WinMark Pro Application Note

Optimizing Mark Speed

FH Flyer marking heads and Fenix Flyer Laser Markers are often integrated as part of a larger product manufacturing or packaging system. During the system development phase, mark files are created and tested as stationary marks in WinMark control mode until the desired quality and cycle time is achieved. When the transition is made from development to fully automated production and the full potential of laser marking is realized, there are often requests to further increase line speed and product throughput.

The *WinMark Pro User Guide*, the *FH Flyer Marking Head Operator's Manual*, and the *Fenix Flyer CO$_2$ Laser Marker Operator's Manual* all discuss how to optimize marking, especially Tracking, by choosing the best text type (stroke versus TrueType) and graphics type (vector versus raster) as well as adjusting variables like mark placement, size, and rotation.

Five other important factors that are often overlooked—object delays, Off Vector Velocity, automation timeout values (in Event Builder I/O), mark order, and Stand-alone operation—are the subject of this Application Note.

Object Delays

Except for the Pline Start Delay property, longer delay values tend to increase dwell time and slow overall cycle time. To optimize delay values (and mark quality), review each subsection below:

Important Note: When making adjustments to delay values, adjust only one delay property at a time.

Pline Start Delay

The default Pline Start Delay value for Flyer heads is 0 µs. In some cases this initial value is still too large for Flyer's high-speed optical scanners and results in polylines that are shortened or shapes that are not entirely closed. WinMark Pro versions v6.0.0.6654 and later have the ability to accept negative Pline Start Delay values. Depending on your material substrate and mark Velocity, optimum delay values may be in the range of –500 to –1000 µs. Refer to the *WinMark Pro User Guide* for further information about this property.

Note: Minimum cycle time is achieved when Pline Start Delay is 0 µs. Positive or negative values will increase cycle time slightly, although this slight trade-off in speed may be required to obtain a high-quality mark.

Pline End Delay

The default Pline End Delay value is 200 µs. For a given mark Velocity, reduce Pline End Delay until polylines become shortened or fail to completely close. Refer to the *WinMark Pro User Guide* for further information about this property.

Interseg Delay

The default Interseg Delay value is 75 µs. Reduce this value until the connections between polylines become too rounded to be acceptable. Refer to the *WinMark Pro User Guide* for further information about this property.

Off Vector Delay

The default Off Vector Delay value for Flyer heads is 250 μs. Reduce this value until you see noticeable "tails", or leading marks, at the beginning of a non-connected polyline. Refer to the *WinMark Pro User Guide* for further information about this property.

Off Vector Velocity Property

Off Vector Velocity is the speed of galvanometer movement between two non-marking polyline endpoints. For Flyer heads, the default value is 200 inches per second (IPS). Although this property is frequently overlooked, increasing Off Vector Velocity can substantially reduce cycle times and allow for increased line speeds in Tracking applications.

The maximum Off Vector Velocity allowed by WinMark is 600 IPS; however, for best results due to lens field size and deflection angle limits, the Off Vector Velocity values shown in Table 1 are recommended.

Table 1 Maximum Off Vector Velocity values

Lens Selection	Max Off Vector Velocity (IPS)
80 mm	195
125 mm	300
125HP mm	300
200 mm	480
370 mm	600

Automation Timeout Values

If your mark file uses multiple MatchDigitalState events (in Event Builder automation), check the *Timeout Msecs* values in the Event Builder dialog. The *Timeout Msecs* property determines how many milliseconds WinMark Pro waits for input bit status to match the specified value before returning a Boolean value of False. The input bit state is continuously scanned until the required bit pattern is matched *or* the timeout period expires. As soon as the input bit pattern matches the specified input state, any remaining timeout period is ignored and the next automation event is executed.

If you application requires a timeout value before executing a series of MatchDigitalState events, enter a timeout value in milliseconds for the *first* MatchDigitalState event only and set the *Timeout Msecs* value for remaining MatchDigitalState events to zero. This assures a consistent, timed response that is not dependent on the order in which the match is recognized.
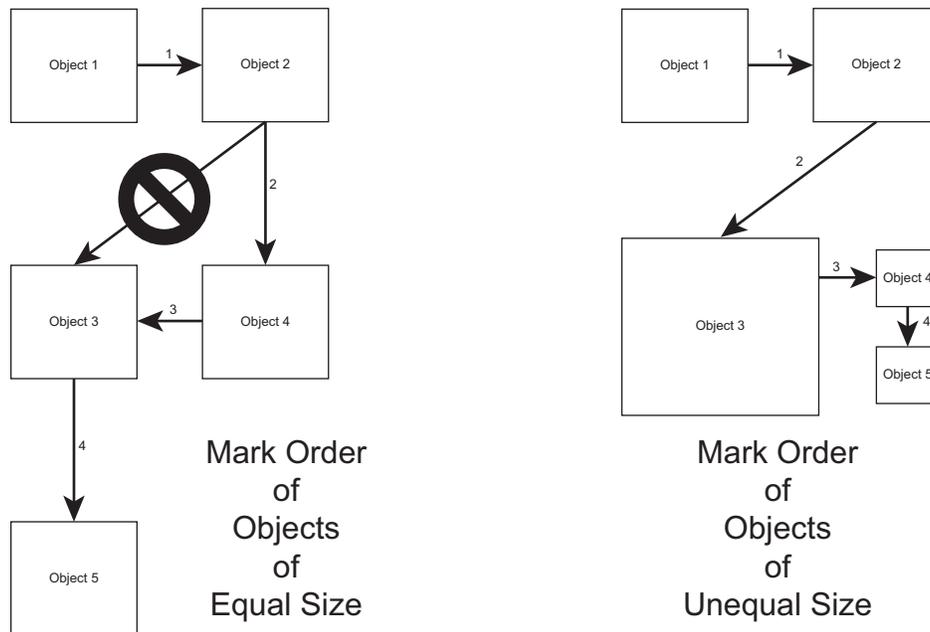
Mark Order

Optimizing the mark order of multiple objects in the .mkh mark file can reduce cycle times by decreasing the number of large off vector moves performed by the galvanometers. This is especially important in Tracking applications where cycle time reductions lead directly to increased line speed capability.

By default, the mark order is based on object creation, or importation. Each new object or imported graphic added to the *Drawing Canvas* is added to the mark order list in descending order. To re-order mark objects in WinMark Pro, go to the Objects Menu and choose Set Marking Order… . Highlight an object and then click the *Move Up* or *Move Down* buttons to relocate that object in the mark order list.

The goal is to mark an object, or group of objects and then move to the next closest object or group of objects in order to minimize long off vector galvanometer moves. As a general rule, the mark should proceed left to right and top to bottom (downstream to upstream in Tracking parlance). Figure 1 shows examples of very basic mark optimization schemes. Diligent testing with your mark files in your specific application is the only way to completely optimize a mark file due to the many variables involved.

In some special cases, even graphic files with large amounts of "white space" can be "exploded", grouped (as required), and optimized using the Set Marking Order… dialog.

Figure 1 Example Mark Order paths

Stand-alone Operation

In Stand-alone mode, Flyer heads operate autonomously with no connection to the WinMark computer, unless the user wants to <u>monitor</u> mark session progress. This mode of operation eliminates the data stream sent from WinMark Pro to Flyer every mark, leading to faster overall cycle times. See the *FH Flyer Marking Head Operator's Manual* or the *Fenix Flyer CO Laser Marker Operator's Manual* for details on Stand-alone operation.

Important Note:　　When operating in Stand-alone mode, do not set Mark On Startup to *Yes* until you have thoroughly tested any automation in the .mkh mark file.

For further information, contact SYNRAD at 1.800.796.7231; outside the U.S., dial +1.425.349.3500 or fax us at +1.425.349.3500. Send email to: support@synrad.com.