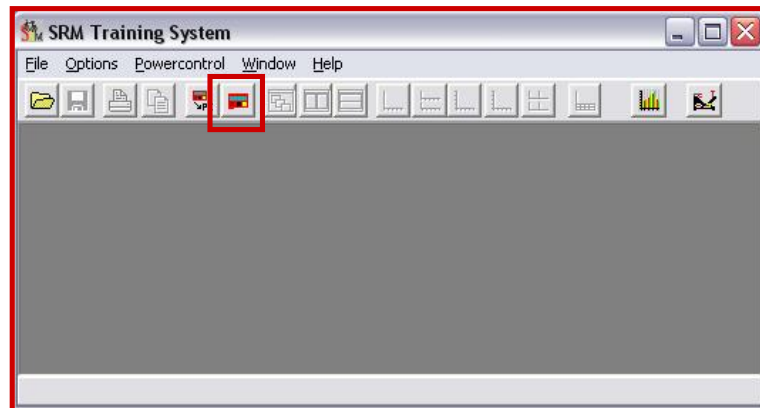
4. The PowerControl Setup screen will open, as shown below. Change the initials to your own, and the "Slope of PowerMeter" to the "slope" marked on the back of your PowerMeter.
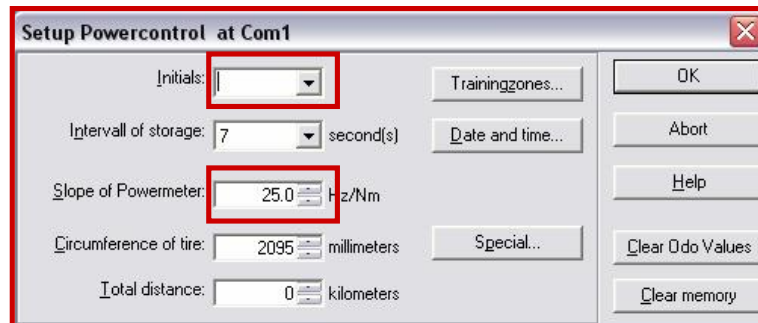
5.   Then change the interval of storage to whatever is best for the kind of riding you do. The storage interval setting tells the PowerControl how often to store the data, so the shorter the interval, the more detail you get about your training, but the shorter the memory of the PowerControl.

Interval of Storage	Recommended For	PowerControl
0.1 / 0.5 seconds	Track Sprint &	30 minutes / 3.1 hours
1 second	Track Endurance, Road	6.2 hours
5 seconds	Road, Mountain Bike	31.1 hours
10 seconds	Long Distance Cycling	62.2 hours
> 10 Seconds	Not recommended	> 62.2 hours

6.   Set the "Circumference of Tire" to the correct measurement for whichever wheel you have your speed sensor on. This number is used to calculate your speed and distance, so it's worth getting it right. Put a mark on the side of your tire as a starting point, put a measuring tape on the floor, and line the mark on your tire up with the 0cm mark on the measuring tape. Sit on your bike, and slowly roll it along the measuring tape until your starting point mark has gone all the way around and is touching the tape again. Make a note of how far you went (in millimetres), and enter it into this field in the software.

7.   Click on the "Training Zones" button if you know your power zones (if you don't, see page 92 for suggestions). You can enter them in the screen that comes up, as shown below. Just set the top value for each zone, and it will be automatically set as the lower value of the next one. Click on "OK" once you're done.

8.   Make sure the date and time are correct in your PowerControl, so that your files are easy to find later on your computer. Click on the "Date and Time" button, and the following screen will appear. You can either enter the time manually by clicking on the number you want to change and then using the up and down arrows, or you can click on the "<<" button to set your PowerControl date and time to the same as your computer. Click "OK" when you're done.
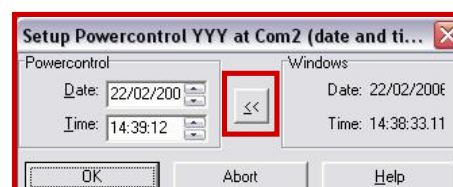
9. You can set the zero offset of your PowerControl manually by clicking on the "Offset" button, but this isn't recommended. It's best to do it on your bike before each ride, as described on page 24. Just for interest, this is the screen that comes up if you do click on it.

10. Click on the "Special" button and this is what you'll see… You can customise how you want to see your data while you ride.
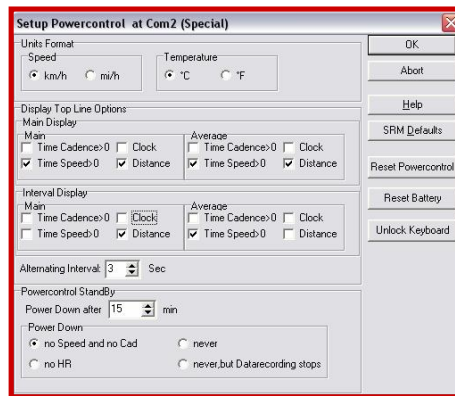
11. The first section of the "Special" screen allows you to set which units you'd like to use. Simply select whether you'd like your data to be shown on your PowerControl in kilometres per hour or miles per hour, and if you'd like the temperature to be shown in degrees Celsius or Fahrenheit.
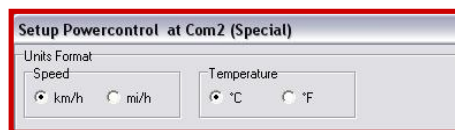
12. The second section of the "Special" screen asks you which values you'd like to see on the top line of the main display of your PowerControl while you ride (PC-V only). You can select one variable, and have it shown constantly, or more than one variable and have them alternate. This section allows you to set different preferences for the real-time, "main" screen, and the "average" data screen. The four options are: "Time Cadence >0" which means time spent pedalling, "Clock" which is the time of day, "Time Speed > 0) which means time spent on the bike while it's been moving (and so includes freewheeling time as well as pedalling time), and "Distance".
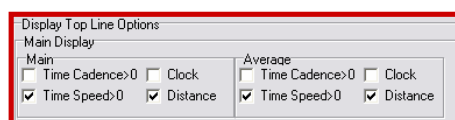
13. The next section of the "Special" screen allows you to chose what information you'd like to see when you're doing an interval (i.e. when you press the "Set" button once on your PowerControl). This allows you to see different information when you're in the middle of an interval, if you wish. Again, you can select more than one option, and the information will alternate on the top line of the PowerControl.
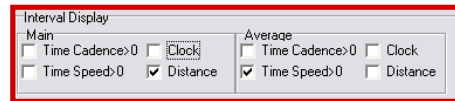
14. You can chose how long you'd like to see each variable that you've chosen in the two sections above. Simply chose how many seconds you'd like in the "Alternating Interval" box. The top line of the PowerControl will then switch from one variable to the next every how ever many seconds.
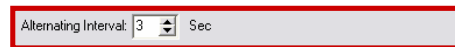
15. The bottom section of the "Special" screen lets you chose when your PowerControl should go into standby mode. Say you'd like it to power down if it hasn't had a heartrate signal for 20 minutes, you'd set the "Power Down after" box to "20" minutes, and select the "no HR" option below. The default option is to power down after 15 minutes of "no Speed and no Cadence", so basically if you've been stopped for 15 minutes. This is a good way to set it, since it will continue to record your heart rate during short stops during your ride or after your ride (as long as you stay within transmission distance), and will allow you to look at your heartrate recovery. If you're doing a really important session, you can set the PowerControl to stay on the whole time by choosing the "never" power down option. Make sure you set this back to one of the other options at the end of the session to keep the battery from running out.
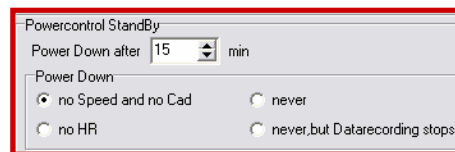
16. Click "OK" to save your settings and exit the "Special" screen.

17. If you want to clear the memory in the box WITHOUT SAVING IT, click on the "Clear memory" button. THIS WILL DELETE ALL OF THE FILES FROM YOUR POWERCONTROL.
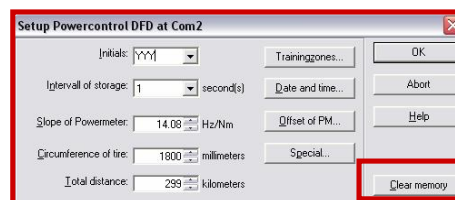
18. Once you've finished setting everything up, click on "OK" to save the settings to your PowerControl.

That's it, you shouldn't need to go back and change much of that again. From now on, you should just be able to use it, download your PowerControl, charge it when you need to, and analyse your training on your computer. The only thing left to do is to make sure your training zones are set correctly.

Setting up your training zones

Regardless of whether you work alone or with a coach, doing the right amount of the right intensity training, together with getting the right amount of rest, is what you're aiming to do. Everyone responds differently to training, so it's important that your training program is individualised. One aspect of this individualisation is using the correct training zones for your current level of fitness, You need to set your training zones in both the PowerControl (two different ways) and the SRMWin software.

Setting Training Zones in the PowerControl

To set zones in the PowerControl, connect it to your computer using the download cable, and open the SRMWin software. Click on the "PowerControl Setup" icon, and then on the "Training Zones" button. Enter the top limit of each training zone in the boxes, for as many zones as you want to use. The top end of each zone will be automatically set as the bottom end of the next zone. Click on "OK" when you're done.

You could also set the zones directly in the PC-V PowerControl, by pressing the "Mode", "Set", and "Pro" buttons all at the same time. This takes you into the "PowerControl setup" menu. Then, keep pressing "Mode" until you reach the screen that allows you to set your first training zone.
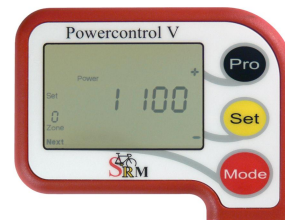
Then press the "Pro" button to increase the number, or "Set" to decrease it, until the zone is correct. Press "Mode" to move to the next zone, until all of your zones are set.

Setting Training Zones in the Software

To set the training zones in the SRMWin software for any existing profile, click on "Options" and then on "9 Training Zones". These zones will be used in the Periodic view.

To edit the current set of zones, simply edit the values already showing. Zones are set according to power, but you can limit them further by adding heartrate, cadence, or speed criteria. For instance, you could set two zones with the same powers but different cadences, one low range and one high range. You can name each zones according to whatever you like to call them.

If you use training zones that are too easy, you won't push your fitness forward at the right times. If you use training zones that are too hard, you probably won't be able to complete your intended training, and even if you can you won't be building the right type of fitness at the right time. Keep in mind that as the season progresses (assuming it's going to plan) your fitness will improve and you'll need to change your training zones. You can set date limits for training zones in the SRMWin software, so that all of your files are analysed with the appropriate zones.

To add a new set of zones as your fitness changes, click on the "New Set" button, and enter the date which the zones will be valid until. The software will assign this new set of zones a number, and you'll be able to see all of your sets of zones by using the left and right arrows.

Part IV: Troubleshooting

My computer won't connect to my PowerControl
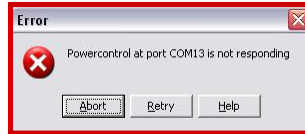
There are a few things that could be causing this, so let's start with the quick and easy ones.

- First of all, check that your PowerControl has some life in it (more than an hour, or 10%). You can do check the remaining battery life by pressing "Mode" and "Pro" at the same time. The value right side middle line with an "h" behind it indicates the number of hours of battery left. If it's less than one hour,, plug it in for an hour and then try connecting again.

- Second, try waking the PowerControl up before trying to connect, by pressing the "Mode" button on it once.

- Third, and this may sound silly but it's easy to do, make sure you have the download cable plugged into the right port on the PowerControl if you have an "online" version with two or three ports on the back. The cable goes into the one called "Online/Charge", NOT the port in the middle labelled "Sensor".

- Fourth, make sure you've plugged the download cable into the same port on your computer as you did when you first connected the two. This is important for USB ports, since most new computers have two or three — the driver is only installed for one port, not all of them. You always need to use the same port to connect your PowerControl, once you've finished the installation and successfully made a connection.

If you've checked all of those and still can't get a connection, and you're using a USB download cable, go back and make sure you've installed the USB driver. It's on the SRM CD-ROM, in a folder called "USBCableDriver". Just double-click on the file in that folder, and it will run the installation program.
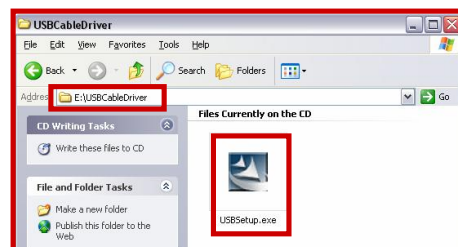
Unplug your download cable, and then plug it in again after the driver has been installed, and it should recognize it as a "Prolific USB to Serial Cable". Once it's done that, try clicking on the "PowerControl Setup" icon again, and it should work.

Hopefully, that's solved your problem. If not, you can configure the connection manually by following the instructions on the next page.

Part IV: Troubleshooting

My computer STILL won't connect to my PowerControl…

How frustrating! But you can fix it, you just need to tell your computer where to look. Here's how…

1.   Make sure your PowerControl is connected to your computer, and is on. If you have a PC-IV, you'll need to keep pressing the "Mode" button on it to turn it on before each attempt to connect.

2.   Click on the Windows "Start" button, and then on "Control Panel". Then, in the screen that opens up, click on "System". You may see a message warning you about changing the settings in this folder, but click on the warning message to view the contents of the folder anyway.
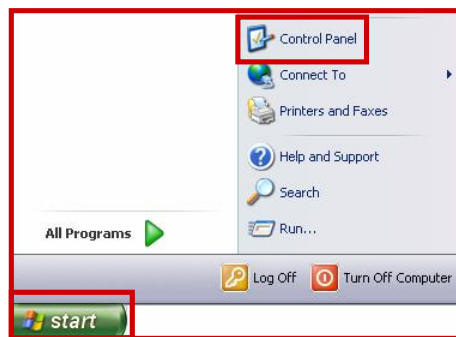
3.   Click on the "Hardware" tab, and then on the "Device Manager" button.
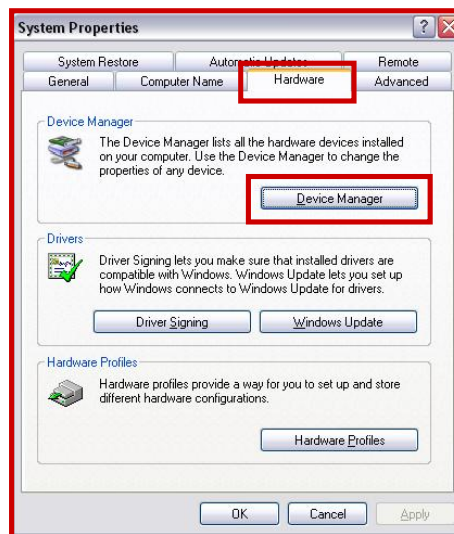
Part IV: Troubleshooting

4. In the Device Manager screen, scroll down until you see "Ports (COM & LPT)" and click on the
    plus sign next to it (which changes to a minus sign when it's open, as shown below) to open it up.
    Then double-click on "Prolific USB-to-Serial Comm Port". If this doesn't exist, it means you need
    to go back and install the USB driver (see page 40 for instructions).
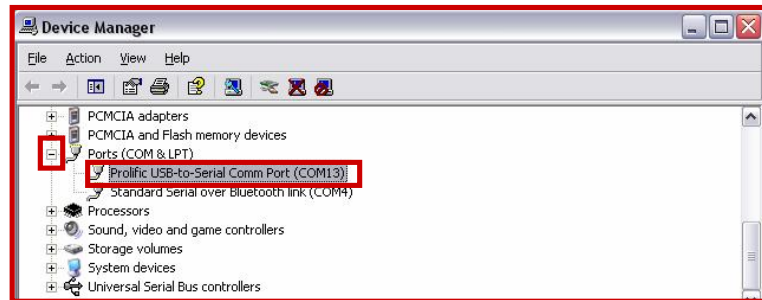
5. Once you're into the Properties screen, click on the "Port Settings" tab, and then on the
    "Advanced" button.
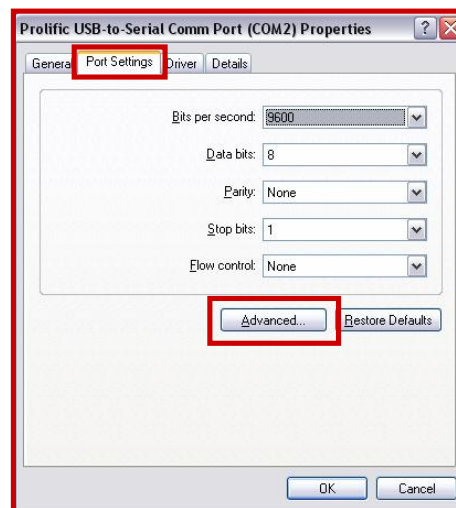
6. In the Advanced Settings screen, as shown below, look at the box near the bottom called "COM Port Number" — you need to have a COM port number below 10 for the USB port to work with your PowerControl. The COM number in the field is the one that's currently being used, so to change it, click on the down arrow to the right of the field, and then select the lowest available COM port. Click on "OK" to save the changes and exit.
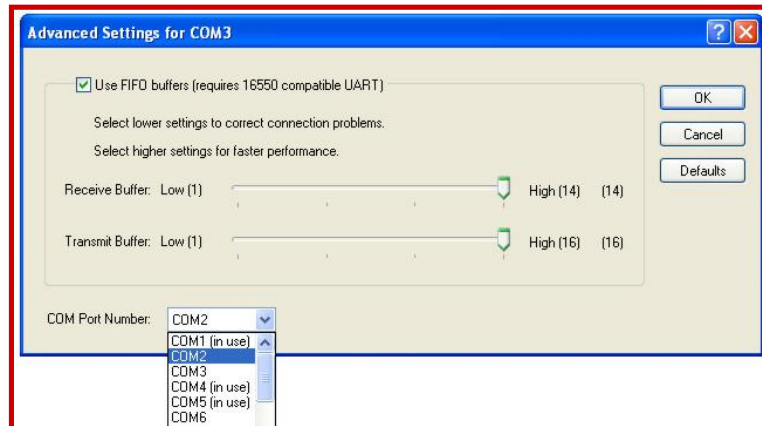
7. Click on "OK" to close each of the other screens, until you've closed the "System" Control Panel.

8. Open the SRMWin software, if you don't have it open already.

9. Tell the program what kind of PowerControl you have, by selecting either "PCV" or "PCIV" from the dropdown list on the main menu bar. Then, click on "Options" on the menu at the top of the screen, and make sure that you're looking at the "0 System" tab, as shown below. Now, Then, tell it where to look for your PowerControl, by selecting the "Active port", which you set a minute ago in the System Properties (i.e. COM2).
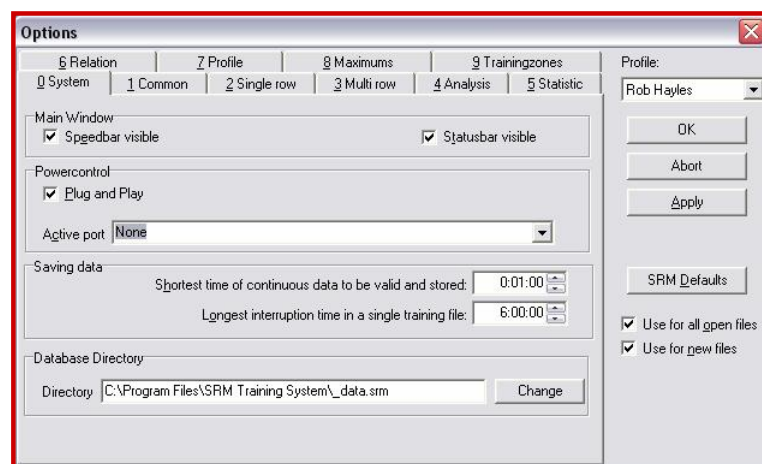
10. Click on "Apply", and then on "OK" to save the changes and exit the Options screen.

11. Now for the moment of truth! Make sure everything is connected, and that your PowerControl is on, and try clicking on "PowerControl Setup" again... It should show you the settings in your PowerControl. If it STILL doesn't work, please get in touch with us.

How do I set the "total distance" on my PowerControl back to zero?

Connect your PowerControl to your computer, and click on the "PowerControl Setup" icon. You will see the screen below. Click on "Clear Odo Values".
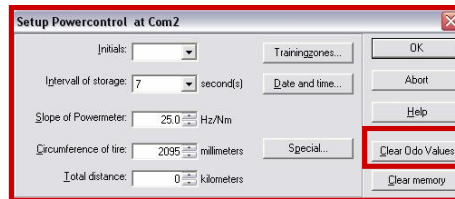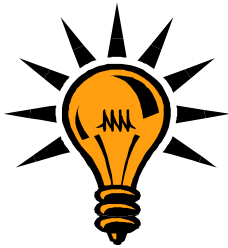

A warning screen, shown below, will appear. Click "OK" if you want to reset your distance, time, and energy to zero, for instance at the start of each season. Click "Cancel" if that's not what you want to do!
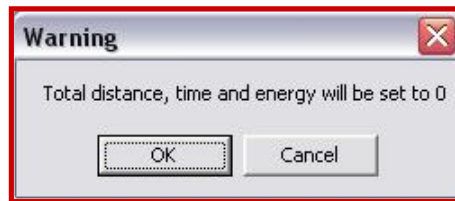
My PowerControl has 'frozen', like a computer that has crashed. I can't get it to do anything…

Make sure your PowerControl is charged, and then connect it to your computer and click on "PowerControl Setup". Then click on "Special". On the right side of the "Special" screen is a button called "Reset PowerControl", click on this. A warning screen will appear, as shown below. IF YOU CLICK ON "OK" ALL OF YOUR STORED DATA WILL BE DELETED, INCLUDING TOTAL DISTANCE, TIME, AND ENERGY, AS WELL AS YOUR POWERCONTROL SETTINGS. Having said that, at least it should work again…
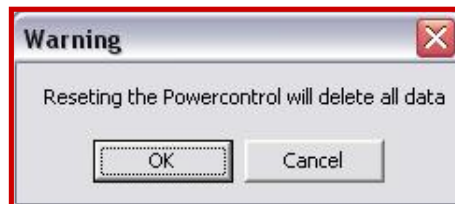
My PowerControl keyboard won't work.

Connect your PowerControl to your computer, go to "PowerControl Setup", and then click on "Special". There is a button on the right side of the screen called "Unlock Keyboard". Click on this, and it should solve your problem. If this doesn't work, send your PowerControl in for a service, as the connection between the keyboard and the rest of the PowerControl may be broken.

Part V: Collecting data

Your SRM Training System is a fantastic training tool, and can give you lots of information to help you get the most out of each ride even while you're still on your bike. It can help you stick to your intended training zones, give you immediate feedback about an interval session, or even help you make sure that your "recovery" ride is REALLY a recovery ride. Or, you can just let it collect data while you enjoy a ride and look at the scenery. This section will cover how to make the most of your PowerControl, as well as how to get the data off of it and onto your computer.

Make the battery last as long as possible

The PowerControl battery should last for about 29 hours of training without needing to be recharged. Having said that, there's nothing more annoying than having the battery die half way through a training session, so it's best to keep it from running down completely. Here are our recommendations for charging your PowerControl battery:

- PC-V (NiMH battery): Plug it in and charge it overnight before each ride. You won't damage the battery by doing this, and if you leave it charging for a long time it won't discharge the battery.

If the battery does run out, the PowerControl will turn off, but your data won't be lost for at least a few days. Plug it in as soon as possible for at least 20 minutes, and then try to download the data.

Turning the PowerControl on and off

The PowerControl turns on when:

- You press the "Mode" button

- The wheel speed sensor is activated by the wheel magnet passing by the sensor (i.e. when the wheel spins, so anytime the bike is moving)

- You connect the battery charger

- You connect the download cable to the PowerControl and your computer, and communication between the two begins (this only works if the serial port runs with enough current, otherwise you need to press the "Mode" button)

Even if the PowerControl is on, it doesn't receive any power data through the sensor cable until the PowerMeter is turned on. This happens when you start pedalling, (backwards or forwards).

The PowerControl turns itself off when it hasn't received any data for a 20 seconds. It stays on when the battery is charging. The PC-V display shows the time and date when it is in stand-by mode, if the screen is blank then the battery is completely dead. The PC-IV display turns off completely when the PowerControl isn't being used.

Part V: Collecting data

Learn about the different functions you can use

You can do a lot with your PowerControl when you're out training, if you know how. Once your PowerControl is on and is getting data from the PowerMeter, there are five different modes that you can work with:

- Real-time mode, which displays what you're doing at the moment

- Interval mode, which gives you information on each interval you've done

- Zero offset setting mode

- System status mode, which shows how much memory and battery remain

- Training zone review mode

It's worth sitting down with these instructions and your PowerControl for a bit when you first get your system, so that you can get familiar with all of the functions. This might also be a good idea if you've upgraded from a PC-IV to a PC-V, since the information is displayed differently on the screen.

How to use your PowerControl PC-V

The new PC-V is not only smaller and lighter than the PC-IV (80g compared to 110g), it has improved features as well:
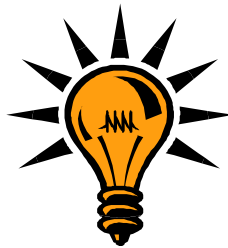
- The display is larger and much clearer

- Data from up to 20 intervals can be reviewed

- Most of the settings can be set without using a computer, by using the buttons on the PowerControl (i.e. time, date, slope, training zones, etc)

- Faster downloading

Part V: Collecting data

Checking battery and memory life, and system information

When the PowerControl battery needs a charge, the letters "Bat" will flash on the screen. A full charge takes 12 hours, during which time "Bat" will still flash, and a plus sign "+" will also appear on the screen. The PowerControl calculates the battery time, it doesn't measure it, so it is possible that it may be incorrect — always make sure it has more charge than you think you'll need. The rechargeable battery should last for about 1000 recharge cycles, after which you'll need to send the PowerControl back to us for a battery replacement.

To see how much battery the PowerControl has left, press the "Mode" and "Pro" buttons at the same time. This takes you to the first of two information screens, as shown below. The top number is the remaining memory, in hours (here, 31.1 hours). The two numbers on the left are the software version for the PowerControl (this one is version 43.09). The middle right number is the battery time remaining, in hours (29 hours in this example). The lower right number is the storage interval, in seconds (i.e. 5 seconds).

PowerControl Software — Remaining memory
Remaining battery life
Storage interval (seconds)

You can change the storage interval by pressing the "Pro" (+) or "Set" (-) buttons.

If you press "Mode" again, you will see the second of the two information screens. This one shows you the total distance you've ridden on the top line (300 km in this example), your total training time in the middle (12 hours showing here), and total mechanical energy used on the bottom line 9.9136 megajoules here).

Total distance (km)
Total time (hours)
Total energy (mJ)

Press and hold the "Mode" button for three seconds to get back to the main screen.

Part V: Collecting data

Viewing data while you ride

Most of the time when you're riding, you'll be looking at the main screen, as shown below. It shows you how long you've been riding, or how far you've gone, or both (you can choose), on the top row, and in the area below it shows you your power, heartrate, speed, and cadence. You can customise the display so that it shows you exactly what you want by using the SRMWin software (see page 38 for detailed instructions).

Power (Watts) →   ← Training Time/Distance

Speed (km/h or m/h) →   ← Heartrate (bpm)

     ← Cadence (rpm)

If you press the "Mode" button once, you will see the "Average data" screen. Your training time, distance, or both, are shown on the top line, and your average power, heartrate, speed, and cadence for your ride so far are shown as well.

Average Power (Watts) →   ← Training Time/Distance

Average Speed (km/h or →   ← Average Heartrate (bpm)

     ← Average Cadence (rpm)

By pressing the "Mode" button again, you can look at your maximum values. This will show you the highest power, heartrate, speed, and cadence you've reached so far during your ride. The top line of this screen shows you how much mechanical energy you've produced, in kiloJoules. See the Nutrition section (page 95) for more information on how to use this to calculate how many calories you've burned.

Maximum Power (W) →   ← Mechanical Energy (kJ)

Maximum Speed (km/h or →   ← Maximum Heartrate (bpm)

     ← MaximumCadence (rpm)

Press "Mode" one more time to reach the final screen in the Main Menu group. It shows you the time of day on the top line, the day and month on the middle line (the 6th of March in this example), and the year at the bottom left (2005 in the example below). The temperature is shown in the bottom right, in either degrees Celsius or Fahrenheit, depending on what you've chosen in the setup process. The temperature shown is the current temperature inside the PowerControl, which is a measure of radiant heat.

Day → → Time of Day

Month

Year → → Temperature

Set markers or intervals during training

You can use the interval feature for lots of useful things, such as:
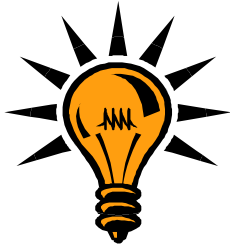
- Lap times

- Marking the start and finish of a climb that you use regularly as a max test

- Marking the competition section of a race-day file, so you can tell where the start and finish were

- Ok, it's an obvious one, marking off intervals

You can see your data for your current interval while you're doing it, and can review up to 20 intervals on the PowerControl screen (you can set as many as you like, but you'll only be able to review the last 20 while you're on the bike). Once you download your file, all of the interval sections will be given their own tab in the file, so that you can look at each one individually with all of the average values calculated for you.

The "Set" button works as a start-stop button for each interval, so you press "Set" once to mark the beginning and again to mark the end. When the PowerControl is in Interval Mode, the letters "Int" will appear on the left side of the screen with the interval sequence number underneath them. In this mode, ONLY data from the current interval is shown.

When you start an interval by pressing the "Set" button once, the screen will show zeros for all of the values, and will then show data for the interval only. Real-time data for your power, heartrate, speed, and cadence will be shown, along with whatever variables you have selected to display along the top line (see page 38 for instructions on PowerControl setup). Press "Mode" once to see average data for your interval so far, and again to see maximum data. Press it one more time to go back to the real-time data screen.

When you stop an interval or marker, the screen will show you the average data from that section of your ride (averaged every 10 seconds), and will then switch back to the main screen. If you want to switch back to the main screen right away, simply hold down the "Mode" button for a few seconds.

You can start another interval immediately after finishing one by pressing "Set" again. The new interval data will be shown after the summary data for the earlier one.

When you download your file to your computer later, the intervals are each given their own tab, as shown below. You can look at them as part of the whole file, or on their own in more detail by clicking on the tab (highlighted with the red box below).

Reviewing interval data on the PowerControl

You can examine the data from your 20 most recently completely intervals by pressing the "Pro" button once to enter the Interval Review Mode. The first of the three interval review screens appears, as shown below. It shows the interval number on the left, the clock time, date, and mechanical energy used (work done).

Press the "Mode" button once to scroll to the next interval review screen. This one is similar to the "Average Data" screen on the main menu, and shows the elapsed time for that interval, along with average power, heartrate, speed, and cadence. Here we're showing you the average data for the second interval.

Press the "Mode" button again to reach the final of the three Interval Review screens, this one showing your maximum data. Here you can see your distance travelled during that interval, along with your maximum power, heartrate, speed, and cadence reached. Again, we're showing you data for the second interval, with maximum values this time.

Keep pressing the "Mode" button to scroll through these three screens for each of your last 20 intervals. If you want to go back to the normal PowerControl display, simply press and hold the "Mode" button for 3 seconds (or press "Pro" twice).

Part V: Collecting data

Reviewing training zone statistics on the PowerControl
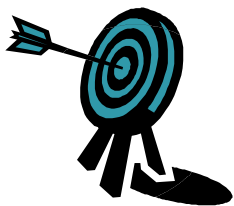
If you're out on a ride where you're supposed to be spending a certain amount of time in a particular training zone, you can easily look at how well you're sticking to your target. First of all, make sure your training zones are set up (see page 90 for instructions), according to power or heartrate limits.

To enter the Training Zone Review mode, press the "Pro" button twice from the main PowerControl screen. You'll see information about your lowest training zone first, with the top line alternating between actual time spent in the zone and what percentage of your ride you've spent in the zone. Your average power, heartrate, speed, and cadence while you've been in that zone are shown underneath.

Press the "Mode" button to scroll through to each of your other zones.

When you're done, press and hold the "Mode" button for 3 seconds (or press "Pro" once) to return to the main display.

Clear the PowerControl display to start a new training file

If you want to clear data from the display of the PowerControl, but keep it in the memory for downloading later, simply press and hold the "Pro" and "Set" buttons at the same time. Don't worry, you can't delete your data by accident, this only wipes the screen clean so you can start fresh while you're out on your bike.
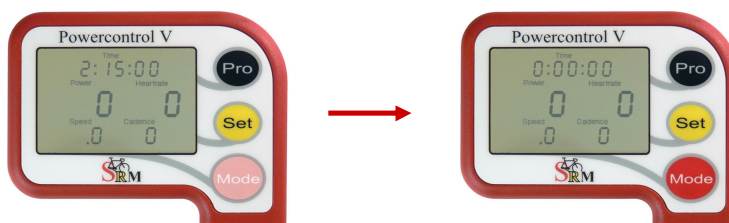
Navigating the PC-V displays
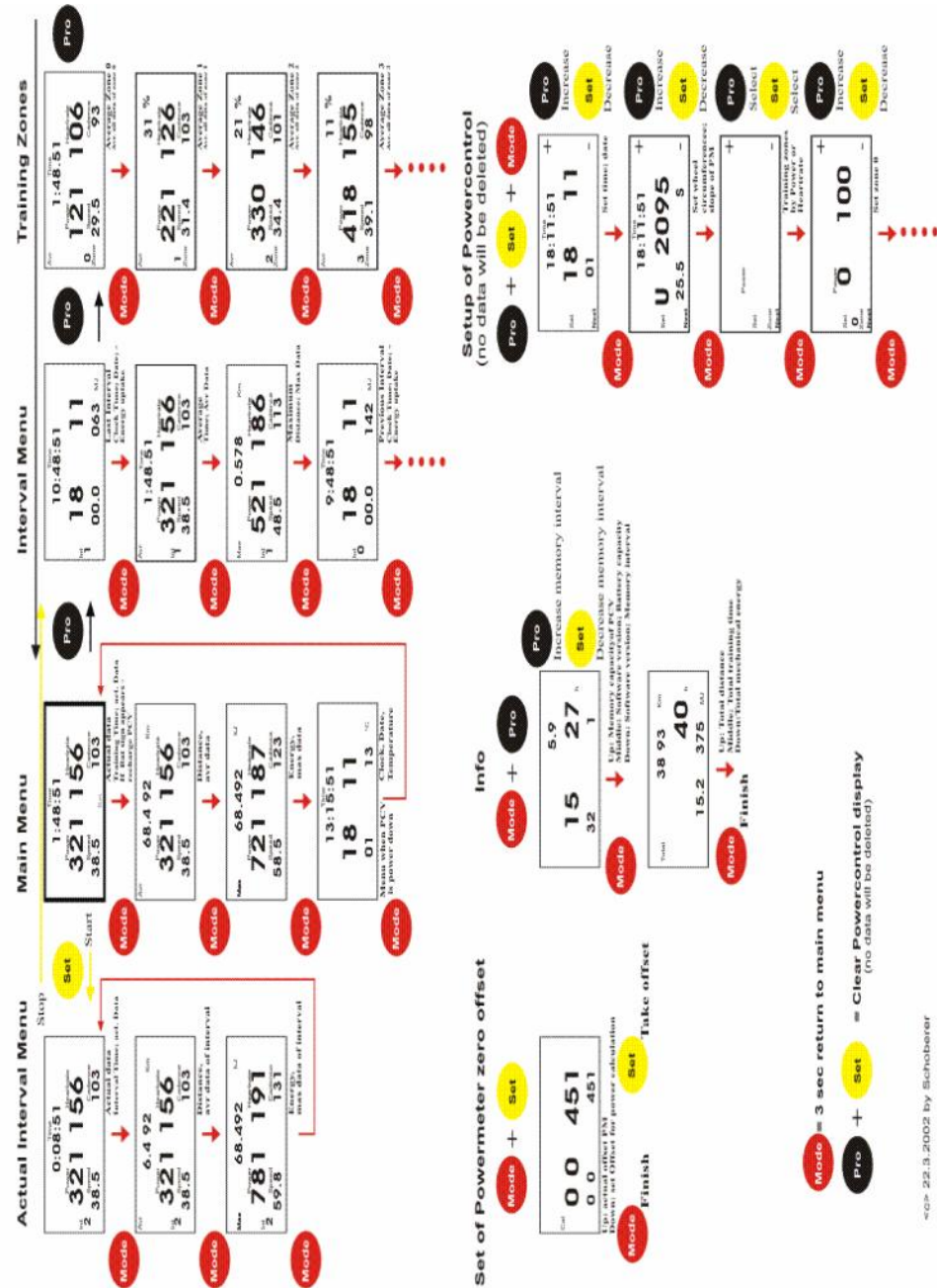
Download your data to your computer
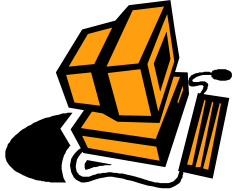
So, now you have data from your ride stored on your PowerControl, and you know how to look at it on the PowerControl display, but how do you get it onto your computer so you can look at it in detail?

Simply connect your PowerControl to your computer with the download cable, and open the SRMWin software. Click on the "Download" icon.
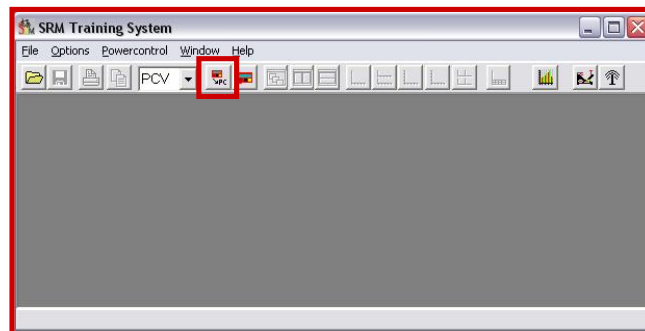
A progress box will appear, as shown below.
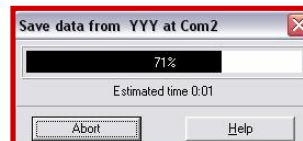
When the file has been downloaded, another screen will appear automatically giving you some options about how you'd like to manage the download. The easiest thing to do is just click on "OK" to save the data to your computer and delete it from your PowerControl. If you'd like to leave it on your PowerControl, for example if you want to download it to a work computer and a home computer, click on "Save only". To clear the data from your PowerControl without saving it, click on "Clear only". You can change the interval of storage as well if you'd like. If you click on "Options", it takes you to the normal "Options" screen (more about this on the next page).

Lots of people have questions about the "Lost data" and "Saved data" portions of the download screen. "Why is my data being lost?!" It all depends on the settings in the "Options" screen, specifically the portion shown below.
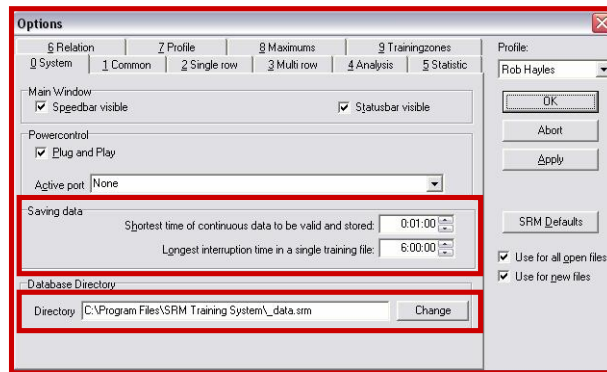
These settings are designed to help you get the data you want, without storing lots of useless data (such as your pit stops). The default settings are as follows:

- Shortest time of continuous data to be valid and stored = 1 minute. If you do a very short effort, such as a standing start, that's shorter than a minute, and you stop before and after, YOUR DATA WON'T BE SAVED. If you do these kinds of efforts, make sure you change this setting to something like 5 seconds.

- Longest interruption time in a single training file = 6 hours. If you're doing multiple sessions in one day, you can change this setting depending on whether you want your rides to show as one file or two. If you keep the default setting, any rides that you do with less than a 6 hour break between them will be stored as one file. If you have a break longer than 6 hours, the rides will be stored as two files. If you want a separate file for every training session you do, change this setting to one hour or less.

You can decide where your downloaded files get stored by browsing your computer and changing the directory in the "Database Directory" section of the "Options" screen.

Once you're happy with your settings, click on "OK" to save them and close the Options screen.

Your training file(s) will open automatically after the download is finished, and will look something like the one shown below. They're automatically stored in the SRMWin database so that you can find them again easily whenever you want.
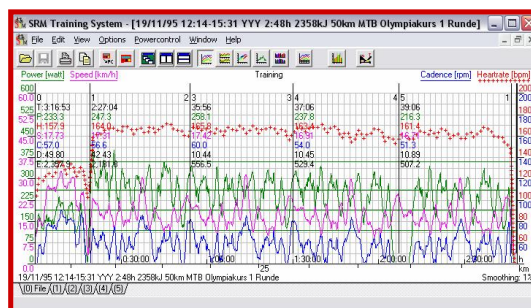
Where did my file go?

The easy answer is "It's stored by name and date". The SRMWin software creates its own database to store every file that you open with the software. All of the files are stored in a folder called "_data.srm", in the SRM Training System folder in your Program Files.

Within the _data.srm folder, a folder is created for each user based on the name or initials entered into the PowerControl. If you are using more than one PowerControl, you can chose to either use the same name for both so that your files are stored together, or different names so that you know which files belong to which bike (i.e. road and MTB).
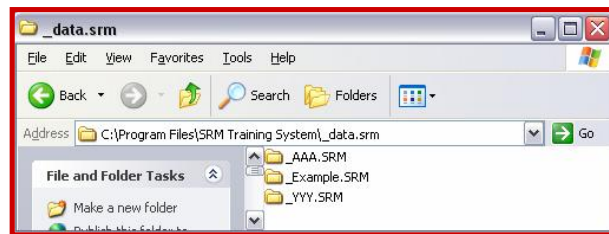
Within each user's folder, files are stored by date, with a new folder created for each month.
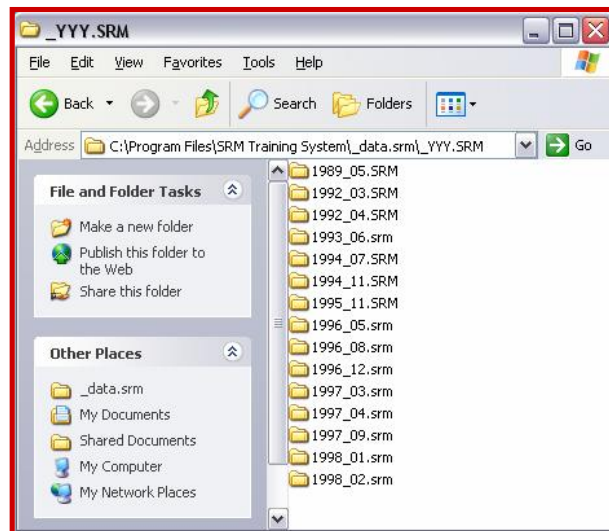
Each file is named with the user's first initial, followed by the date (ddmmyy) and a letter (A. B. etc) in case there are multiple files for the same day.
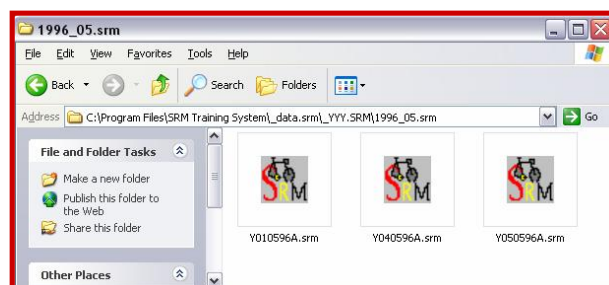
You shouldn't ever need to open the _data.srm folder, since the SRMWin software allows you to manage all of your files from within the program. Just click on the "Open" icon, and you'll see a list of your files. Files are arranged by date, with the newest files at the top. You can search for files by initials and/or date by using the fields highlighted below.
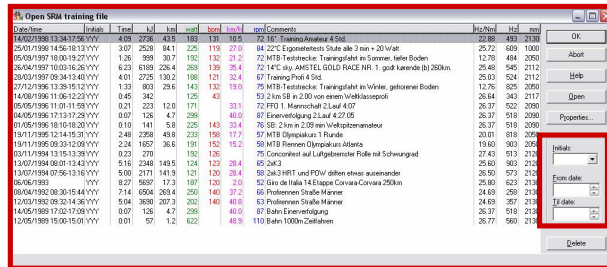
You can enter a description for each file after you download it. To do this, select a file from the list (as shown above) by clicking on it once, and then click on the "Properties" button on the right side of the screen. Or, if you have the file open, click on "File" and then on "Properties".
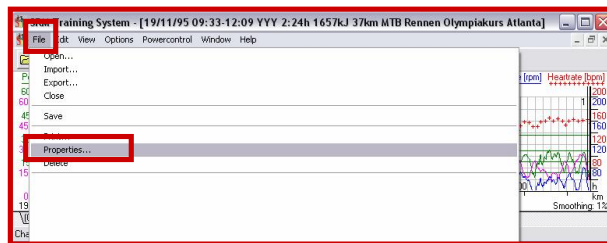
This will open the Properties screen, shown below.

You can type whatever you like in the comments box, such as "Alsager Loop, heartrate low but power ok, headwind at end". That way when you want to compare files between two or more rides on the same route, you can find them easily. You can also change the initials, date, time, slope, zero offset, or tire circumference if you need to.
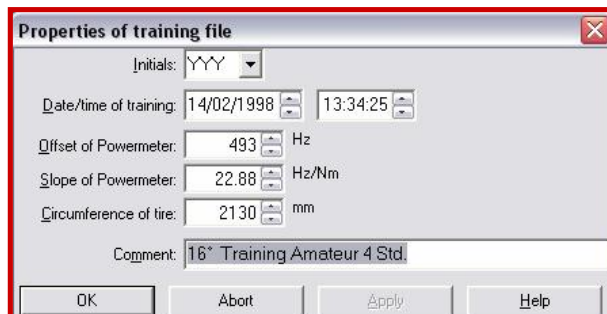
Click on "OK" once you're done to close the Properties screen.

Importing and Exporting files

If, like many cyclists, you have a coach that you keep in touch with regularly by phone and email, you'll need to know how to send your SRM files to them. If you're a coach, you'll need to know how to open these files up when you get them. If you're a scientist, you might want to export data to a spreadsheet or statistics program to do a detailed analysis. Whatever your needs, it's a simple process with only a couple of steps.

Exporting files

Open up all of the files that you want to export in the SRMWin software. Then, click on "File", followed by "Export".
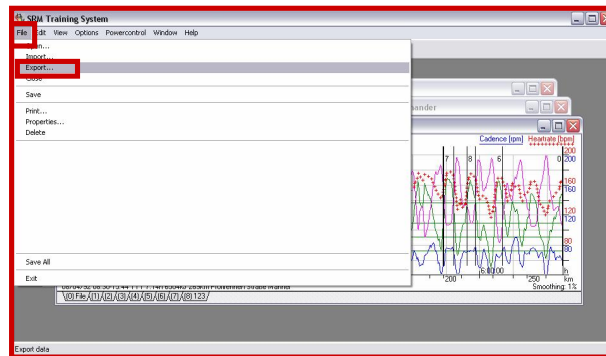
The "Save as" screen will appear, as shown below. Select where you'd like to save your files to at the top of the screen, and put a tick in the "Export all open files" box if that's what you'd like to do.
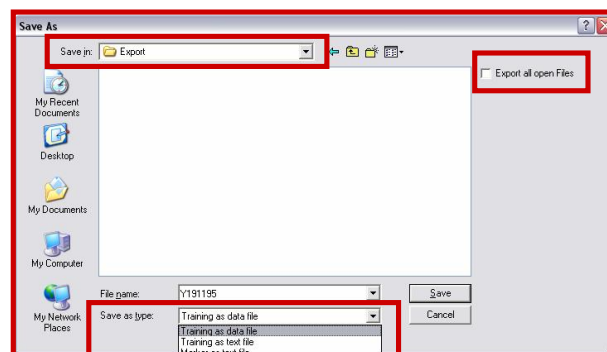
At the bottom of the screen, you'll see a drop-down menu with three options for what "type" of file you'd like to save it as. For most cases, you'll want to leave it as it is on "Training as data file", so that the entire file is exported in SRMWin format. If you want to export the entire file in a format that other programs, such as spreadsheets, can read then select "Training as text file". If you only want to export one marker then select "Marker as text file" (marker must be open) .

Click on "OK" and you're all done. Now you can attach your files to an email and send them off.

Importing Files

Once you receive a file through your email, you should be able to simply double-click on it to open it up in the SRMWin software (as long as you have the software installed on your computer). It's that easy!

If for some reason that doesn't work, save the file onto your hard drive (somewhere like either your Desktop or the "My Received Files" folder in "My Documents"). Then open up the SRMWin software, click on "File", and then on "Import".

You'll then be able to select the file from wherever you saved it. Click on "Open" to finish the import and open the file.
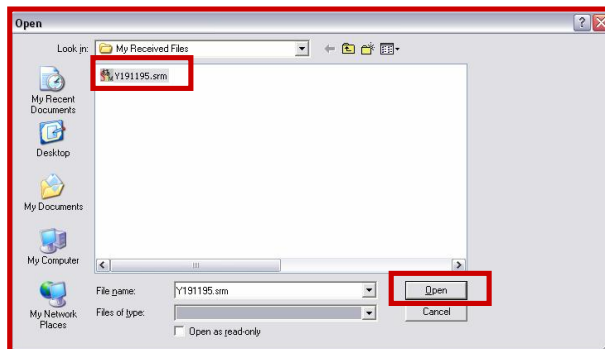
The file will then automatically be saved in your SRM database.

I'm trying to set the zero offset, but the PowerControl won't go into the right mode

If the PowerControl thinks you're in the middle of an interval, it won't switch into zero offset mode. If this is the problem, the letters "Int" will be showing on the left side of the PowerControl's middle line, with an interval sequence number below them. Simply press the "Set" button once to end the interval, and then try to get into zero offset mode again by pressing "Mode" and "Set" at the same time.

I've been riding for longer than the PowerControl says

The PowerControl may think that you're in the middle of an interval, and so is only showing you data from a portion of your ride. Look to see if the letters "Int" are flashing on the left side of the display, and if they are, press the "Set" button once to end the interval. After 10 seconds or so when the summary data from that interval is displayed, you'll be back into normal mode and will see data from your entire ride.

Otherwise, it may be that you've set your PowerControl to show your rolling time ("time speed > 0") or pedalling time ("time cadence > 0"). Both of these settings will omit time that you've spent stopped at a stoplight, for instance. To change these settings, connect your PowerControl to your computer, open up the SRMWin software, and click on the "PowerControl Setup" icon. Click on the "Special" button, and then select whichever display options you prefer.

The PowerControl keypad doesn't work

First of all, try unlocking the keypad by connecting your PowerControl to your computer and using the SRMWin software. Click on the "PowerControl Setup" icon, and then click on "Special". Then click on "Unlock Keyboard".
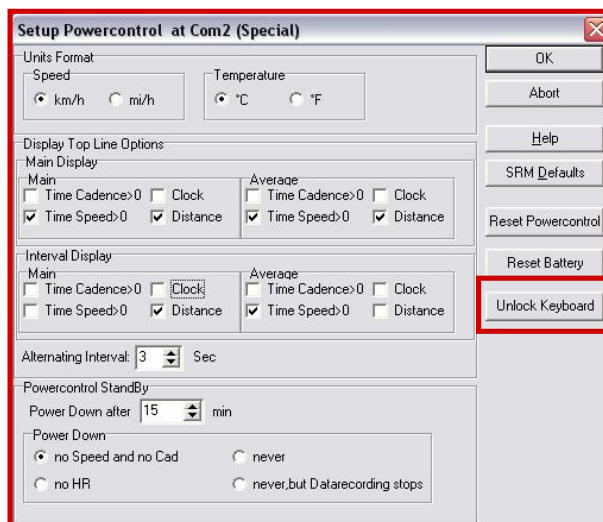
If that doesn't work, it may be that there is a physical problem with the connection between the keypad and the electronics in your PowerControl. Send it back to a service centre along with a Return Form.

Part V: Troubleshooting

The display freezes after hitting the "Set" button

The display "freezes" for about 10 seconds when you end an interval, so that you can see your summary data from that interval. If you don't want to see this, press and hold the "Mode" button until you see the main screen again.

The power reading is too low or too high

Once you've been training with power feedback for a short while, you'll have a pretty good feel for what power you normally produce. If you notice that the power being shown on the PowerControl is too low or too high, there are a few things you can check.

First, check that you have the correct slope entered into your PowerControl. Press the "Mode", "Pro", and "Set" buttons all at the same time. This takes you into the first setup screen. Press "Mode" six times to get to the second setup screen. The slope that the PowerControl is using for it's power calculations is shown at the bottom left of the screen (e.g. "25.0"). If it isn't the correct slope for your PowerMeter, press the "Mode" button once more so that the "S" in the bottom right of the screen is flashing. Then correct the slope by pressing the "Pro" button to increase it or the "Set" button to decrease it. Press and hold the "Mode" button to exit the setup screen when you're finished.

Second, check that the zero offset is correct, by following the instructions on page 24.

Third, check that the sensor cable is positioned correctly, so that it is receiving data from the PowerMeter through the whole 360° revolution. Instructions on how to do this are on page 19.

If you've done all of the checks listed above and the power reading is still too low, you can send it in to an SRM Service Centre for calibration.

There is no heartrate reading on the PowerControl

The new PC-Vs work with coded Polar heartrate straps (T61 or WearLink). Older models (before November 2005) work with uncoded Polar or Suunto straps.

If you're using the correct type of strap for your PowerControl and still don't get a reading, check that the battery in your heartrate strap is working by testing it with it's companion heartrate watch. If it works with the watch, try holding the PowerControl close to your chest and see if you get a reading. If it works when the PowerControl is close to the strap, adjust your handlebar mount with your PowerControl on it until you get a reading when you're in riding position.

Part V: Troubleshooting

There is no speed reading

This is an indication that something is going wrong between the speed sensor and the PowerControl. There are a couple of things that you can check.

First, make sure you have the speed sensor and wheel magnet mounted correctly (see page 20 for details). Then check that there is no damage to the sensor cable between the speed sensor and the plug. If there are any nicks or cuts that expose bare wire, then you'll need to order a new sensor cable.

Look at the plug on the back of the PowerControl. If the prong in the 11:00 position is missing or is pushed too far into the PowerControl, the speed data won't be able to get from the sensor cable to the PowerControl. Please send the PowerControl to a service centre for repair.

The speed is too high or too low

First, check that you only have one magnet mounted on your spokes. If there are two, this will cause the speed to be doubled. Then check that the tire circumference is set correctly (see page 37 for details). Last, make sure that the units are set to what you would like to see (miles or kilometres, see below for instructions).

How do I switch from metric to imperial or vice versa?

You can chose what units you'd like to use, both on the PowerControl and in the SRMWin software. You need to connect your PowerControl to your computer and use the SRMWin software to change both of these settings.

To change the units that you see on the PowerControl, connect your PowerControl to your computer with the download cable, start the SRMWin software, and click on the "PowerControl Setup" icon.
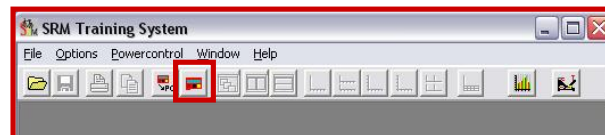
Then click on the "Special" button.
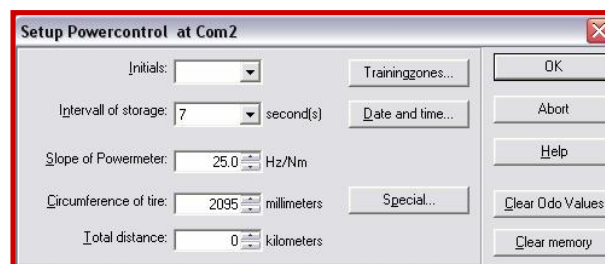
Part V: Troubleshooting

At the top of the "Special" screen, select the units that you'd like, either km/h or mi/h for speed (distance will be changed as well), and Celsius or Fahrenheit for the temperature. Click on "OK" to save your choices.
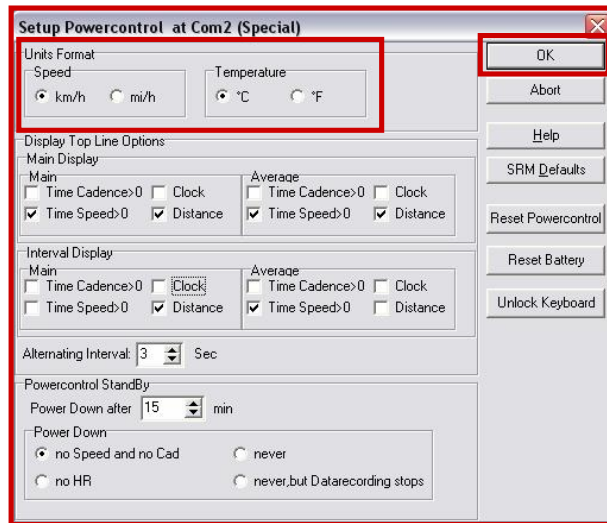
To change the units shown on your SRM files in the SRMWin software, click on "Options" on the menu bar.
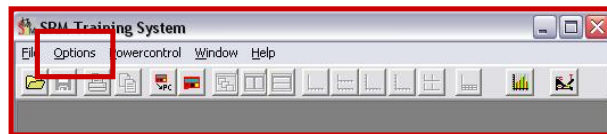
Then, click on the "1 Common" tab, and chose the units you'd like to see for each of the variables. Click on "OK" to save your selections.
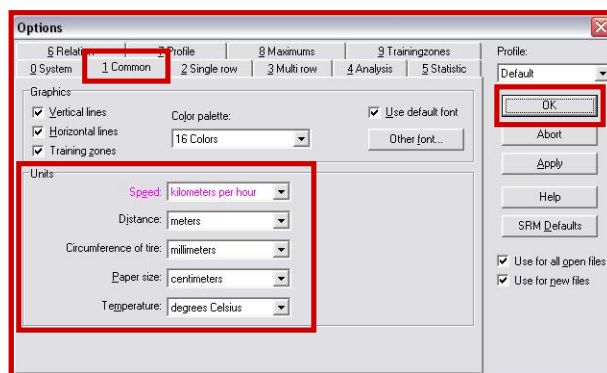
Now all of your data should be shown in your preferred units, both in the software and on the PowerControl.

Where are my files? When I try to open them they don't appear in the list of files...

A few things could have happened to cause this:

- The date and time on your PowerControl were wrong, and so your files were filed incorrectly in the SRM database when you downloaded them

- The files didn't download properly from the PowerControl to your computer

- The SRMWin software is looking in the wrong place on your hard drive for your downloaded files

Ok, so let's start with the easy one. Have a look on your PowerControl to see what date and time it thinks it is.
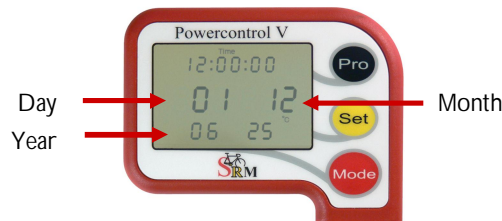
If it thinks it's 1901 instead of the 21st century, then you're files are stored as 1901. Look down at the very bottom of the list of files (since they're stored by date), and there they'll be. To fix the date in each file so that they're filed where they should be, open the File Properties (see page 61) and change the date for each file. Then, to fix the time and date on the PowerControl so this doesn't happen again, connect the PowerControl to your computer with the download lead and click on the "PowerControl Setup" icon. Click on the "Time and Date" button, and then put in the correct information and click "OK" (see page 37 for detailed instructions).

If the time and date were ok, then double-check that the PowerControl downloaded properly. Connect it to your computer again and retry the download while holding down the left "Shift" key on your computer keyboard. This will get any data left on the PowerControl off of it, even if the computer thinks there's no file to download. If a file is downloaded, have a look at the "Lost data" information.
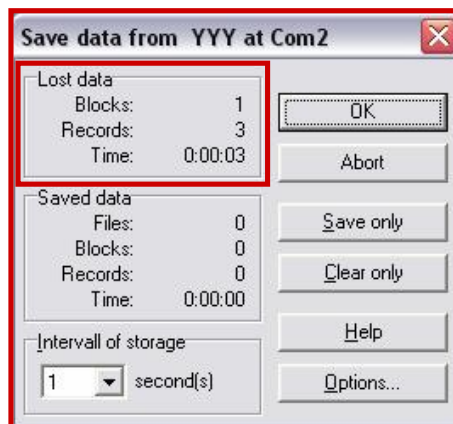
If a lot of data is being lost (i.e. the whole file's worth if you were doing very short efforts), click on the "Options" button and fix the "Saving data" section so that your data is saved (see page 59 for detailed instructions). Click on "Abort" in the download screen, and then retry the download. Click on "Save only" to save your files without deleting them from the PowerControl until you're sure that they've been saved safely.

One of the most common problems with the SRMWin software is that it's looking in the wrong place for the downloaded files. We all like to organise our computer files differently, and so often we save the "_data.srm" folder somewhere other than the default location during the installation process. Depending on how you do this, the software can end up looking in an empty folder while all of your files build up somewhere else. This is easy to fix, but just in case you don't know where your "_data.srm" folder is, we'll go through the whole process the long way.

What you need to do is have a look on your hard drive for the folder called "_data.srm", and once you've found it, tell the program where to look.

To find where your data folder is hiding, click on the Windows "Start" button, and then on "Search".
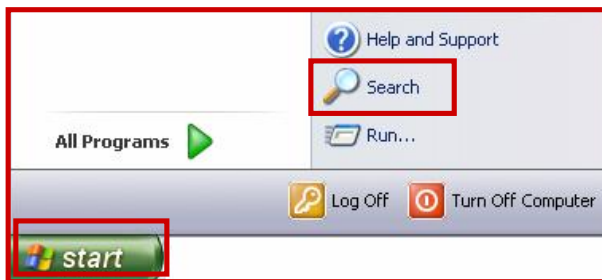
Search for "All files and folders", and then tell it to look for "_data.srm". Click on "Search". Then sit back and wait until the search has finished, it might take a few minutes.
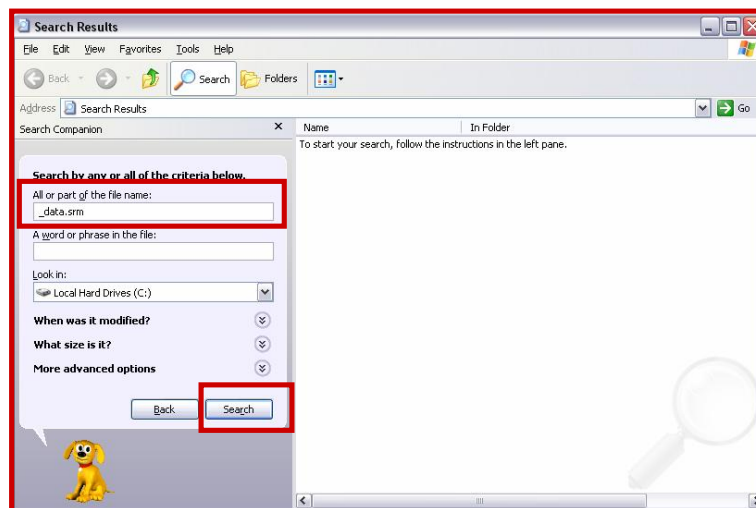
The computer will find any folders with that name on your hard drive. Open them up to see which one has your files in it! Then make a note of the "address" of the correct folder (i.e. C:\Documents and Settings\Andrea\My Documents\SRM).
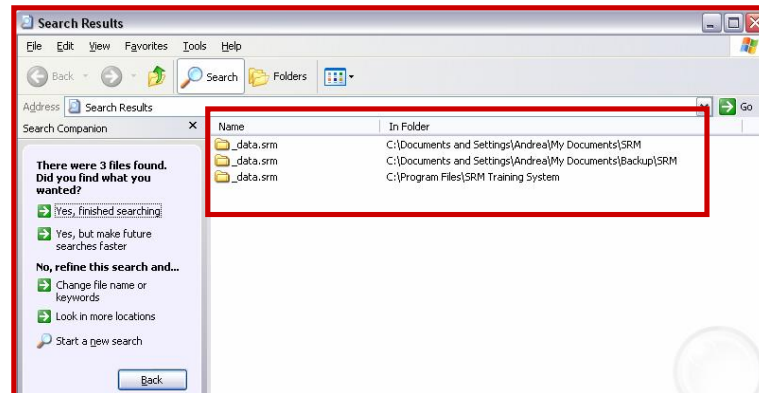
Then, in your SRMWin program, click on "Options" along the top menu bar. On the "0 System" tab, which comes up automatically, there is a field at the bottom that tells you where the program is looking for your files. Click on the "Change" button.
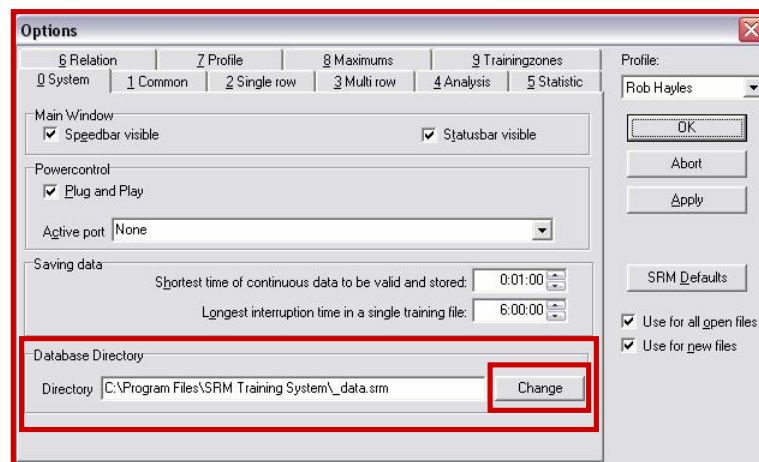
Then browse to the correct "address" for your data file. Make sure you select the "_data.srm" file itself, so that it becomes the end of the address. Click on "OK".
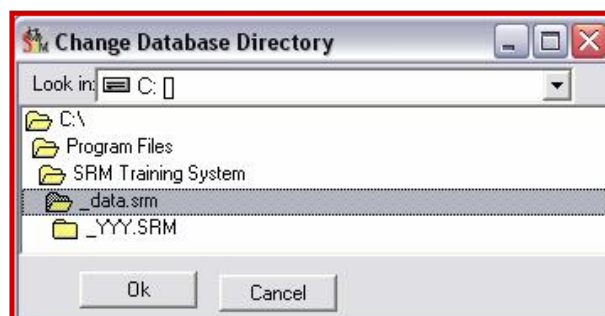
Now, try to open your files again by clicking on the "Open" icon in SRMWin. They should be there...

Part V: Troubleshooting

Can I set the clock to show 12hr time instead of 24hr?

Not in the current version of the software. We may change this in the future.

Your first file – what does it mean?

You click "OK" at the end of the download process, and up springs your file… it looks lovely, but how the heck do you read it? There are lots of different ways of looking at your data, but we'll start with the "Single Line" view, which is how the file opens automatically.

Looking at files in Single Line view

This is the overall picture of your ride, with your power, heartrate, speed, and cadence data shown as they happened, reading the file from left to right. Here are the basics of reading a file:

- Variables are colour coded, with the key shown at the top left and right corners of the file: Power is green, Speed is pink, Cadence is blue, and heartrate is red.

- The values for each line are shown on the left and right sides of the graph, and are colour-coded as well. Power and Speed are shown on the left axis, and cadence and heartrate are shown on the right axis.

- The elapsed time and distance are shown along the bottom axis.

- Hovering your cursor over any point on the graph will display colour-coded data for that point along the very bottom of the file.

- Average data for the whole ride is listed down the left side of the file. "T" is total time, "P" is average power, "H" is average heartrate, "S" is average speed, "C" is average cadence, "D" is total distance, and "E" is energy used (in kJ).

- The File Properties are displayed at the very top of the file, as well as just underneath the x axis, telling you the date, time, initials, energy used, distance travelled, and any description that you've entered.

- Training zones (as set in "Options") are shown by green horizontal lines across the whole graph.

- Data is "smoothed", or averaged, by 1% in this view.
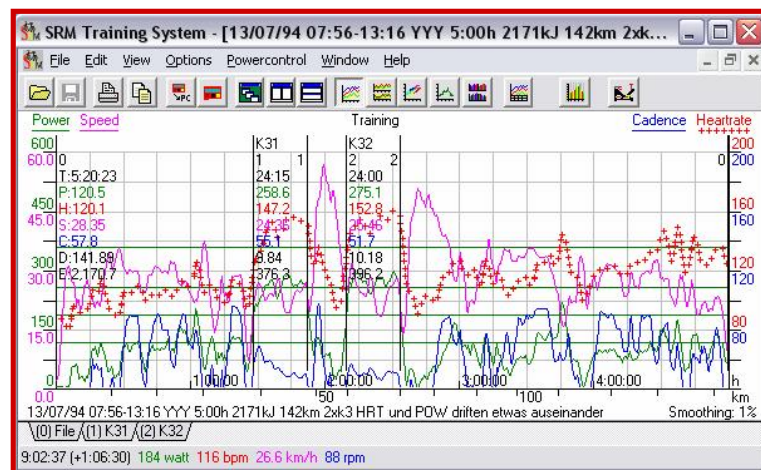
If you just want to see a general view of your ride without so much detail, click on the Single Line icon again and the graph will change to the "Trend of Training" display. This is an overview of your ride, with all of the same data, but "smoothed" by 10%. Click on the Single Line icon again to return to the normal view.

In our sample file below, you can now easily see that there was one big climb, with a descent partway through. You read this by looking at all of the variables together, for instance the power (green line) went up at the same time as the heartrate (red "+" signs), indicating that the rider was making an effort. This happened while the speed (pink line) and cadence (blue line) were slowly dropping off. The descent is the opposite, power and heartrate coming down while the speed goes up. Cadence often goes to zero on a descent as you freewheel, but in this case the rider pedalled most of the time.
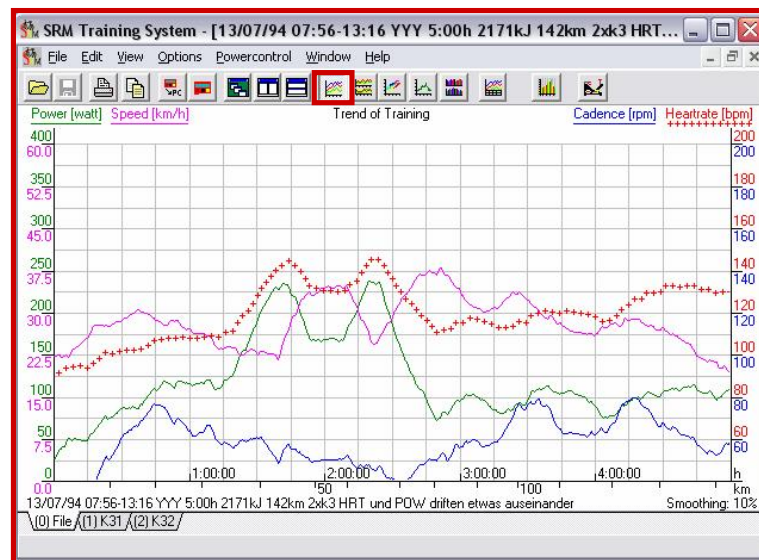
You can change a number of options for this view by either double-clicking anywhere on the graph, or by clicking on "Options" at the top of the screen and then selecting the "2 Single row" tab. You can choose which data you want to see on the graph (tick the "Visible" box), as well as the lowest and highest values for each variable on the graph. If you're a sprinter, you'll need to raise the top of the power axis higher than the default 600W, or your data will be off the chart!

Any markers or intervals are shown between two black vertical lines, with average data (colour-coded again) for each one shown within the lines. A tab for each marker appears at the bottom of the file so that you can look at them in more detail. If you hover your cursor over each tab, it will highlight the marker that it represents.
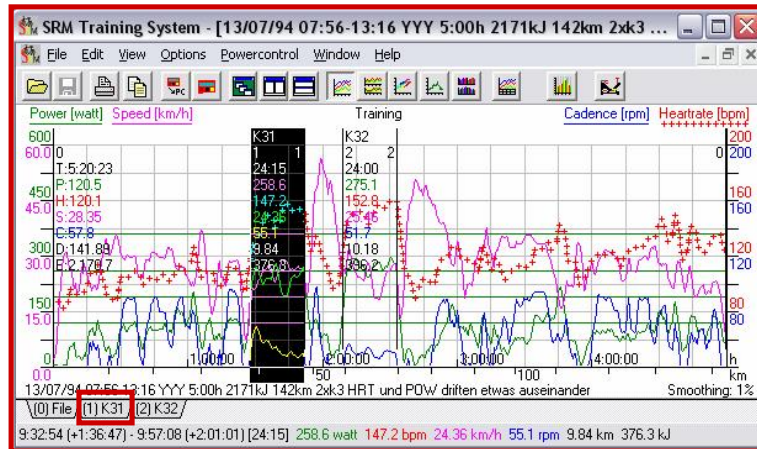
To look at a marker on it's own, simply click once on the tab along the bottom of the file. The data from that marker will be shown on it's own, so that you can see it more clearly. All of the data that you see now is from that marker, including the elapsed time and distance along the bottom axis.

To see the whole file again, just click on the tab on the bottom called "(0) File".
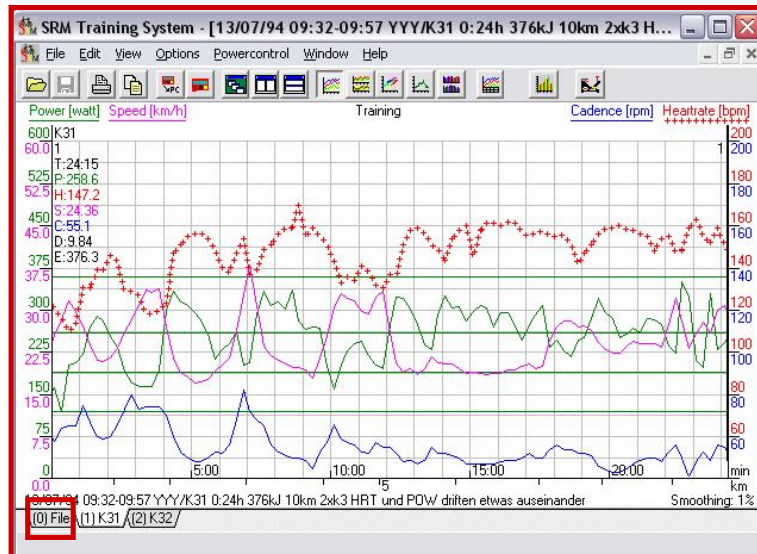
You can add new markers anywhere in the file, by selecting a section with your cursor. Put your cursor wherever you want the section to begin, press and hold down your left mouse or touchpad button, and then drag your cursor to where you would like the section to end.
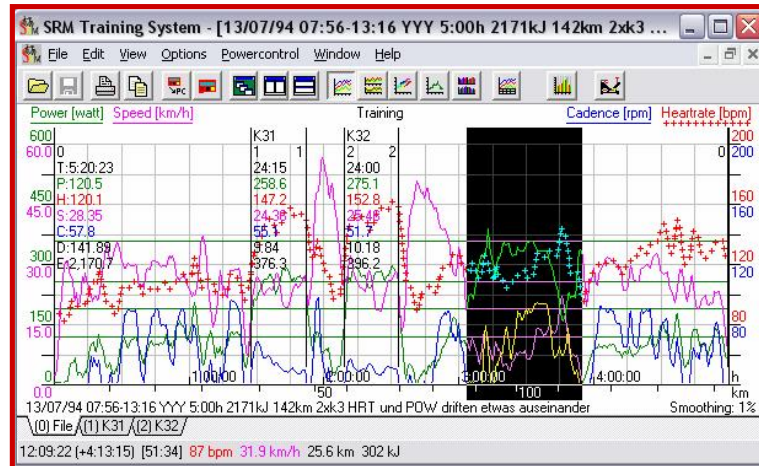
Then let go of the mouse or touchpad button, and you'll see the following box. This lets you put the marker exactly where you want it, if you need that kind of accuracy. You can give the marker a title in the "Comment" box, and then choose a number of ways to set the start and finish.

- "Relative Time" is time from the start of the file. If you want to start the marker at one hour into the ride, set the "From" box to "+1:00:00.00". Then you can choose to end it at a specific time in the "To" box, or just give the marker a duration, i.e. 2 hours long, in the "Time" box.

- "Absolute Time" is essentially the same as relative time, but in time of day instead of time from the start of the file.

- "Distance" allows you to set the marker according to kilometres or miles ridden. With this one, keep in mind that you don't ride in a perfectly straight line, so if you're using this to try to match up landmarks in a race (for instance a particular climb), you're better off selecting the marker based on other measures.

- "Work" lets you select a marker based on how much energy you used, for instance "how much of my ride did it take from this point to use 350kJ?" could be answered by putting "350" in the "Distance" (meaning "Range") box.

Click on "OK" when you're happy with your selection, and your new marker will appear on your file, with it's own tab along the bottom.
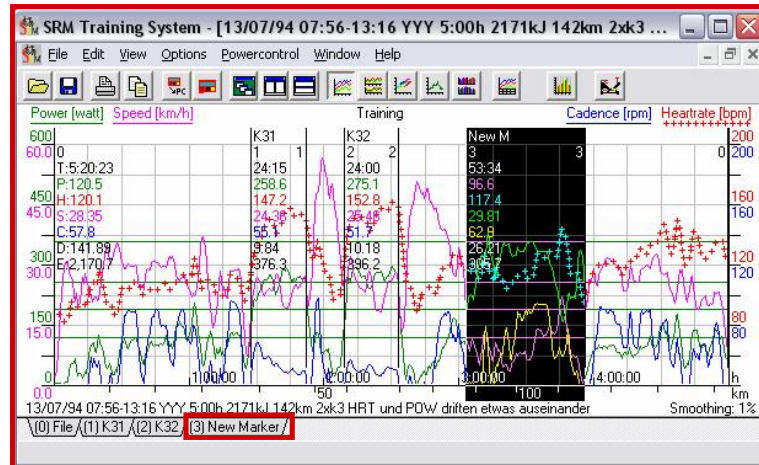
If you're still not happy with where the marker starts and finishes, put your cursor on the marker's tab at the bottom of the file, and click your right mouse or touchpad button (called "right-clicking").
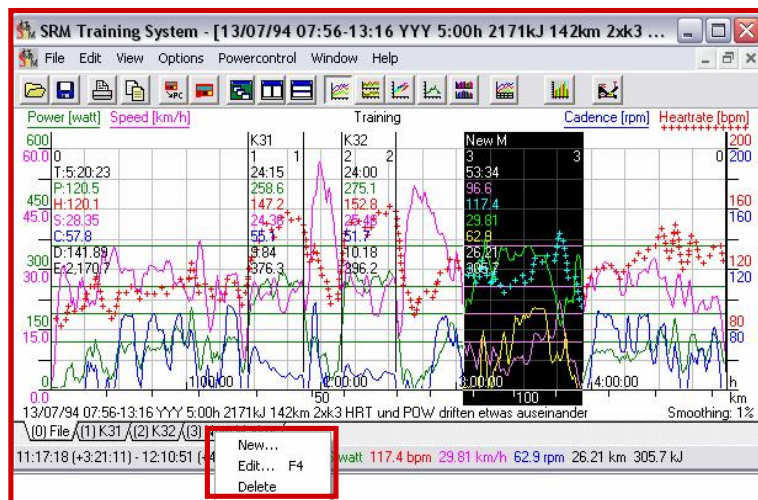
Then click on either "Delete" to get rid of the marker (don't worry, you can't delete any data), or "Edit" to bring up the "Edit Marker" screen, and make your changes. Click "OK" to finish.

If you want to see your file in full detail, you can get rid of the smoothing by double-clicking anywhere on the graph to bring up the "Options" screen, and then changing the "Smoothing" field to "0%". Here is what you'll see once you click "OK". This file is still readable, but if you looked at a criterium file like this it would be one big blob of colour. So why would you want to look at a file in this view? If you're doing really short efforts and want to see exactly what happened, or if you suspect that your data might have some weird spikes in it from riding past a radio tower (these can sometimes cause interference), this is the view for you.
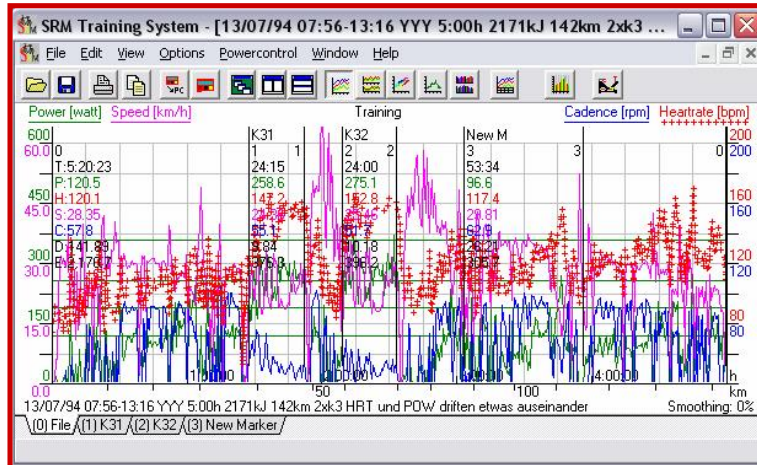
Interpreting the Single Line graph

So, now you can look at your data in a few ways, and select or modify markers to look at important parts of your ride on their own. But what does it MEAN?

There are a few things you can look for in this view:

- Get a general idea of how hard you worked by looking at your average power and heartrate.

- Move your cursor across the highest points on the green power line to see what your maximum powers were.

- Are you rested and healthy? If you are, your heartrate will respond almost immediately to any changes in power, so you'll see quite sharp changes in the red line. If you're fatigued or ill, your heartrate response can be blunted, and any changes will be much slower and smoother.

- Did you get dehydrated? If you did, your heartrate at the end of the ride will be noticeably higher than at the beginning of the ride for the same power.

- Did you fatigue during the ride? If you're doing a series of efforts, look to see if your maximum and average powers dropped off by the end of the series.

- How much energy did you use? Look at the information at the top left of the file, and "E" will show you how many kJ you used. See page 93 for conversion to kcal.
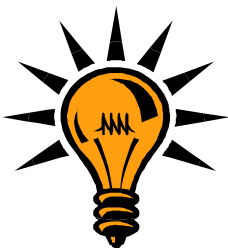
What you CAN'T see is how hard you tried! You'll need to write that kind of information in the comments section of the File Properties, so that "how you felt" is stored along with "what you did". DON'T UNDERESTIMATE THE IMPORTANCE OF YOUR SENSATIONS ON THE BIKE, this is what gives the SRM data meaning and context. You're not a robot, after all.

It's always worth wearing a heartrate monitor when you're using your SRMs, because the combination of the power and heartrate data tells you much more than either one on its own. You want to know how your body reacted to doing a particular effort, and how that response changes as your training progresses — just looking at power on its own won't give you the full picture.

Looking at files in Multiline view

If you were out on your bike for a long time, it can be difficult to look at the whole file compressed into one line. If this is the case, click on the "Multiline view" icon once and the view will split into two lines, like this:
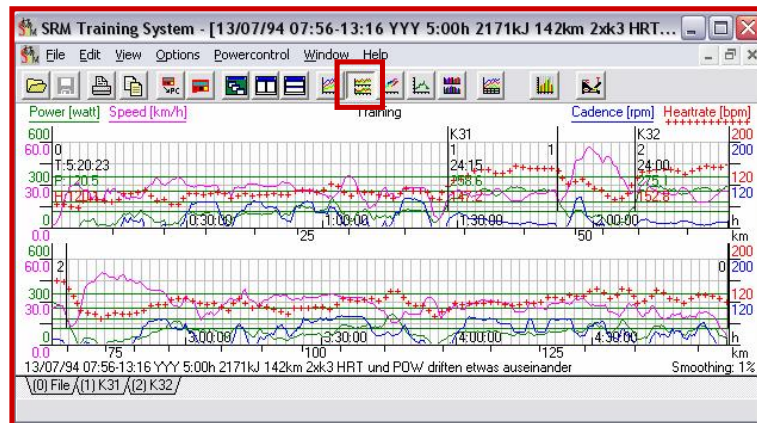
The ride is now split into two, so that you can see it more clearly. You read the file the same way, from left to right, along the top line first and then the bottom line.

If you click on the Multiline view icon again, the file will be shown as three lines, and so on and so on. To get back to the normal one line view, just click on the "single line" icon.

All of the same information is shown in this view as in the Single Line view, but it can be easier to identify particular parts of your ride, or to select new markers.

Looking at files in Statistic view

Say you did a training session where the goal was to do some low-cadence climbing intervals. You've never done the session before, and you're not too sure how well you stuck to the plan. You'll get a pretty good idea from the single line view, but you could also have a look at the "Statistic" view (note this is a different file than the one we've used in the other examples).

Here's the Single Line view of the effort, which was 7 efforts of 4 minutes riding at 80rpm followed by one minute riding at 50rpm, while trying to keep the power constant.
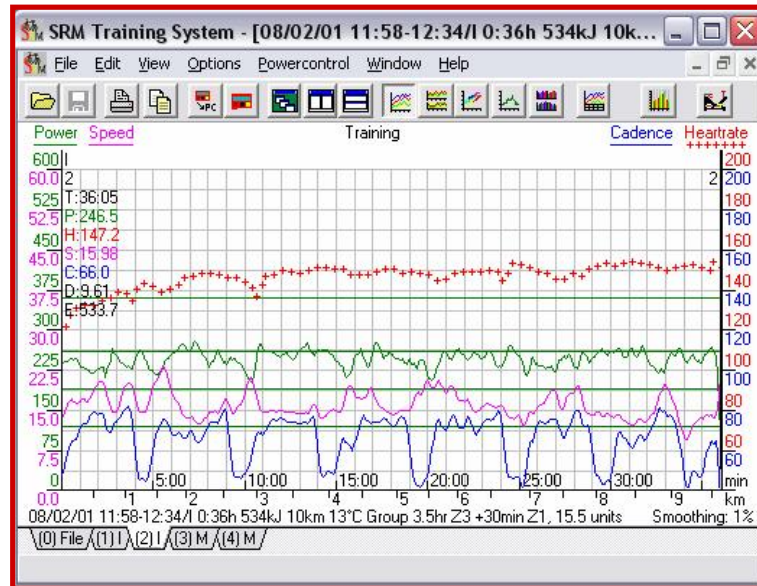
Now here's the Statistic view, showing the same data in a histogram. This is a graph that shows how often each value (i.e. 80rpm) happened during the interval, as a percentage of total time.
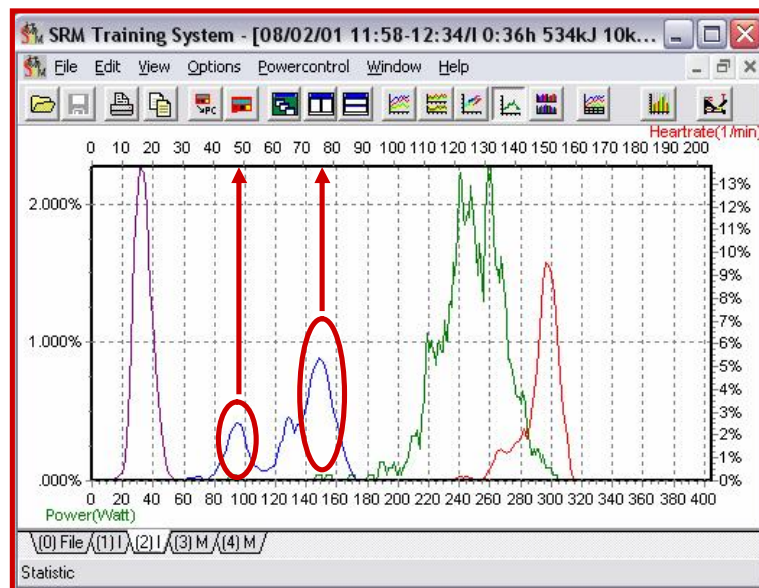
The graph shows speed, heartrate, and cadence values along the top, and power along the bottom, with frequencies up the right side. The higher the bump, the more often that value occurred during the marker or file. So, in this example, there is a bump in the blue cadence line around 50rpm, and another around 75rpm, with a fairly narrow range of powers. This shows that the efforts went according to plan, although the rider struggled a bit to get the cadence right up to 80rpm.

The New Statistic View

In the new version of the software, there is a second way to look at the statistics of a file. This shows you how all of the variables, such as cadence and power, relate to each other.

Let's stick with the same example of the low-cadence, constant power efforts. While there's a separate graph for each variable as the main variable, we're interested mostly in the Cadence graph, in the bottom left of the screen. This shows:

- Cadence frequencies dropping down in blue bars from the top line. Looking at the bottom axis, we can see that there is one bar showing between 40-60rpm, and another larger bar showing between 60-80rpm.

- Power, heartrate, and speed bars for each cadence range come up from the bottom of the graph, with the values on the axis on the left and right (colour-coded again).

- If you hover your cursor over one of the bottom bars, as I did below, the average value for that range and that variable will be displayed (here, 248W for the cadence range 60-80).

- If you hover your cursor over one of the top bars, the time spent in that range will appear.
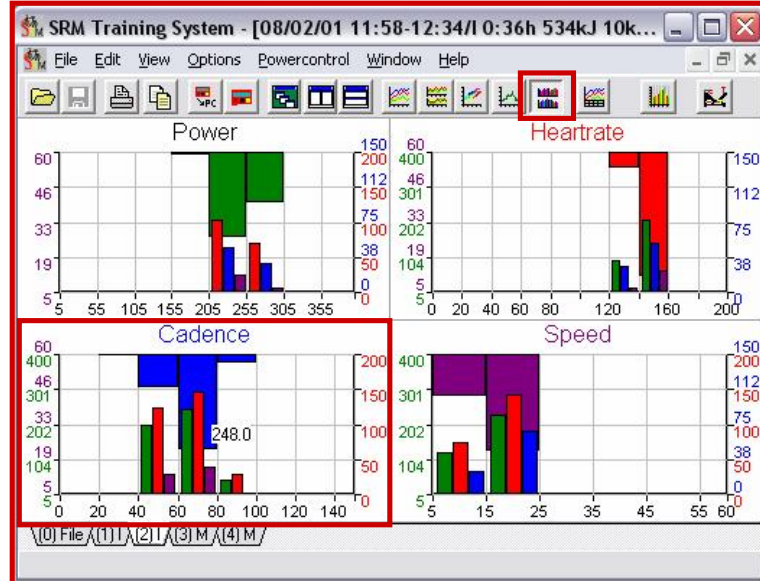
Ok, so what does this actually tell us?

- The rider was putting out more power at the higher cadence range (248W at 60-80rpm) than the lower cadence range (204W at 40-60rpm), so the session goal of keeping the power the same wasn't met. A goal for the next time!

- The rider's heartrate was higher (147bpm) in the higher cadence range than in the lower one (125bpm)

Editing your data (why and how)

Another way to look at your data is the "Edit Data" view, as shown below. This is essentially the same view as the "Single Line" graph, but with the data values presented underneath in a table.

You can see which portion of the file is being presented in the table by looking for the grey bar on the graph. This will move across the graph as you scroll through the file using the horizontal scroll bar at the bottom of the file.

This view allows you to:

- Look at each data point without having to scroll your cursor across the file, as the data is presented under the graph in a table

- Identify maximum values or set new markers exactly and easily

- Edit data if you believe there are incorrect data points, for instance a spike in the data caused by interference from a radio transmitter
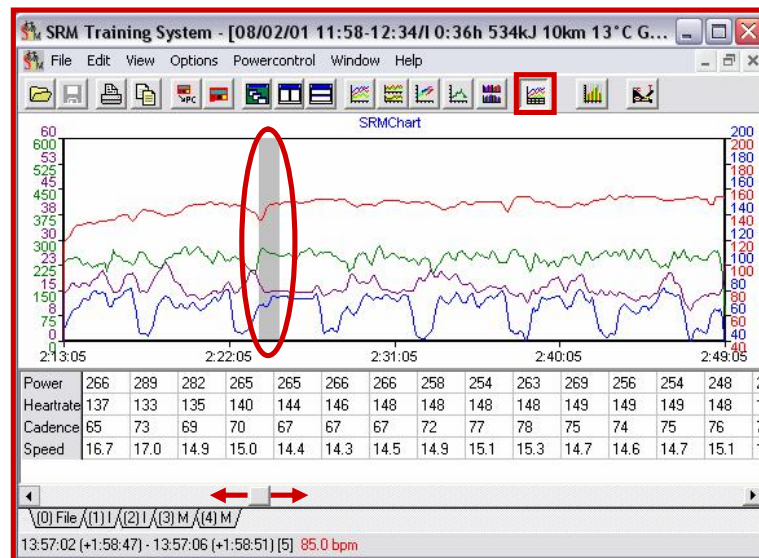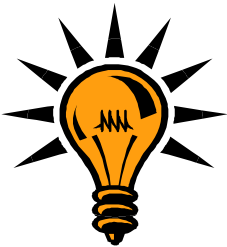
You can select one or more cells in the table, and the selected area will be shown on the graph with a vertical line or bar. This makes it possible to change the data in all of the selected cells simultaneously. Your changes will be shown immediately on the graph.

You can zoom in on the graph by clicking and dragging to the right (as you would to create a new marker). Then only the area that you have selected will be shown on the graph and the data table. To zoom out again, click and drag to the left.

Are you getting more fit?

Now that you can look at and interpret a single file on it's own, we can move on to comparing files since this is what is going to tell you how your training is going.

The first step for comparing files is to open the files that you're interested in, and then click on the "Horizontal" icon to show both files at once. These should be files from similar rides, either the same rider on different days (or weeks, or years, or even different laps on the same day), or different riders.

Here's an example, a mountain bike course, ridden by the same rider in the winter and then in the summer. The files don't look exactly the same, but the general pattern is the same, as you can see through sections marked off in each file for comparison.
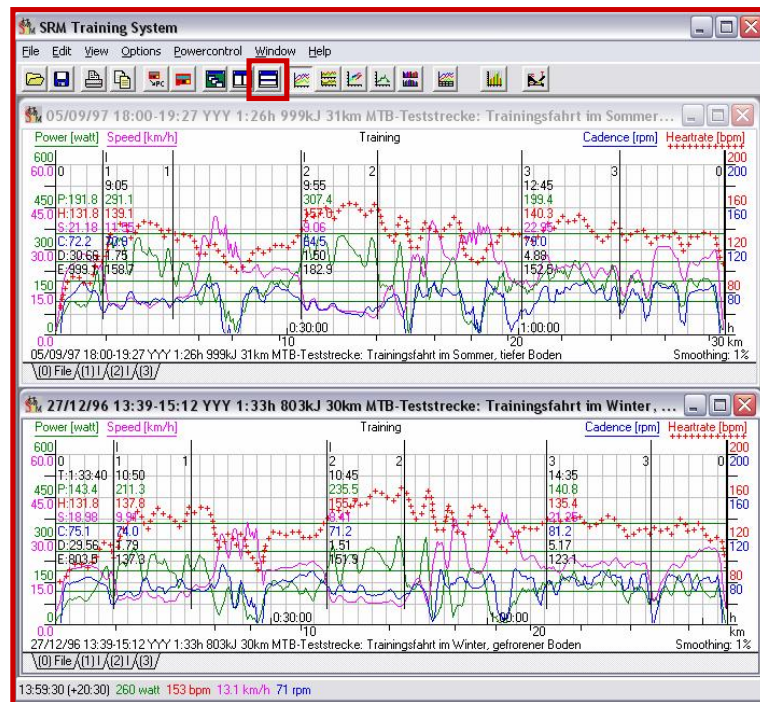
So, how do you start comparing them?

- Look at the average values for each entire file

    - Average power in the winter was 143W, and in the summer was 191W

    - Average heartrate in the winter and summer was the same, 131bpm

    - Average speed in the winter was 18.98km/h, and in the summer went up to 21.18km/h

    - The whole course took 1:33 to complete in the winter, and 1:26 in the summer (which makes sense since they were going faster)

    - So, the rider could produce more power for the same level of effort and could therefore go faster in the summer, showing that they were more fit.

You could then go through the same comparison for each of the markers, to have a closer look at different climbs or technical sections. Then, you can move on to looking at efficiency in the "Analysis" view.

The Analysis View – a (squiggly) way of looking at your efficiency

Many people take one look at this view and quickly switch back to the familiar Single Line view… But it's worth the effort to figure it out, since it can tell you some vital information about your fitness. It's not as confusing as it looks, honest. Let's use the mountain bike file again as an example, since it's a good long ride with a range of powers and heartrates. Short efforts are no good for this kind of analysis, ideally you should look at a file that's three hours or longer.

We'll start off by looking at the winter mountain bike file on it's own. Here's how to read it:
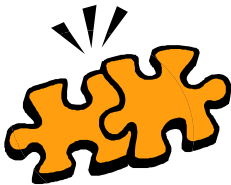
- See the rainbow line in the top right of the screen? It tells you the order that your data happened in (yellow at the beginning of the ride, then red, then green, etc… the end of the ride is shown in purple)

- The big squiggly line shows you what your heartrate did in relation to the power you were putting out. So, the heartrate climbs at the start of the ride (yellow) as the power goes up (the line moves to the right), and then drops again (red, meaning the next portion of the ride) as the power goes down (the line moves to the left). Simple, right?

- The black lines that divide the graph up into rectangles show you where the power and heartrate sit in relation to the training zones that were set in your PowerControl. Percentage of the ride spent in each zone, as well as actual time, are shown along the bottom of the graph. In this example, 8% of ride, or 7 minutes, was spent in zone 4.

- How often (i.e. what percentage of the ride) each power and heartrate happened is shown as bars along the bottom and left side of the graph respectively.
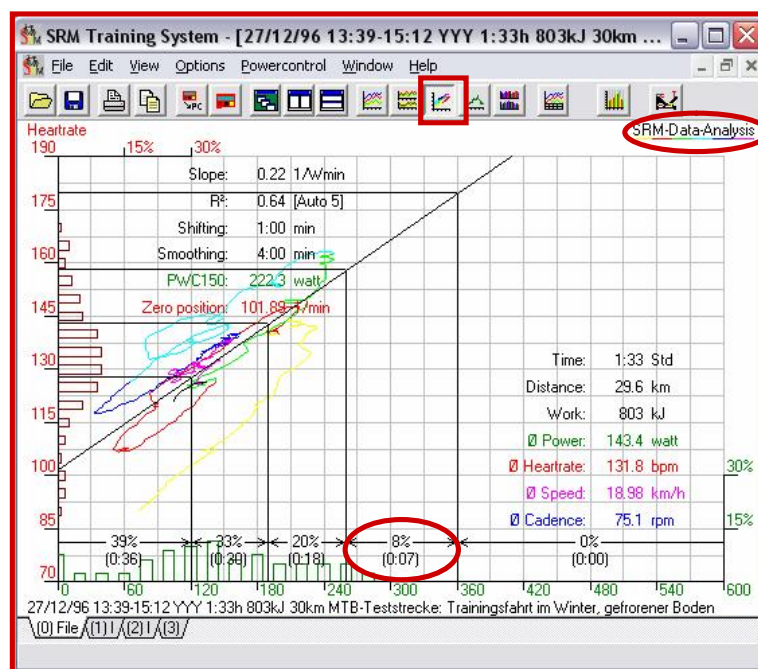
There are also quite a few numbers written on the graph, These range from basic information about the graph settings to measures of physiological efficiency that allow you to see how your fitness is changing:

- "Slope" = The slope of the diagonal line that runs through the middle of the squiggle. This value tells you how much your heartrate changed for each one Watt change in power. The more fit you are, the lower this number will be, since it will take less effort to produce each Watt (better aerobic capacity).

- "R^2" = Tells you how closely the squiggle fits the diagonal line, or how much "scatter" there is in the data. It's actually a percentage value that tells you how well your data is explained by the "best fit" line drawn through it. It can be used to indicate whether you were burning mostly fat or mostly glycogen during your ride:

  - During a fat-burning ride, there should be little variation of heartrate for a given power, since this should be a steady ride at a sustainable pace. As glycogen is used to produce energy, fat is metabolised to replace it, with no need to tap into the anaerobic system and no drop-off in efficiency. This means that the heartrate to power relationship will stay remain very similar throughout the ride, leading to a strong relationship between the two and a high "R^2" value.

  - During a high-intensity ride, the body will use both the aerobic and anaerobic systems to produce energy, and will not be able to sustain a difficult pace for too long. The power will drop while the heartrate stays the same, leading to changes in the relationship between the two. This will give lots of "scatter" to the Analysis graph, and a low "R^2" value.

- "Shifting" = How much is the heartrate data time-shifted relative to the power data? Here it's set to one minute, to make up for the delay in the heartrate response when there is a change in power. This is done because the steady-state relationship between the two is a better indicator of aerobic fitness than the real-time response.

- "Smoothing" = How often are the data averaged? For this view, they are averaged every 4 minutes, so every point on the graph represents the average of 4 minutes of data. This length of time is chosen because maximum power output for 4 minutes is a good predictor of a cyclist's transition threshold between aerobic and anaerobic work. Averaging the data less than this would make the graph even messier, and averaging it more than this would risk losing points on the graph that are important for analysis of the aerobic system.

- "PWC150" = How many Watts can you produce at 150 beats per minute heartrate ("PWC" stands for "Predicted Work Capacity")? As your fitness improves, this number will go up as you become more efficient at producing power.

- "Zero position" = An on-the-bike 'resting' heartrate. This is the point on the heartrate axis where the diagonal best-fit line starts. As your fitness improves, this number will decrease.

On the bottom right of the graph, total time, distance, and work are displayed, along with average values for power, heartrate, speed, and cadence.

Now, let's have a look at how you might use all of this information with the mountain bike example.

Here are the two mountain bike files, the left one from the winter and the right one from the summer, shown in Analysis view with vertical tiling. To see a view like this, open two or more files, and then click on the "Vertical" icon.

We're trying to find out if the training that this rider has done between the winter ride and the summer ride has improved his fitness, particularly his efficiency. We can do this by looking at the following:
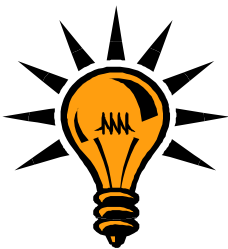
- The slope of the best-fit line. The line is steeper on the left file than the right, which you can see just by looking at them quickly. In the winter, his heartrate increased by 0.22 beats per minute for each Watt, while in the summer it only increased 0.18bpm/W. This is an indication that his aerobic capacity has improved, and he is more efficient.

- The power produced at 150 beats per minute heartrate (PWC150). He starts off being able to produce 222W in the winter, and by summer he can produce 286W for the same heartrate, again showing an improvement in efficiency.

- The on-the-bike 'resting' heartrate ("zero position"). This comes down from 101bpm to 98bpm, again indicating that his fitness is better.

- The total work done went from 803kJ to 999kJ, because he was able to produce much more power.

- The training zones, based on power, equate to much higher heartrates in the winter than the summer. In reality, you should update your zones as your fitness improves, because as this shows clearly it takes much less effort to produce the same power. If you keep training to the same zones, your training won't be hard enough for you and your fitness will plateau.

So, after all of that, we can confidently say that the rider is much more efficient after whatever training he did between the winter ride and the summer. You could this type of analysis to help guide your training.

Phew, that was a long explanation. Just one last thing about the Analysis view — you can change some of the settings if you want to. Just click on "Options" and then the "4 Analysis" tab.
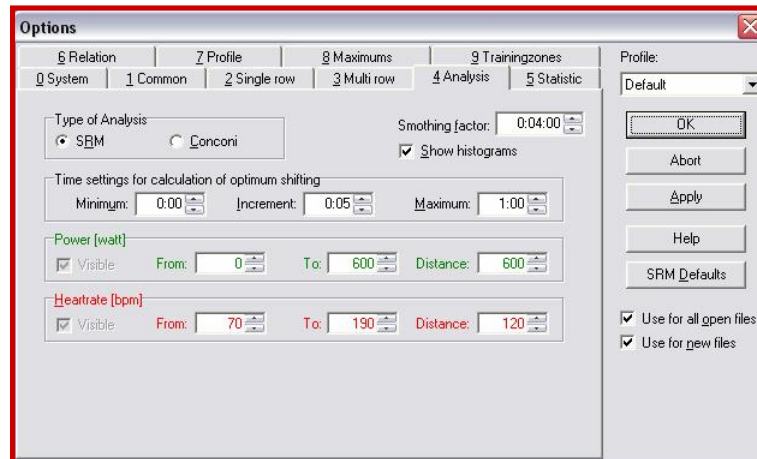
You can change the smoothing factor, choose whether or not to see the power and heartrate histograms, change the heartrate/power time-shifting settings, and change the ranges of power and heartrate that are displayed on the graph. Click "OK" to save your changes, or "SRM Defaults" and then "OK" to put all of the settings back to the normal settings.

The Conconi Analysis View

Clicking on the "Analysis" icon twice takes you to the "Conconi Analysis" view. This will do the data analysis for you if you complete a Conconi test, which requires an ergometer. Program the resistance to a specific schedule, as follows. Begin with a 30 minute warm-up between 100-250W. Then, the start the test at at 60rpm and 100W. Increase the cadence by one rpm and the resistance by 5W every 30 seconds, until you reach a cadence of 95rpm. Then increase by two rpm and 10W every 20 seconds. Continue this until exhaustion, and then do a 10 second maximum effort.

The Analysis view does not run the test for you, only the data analysis. No time shifting is done, and the data is averaged every 15 seconds. The key result is the Slope, which will decrease as fitness improves.
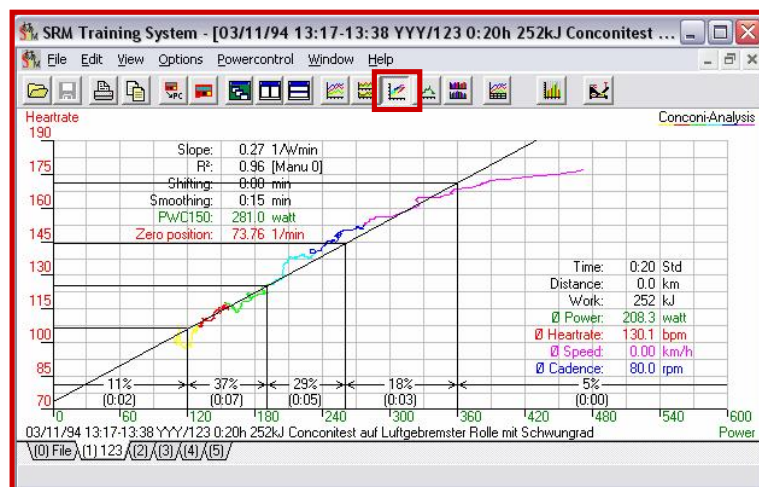
The Big Picture (Periodic view)

The Analysis view is great for comparing a couple of files, but the "Periodic" view is the one you want for looking at lots of files together and seeing the overall effect of your training. This "big picture" view is just a few clicks away, and is an easy way to look at the important data from weeks, months, or even years of your files at once. After you set it up once, you'll be able to look at your files in a graph packed with useful information, like the one shown below.
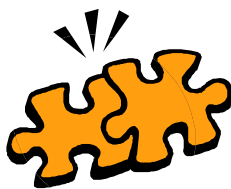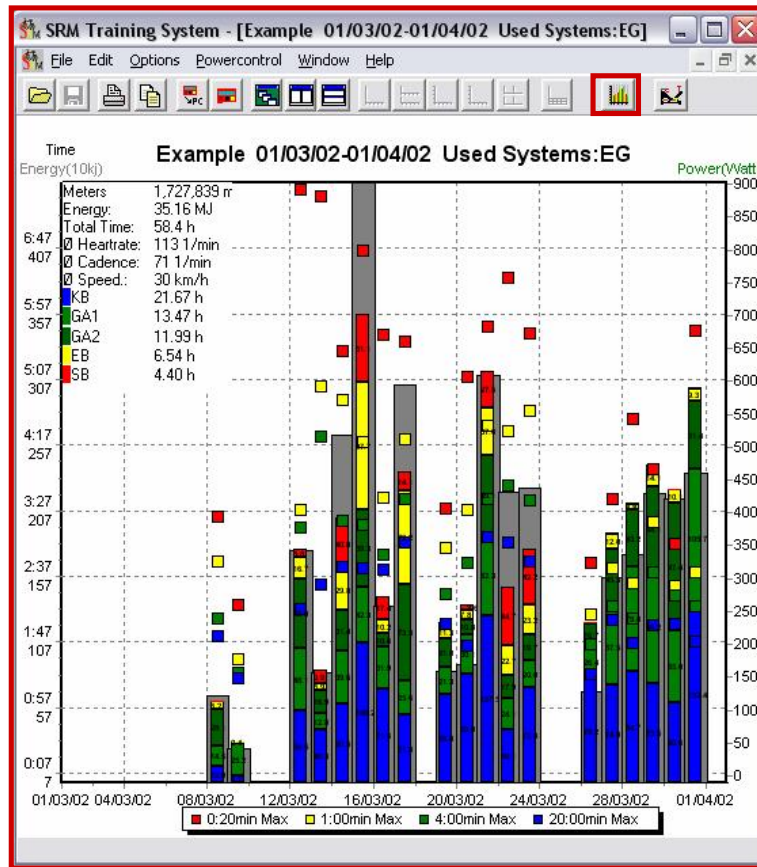
In the example above, the graph shows each day's data for March 2002 for a rider with initials "EG".

- All total and average data is shown in the top left corner of the graph.

- Total time spent in each training zone for the time period specified is also shown in the top left, along with the colour coding used on the graph for each zone.

- Maximum powers for the times set in "Options" are shown as coloured squares for each day, with the legend below the graph. Hold your cursor over a box to see the exact value in Watts.

- Each vertical bar represents time spent training per day (along the left y-axis), with total time broken down by colour into time spent in each training zone.

The grey background for each bar represents either distance or energy used, depending on the settings that you select in "Options".

So, it's worth a few minutes to set it up, right? The first step is to click on "Options" on the top menu bar, and then click on the "7 Profile" tab.
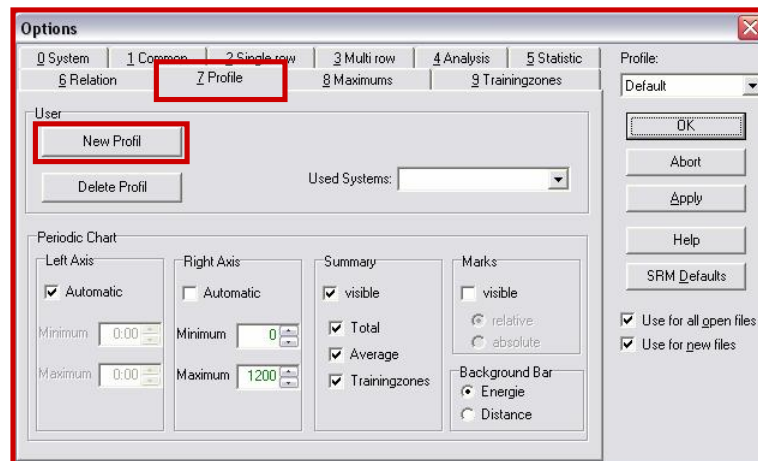
Then click on the "New Profile" button, and the following box will appear. Type in whatever name you want to use for your profile, and click "OK".

The name that you've given your profile now appears in the drop-down list on the right side of the "Options" screen. The next step is to choose whose files you want displayed when you select this profile, by telling the program which initials to associate with it. Go to the "Used Systems" field, click on the little arrow beside the box, and select whichever initials you'd like to use. You can choose more than one, if you're using two PowerControls with different initials for instance, just hold down the "Ctrl" button on your computer keyboard and click on as many sets of initials as you'd like. Click the vertical "OK" button to the right of the initials to accept your choices.
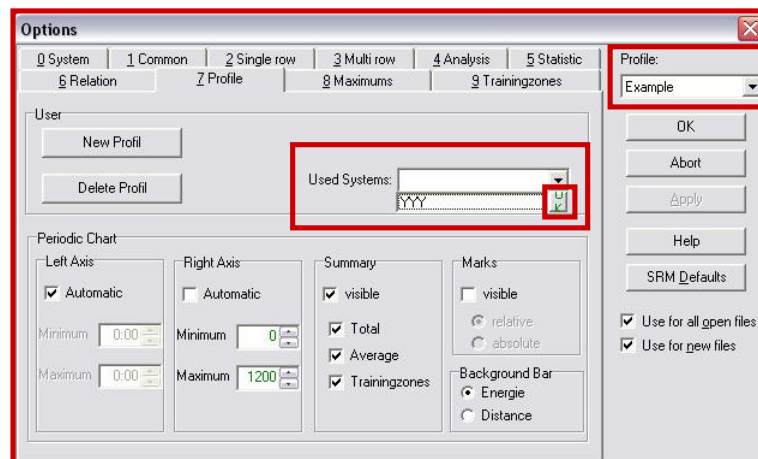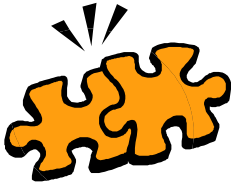
Then you can decide exactly what you'd like to see on the graph, as follows:

- Left axis: Time and Energy. You can tick the box to have the software chose the lowest and highest values on the axis automatically, which is normally easiest, or you can tell the software what numbers to use.

- Right axis: Power. Again, it's easiest to let the software take care of the lowest and highest value automatically, but if you want to change them, you can.

- Summary: The totals that are normally at the top left of the periodic graph. You can choose to have these displayed ("visible") or not, as well as which ones you'd like to see ("totals", "averages", "training zones").

- Marks: Actual values displayed on each part of each bar on the graph. You can chose to have these visible or not, and then whether you'd like "relative" (percentage) or "absolute" (hours and minutes) values shown.

- Background Bar: The grey background to each bar on the graph can be set to represent either energy used or distance travelled.

If you want to change the maximum powers that are calculated from the default (20 seconds, 1 minute, 4 minutes, and 20 minutes), click on the "8 Maximums" tab and enter your preferred values and colours.

Now that the setup is finished, you can click on the "Periodic" icon in the software. You'll be given a choice of which profile to use, what dates you'd like to look at, and if you want to see each day on it's own or grouped together. You can type the date in manually, or click on the arrow to the right of the box to pick dates from a calendar. To have each bar represent a week, set the interval to 7 days, for a month set it to 30 days, or for a year set it to 365 days. Then click "OK" and the graph will appear!

What does it mean?

The Periodic view is fantastic for keeping track of how your training is going. It can give you information to help you compare your fitness at different times, as well as to assess the effect of a prescribed training program. You (and your coach, if you have one) can see how closely the training you did matched the plan for a given period, and what the effect was.
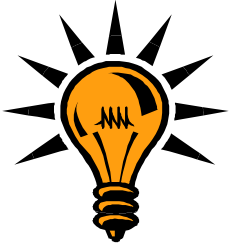
- Did you do the prescribed amount of work (time/energy/distance) in total, and in the correct training zones?

- Did your power increase as expected? Or did you end up building endurance (i.e. 20 minute maximum power) when you were trying to work on your sprint, (20 second maximum power) for instance?

- Are you seeing a general progression in your fitness, where after a block of hard training and then a recovery period you see in increase in your power? Keep in mind that the rest is as important as the training for adaptation…

- Are you better this year than you were at the same time last year? Better than you've ever been?

Training programs these days are 'periodised', meaning that you do different types of training at different points in the year in order to reach your peak fitness for your main goal of the season. If you do this type of training for more than a year, you'll want to be able to go back and look at what worked for you and what didn't. Always make sure you write in the properties of each SRM file how you were feeling, so that you can go back and look at what you did in the weeks before you felt great! Then go into the Periodic graph, looking at 7 day intervals to group the data by week, as shown below.
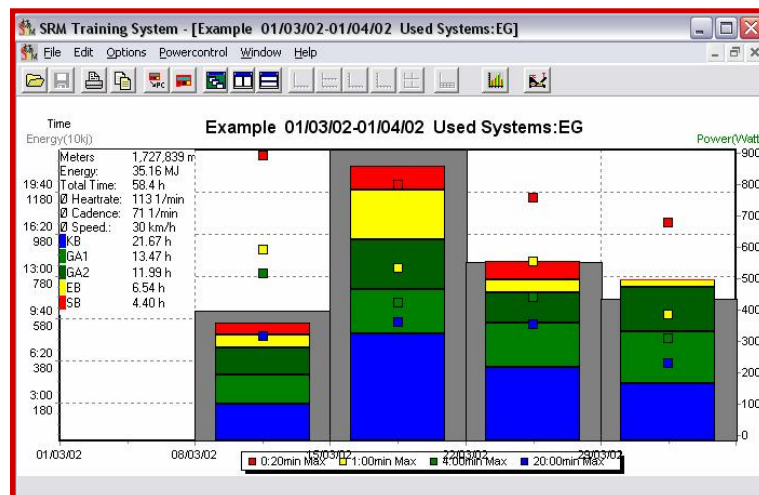
This graph shows 4 weeks of data, one bar per week, for the same dates as the previous sample graph. Double-click on any bar to see the daily graph, and double-click on any bar in the daily graph to see the actual SRM file for that day.

What can you see from the graph?

- What proportion of high-intensity to low– and medium-intensity work did you do? If you choose to see the "Marks" in Options, and select "relative", each section of each bar with show you the percentage of work done in that training zone. If you want to know the actual time spent in each zone, select the "absolute" option. This makes it easy to replicate any phase that went well in the past, and to spot any unintended changes.

- What were your best powers for each week? As much as we'd like them to, powers don't always go up — in the example, for instance, the rider started off fresh and gradually fatigued through the month as he completed an overload phase. That's good to see! If his maximum powers had all stayed high, it would have shown that he wasn't training as hard as he needed to in that phase. After a good rest at the end of the phase, his powers should be higher.

- Following on the from the previous point, do you see improvements in your power after resting? If you don't, are your "recovery" rides REALLY recovery rides, or are you doing too much work above your recovery zone? If you still don't recover, have a look at the section on overtraining.

- Keep in mind that you can summarise your data any way you'd like, including by month or by year. This is a great way to learn the 'big picture' lessons and adjust your training accordingly!
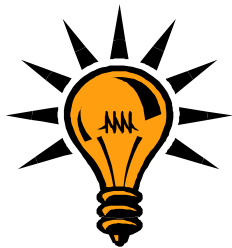
Here are some more ideas for getting the most out of the Periodic view:

- Analyse the month before a major event (or max test) when you went really well. How much time did you spend in each training zone? How much training did you do in total? Now you can use this information to plan the lead-up to any major goals in the future, with the confidence that your training plan will work for you.

- Trying to get your taper right before a big race? Remember, it's a balance between intensity and volume, not to mention rest. Each time you try a taper, make sure you look back at the overall picture of what you did. If it worked well, replicate it again next time. If it didn't decide what went wrong and make a note of what you'll do to fix it in the future.

- Tired of scanning through all of your files looking for your best power over four minutes (sometimes used to determine aerobic threshold)? Go straight to the periodic view, either daily or weekly (or even monthly), and get the information quickly and easily.

- If you do a max test, either in the lab or in the field, get your maximum aerobic power (sometimes called maximum minute power) easily by putting your cursor over the 1-minute maximum square on the periodic graph.

- Look at your entire cycling career (well, the part you have SRM files for) in one graph! Group your data by month or by year to get the REALLY big picture of how your fitness has developed.

There's so much you can do with this view, use it regularly and you'll move from looking at data to actually gaining knowledge quickly and easily.

Getting your Training Right: Determination of training zones

Knowing why you would want to set training zones is one thing, but actually knowing how to set them is another. This is where a coach or physiologist can be a big help with their specialised equipment and knowledge, so if you're really not sure what to do then drafting in an expert is an option to consider.

Having said that, here are some basic guidelines you can follow to set approximate zones using your SRM system:

- On a day when you're well-rested, do a 5 minute maximal effort after you feel sufficiently warmed up. It's best if the effort is done uphill, if there's a long enough climb near you.

- Look at the ride in Periodic view to find out the maximum power that you can sustain for 4 minutes (hover your cursor over the small green square to see the exact value)

  - This power is a predictor of your threshold for aerobic work, after which the contribution from your anaerobic energy system increases, and you get that burning sensation that means you're working at an unsustainable power.

- Calculate 80% (lower threshold limit) and 90% (upper threshold limit) of your 4-minute maximum power. This gives you a range for your aerobic threshold power, and you can use these values to calculate your training zones.

	Lower Limit	Upper Limit	Purpose
Zone 1	0 Watts	33% of lower	Regeneration and recovery
Zone 2	33% of lower	66% of lower	Training for fat metabolism
Zone 3	66% of lower	100% of lower	Training for fat and aerobic
Zone 4	Lower	Upper	Training for carbohydrate metabolism
Zone 5	Upper	Maximum	Anaerobic training, lactic acid

Example

Let's say a rider had a 4-minute maximum power (MAP4) of 410 Watts, and wanted to calculate his training zones. He'd start by calculating the upper and lower limits of his threshold, as follows:

Lower Threshold Limit = 80% of MAP4 = .80 x 410 = 330 Watts

Upper Threshold Limit = 90% of MAP4 = .90 x 410 = 370 Watts
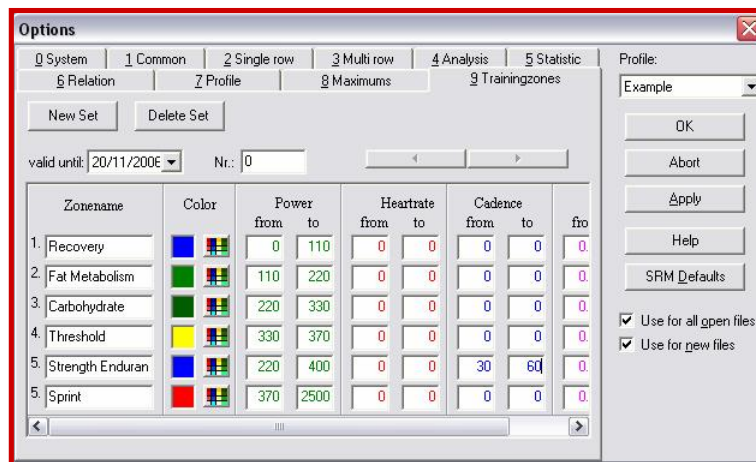
His training zones would be calculated as follows:

	Lower Limit of Zone	Upper Limit of Zone
Zone 1	0 Watts	.33 x 330 = 110 Watts
Zone 2	.33 x 330 = 110 Watts	.66 x 330 = 220 Watts
Zone 3	.66 x 330 = 220 Watts	330 Watts
Zone 4	330 Watts (Lower threshold limit)	370 Watts (Upper threshold limit)
Zone 5	370 Watts (Upper threshold limit)	Maximum sprint power (For most people, set this to 1500W so you don't miss any data)

If you're interested in tracking specific types of training, for example low-cadence strength endurance, you can set zones that overlap with the existing zones. For the hypothetical rider in the example above, an extra "strength endurance" zone could be set, with powers between 220 - 400 Watts and cadences between 30 - 60 rpm. To add the extra zone, just put your cursor in the bottom "Zonename" field, right-click, and select "New zone". Be aware that if you add an overlapping zone the total time in all zones that is shown in the Periodic view will be greater than the actual time you spent training.

Once you've calculated your zones, remember to enter them into both the SRMWin software and your PowerControl.

Overtraining

By looking at power and heartrate together, its possible to pick up early signs of overtraining (or Unexplained Underperformance Syndrome, if you want to give it the current scientific name for it), as well as signs that you could train harder. You'll quickly learn what your individual response to inadequate recovery is, and will begin to get a feel for when you need to back off or push on.

Here are a few things to keep your eye out for, since they can be early indications of overtraining if they happen consistently over a period of time (not just in one training session):

- The obvious one, underperforming in training and racing with no explanation

- Lack of motivation for training

- A blunted ('flattened') heartrate response compared to normal

- An average heartrate that is either much lower or much higher than normal for you on a ride that you complete regularly, together with sensations of heavy fatigue

- A drop in the amount of power you can produce on a ride that you do regularly, along with feeling fatigued

- Your heartrate and power don't recover after a rest day or days

If you have a coach, they will be on the lookout for these types of signs, and can help you make the decision to back off and rest when necessary. Many people, especially if left to their own devices, get caught in a downward spiral that goes something like this:

- Feel bad during training

- Perform below expectation and feel terrible in a race

- Think they didn't train hard enough for the race, and increase their training

- Feel worse , train harder, perform badly, and again, and again…

The only way to end the spiral is to rest as much as your body needs. We're talking days, weeks, and sometimes even months in highly motivated full-time athletes. The earlier you stop the downward spiral, the less time you'll need to recover. If you rest for a week and don't notice any improvements, it's time to see a specialist. Don't put this off, the sooner you take action the sooner you'll be back at your best.

Undertraining

The flip side of the overtraining coin… If your training is too easy, your body won't get the stimulus it needs to adapt and make you faster. This can happen if your fitness has noticeably improved but you haven't adjusted your training zones to match your new fitness level. Your fitness will plateau and even start to regress, so keep an eye out for this and make sure you update your training zones regularly throughout the season. Again, working with a qualified coach or physiologist can help you avoid this problem.

Nutrition and the SRM

This manual is not a replacement for a qualified health care professional, such as a coach, dietician, or nutritionist, so if you have questions or are considering making major changes to your eating habits or weight then please consult a professional. However, there are a few rules of thumb you can follow when training with your SRM.

Regardless of whether you're trying to maintain, lose, or even gain weight (it's rare, but it happens), balancing your energy intake from food and drink with your energy output through lifestyle and exercise is the key. For most people, the best estimate of how much energy they burn doing a particular type of exercise comes from a little chart on the wall at their local gym. Clearly, this is an average value for an average person exercising at an average intensity, and nobody is actually average. Wouldn't it be great to have a more representative estimate of how many calories you burned on your ride? Well, now you can.

Say your SRM says that you produced 1000kJ on one of your rides. How many calories does that equate to?

Short answer: 1000 kcal (kcals are the same as the common usage of "Calorie")

Long answer: You produced 1000kJ of mechanical energy. If you were as efficient as humanly possible, you produced 3 times that amount of heat, which is another 3000kJ, so you actually produced 4000kJ of total energy. One "Calorie" (actually a kilocalorie, or kcal) equals 4.2kJ, so divide 4000 by 4.2 to get roughly 950kcal. That's 95% of the kJ value shown on your SRM file. Now, you may actually be slightly less efficient than the theoretical maximum, so to be on the safe side use 85% instead of 95% and you get 850kcal. This is a more realistic estimate of how many calories you burned.

Summary: You can simply use the same number as the kJ. But if you want to be closer to the real value, use 85% of the kJ value (for those of us who are mathematically challenged, that's 0.85 x the kJ value).

If you're trying to keep your weight stable, you'll need to replace all the calories that you burned. If you're trying to lose weight, you'll want to replace some but not all of those calories. If you're trying to gain weight, you'll need to eat more than you burned. Keep in mind that you also need to replace the calories your body uses to run your body (i.e. breathing, heart beats, running your kidneys, etc.). For most women, this equates to roughly 1800-2000 kcals per day, and for most men it's around 2500 kcals per day.

Eating and drinking while you ride is extremely important, even if you're trying to lose weight. Without adequate energy and fluid you won't be able to perform at your best, and you won't be able to make the most of your training. If you underfuel consistently, your fitness is likely to suffer. If you dehydrate, your heartrate is likely to drift upwards as your ride progresses, meaning that it will take you more effort to produce the same power (this is called "cardiac drift"). This is a particular risk when it's hot out. Make sure you replace not just your fluids, but your electrolytes (salts) as well. Sports drinks are a good way to do this.

An easy way to spot whether or not you had cardiac drift during a ride is to look at the SRM file in Analysis view. If the dark blue and purple squiggles are significantly higher than the yellow and red squiggles (as shown in the file below), then your heartrate was higher for the same power at the end of your ride than at the beginning. This may have been caused by dehydration, so make sure you drink more fluids while you ride in the future.
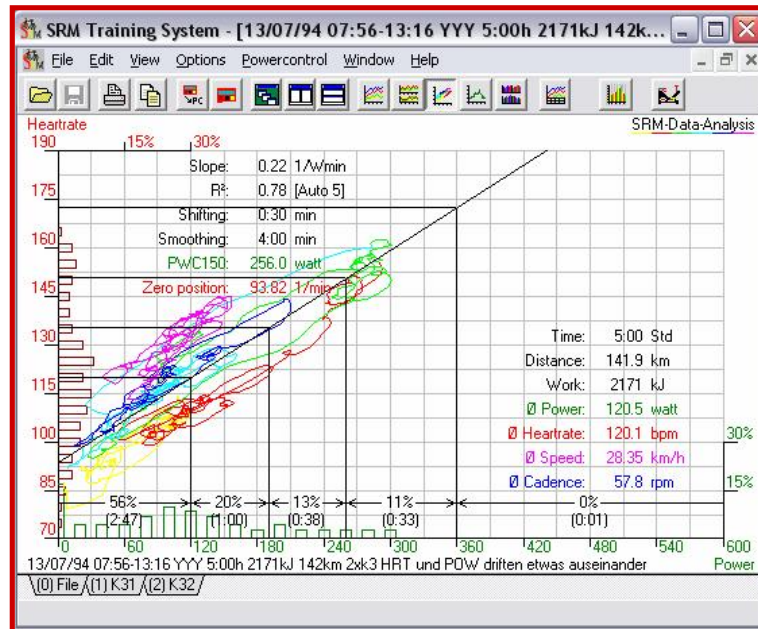
While good sports nutrition can help you reach your potential, it can't make you a champion. However, BAD sports nutrition can take a potential champion and make them look ordinary. If you really want to see how good you can be, make sure you get good advice from an accredited professional, or at least read up on it yourself. It can make a difference to your performance!

Part VII: How does the SRM Training System work?

Operating principles (or "how does this thing work, anyhow?")
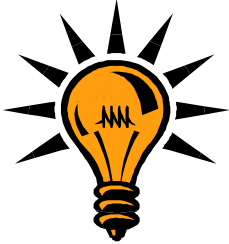
The SRM Training System measures POWER, which is, according to physics, the rate of energy conversion (in Joules/second (J/s), or Watts (W)). For those of us who aren't born physicists, it can be easiest to think in terms of light bulbs, since that's usually the only experience of "Watts" that we have.

Since power is a measure of energy over time, you have to measure both. In terms of cycling, this means you need to know how hard you're pushing on the pedals (this is called "torque", which is just energy that's being pushed in a circle), and how fast you're doing it (i.e. your pedalling cadence).
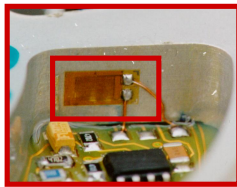
SRMs measure torque using strain gauges, which are bonded to the metal on the inside of the PowerMeter. When they're powered by the battery inside (so, when you've spun the cranks a few times), they give off a constant electrical signal, in volts. By the way, this is the "zero offset" of the PowerMeter. When the metal bends (as it does in all cranks, whether you measure it or not) as you pedal and the bike chain provides resistance, the strain gauges stretch and give off a higher electrical signal. How much higher is determined by the PowerMeter's unique "slope". All of this gets measured as volts, amplified, and converted into "frequency" (Hz) inside the PowerMeter.
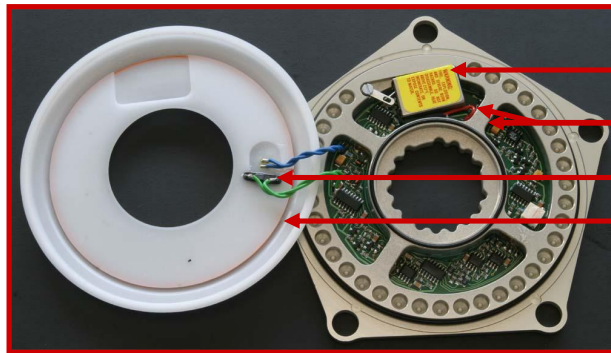
- Battery
- Strain Gauges
- Reed Switch
- Transmitter Coil

The cadence is measured by something called a "Reed Switch". This is basically just two very fine wires that normally rest side by side, not touching. This switch is glued to the inside of the plastic lid of the PowerMeter, you can usually see it – it looks like a little black blob. When you pass a magnet past a Reed Switch, the two wires are pulled together by the magnetic force, and they touch, just for a moment, completing an electric circuit and creating a pulse that the PowerMeter picks up. When you pedal with your SRMs on your bike, the Reed Switch gets tripped once per pedal revolution, as it passes the magnet in the power sensor, and that's how your cadence is measured.

The energy (as "frequency") and time (as "angular velocity", or cadence) information are sent to the power sensor as one signal. This signal is "pulse width modulated", which means that the two bits of information are put together as electrical blips. These blips will happen as often as the frequency, and for as long as the cadence. The information is passed by an inductive transmitter (which generates a very small electrical field), which is coiled around the inside of the PowerMeter's plastic lid. You can see it too, it's a circle of

copper wire that you can see through the plastic. The signal is sent nearly constantly (every 5 milliseconds, or 5hz) by the copper coil in your PowerMeter to another copper coil in the power sensor on your bike frame. All of this information is then transferred to your PowerControl by the sensor cable.

The amount of information passed from the PowerMeter to the PowerControl is massive, too much for the PowerControl to store, so it converts the raw data into power. It deciphers the "pulse width modulated" signal, and averages the torque over each pedal revolution. It multiplies this by the cadence to give you your power reading, according to the following calculation:

$$P = T\omega = [(f_{loaded} - f_{zero\ offset})\ \nu 2\pi\ /\ F_{cal}\ 60]$$

Where:

- P = power (Watts)

- T = torque (Nm)

- ω = angular velocity (rad^{-1})

- f_{loaded} = frequency output of PowerMeter when a known load is applied (Hz)

- $f_{zero\ offset}$ = frequency output of PowerMeter when no load is applied (Hz)

- ν = cadence (revolutions per minute)

- Fcal = calibration factor, or "slope" of the PowerMeter (Hz/Nm)

Other Data

There are other variables that you can measure with the SRM Training System other than power and cadence, such as:

- Heartrate (if you are wearing a compatible heartrate belt)

- Speed

- Distance

- Mechanical energy, or "work", in kilojoules (kJ)

- Time (i.e. duration of your ride)

- Temperature

- Date

Heartrate is measured by a Polar heartrate belt, which sends out a radio signal that is picked up by the PowerControl. Because radio signals are affected by electricity, if you ride near high-frequency power lines or electricity substations you may get interference in your heartrate data.

Speed and distance are both calculated using the wheel magnet and the "circumference of tire" measurement that you entered into the PowerControl when you set it up. The wheel magnet passes the wheel sensor once per wheel revolution, so the system knows how many times the wheel has turned. For distance, it simply multiplies this by the tire circumference to tell you have far you've travelled. To calculate speed, it takes the distance and divides it by time. For your ride as a whole, it will divide the total distance by the total time. Out on the bike, speed is measured and calculated every wheel revolution, but to make it clearer to read on the PowerControl the data is averaged over 3 seconds. The screen is updated each second. As with power, only the final information is saved, not the raw data used to do the calculations.

Mechanical energy, or "work" in the physics sense of the word, is power multiplied by time. So, the PowerControl simply multiplies the total power you've produced, either for your whole ride or for an interval that you've done, and multiplies it by the time taken to produce it.

Temperature is measured by a thermocouple inside the PowerControl. It measures the temperature inside the PowerControl box, so if you leave it in the sun then the inside of the box will heat up to higher than the ambient temperature and your temperature reading won't be correct.

Time and date are measured by a timing chip in the PowerControl. You can set the time of day and the date once , and the PowerControl will keep track of them until it's battery dies. The timing chip is also used to measure elapsed time while you ride.

Functional Diagram of the SRM Training System

For the engineers out there...
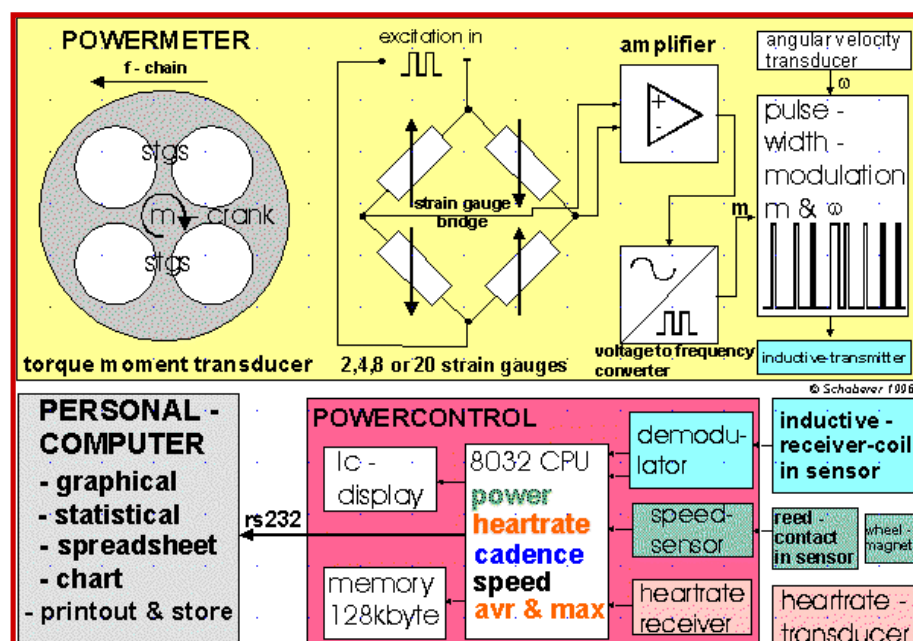
Part XV: Technical Specifications

PowerMeter (power measuring	Amateur Road Version	Professional Road, MTB, Track Versions	Science Road, Track Versions
Materials:	Aluminium (7075), glass fibre reinforced plastic	Aluminium (7075), glass fibre reinforced plastic	Aluminium (7075), glass fibre reinforced plastic
Diameter of pitch circle (chainrings):	130mm, 110mm	130mm, 110mm 144mm (track)	130mm, 110mm 144mm (track)
Chainrings:	38-46 & 50-61 (standard 53/39)	38-46 & 50-61 (standard 53/39), compact 50/34	38-46 & 50-61 (standard 53/39)
Crank Lengths:	165 - 180mm	165 - 180mm	165 - 180mm
Crank Manufacture:	Shimano Octalink / Durace (2002) / Ultegra 9-speed,, Campagnolo	Shimano Octalink / Durace (2002) / Ultegra 9-speed,, Campagnolo	Shimano Octalink / Durace (2002) / Ultegra 9-speed,, Campagnolo
# of Strain Gauges:	2	4 (Road/Track)	8
Cadence Operational	20 - 255 rpm	20 - 255 rpm	20 - 255 rpm
Power Operational	0 - 4800 Watts	0 - 4800 Watts	0 - 4800 Watts
Accuracy:	±5%	±2%	±0.5%
Signal Transmission:	Inductive	Inductive	Inductive
Service Life:	>2000 hours	>2000 hours	>2000 hours
Weight (175mm crank,	840g	773g (square taper) - 843g	836g
Watertight:	Yes	Yes	No

Special PowerMeters (power measuring	FSA	Shimano Dura-Ace 10-speed compatible	Cannondale Hologram Si
Materials:	Aluminium (7075), glass fibre reinforced plastic, carbon	Aluminium (7075), glass fibre reinforced plastic	Aluminium (7075), glass fibre reinforced plastic
Diameter of pitch circle (chainrings):	130mm	130mm	130mm
Chainrings:	Standard 39/53 / compact	Standard 39/53	Standard 39/53
Crank Lengths:	170, 172.5, 175mm	170, 172., 175mm	170, 172., 175mm
Crank Manufacture:	FSA	Shimano	Cannondale
# of Strain Gauges:	4	4	4
Cadence Operational	20 - 255 rpm	20 - 255 rpm	20 - 255 rpm
Power Operational	0 - 4800 Watts	0 - 4800 Watts	0 - 4800 Watts
Accuracy:	±2%	±2%	±2%
Signal Transmission:	Inductive	Inductive	Inductive
Service Life:	>2000 hours	>2000 hours	>2000 hours
Weight (175mm crank,	786g including axle	812g including axle	657g
Watertight:	Yes	Yes	Yes

PowerControl V (bicycle computer)	Amateur	Professional	Science
Weight:	80g	80g	80g
Size:	53 x 80 x 15mm	53 x 80 x 15mm	53 x 80 x 15mm
Storage Capacity:	128kb, 72 hours	128kb, 72 hours	128kb, 72 hours
Service life with fully	31 hours	31 hours	31 hours
Interface for Windows PC	RS 232 / USB	RS 232 / USB	RS 232 / USB
Heartrate Sender:	Polar T61 or WearLink / Pre Nov '05: Polar uncoded or Suunto	Polar T61 or WearLink / Pre Nov '05: Polar uncoded or Suunto	Polar T61 or WearLink / Pre Nov '05: Polar uncoded or Suunto
Variables measured:	Power, heartrate, speed, distance, time, energy. All maximum and average values.	Power, heartrate, speed, distance, time, energy. All maximum and average values.	Power, heartrate, speed, distance, time, energy. All maximum and average values.
Online Option available (Simultaneous data transmission to PC)	On request	On request	On request
Torque Option available (analyze pedalling	Not available	On request	On request
Colour:	Red, blue, black, yellow	Red, blue, black, yellow	Red, blue, black, yellow
SRMWin Software			
Data export	Yes, ASCII	Yes, ASCII	Yes, ASCII

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