

INNOVATIVE TIMING SYSTEMS, LLC



Engineering and Product Specifications



Jaguar Advantages

- ✓ Low-cost disposable timing chips (tags)
- ✓ No messy mats that can cause problems
- ✓ Highly redundant design
- ✓ Compliant with UHF Gen 2 protocols
- ✓ Anti-collision technology
- ✓ Up to 8 hours on battery
- ✓ Up to 500,000 tags with up to 250 million reads
- ✓ Dual on-board processors
- ✓ DSP signal processing
- ✓ SNMP management
- ✓ Reads tags up to 30 feet
- ✓ No tuning required
- ✓ Hardened case
- ✓ Supports worldwide standards including America, Europe, Asia, and Africa

The Innovative Design

The Jaguar platform uses a powerful tag that doesn't suffer from electrical interference often experienced with competing systems. With our solution, there's no need to become an electrical engineer and worry about tuning antennas or mat placement. Jaguar uses a multi-frequency hopping technology that can automatically select a single frequency from over 50 available, to ensure that read speed is reliable and fast. This happens in real-time and you never have to worry about it. With antennas that can be placed overhead or beside your course, you also don't have to worry about the ground conditions, level surfaces, or the weather. Unlike most systems that have a maximum tag read range of 3 feet or less, Jaguar can read the tag from as far as 30 feet away! Need a finish line that's 50 feet wide? No problem...and no need to buy a truckload of mats. Jaguar can handle any size start, split, or finish line. What's more, you can have a race on an open road because our system doesn't require mats on the ground. That's just the beginning though.

Jaguar is a fully redundant platform that's designed to read chips as quickly and as often as possible. Unlike mat based systems that can lose reads if a mat fails, Jaguar uses an overlapping RF field so that a single tag can potentially be read by multiple antennas and readers. In addition, the system is unique in that it provides the ability to capture the finish times for runners who have lost their tags. With competitors' systems, a lost tag simply means you have no finish time for that individual. With Jaguar, you'll have their finish time and you'll know that you've achieved your goal of outstanding race coverage. In summary, Jaguar can handle the most unusual problems that come up at a race.

The Jaguar system comes in a hardened case that's designed to protect it even in the harshest of environments. In addition, it can operate for up to 8 hours without external power, making it ideal for long races or marathons. The system can store up to 500,000 tags and it automatically backs up your data to minimize any chances of lost information.

Jaguar also supports Wi-Fi and wide area networking, allowing you to have results automatically sent to any computer at your race site. In short, the system is reliable, powerful, and comprehensive.

Note: The Jaguar system is constantly evolving and changing, so information in this document is subject to change without notice

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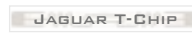
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The Innovative Tag



The Jaguar platform supports several different tag designs that are optimized for the type of race you are timing. For most running or cycling events, you'll use the Jaguar S-Chip. This is a powerful, yet disposable tag that is approximately ½ inch high by 3 inches long. It comes with an adhesive backing that is easy to apply to a race bib, bike tag, bike helmet, etc. For triathlons and swimming events, you'll use the Jaguar T-Chip. It uses the same processor technology as our S-Chip, but the size has been reduced to easily fit onto an ankle strap. The T-Chip has a slightly reduced read range, but this won't be of any concern as you'll see in the table on the adjoining page. Both chips utilize a multi-read protocol and operate on multiple frequencies, ensuring accurate reads at long distances. Furthermore, our tags don't suffer from the types of problems seen with other race timing systems. For example, our system uses advanced DSP filtering to minimize the problems caused by collisions, noise, weather, or nearby metal objects. Let's take a look at an example of how noise can impact other race timing systems.

Have you ever turned on your AM radio during a storm? You've certainly heard the static and interference caused by the electrical disturbances in the storms. In fact, you can hear this noise even when storms are hundreds of miles away. AM radio uses a frequencies in the 530 to 1,700Khz range. These are considered low frequencies and it's these low frequencies that can be greatly impacted by electrical power line noise, metal objects, weather, and other sources of radio interference. In fact, this noise can be even worse as you go lower in frequency...below the AM range. Many timing systems use frequencies in this range. Now let's examine what happens above the AM frequency range.

Have you ever heard of shortwave radio? It's used by thousands of people every day to hear radio broadcasts from stations in countries around the world. Popular stations include Voice of America, BBC, Radio Cuba, and Radio Moscow...just to name a few. These radio stations operate on numerous frequencies between 1.8Mhz to 21Mhz. You see, everything in these range of frequencies are often called shortwave. In addition, there are numerous other types of private and public stations that share these frequencies. The airlines use them, as do amateur radio operators. These frequencies are popular because they can carry a signal a great distance. However, there are also many challenges when using these frequencies. They can be impacted by the weather, electrical noise, solar flares, and other types of interference. Although these frequencies are less prone to interference than lower frequencies such as those in AM radio, these shortwave frequencies are still problematic when you need to communicate with absolutely no problems. So, what's the solution, and what does Jaguar do to overcome these problems?

Unlike other timing systems that operate in these lower frequencies, Jaguar operates in the 900 to 920Mhz range. These are called ultra-high frequencies (UHF) and they are absolutely ideal for chip timing systems. These frequencies are much cleaner and static-free when communicating. UHF frequencies, and those above them, are always chosen by companies and organizations that demand the best from their communication systems. These types of frequencies are used by the police, fire departments, military, NASA, satellite television, cell phones, and even in your wireless router in your office or home network. There's a reason why your laptop's wireless card, that provides you access to the internet, uses higher frequencies. They are efficient, clean, and reliable. In fairness, there is one drawback to UHF. It has a limited range of typically a few hundred feet to perhaps a few miles. That's why your cell phone may lose coverage if you get into a remote area. However, since our Jaguar tags only have to be read within perhaps 1 to 30 feet of the antennas, this distance limitation has no impact on our system. In summary, UHF is the only truly reliable frequency range for a timing system. That's why our system keeps right on working no matter what the weather looks like, no matter how many metal objects are near your finish line, and no matter how many electrical power lines are near your course.

When it comes to making a decision on purchasing a timing system, why not select one that uses cutting edge technology and a frequency range that's clearly the best. After all, your cell phone provider, your satellite television provider, and your laptop wireless card provider all chose these frequencies for the same reason. They're truly reliable in the most demanding environment.

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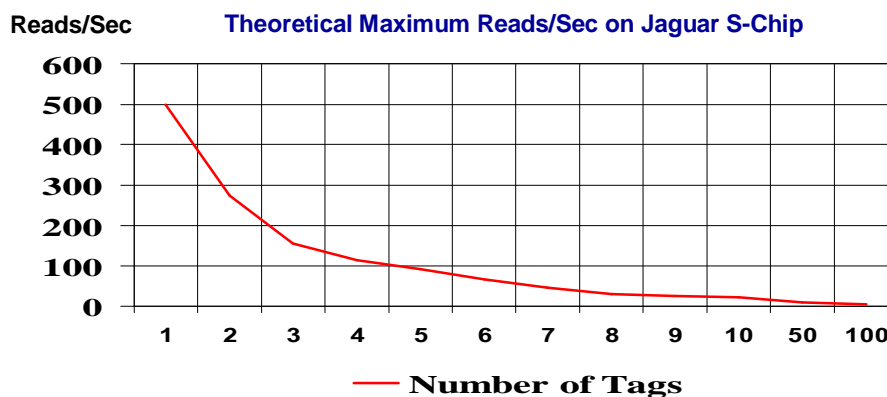
The Innovative Tag (continued)

Now that you understand the importance of frequency selection, let's take a look at the performance characteristics for each of the Jaguar tags. One of the most important differences between Jaguar and other timing systems is the incredible speed at which we can read our tags. While some of our competitors may claim they can handle high speeds, compare our numbers and decide for yourself. If you're timing a cycling event, it's crucial that your timing system can read the tag as the biker passes your finish line at speeds of 25 to 30mph. In some cases, you may need to read the tag at even higher rates of speed. The beauty of Jaguar is that it can read a tag at a maximum speed of about 500 times per second. In theory, this means you could read a tag coming through your finish line at a speed of 300mph. In reality, this is never going to happen. However, it's great to know that the system has this amount of raw speed and can handle your most challenging races.

The following are the individual tag performance characteristics:

Tag Type	Max Reads/Sec	Max Distance Readable	Max Speed Readable	Max Tags Read Simultaneously
Jaguar S-Chip	500/sec	30 feet	60mph	256
Jaguar T-Chip	500/sec	10 feet	45mph	256

The graph below indicates the maximum number of reads per second that will occur for each tag as the total count of tags increases. Let's examine this in more detail. Jaguar needs to be able to read the tag at least one time to ensure that we have an accurate start, split, transition, or finish time. In the chart below, you will note that when a single tag is placed near the Jaguar antenna, it is read 500 times/second, which is far more than needed. In the case of five tags, Jaguar reads each tag an average of 92 times. With 10 total tags, each one is read an average of 22 times. This chart begins to flatten as the system load balances to ensure that each tag is read at least one time. The Jaguar system uses a highly intelligent load balancing design that ensures that every tag is read at least one time. The theoretical maximum for the total number of tags that can be read in one second at a Jaguar finish line is currently 256. If you have a finish line that needs greater performance, our engineers can work with you to custom design a solution.



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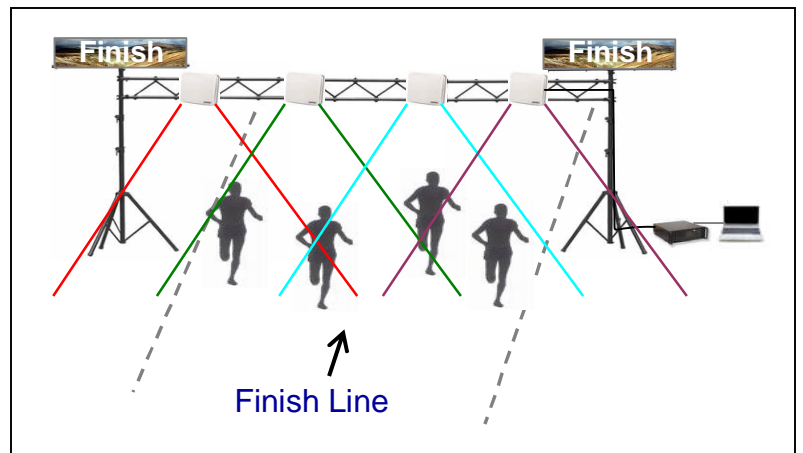
Engineering and Product Specifications

The Innovative Reliability

Jaguar was designed to provide extreme reliability and redundancy. After all, you can't afford to have a system failure ruin your race. Unlike older systems that use mats, Jaguar uses high-performance antennas that provide overlapping redundancy to maximize tag reads...even if part of the system fails. In addition, Jaguar uses multiple antenna fields, combined with multiple readers, to ensure that no single failure can ever cause you to lose critical race data. The following diagram provides a typical race configuration for a running event. Let's examine how Jaguar operates to fully understand and appreciate the incredible amount of reliability and redundancy provided by the system.

Notice in the diagram the colored lines that extend out from each antenna. These lines represent the area of coverage for that particular antenna. The Jaguar antennas are designed to provide a wide area of coverage to ensure that the runner will pass through multiple antenna fields as they cross the finish line.

In the case of the two runners who are close to the outside edges of the finish line, their tags may be read by two or more of the antennas. The two runners that are closer in will be covered by three antennas. Jaguar is designed to ensure that most runners will pass within the fields of three antennas the majority of the time. Thus, if a single antenna would fail for any reason, the other antennas would continue to read tags. Again, this is another reason why Jaguar is a better design for race timing. You don't have to worry about a mat failing and missing reads. Although the picture doesn't show it, Jaguar even uses multiple readers to ensure that a single reader failure can't cause you to lose race data. It's truly a highly redundant system. That said, let's consider the worst case scenario...the runner has lost their tag.



When a runner loses their timing chip with most systems, they simply don't get a time. Not with Jaguar. Our system provides you the ability to tell it that the runner just finished the race and that they have no tag. Not only that, Jaguar can actually figure out the race time for that participant and generate a report for all runners who finished with no timing chips! As you can see, we have thought of everything when it comes to making sure you achieve great success! The reason for our passion is simple...we're also athletes who have seen other timing systems fail to deliver world-class results. Furthermore, we use Jaguar to time our own races, and we want to have outstanding results for our participants.

The Innovative Flexibility

When it comes to race timing, we realize that you need maximum flexibility with your system. That's why we designed Jaguar to be very modular and scalable. You can begin with a single system that handles small races, and grow the platform to handle the largest of Marathons. The great news is that unlike systems that require cumbersome mats, Jaguar uses powerful antennas that can be placed above or beside a race course. Our Jaguar software is unlike anything you've ever seen for managing your race. It has a complete race database with real-time updates. It can send race results to cell phones. Need a finisher report every 5 minutes? No problem. Want race updates sent to the race director's laptop computer every few minutes? Again, no problem. In short, Jaguar is powerful, flexible, and it delivers outstanding results.