

# **What is Fully Automatic Timing (FAT) ?**

In simple terms, a Fully Automatic Timing (FAT) system consists of technology that allows a track race to be started and stopped automatically, thus eliminating human reaction time (and human error) from affecting the finish times. A true FAT system must have a mechanism that starts the clock at the exact instant that the gun fires and stop the clock at the exact instant that an athlete crosses the finish line.

Stopwatches are started by hand and stopped by hand. Likewise, even relatively expensive systems like the "Sprint 8," "Time Machine," "Chronomix," etc, are stopped and started by hand, thus producing "hand times" which cannot be considered accurate.

## **What are my options for FAT ?**

Prior to the mid-1990's, automatic timing was generally done by using an Accutrack system which took film-based, time-sequenced photographs of the finish. This was costly and time-consuming. Accutrack was rendered obsolete with the introduction of line-scan technology in the mid-1990's.

### **Line-Scan FAT Systems (Finishlynx)**

Line-scan FAT systems operate by using a very high-speed camera (generally 500-2000 frames per second) positioned precisely at the finish line. As competitors cross the finish line, this camera takes a series of very narrow (fraction of an inch wide) pictures. It will capture hundreds or even thousands of times per second, and computer software will then combine all of the images into a meaningful, time-sequenced picture of the race-finish. Most line scan systems can easily produce accurate results to one-one-thousandth of a second (0.001), even though track times are normally recorded to the hundredth. This allows for ties to be accurately broken by athletes in different heats.

In the United States, the primary manufacturer of this kind of system is Lynx System Developers, makers of the Finishlynx timing system. There are other companies with comparable products, but they are generally based outside of the USA – Omega (Switzerland), TimeTronics MacFinish (Belgium), Alge (Austria). Lynx systems may also be re-badged and sold under the distributor's name, such as Gill, Springco, & Nishi (Japan).

Line-scan systems are considered the gold-standard for FAT timing in track, and they are used for almost all major competitions. These systems can be fairly expensive, unfortunately, starting at around \$8000, not including computers. A typical setup that includes a color camera and wireless start system (both highly recommended) is likely to cost in the neighborhood of \$12,000 - \$15,000, not including computers.

## **Video-Based FAT Systems**

### **Pyro Bright Flash / Video Tape**

Also in the late 1990's, another new technology was introduced, the *Pyro Bright Flash* system. This setup utilized a scope that is pointed at the starter's pistol. When the gun is fired, the flash starts an internal clock, housed inside the scope. The signal would then be transferred to a VCR which recorded video footage from a standard camcorder as well as adding an overlaid time-stamp from the timing scope. An evaluator would then review the finish video, frame by frame and record the appropriate finish time for each competitor as he/she crossed the finish line in the video. This system was useful because it could record accurate times for a small fraction of the cost of a line-scan system or an Accutrack photo-finish system. The problem with this system, compared to high-end options, is not so much with "accuracy" as it is with "precision." Using a standard video camera and standard VCR, users are limited to recording at 29.97 frames per second; thus, times can only be recorded to the next higher 0.0333 seconds (properly rounded up to 0.04 seconds). It is also very common for competitors, especially in the sprints, to finish the race "between frames" of the video. Thus, their time will be recorded using the frame captured after they actually finished the race, giving the athlete a time that is 0.01-0.03 seconds slower than it should be.

### **Computer/Video Based Systems (Eagle Eye, Flash Timing)**

In recent years, companies have developed systems that have further improved upon this video-based technology. These newer options still utilize the Pyro Bright Flash as the base of the system, but instead of recording to video tape, the video signal is sent directly to a computer. This allows for a couple improvements over the early Pyro Bright. The newer timing software allows for direct integration with popular scoring software, such as Sydex and Hytek, sometimes eliminating the need for recording times on paper. Also if the proper type of camera is used (no HighDef, No Hard Drive-based, No DVD-based, no really old cameras), the new software can usually break each frame into two separate fields, essentially converting the video to 59.94 frames per second from the original 29.97 achieved with standard video equipment. Now times can be accurately recorded to the next higher 0.0168 (rounded up to 0.02) seconds. The issue of athletes finishing between frames still exists, but it is not as significant as before.

Video-based timing software and systems are sold by at least two US-based companies: Eagle Eye and Flash Timing. The Pyro Bright Flash system is available through these two companies as well as other track equipment retailers. A system of this type generally consists of the following components: Pyro Bright Flash, Video Camera, Digital Video Converter (usually firewire-based), timing software, and computer(s). Basic packaged systems are generally in the \$2500-\$3000 range. However, people who are very tech-savvy and understand exactly what they are buying could actually price-shop and piece together a comparable system for under \$1500, not including computers.

Video-based systems are not likely to replace line-scan systems for major competitions, but they can be a great way for high school programs to start hosting meets with basic FAT functionality.

The IAAF and USATF do not accept video-based times for records, seeding, or qualification purposes. The NCAA allows their use for seeding and qualification but specifically states that *Finishlynx* must be used for NCAA sponsored competitions. Video systems are only allowed to be used as a backup. At this time, the NFHS and the MHSAA have not officially defined what constitutes an “acceptable” FAT system. It is possible that some time in the future, those organizations may require 100 frames per second or higher (versus the 60 fps possible now). Line-scan cameras generally use 500-2,000 frames per second for running races and up to 10,000+ frames per second for motor sports.

Line Scan Systems (Finishlynx)	Video-Based Systems (Eagle Eye/FlashTiming)
<p><b><u>PROS:</u></b></p> <ul style="list-style-type: none"> <li>• Highly accurate. Can easily record times to the nearest 0.001</li> <li>• Used in most major competitions.</li> <li>• High quality components and technical support.</li> </ul> <p><b><u>CONS:</u></b></p> <ul style="list-style-type: none"> <li>• Initial cost can be substantial (easily \$8,000-\$15,000)</li> <li>• First time setup can be difficult.</li> <li>• Requires a moderate level of training to set up and operate properly.</li> </ul>	<p><b><u>PROS:</u></b></p> <ul style="list-style-type: none"> <li>• Relatively inexpensive</li> <li>• Possible easier setup.</li> <li>• Easier to move system if you have multiple finish lines.</li> <li>• May be able to utilize video camera and computers that you already own.</li> </ul> <p><b><u>CONS:</u></b></p> <ul style="list-style-type: none"> <li>• Although times are listed to 0.01 and even 0.001 digits, the precision of this technology is actually around 0.02. Times may be 0.01-0.02 seconds slow as a result of competitors finishing between frames of the video.</li> <li>• Computer requirements are more critical than for line-scan systems due to the bandwidth and large file size of the video being streamed to the computer. Slowdowns on the computer or network can cause frames to be lost and affect timing. Using the wrong type of firewire (or slower) connection can cause frames to be lost, as can the use of DVD-based &amp; Hard Drive-based cameras.</li> <li>• High definition cameras can not be used as they have lower frame-rates (24 fps) than standard video cameras.</li> <li>• Camera alignment is not as precise as on Line-scan systems, and can have small effects on times.</li> <li>• Pyro Bright Flash requires special shells to be used in the starters gun in order to insure that the timer is started properly.</li> </ul>

# I'm in. How can I pay for it?

First of all, you may not need to. It isn't necessary for every team in the state to have an FAT system. The MITCA proposals should in no way be seen as a "mandate" that every school convert to all FAT timing. It is felt, however, that championship caliber meets (Regionals) should utilize this technology.

*If FAT costs seem outrageous, ask yourself if your school's football coach would even think twice about spending that much money. Some of them spend thousands of dollars each year just on apparel for the coaches in their program. Our track athletes are just as deserving as those in other sports. We need to convince our athletic directors and communities of that fact.*

For track programs that are interested in moving forward by investing in an FAT system, there may be options available depending on individual circumstances.

**Rental** – If you only host one big meet per year, it may be more economical to spend \$1000 per year to hire a good FAT timing crew, rather than spend \$15,000 to purchase your own. Then you also have someone there to operate it as well. The cost to hire an FAT crew may vary greatly depending on the specific services you require.

**Start with a video system** – It's much cheaper, and you may be able to start saving for a Finishlynx over the course of a few seasons. Then you can keep the video system as a backup or sell it to another program.

**Share costs** – Conferences could pool resources. If each team in an 8-team league were to contribute \$2000, it would be easy to afford a fully-featured Lynx system, including computers and scoring software. Large districts with multiple high schools may be able to share a system between them.

**Bond money and Capital funds** – Are you installing a new track or resurfacing soon? Get a quote and try to include the timing system as part of the bond money for facility upgrades. Is there capital that needs to be spent before the fiscal year expires?

**Fundraising** – This is obvious, and we all do too much of it already; however, maybe you will need to spread the purchase over 2-3-4 years and save up. Or purchase in parts. Or buy a basic system and gradually upgrade over time. Ask your AD or booster club to match funds that your team raises. Look for donations, sponsors, even grants. Be creative!

# FAT is here...What to do with the times?

One snafu that always arises when coaches begin discussing the wider implementation of FAT timing is “what do we do about school records?” We understand that FAT times are accurate, and hand times are not accurate. Do we scrap all of our hand-timed records and start over? That’s likely to anger a lot of people. A wind-legal 10.98 in the 100m dash is a good, accurate time. How does it compare or rank with your long-standing (and presumably “inaccurate”) school record of 10.7 seconds, hand timed (or 10.69 hand...which “broke” the old record of 10.7)? These are real issues that coaches are already dealing with. 25 years ago, coaches had to figure out what to do as the sport transitioned from yardage tracks to metric tracks. At that time, the sport was at least dealing with fixed distances and the existing “conversion factors” were at least somewhat more meaningful than they are in this scenario. You can’t “convert” an inaccurate time into an “accurate” time...you can only make generalizations.

Many statistics will show that the long-standing conversion factors of 0.24/0.14 seconds are simply not in line with what we see in real-world situations. 0.4 seconds is much more realistic, but it is still just an average...not a constant.

If the number-crunching is not bad enough, coaches sometimes have to deal with a lot more factors than statisticians. Decisions can be strongly influenced by athletes (past and present), parents, previous coaches, program history, community perceptions, etc. This is an issue where one simple answer will not fit every situation, and may require a certain level of subjectivity. One thing should remain in the mind of every coach who undertakes this task: **The transition toward FAT timing need not undermine the validity of decades of valuable hand-timed history.**

Below are some possible guidelines that coaches may consider...these are by no means, steadfast rules. Coaches will need to make their own decisions based upon the unique circumstances of their own school and carefully consider the politics that may or may not surround it. These suggestions are designed to be relatively stats-conscious, but with a secondary goal of offending as few people as possible.

- If an FAT time is faster than a hand time (HT), then the FAT should be considered superior and listed as the only record. It should also be specifically noted as FAT, and not HT.
- If there is an FAT time that is within 0.5 seconds of a hand-timed record, list them both as records (noting which is FAT and which is HT) until there is an FAT time that is clearly superior.
- If there is a distance race listed with a .0 (1600m time of 4:17.0), there is a good chance that the decimal was simply dropped in the results (ie 4:17.6 rounded down and recorded as 4:17). In this case, you may consider listing any FAT time within at least 1 second and count them both as “records” until there is a single clearly superior performance to list.

*For most programs, it may be many years before they will have one clear-cut, FAT school-record in every event. Listing more than one performance as a “record” does not have to be a negative.*

- When comparing FAT to HT for yearly or historical listings, consider hand times to be around 0.4 seconds fast on average. If comparing HT & FAT on the same list, rank them accordingly (11.00, 10.7, 10.8, 11.25, 10.9, 11.0, 11.35, 11.1). Or, don’t “rank” them at all. List them in a logical order, but acknowledge that it is not an exact science. State and National rankings generally would not consider FAT & HT side-by-side for sprint races, but individual schools may not have enough FAT times to warrant listing them separately. Also, there will always be general interest in comparing performances from one athlete to the next.
- In Michigan, we don’t generally attend many meets with wind readings, but there are plenty of meets that are clearly wind-aided. Those marks should be designated as such, and generally should not be considered for record purposes. However, who is to say that the old record wasn’t wind-aided as well? It may have been. Coaches may choose to include faster wind-aided times (denoting them with a “w”) and list it along side of the “official” record. Again, listing more than one may be ok until you have a sure-thing.

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**All of the items in this pamphlet are for educational purposes, but may not necessarily represent fact in all cases. The information presented is largely from the research and experience of one coach, and you are encouraged to investigate further for yourself. An opinions expressed should not be attributed to MITCA, the MITCA Track & Field committee. This is also not intended to endorse any particular product.**