



**Generation III
Pairing and Operating Instructions
For ANT+Sport DFPMs**

**CinQo, SRM Wireless, PowerTap
ANT+
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Firmware 400+**



INTRODUCTION

The iBike® Aero and direct force power meters (DFPMs) using ANT+Sport wireless communication now work together to open a new world of competitive cycling possibilities. Marrying together the iAero's patented method of opposing force power measurement with a corresponding DFPM measurement makes it possible for cyclists to obtain power *and* aerodynamic information *together, at the same time, at all times* during their rides. Additionally, for the first time ever, cyclists can see during their ride a continuous display of aerodynamic drag coefficient (CdA) and the Time Advantage™ implications of changes in riding position.

These instructions will cover the pairing and calibration aspects of the iAero® power meter and compatible DFPMs. For details on the use of your iAero and DFPM to obtain Continuous CdA and Time Advantage measurements, please consult the iAero Manual, located on your iAero CD.

Requirements

To use your iAero and ANT+Sport DFPM together requires the following:

iBike Aero Gen III power meter head

Firmware 400+ installed in iAero

iBike Wireless Mount (either stem mount or handlebar mount)

iBike wireless speed sensor or Garmin combined speed/cadence sensor (use of Garmin sensor requires iBike G firmware, sold separately)

iBike 3 software

ANT + Sport DFPM (Quarq CinQo, SRM Wireless, or PowerTap ANT+)

INSTALLATION

When using the iAero/DFPM combination it is NOT necessary to use an iBike cadence sensor. This is because the cadence data is measured by the DFPM and is displayed on the iAero screen and recorded in the iAero ride file.

Therefore, install the iAero and iBike speed sensor *only* (or, if you are using iAero G firmware a Garmin speed/cadence sensor) according to the directions in the iAero Manual, available on your iAero CD.

Install the DFPM according to the directions provided by the manufacturer. Make sure to correctly position and install the DFPM's cadence magnet!

IAERO/DFPM PAIRING INSTRUCTIONS

The pairing process is extremely simple:

- 1) Install your iAero, speed sensor (iBike or Garmin) and DFPM on your bike
- 2) With the iAero, go to Setup/WLS CFG
- 3) Set WLS to "On" then press the center button
- 4) Set SPD to "Find" then press the center button
- 5) Set CAD to "None" then press the center button
- 6) If you're using an HR strap, set HRT to "Find" then press the center button
- 7) Set Pin (power in) to "Find" then press the center button. The "Power In" setting set to find means that the iAero will look for an incoming power signal being sent by the DFPM.
- 8) If you wish to smooth the DFPM watts display on your iBike screen, set Smooth to "On"
- 9) Confirm that PCAL is set to idle (this is the default position) and then press the center button. PCAL is the function that calibrates the DFPM. After the DFPM is paired the calibration process will be performed.
- 10) The iAero will now be on the WLS CFG screen. Press/hold the top arrow to exit setup. Fasten your iAero to your wireless mount. Your iAero is now ready for the pairing process
- 11) Start pedaling. Once you do so Within a few seconds you'll see the messages "SPD FOUND", "CAD FOUND", "HRT FOUND", "PIN FOUND". Your iAero is now paired with your speed sensor and with your DFPM!

IMPORTANT: DURING THE PAIRING PROCESS YOUR IAERO WILL "HEAR" ANY ANT+SPORT THAT IS TRANSMITTING A PAIRING SIGNAL. THEREFORE, MAKE SURE TO PERFORM THE PAIRING PROCESS ONLY WHEN THERE ARE NO OTHER IBIKE, GARMIN, CINQO, WIRELESS SRM, PT ANT+ OR OTHER ANT+SPORT SENSORS NEAR YOUR BIKE EXCEPT YOURS! ANY EXTRANEIOUS ANT+SPORT SENSORS SHOULD BE AT LEAST 30 FEET AWAY.

DFPM CALIBRATION PROCEDURE

Once you've paired your iAero to your DFPM a simple calibration procedure needs to be performed to calibrate your CinQo or SRM Wireless DFPM. Here is how to calibrate your DFPM:

- 1) Awaken all your wireless sensors.
- 2) Spin the DFPM crank backwards a few times. This awakens the DFPM.
- 3) Attach your iAero to your wireless mount.
- 4) Start riding your bike. In a few seconds you'll get the messages "SPD FOUND", "CAD FOUND", "HRT FOUND", "PIN FOUND"
- 5) After finding your wireless sensors, enter the iAero's Setup screens, go to WLS CFG, and press the center button of the iAero repeatedly until you find the screen PCAL/IDLE
- 6) Click the up arrow of your iAero. You'll see the message "PCAL/START". Your iAero is now ready to start the calibration process of your DFPM.
- 7) To perform the calibration procedure, press the center button of the iAero. You'll see the message "PCAL/PROC" (power calibration process). In a few seconds you'll get the message "PCAL/DONE" (power calibration done).
- 8) If the calibration process does not work properly you'll get the message "PCAL/FAIL". If this happens, spin backwards your DFPM crank a few times, then repeat steps 6 and 7.

That's all there is to it!

IMPORTANT: YOU MUST CALIBRATE YOUR DFPM PRIOR TO EACH RIDE.

IMPORTANT: YOU MUST PERFORM THE IAERO TILT AND WIND OFFSET CALIBRATIONS PRIOR TO EACH RIDE.

CALIBRATING YOUR IAERO AND DFPM TOGETHER FOR CONTINUOUS CDA MEASUREMENT

The calibration procedure for the iAero/DFPM combination is COMPLETELY DIFFERENT FROM ANY PREVIOUS IBIKE CALIBRATION PROCEDURE:

- a. Tilt calibration is the same, but
- b. NO COAST DOWNS ARE REQUIRED
- c. A single calibration ride, 4 miles long, IS REQUIRED
- d. The 4-mile ride is analyzed in iBike 3 software.
- e. Baseline (normal) aerodynamic and frictional drag coefficients are determined by the iAero/DFPM data

Here is the calibration procedure:

- 1) Set up your iAero and DFPM on the bike and pair them
- 2) Perform a tilt calibration. Be careful and take your time. Mark the places where you'll turn the bike.
- 3) VERY IMPORTANT: before starting your calibration ride make sure your iAero has adjusted to the outdoor temperature. Proper wind speed measurement is critical to best results, so BEFORE you start calibrations, ride around with your bike for 10 minutes to let your iAero adjust to outdoor conditions.
- 4) Be certain that you perform the Wind Calibration carefully before beginning your calibration ride.
- 5) If your Tilt and Cal Wind are performed more than 30 minutes prior to the start of your Cal Ride, after starting the Cal Ride steps you'll need to repeat these important calibrations.
- 6) Make sure the DFPM has had its PCAL calibration completed. If your DFPM calibration is incorrect then ALL the data from your iAero will be wrong, too!
- 7) Once your iAero and DFPM are ready, do a two mile calibration ride with the Cal Ride step found in your Setup screens.
- 8) When you've completed your calibration ride use the "Profiles/Download Coast-Downs & Calibration Ride" command data to analyze your results. The iBike 2 will compute aerodynamic and frictional drag coefficients based on the DFPM and iAero data captured during the calibration ride.
- 9) And, VERY IMPORTANT, after you've done the analysis click the

"Accept Profile and send to iAero" command to UPLOAD your analyzed results to your iAero. If you forget this step then ALL YOUR HARD WORK WILL BE MEANINGLESS!

Your iAero and DFPM are now ready to measure power, Continuous CdA, Time Advantage, and all other iAero measurements.

Note that iAero Continuous CdA measurements are read out to two significant digits.

USING YOUR IAERO/DFPM ON THE ROAD

Once your sensors have been awakened and you've calibrated your iAero and DFPM you're ready to ride.

Remember that, to conserve battery life, wireless sensors will turn off after a few minutes. When this happens you'll get a message on your iAero naming the sensor that has gone to sleep (for example, "Pin Fail" means that the DFPM has gone to sleep).

Whenever you start riding your iAero will pair automatically with your wireless sensors.

iAero/DFPM Data Display

While riding here is what you'll see:

Bike computer screen: Speed/Distance/Time. All data displayed are based on iAero measurements.

Power Screen (CdA off): Speed/Power/Cadence-HR. **The power and cadence data displayed on the iAero screen are measured by the DFPM.** However, the iAero is recording iAero AND DFPM data together.

Power Screen (CdA on): Speed/Power/Cadence-HR-CdA-Time Advantage. The power and cadence data displayed on the iAero screen are measured by the DFPM. CdA and Time Advantage data are measured by the iAero and DFPM together.

REMINDER: To use the Continuous CdA and Time Advantage feature of your iAero/DFPM combination, enter Setup, scroll to CdA, use the up arrow set CdA/On, then press the center button to accept.

IMPORTANT: WHEN USING THE CONTINUOUS CDA AND TIME ADVANTAGE FEATURES, FOR BEST RESULTS IT IS ESSENTIAL THAT ALL CALIBRATIONS BE PERFORMED CAREFULLY. CONSULT THE IAERO MANUAL FOR DETAILED CALIBRATION INSTRUCTIONS.

USING THE iAERO/DFPM FOR AERODYNAMICS MEASUREMENT

The iAero provides accurate and useful aerodynamic data as well as accurate and useful power data.

As is the case with any measurement instrument, knowing how the iAero works will help you understand when it is providing you maximum-accuracy data, and when won't be as accurate.

The governing principle is this: the force applied to the pedals is equaled by the forces opposing the bike's forward motion (Newton's Third Law).

The iAero measures opposing forces: opposing gravity (hills), opposing acceleration (inertia), opposing wind, and opposing friction. These opposing forces slow down the bike and the cyclist applies forces at the pedal that *precisely* equal the opposing forces, moment-by-moment.

For aerodynamic measurements, applied *and* opposing forces must both be known. Why? When applied *and* opposing forces are known *simultaneously*, then drag coefficients can be determined in a straightforward manner.

The iAero measures two different but related kinds of aerodynamic drag coefficients, based on two different ways of measuring applied forces:

- 1) Snapshot CdA™. Whenever you're coasting the applied force is known exactly (it's zero!). The rider holds his position still and the iAero measures opposing forces while coasting (say, while coasting down a hill). The aerodynamic drag coefficient is measured as a "point-in-time" snapshot. Snapshot CdA is very similar to what is measured in a wind tunnel.
- 2) Continuous CdA™. In this situation both an iAero AND the DFPM are on the bike, with the DFPM providing applied-force information to the iAero. The DFPM provides continuous, accurate applied force data to the iAero. The iAero compares DFPM data to opposing force data and computes drag coefficients continuously, *in real time*. The restrictions of Snapshot CdA do not apply: you can be pedaling, changing ride

position, even changing clothing. Continuous CdA provides constant updates on your CdA, and provides the basis for an amazing new measurement called Time Advantage™.

Needless to say, in either measurement scenario lots of fancy physics and computations are going on inside the iAero.

IMPORTANT

Aerodynamic measurements are tricky to make, especially outdoors. There are situations when the iAero/DFPM will work very well, and others where it will have trouble. Here they are:

iAero drag coefficient and Time Advantage measurements are best when:

- 1) iAero calibrations are performed properly (!)
- 2) Tilt calibration is correct (should not be an issue unless your mount is loose or you've adjusted your handlebars)
- 3) Wind offset is performed before the ride, *after* the iAero is acclimated to outdoor temperature
- 4) You're doing a solo ride (not in a pack)
- 5) The pavement quality is the same as that used in the calibration ride
- 6) Cross-winds are small
- 7) Temperature is reasonably constant during ride
- 8) Bike is working properly (i.e. brakes aren't rubbing on the wheels, tires are inflated properly)
- 9) (DFPM ONLY) your DFPM is calibrated properly and working properly

iAero drag coefficient and Time Advantage measurements aren't as good when:

- 1) You're drafting
- 2) when you've performed the setup calibrations improperly
- 3) you do not perform wind offset properly before the ride
- 4) road conditions are significantly different from your calibration ride (e.g you calibrated on asphalt but you're riding on a sandy beach)
- 5) ride temperatures change by 20F or more during the ride
- 6) Your bike's condition has changed significantly (e.g tire pressure is low)

SUMMARY: YOUR IAERO WORKS BEST WHEN 1) IT IS SET UP AND CALIBRATED PROPERLY; 2) YOU'VE CHECKED TILT AND PERFORMED A WIND OFFSET CALIBRATION PRIOR TO YOUR RIDE; 3) YOU'RE RIDING SOLO; 4) ROAD CONDITIONS ARE SIMILAR TO THOSE OF YOUR CALIBRATION RIDE

USING CONTINUOUS CdA AND TIME ADVANTAGE ON THE IAERO

Once you've set up your iAero and DFPM you can ride as usual:

- 1) All traditional functions, measurements, and screens of the iBike are unchanged.
- 2) To enable on-screen CdA display, go to Setup/CdA. Press the center button, click the up arrow to set CdA "On", and click to accept.
- 3) With CdA "On", the bottom window of your Power Screen will alternate between cadence, heart rate, Continuous CdA, and Time Advantage.
- 4) When viewing the Power Screen, the power number displayed in the middle window is the power reported by the DFPM.
- 5) Ride files will contain both iAero and DFPM information.
- 6) When bike speed is less than 15 mph Continuous CdA displayed will be your baseline value.
- 7) When bike speed is less than 15 mph or total opposing wind speed is below 5 mph, Time Advantage will not be changed.
- 8) To reset Time Advantage to zero, perform a Trip Reset.

Other important things to remember:

- 1) Continuous CdA and Time Advantage measurements are most accurate *when riding solo*.
- 2) Continuous CdA and Time Advantage measurements probably won't be accurate when riding in a pack.
- 3) Continuous CdA and Time Advantage measurement accuracy will be adversely affected by changes in frictional drag. For example, if you go from normal pavement to soft dirt your CdA and Time Advantage measurements will be inaccurate while you ride in the soft dirt.
- 4) For maximum accuracy you MUST be sure to let your iAero acclimate to outdoor temperature AND to perform a wind offset calibration prior to each ride.
- 5) Make sure to zero-offset your DFPM prior to your ride.
- 6) Remember: the accuracy of the iAero/DFPM is highly dependent upon proper setup, calibration, and use.