Opening a Scanners Z Tolerance (Defocus) – Reference Documentation

Purpose

The purpose of this document is to outline how users can adjust the Z dimension of the scanners Field of View (FOV). By default, scanners ship with a Z tolerance of +/- 1mm from the nominal focus position. In other words, the total Z dimension of the FOV is 2mm.

When using a 2D scanner, if users wish to defocus the beam, the scan head either needs to be positioned closer to the work surface or further from the work surface. This ultimately changes the relative position of the focus plane in relation to the work surface. Furthermore, if IPGScan is unaware of this offset and if no scaling factor is applied to Process Objects within the IPGScan job, laser output will likely be dimensionally incorrect according to the specified parameters within the job. For this reason, adjusting the scanners FOV Z tolerance allows users to position Process Objects within IPGScan so they more accurately represent the Process Object location on the real world work surface in relation to the scan head. Ultimately, this results in the correct dimensional output of Process Objects without the user having to specify any scaling factors within the IPGScan job.

Software

The following software version is required.

- IPGScan Software Suite 1.0.0.14238 or higher

Procedure and Examples

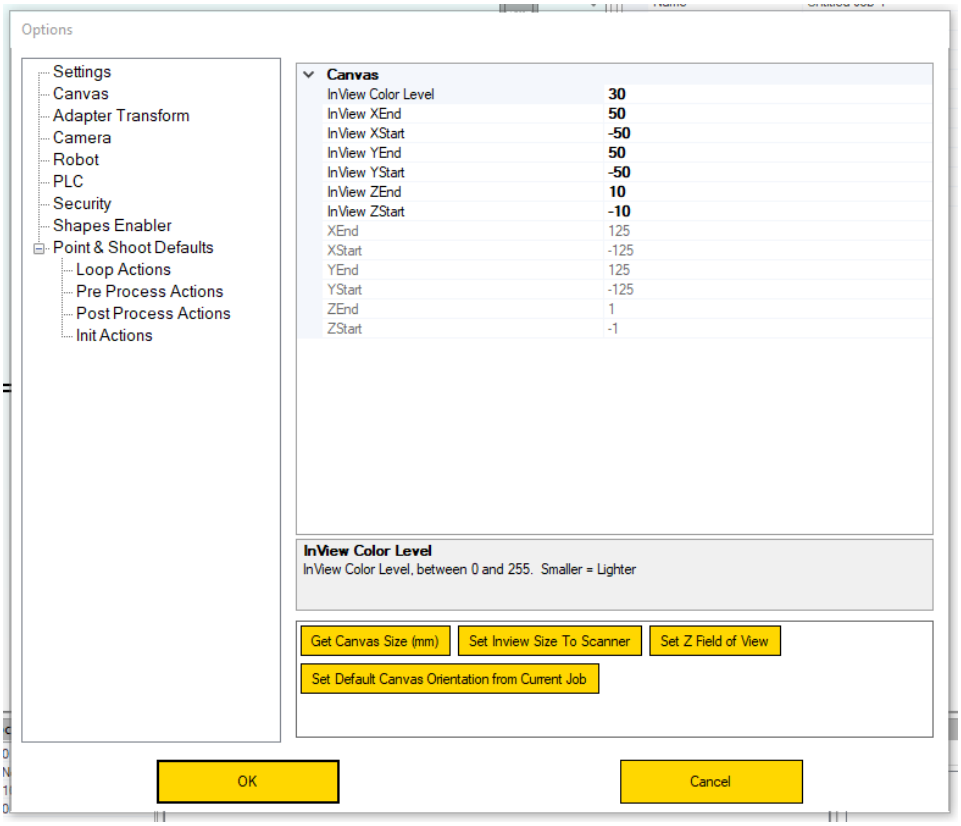
The following sections include a procedure for opening up the scanners FOV Z tolerance as well as an example for both Point and Shoot style processing and Robotic OTF processing.

Procedure

The following steps detail how users can adjust a scanners FOV Z tolerance.

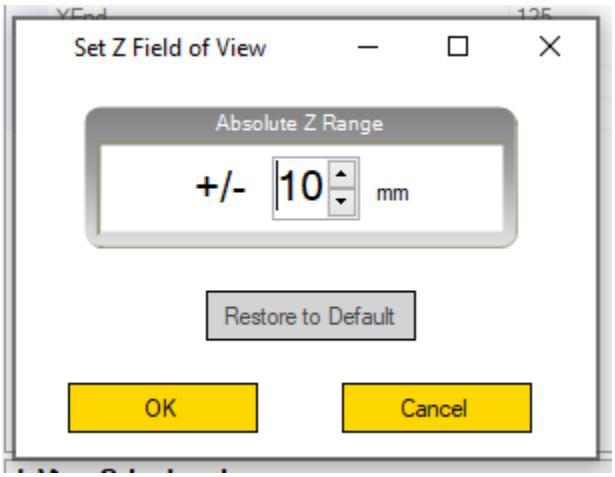
1. Open IPGScan and connect to a desired scanner.
2. Click “View”.
3. Click “Options”.
4. Click “Canvas”.
    a. Here users are presented with the scanners current Canvas (FOV) size as well as InView (Robotic OTF and Gantry Application Specific parameters) size. See Figure 0-1.
    b. For this example, notice how the default “ZEnd” and “ZStart” values are 1 and -1.

Figure 0-1 IPGScan Option Window - Canvas Parameters



5. Click “Set Z Field of View”.
6. Adjust the “Absolute Z Range” to the desired +/- value.
    a. In this example, the Absolute Z Range is set to +/- 10mm from the nominal focus position (Z FOV dimension of 20mm total). See Figure 0-2.

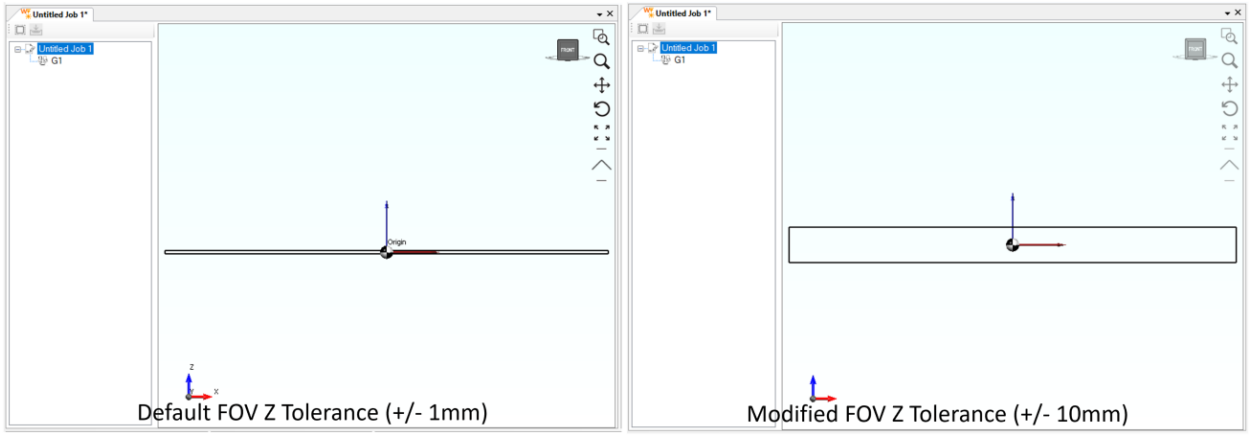
Figure 0-2 Setting the Absolute Z Range



7. Click “Ok”.

8. Click “Ok” to acknowledge the change and then close and reopen IPGScan.
    a. Upon reopening, users should notice that the FOV Z tolerance has been modified (from a Front or Side View). See Figure 0-3.

Figure 0-3 Change in FOV Z Tolerance



Restoring FOV Z Tolerances back to Default Settings

To restore FOV Z tolerances back to the default settings, simply navigate to the “Set Z Field of View” window (as seen in Figure 0-2) and click “Restore to Default.” Acknowledge the changes, close IPGScan, and reopen IPGScan for the changes to take effect.

Robotic On-The-Fly Example

In the case of Robotic OTF jobs, defocusing/opening up the scanner FOV may be desired for process results (i.e. weld quality) or to make it easier to pass dryruns and setup the process.

Figure 0-4 provides an example of a robotic OTF job where no intentional defocus was implemented. In this example, the scanner has a default FOV Z tolerance of +/- 1mm. After performing a dryrun of the process, users can select each Process Object and view the average defocus for that object. In this example, Weld 4 has an average defocus of .400mm.

Figure 0-4 Robotic OTF Job Without Defocus

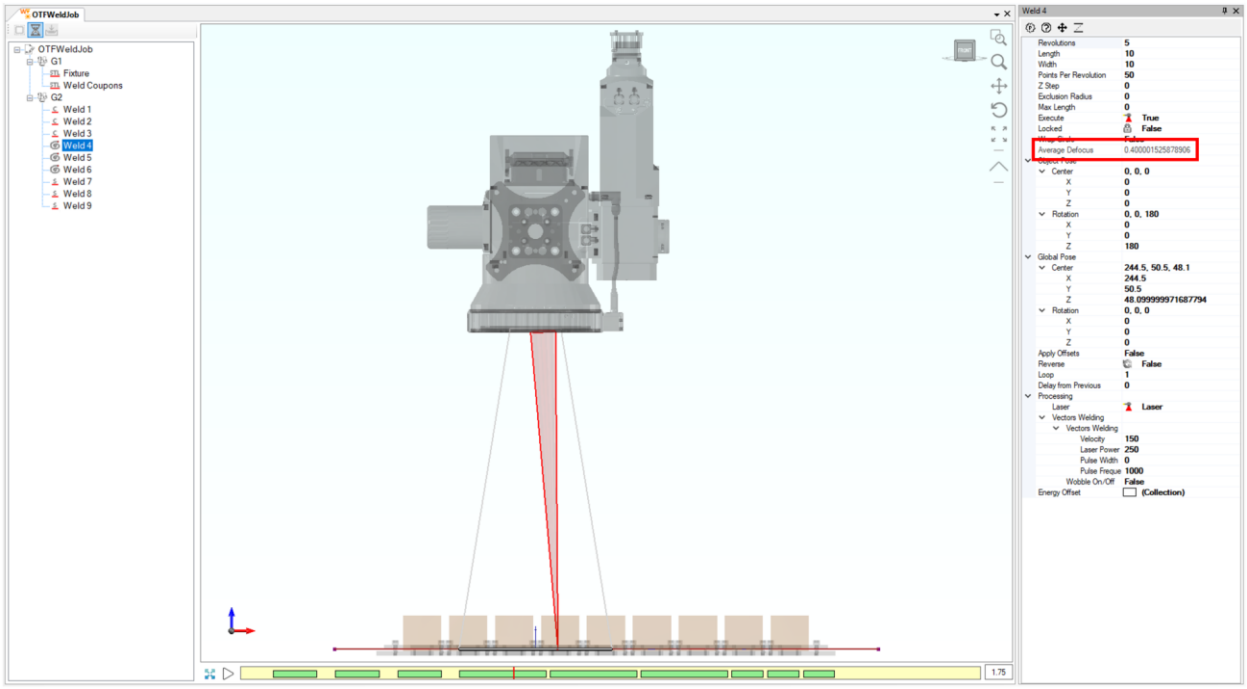


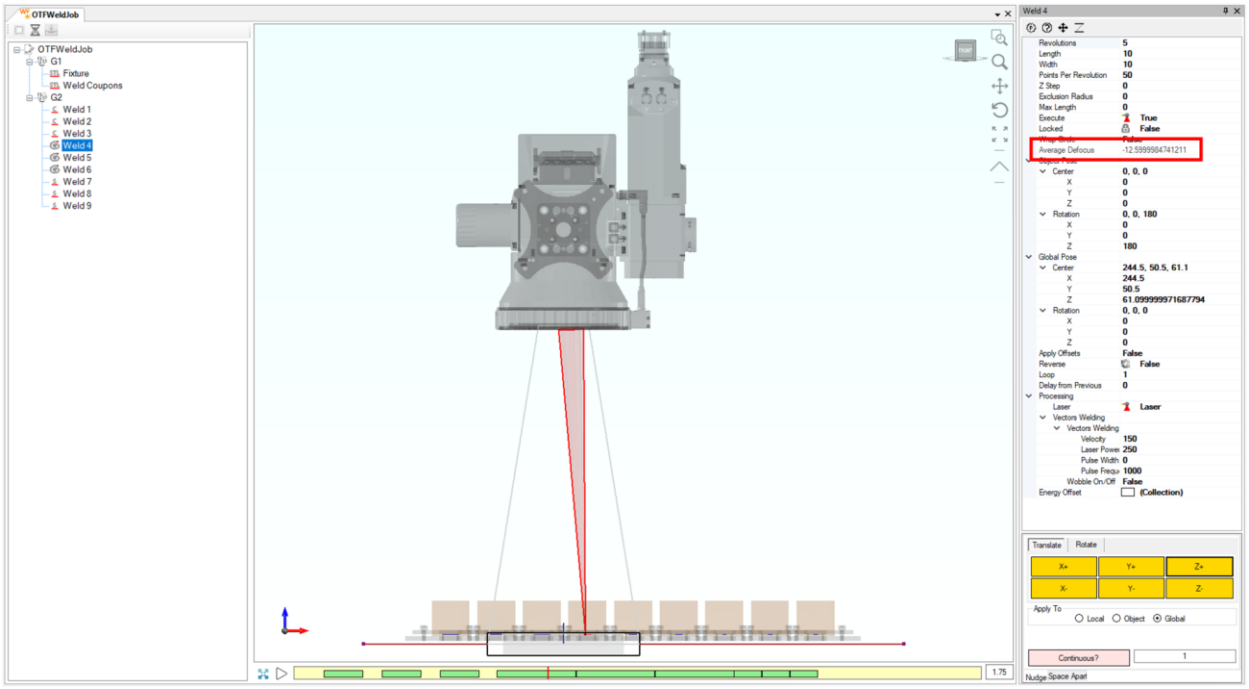
Figure 0-5 provides an example of a robotic OTF job where an intentional defocus was implemented. In this example, the scanner was configured with an “Absolute Z Range” of +/- 15mm. The In-View Z tolerance was also increased to +/- 14mm. With the Z tolerance of the scanner’s FOV increased, the user can now program the robot to position the scanner closer to the work surface or further from the work surface in order to apply an intentional defocus.

IMPORTANT **For Robotic OTF applications, the robot trajectory must be recaptured and loaded into the IPGScan job anytime a robot program change is made. Once a new trajectory is loaded into the job, users should dryrun the job to ensure it completes as expected.**

With the intentional offset applied, users can once again perform a dryrun and select each individual object to view the average defocus. In this example, Weld 4 has an average defocus of -12.599mm. This means that the scanners nominal focus position is 12.599mm below the Process Objects program

location (which should be at the work surface of the material in the real world). An average defocus value that is positive indicates that nominal focus position would be above the Process Objects program location.

Figure 0-5 Robotic OTF Job With Defocus

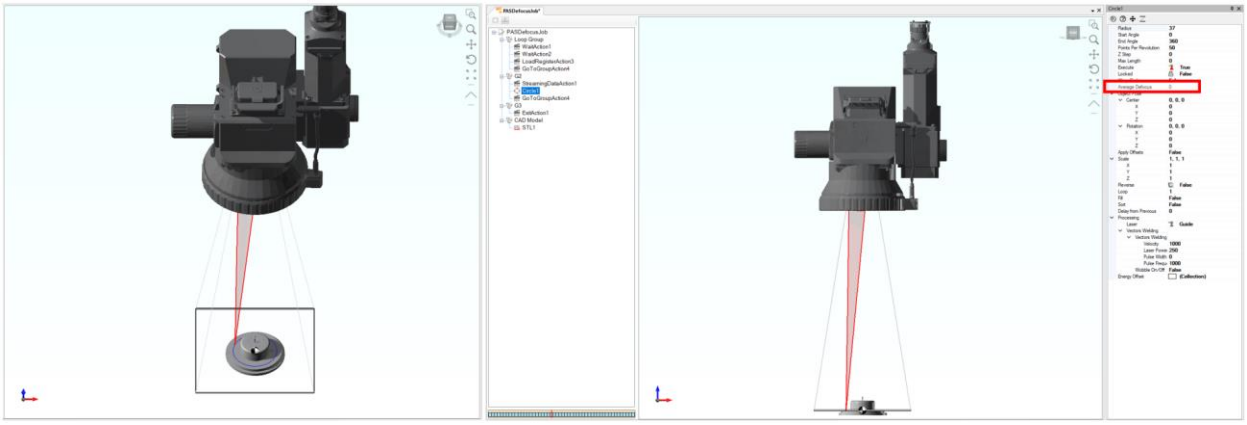


Default and Point and Shoot Job Example

Defocus can also be utilized with Default and Point and Shoot type jobs. For instance, instead of having to apply a scale or purposely offset a Process Objects size in IPGScan in order to compensate for an intentional defocus, users can utilize the defocus functionality to increase Z tolerance of the scanner. With the increased Z tolerance, users can then preserve Process Object sizing parameters, but simply offset the objects so the distance between the scan head and work surface correlate in IPGScan to how they do in the real world.

Figure 0-6 outlines and example of a Pin and Bushing part with a single weld. In this example, the scanner is configured with default Z tolerances of +/- 1mm. For this reason, the weld is positioned at the scanners nominal focus position and an average defocus of 0mm can be seen when Circle1 is selected.

Figure 0-6 Point and Shoot Example Without Defocus



If users wish to apply to defocus in this instance, the Z tolerance can then be increased as seen in Figure 0-7. In this scenario, the scanners “Absolute Z Range” was increased to +/- 15mm. With the increased Z tolerance, users can then position the Process Object (Circle1) so that the distance of the Process Object in relation to the scan head in IPGScan matches that of the scan head and the weld surface in the real world. When the IPGScan setup matches that of the real world setup, no scaling or intentional offsetting of Process Object parameters is required in order to compensate for the scanner to process out of focus. As seen below, Circle1 has an average defocus of 12mm, which indicates that the nominal focus position of the scanner is 12mm above the Process Object position (work surface position).

Figure 0-7 Point and Shoot Example With Defocus