

On-The-Fly Trigger Delay – Reference Documentation

Purpose

The purpose of this document is to outline how users can apply a trigger delay to robotic On-The-Fly (OTF) jobs in order to vary the positional output of the laser. This may be necessary in instances where the trigger does not take place exactly where the user expects it too. For instance, triggers are often times slightly delayed from a robot program position simply because it takes the robot time to register that the digital bit must be set active/inactive. This ultimately can result in an offset of laser output from the users desired program location using the guide laser.

IMPORTANT A consistent trigger is required in order for OTF Trigger Delay to be effect. In most cases, a discrete IO connection is going to provide the most consistent trigger. Fieldbus interfaces will typically introduce latency and not provide a consistent trigger. In an example such as this, the OTF Trigger Delay would not be able to compensate for the inconsistent trigger.

Software

The following software is required for the use of OTF Timing Delay functionality.

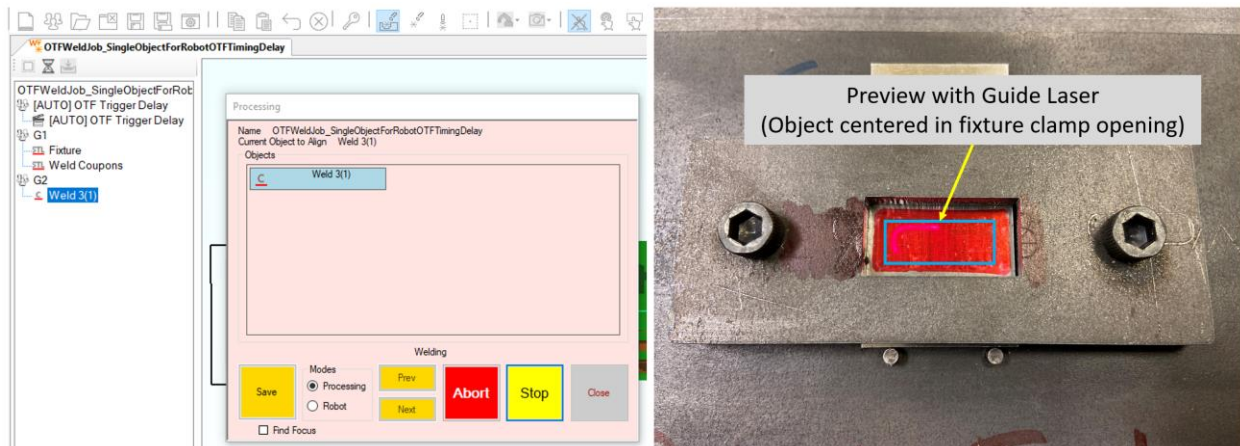
- IPGScan Suite Installer v1.0.0.15041 or greater

Procedure

The following steps outline a procedure that users can follow to utilize the OTF Timing Delay functionality and more accurately dial in the laser output to their programmed location. This process can either be completed by setting up a dedicated test (that uses robot and weld speeds similar to a production process) or by running multiple cycles on an existing system.

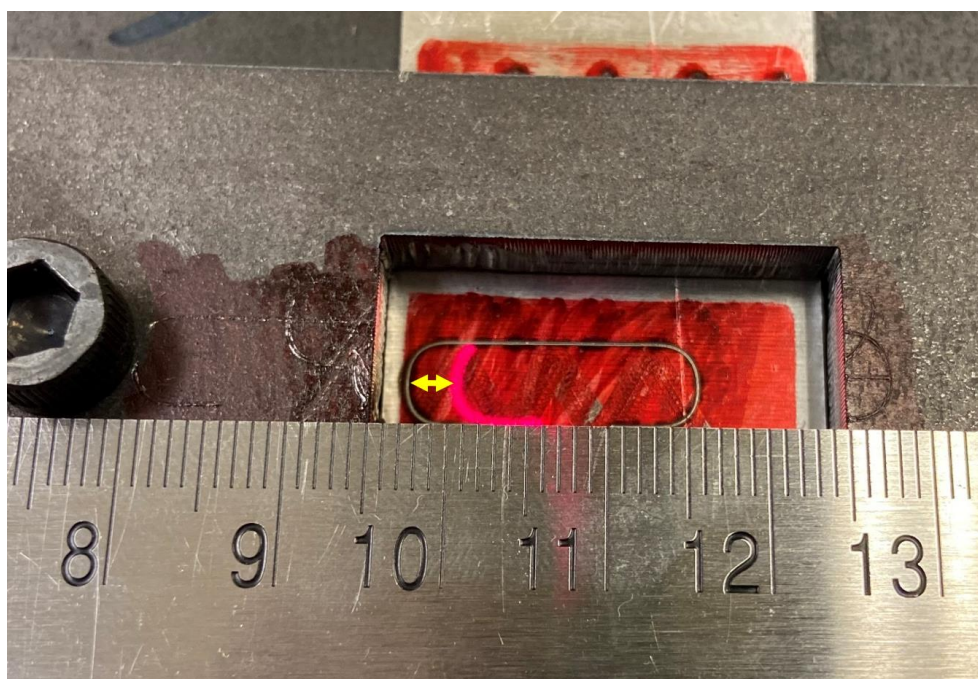
1. Start by examining and touching-up the program location of a given object using the guide beam. For OTF processes, this should be done using the Processing Window.
 - a. In this example, a staple shape weld is centered in the opening of a fixture clamp. See Figure 0-1.
 - b. It is good practice to save the robot position for this weld position. This will make it easy to return to this location later on in the procedure.

Figure 0-1 Placing a Process Object Using the Guide Laser



2. With the process object position touched-up, the OTF process can now be run with the laser.
 - a. Prior to cycling the actual equipment, be sure to perform a dryrun of the process to ensure the job will properly execute.
 - b. Take note of the robot travel speed for the OTF process. This value will be required for calculating the required trigger delay. In this example, a robot speed of 150mm/sec is used.
3. Once the process completes, reposition the head to preview the object placement with the guide laser (as outlined in step 1).
4. Measure the offset distance between the guide laser and the actual laser output. See Figure 0-2.
 - a. In this example, a distance of 3.5mm was measured.

Figure 0-2 Measuring the Offset Distance between the Guide Laser Projection and the Laser Output Position



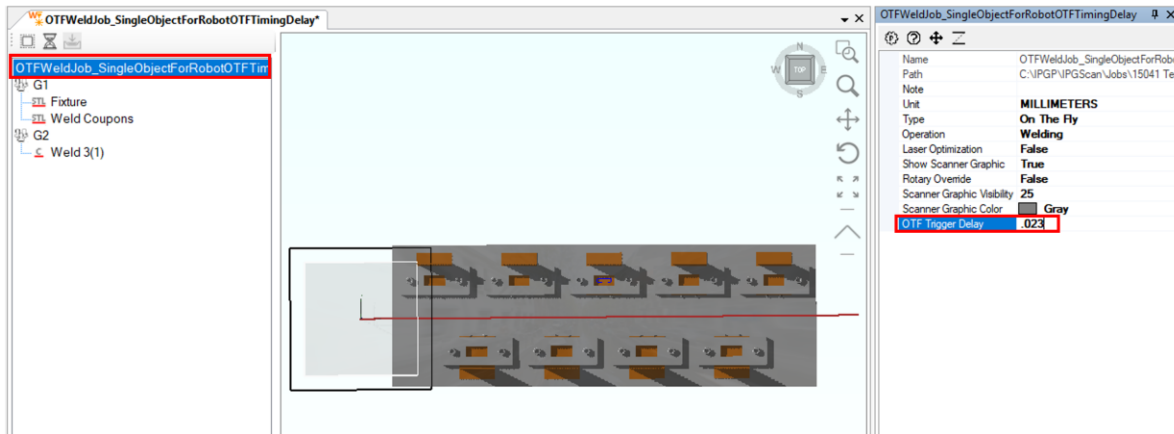
5. Perform the following calculation to determine the proper OTF Trigger Delay time.

a.
$$\frac{\text{Measured Offset [mm]}}{\text{Robot Travel Speed } \left[\frac{\text{mm}}{\text{sec}}\right]} = \text{OTF Trigger Delay [sec]}$$

- i. Measured Offset – This is the distance that is measured between the guide laser position and the real laser output.
- ii. Robot Travel Speed – This is the travel speed that the robot was moving at when the real laser output was marked on the part.
- iii. OTF Trigger Delay – This is the calculated value that will be entered into IPGScan.
- iv. Example:
$$\frac{3.5 \text{ mm}}{150 \text{ mm/sec}} = .023 \text{ sec}$$

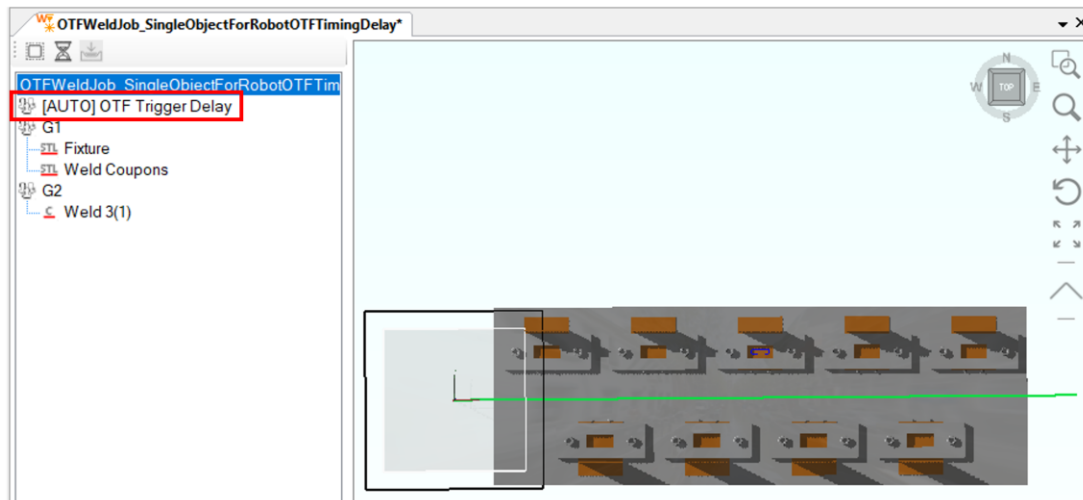
6. Enter the calculated OTF Trigger Delay time for the given OTF Job. See Figure 0-3.

Figure 0-3 Entering an OTF Trigger Delay for a OTF Job



- a. Once the OTF Trigger Delay is entered, users will notice that the robot trajectory is a different color and that a Group is automatically generated in the Job Tree. See Figure 0-4.

Figure 0-4 Auto Generated Group and Trajectory Color Change



7. With the OTF Trigger Delay added, cycle the process just as it was done in step 2.

IMPORTANT No robot program changes should have been made from step 2 to step 7. Any changes that may have been made could affect the process output and may result in unexpected results.

8. Once the process completes, reposition the head to preview the object placement with the guide laser (as outlined in step 1).
 - a. Here users should now notice that the new laser output is closer to the guide laser position or overlapping the guide laser position (see Figure 0-5). If some offset still exists, users can continue to modify the OTF Trigger Delay value to further dial in the process.

Figure 0-5 Laser Output Now Aligns with the Guide Laser Position

