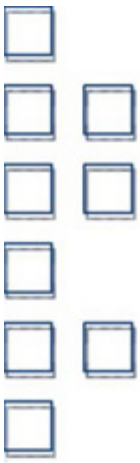
IPGScan Software

User Manual



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1.0 Overview

IPGScan and the Scan Controller seamlessly interface to IPG lasers. With the addition of the application software, IPG is able to offer a complete remote solution to Integrators and OEMs.

1.1 Requirements

The following requirements are necessary for installation and use of the IPGScan software

- Windows 7 & 10, Professional or higher
- IPG ScanPack software
- IPGScan (for Welding, Marking or Cleaning applications)

2.0 Software Installation

2.1 Installing IPG ScanPack

You need to install IPG ScanPack to use IPGScan with your scanner system.

ScanPack is a DLL file in which IPGScan interfaces for communicating with the Scan Controller over Ethernet. The ScanPack installation installs Bonjour (a protocol that discovers IP addresses over the network), Microsoft Visual C++ Runtime Libraries, and the ScanPack DLL on your system.

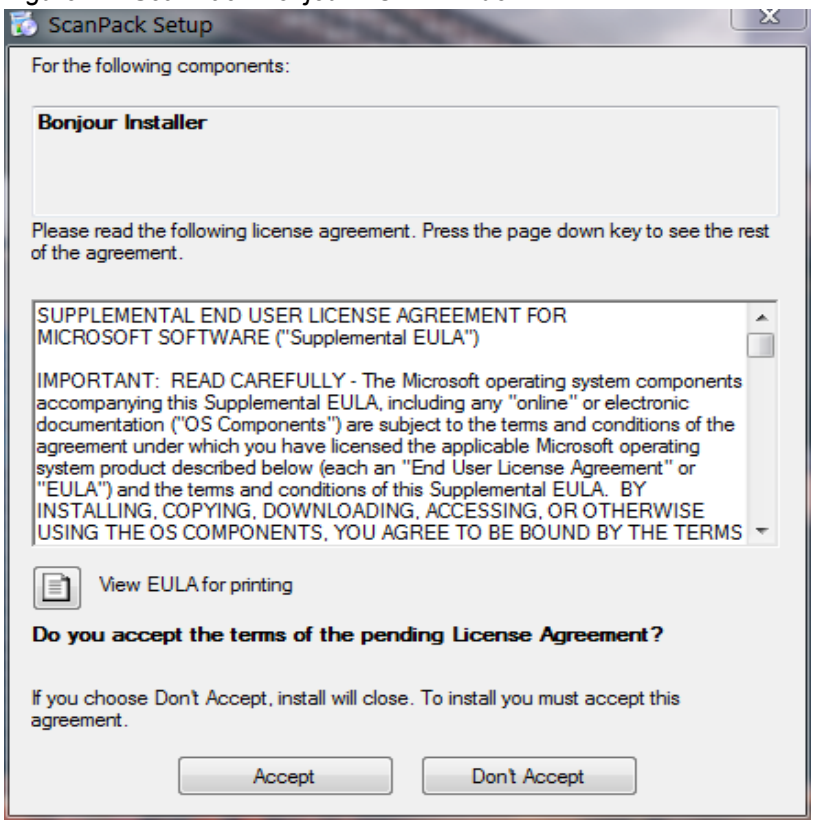
Before installing IPG ScanPack, uninstall any previous versions, if applicable.

To install IPG ScanPack:

1. Open a web browser and go to "**software.ipgphotonics.com**".
2. Click the "**ScannerCommon**" folder.
3. Click the "**ScanPack**" folder.
4. Download the ScanPack.zip file to your computer.
5. Once downloaded, extract the ScanPack.zip file. A folder called ScanPack is created.
6. Open the folder and run **setup.exe** and click "**Next**". The Bonjour EULA Window appears as shown in Figure 2.1.

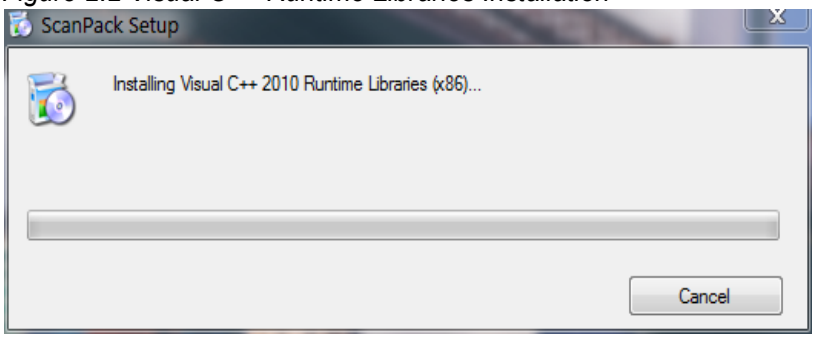
Note: The MSI file will not automatically install Bonjour or Visual C++.

Figure 2.1 ScanPack Bonjour EULA Window



7. Click "**Accept**" to accept the license agreement. The following dialog box appears as shown in Figure 2.2.

Figure 2.2 Visual C++ Runtime Libraries Installation



8. Click "**Install**" to install Visual C++ 2010 Runtime Libraries to your system. The following status message appears.
    a. If the computer already has Microsoft Visual C++ 2010 x86 installed, a prompt to repair or remove the installation will appear. Select "Repair" and click "**Next**". Figure 2.3 shows this window.

Figure 2.3 Status Message Window

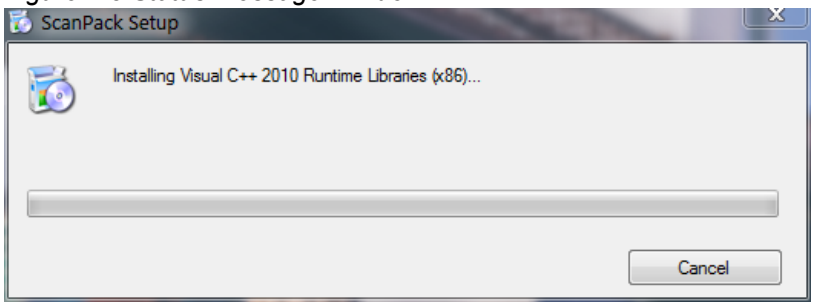
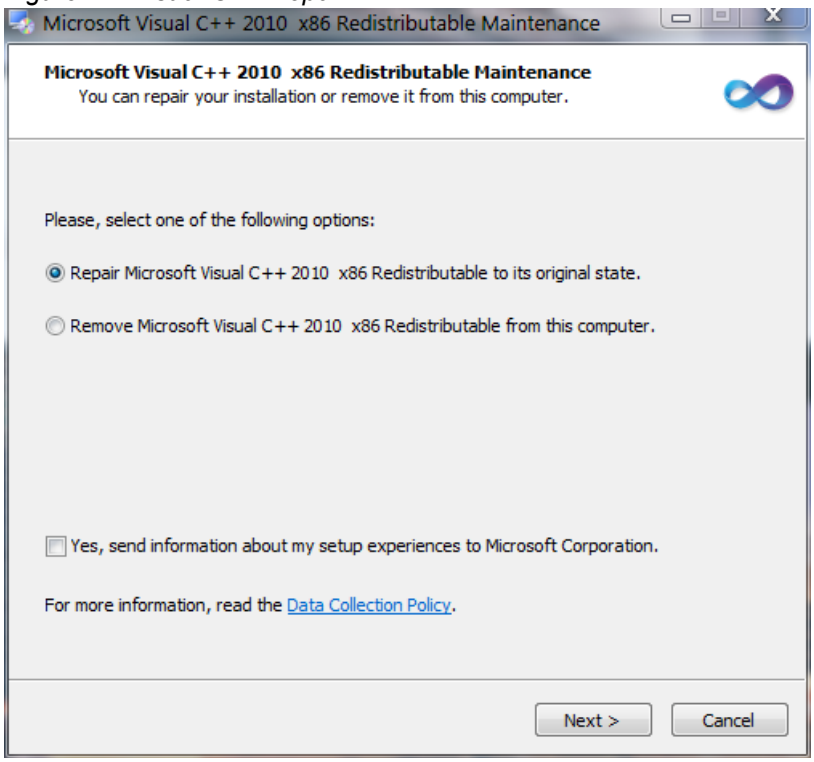
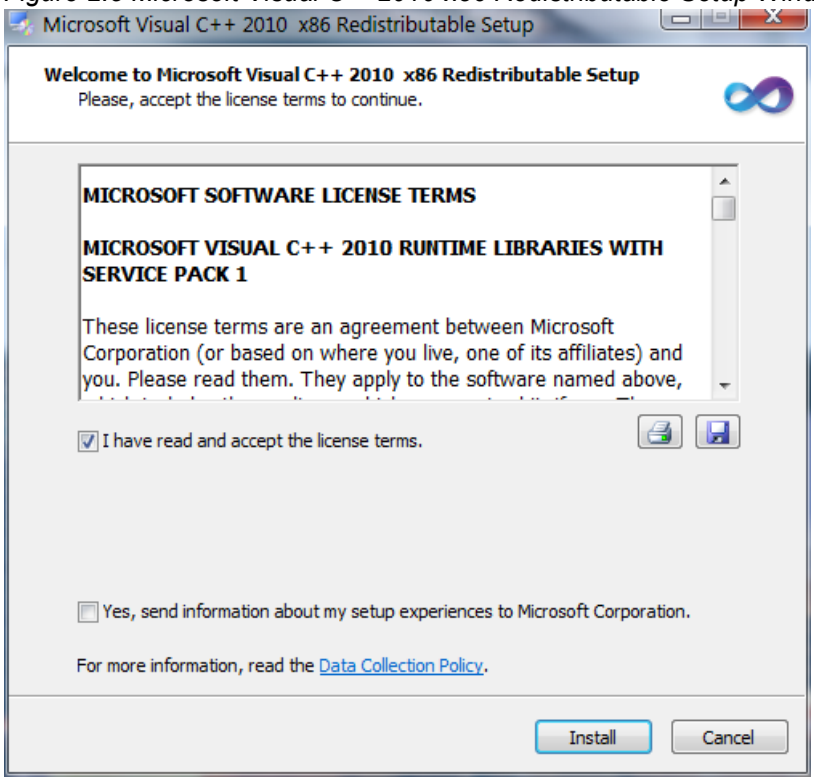


Figure 2.4 Visual C++ Repair



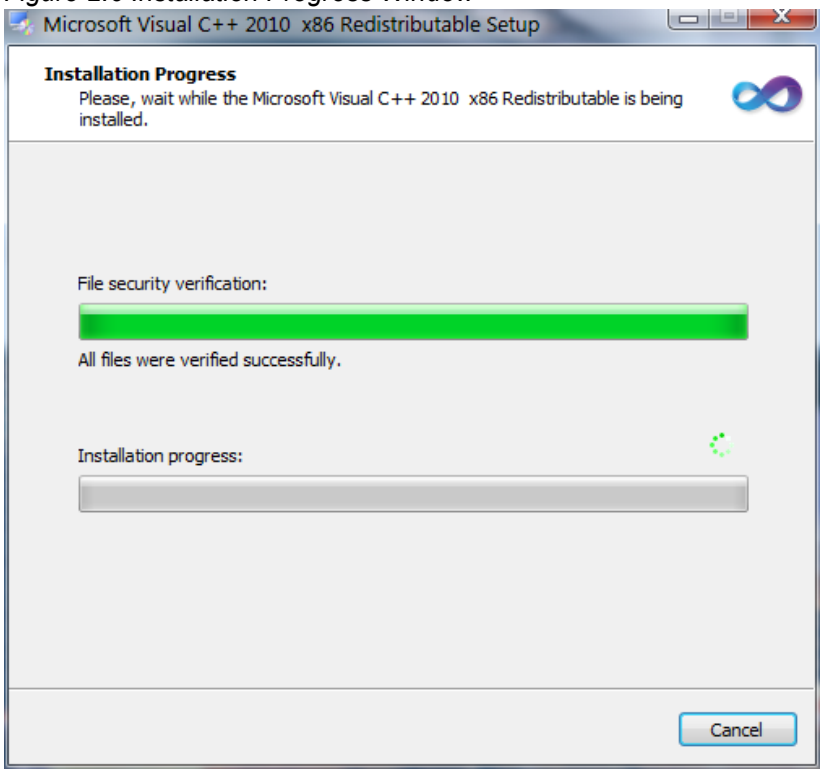
9. Next, the **Microsoft Visual C++ 2010x86 Redistributable Setup** window appears as shown inFigure 2.5.

Figure 2.5 Microsoft Visual C++2010 x86 Redistributable Setup Window



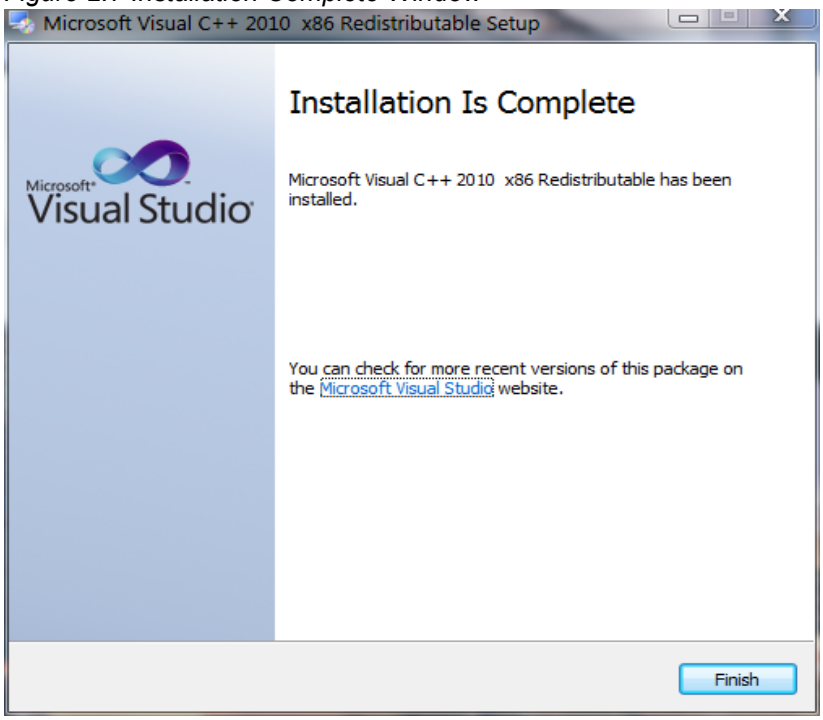
10. Click “I **have read and accept the license terms.**” and click “**Install**”. The following window appears with the **Microsoft Visual C++ 2010 x86 Redistributable** installation progress as shown in Figure 2.6.

Figure 2.6 Installation Progress Window



11. Next, the "**Installation Is Complete**" window appears as shown in Figure 2.7.

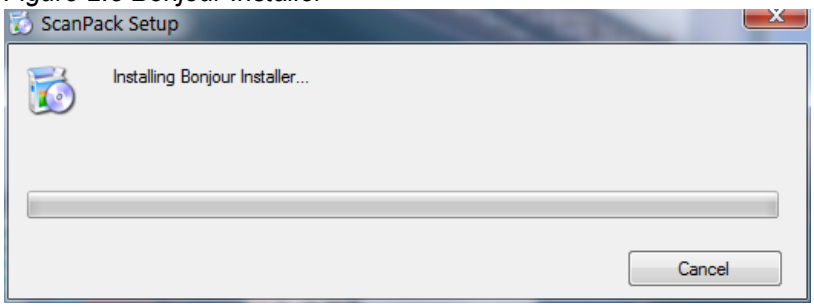
Figure 2.7 Installation Complete Window



12. Click "**Finish**".

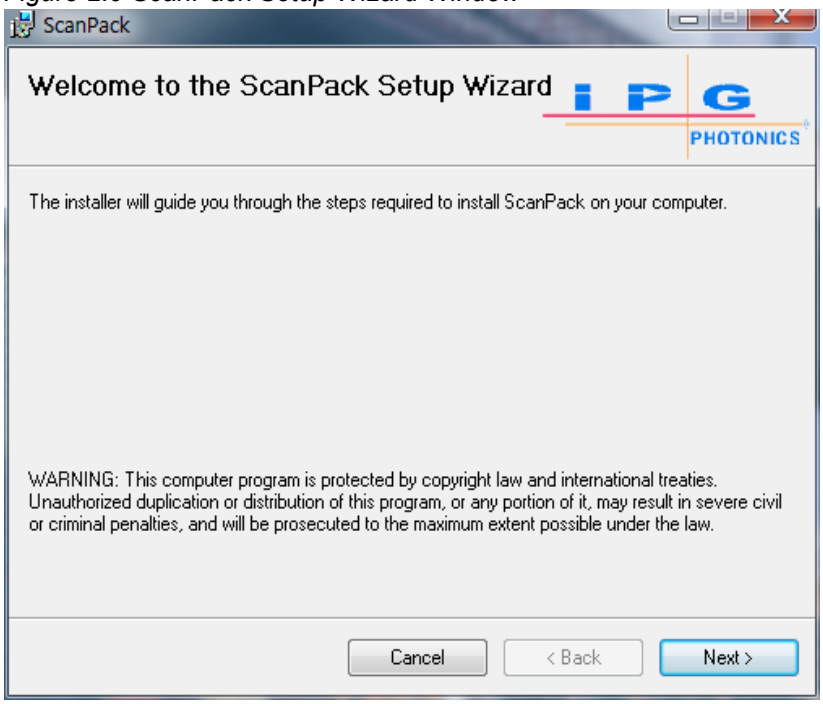
13. A Bonjour window should appear to show it's installing, Figure 2.8.

Figure 2.8 Bonjour Installer



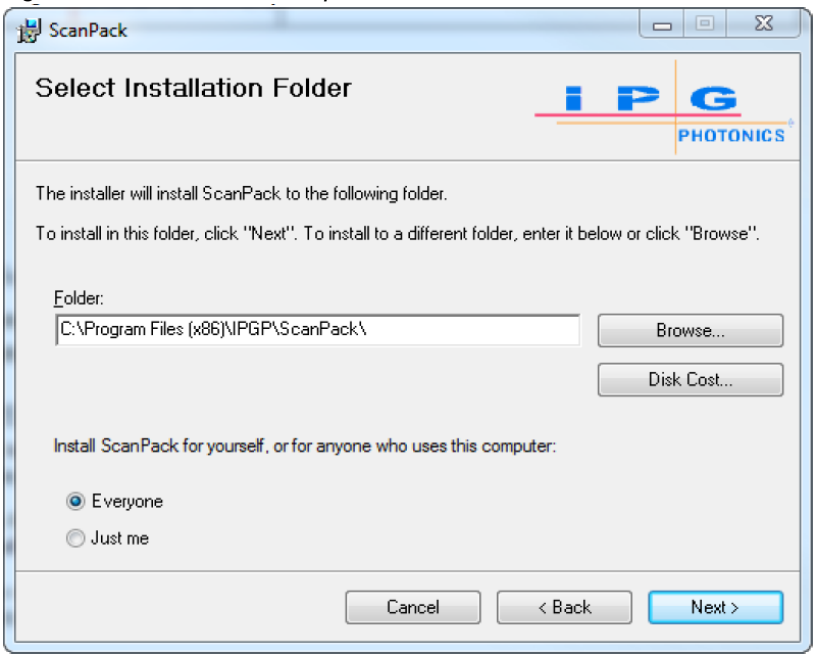
14. The **ScanPack Setup Wizard** appears as shown in Figure 2.9.

Figure 2.9 ScanPack Setup Wizard Window



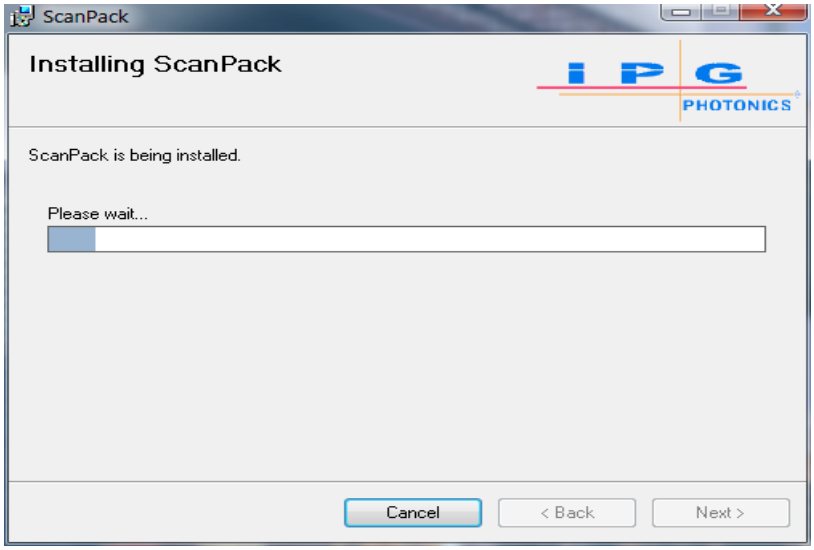
15. Click "**Next**" to proceed. The "**Select Installation Folder**" window appears, as shown in Figure 2.10.

Figure 2.10 ScanPack Setup - Select Installation Folder



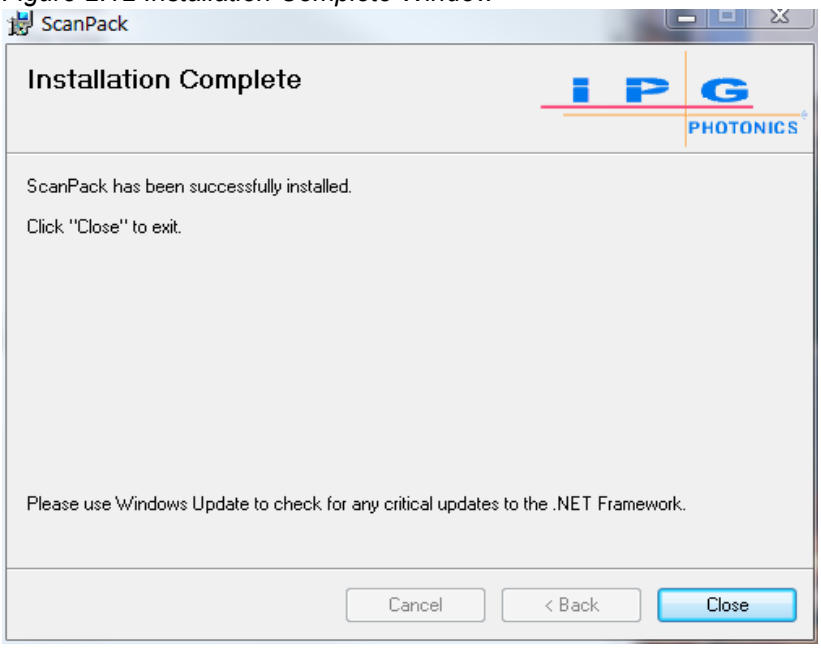
16. Click "**Next**" to accept the default folder.
    a. Click "**Browse**" if you want to change the default folder to another location.
    b. Click "**Everyone**" to allow all users to have access to the ScanPack DLL or "**Just Me**" if only you want access.
17. Click "**Next**" to begin installation. The **Installation Progress** window appears, as show in Figure 2.11.

Figure 2.11 Installation Progress Window



18. Click "**Next**" to proceed. The **Installation Complete** window appears, as shown in Figure 2.12.

Figure 2.12 Installation Complete Window



19. Click “**Close**” to exit the program. ScanPack is successfully installed on your system.

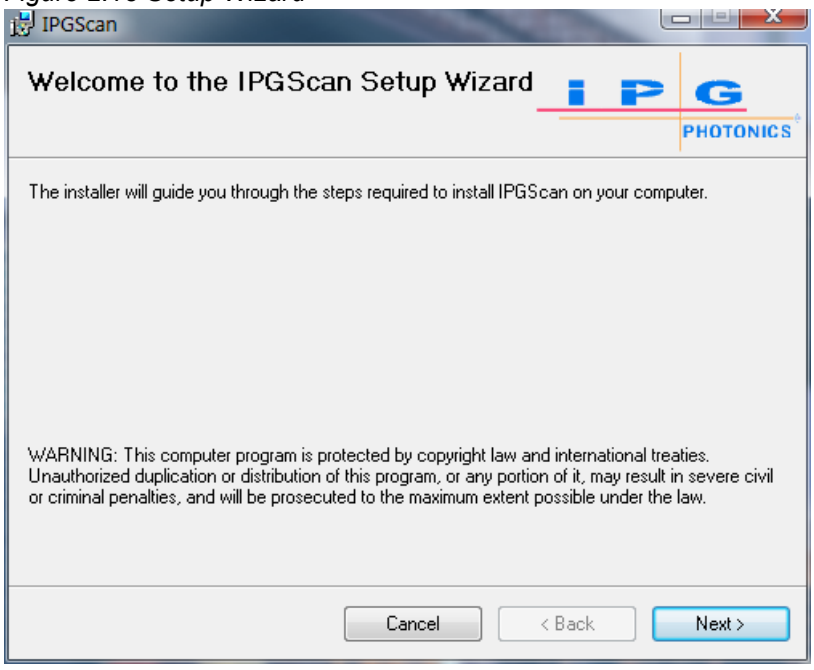
2.2 Installing IPGScan

Before installing IPGScan, you need to uninstall any previous versions if applicable.

To install the IPGScan software:

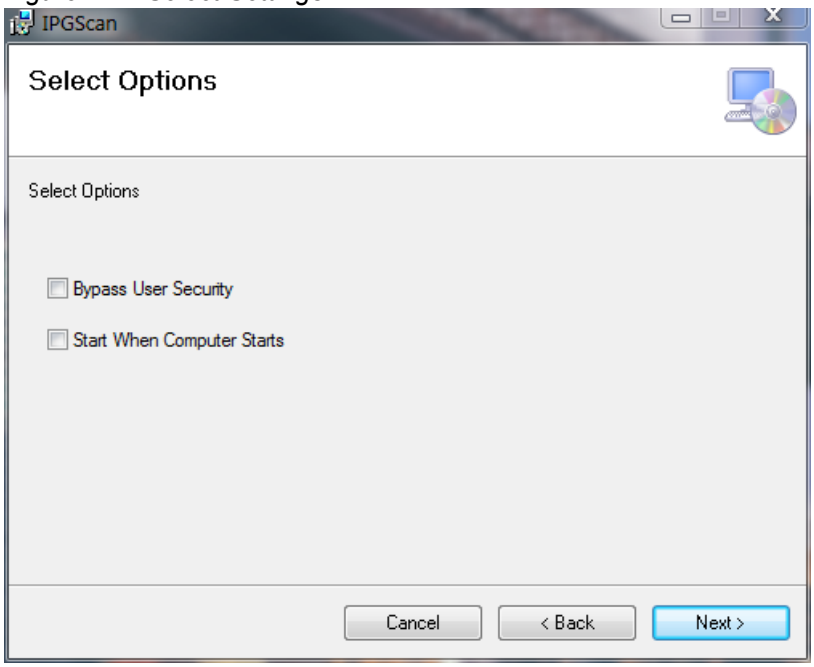
1. Open a web browser and go to **software.ipgphotonics.com.**
2. Click the “**ScannerSoftware**” folder.Click the “**IPGScan**” folder.
3. Download the installation IPGScan zip file to your computer.
4. Once downloaded, extract the zip file. A folder is created.
5. Open the folder and run **setup.exe**. The **Setup Wizard** appears, as shown in Figure 2.13.

Figure 2.13 Setup Wizard



6. The next menu will have two options shown in Figure 2.14.
    a. "**Bypass User Security**": automatically skips the login and password requirement when IPGScan is started.
    b. "**Start When Computer Starts**": automatically start IPGScan when the computer starts.

Figure 2.14 Select Settings

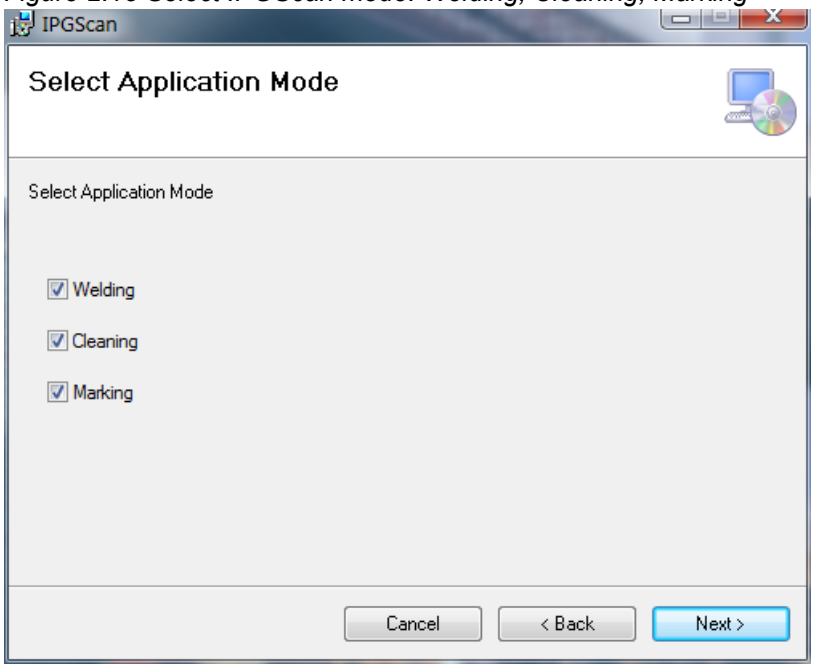


7. Click "**Next**". Now select which **mode(s)** to install (Figure 2.15). On this window you can install any of the IPGScan modes, including all of them at the same time.

Note: The main difference between the welding, cleaning and marking modes is how the laser parameters are defined. You can access all the features in each mode; however the

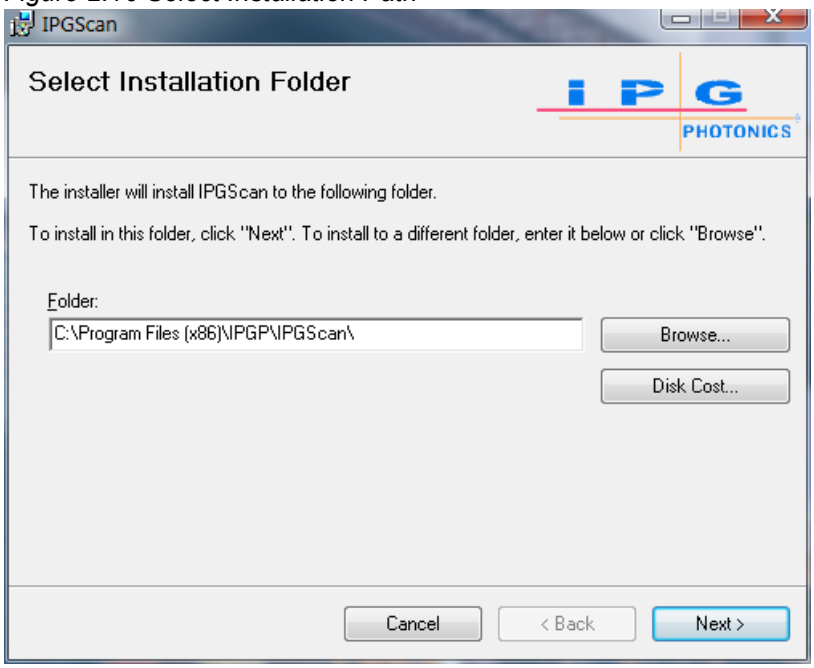
default setup will be which program you run. If you install multiple modes, there will be different ".exe" for each.

Figure 2.15 Select IPGScan mode: Welding, Cleaning, Marking



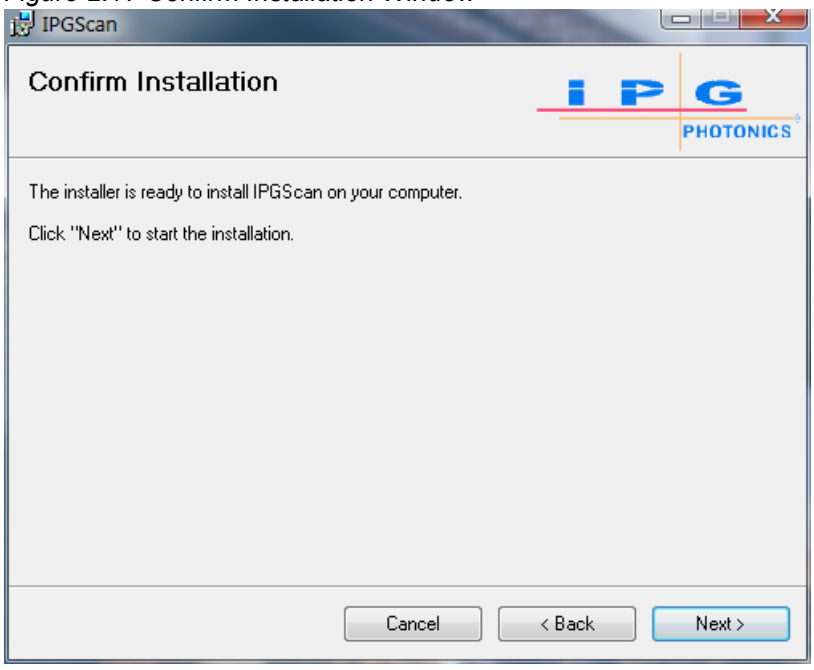
8. Click "**Next**". The **installation path** for IPGScan can be set in this window, Figure 2.16.

Figure 2.16 Select Installation Path



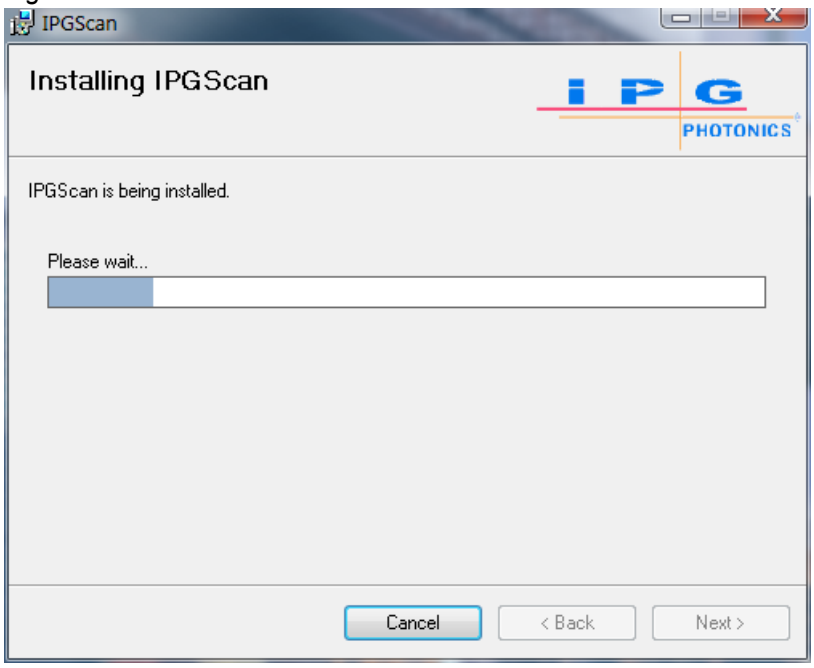
9. Click "**Next**". The **Confirm Installation** window will appear, as shown in Figure 2.17.

Figure 2.17 Confirm Installation Window



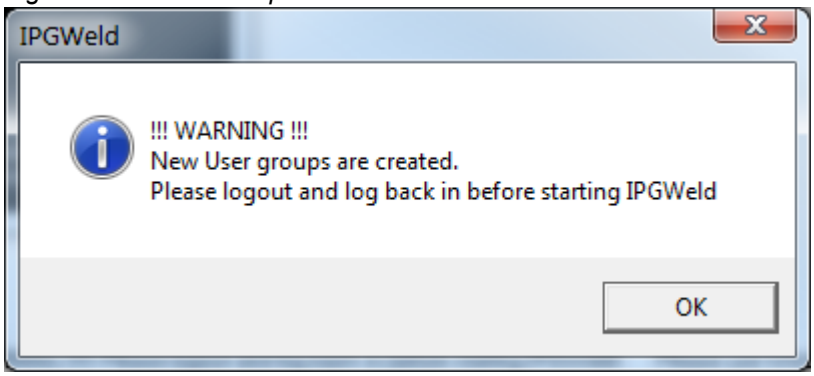
10. Click “**Next**” to proceed.
11. The **Installing IPGScan** window appears, as shown in Figure 2.18.

Figure 2.18 Installation IPGScan Window



12. When the installation is complete the User Groups window, shown in Figure 2.19, will appear. If IPGScan was previously installed, no restart is required. For more information on user groups see Section 4.2.

Figure 2.19 User Groups have been Created Window



3.0 Scan Controller Utility

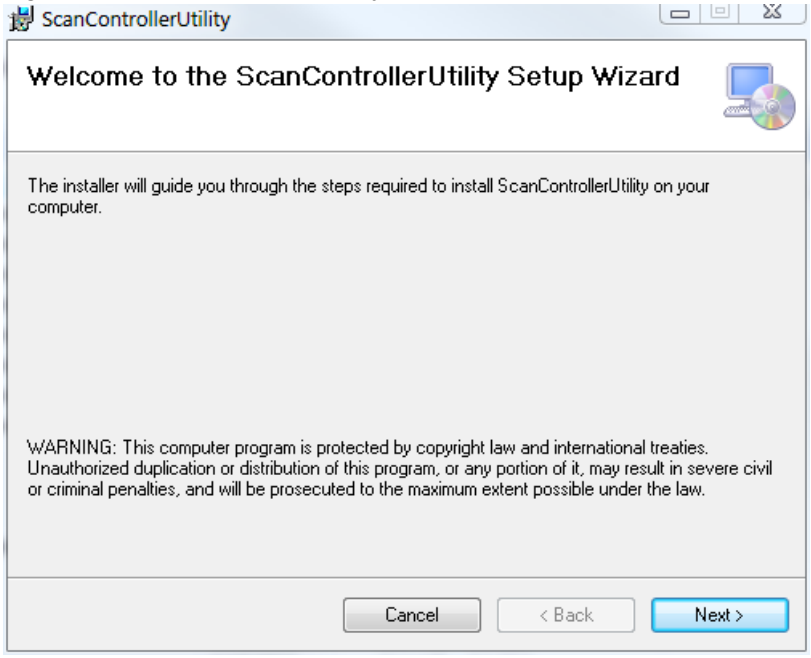
3.1 Installing IPG Scan Controller Utility

Users can set a static IP address and change the host name of the Scan Controller using the Scan Controller Utility. The Scan Controller Utility also lets you select the correct configuration files for use in IPGScan.

To install the Scan Controller Utility:

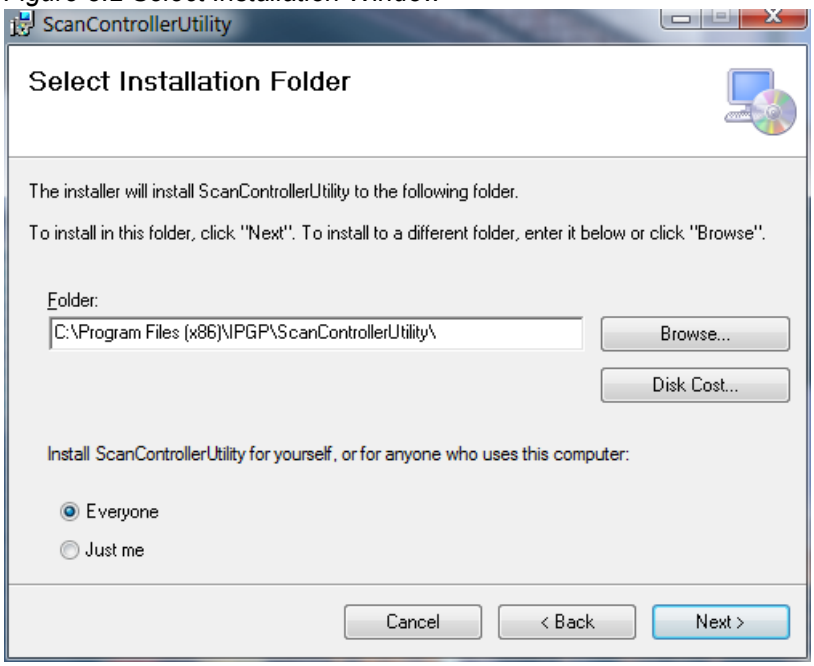
1. Open a web browser and go to **software.ipgphotonics.com**.
2. Click the **ScannerCommon** folder.
3. Click the **Utilities** folder.
4. Download the **ScanControllerUtility.zip** file to your computer.
5. Once downloaded, extract the **Utilities.zip** file. A folder called Utilities is created.
6. Open the folder and run **setup.exe** and click "**Next**". The following window appears as shown in Figure 3.1.

Figure 3.1 Scan Controller Utility Window



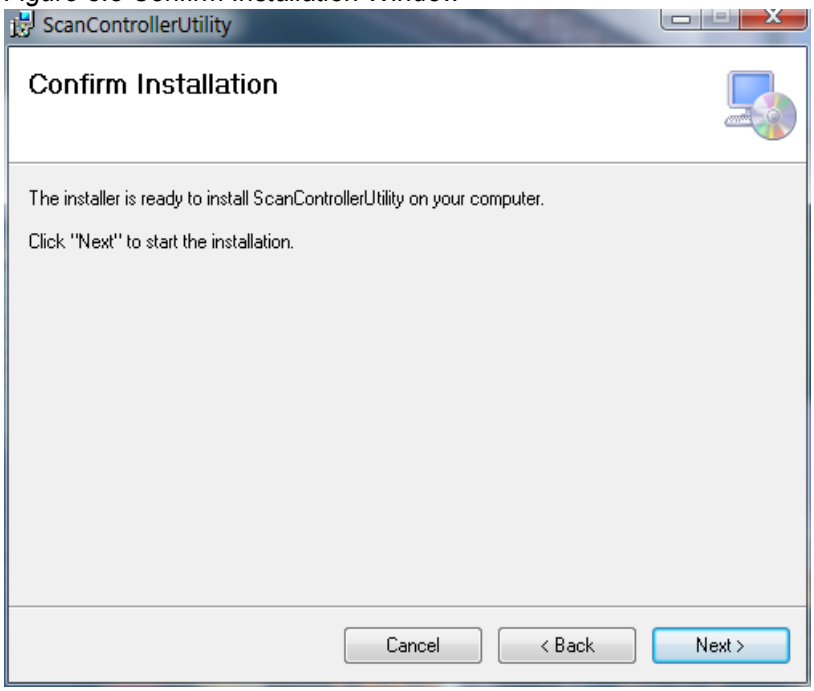
7. Click "**Next**". The **Select Installation Folder** window will appear as shown in Figure 3.2.

Figure 3.2 Select Installation Window



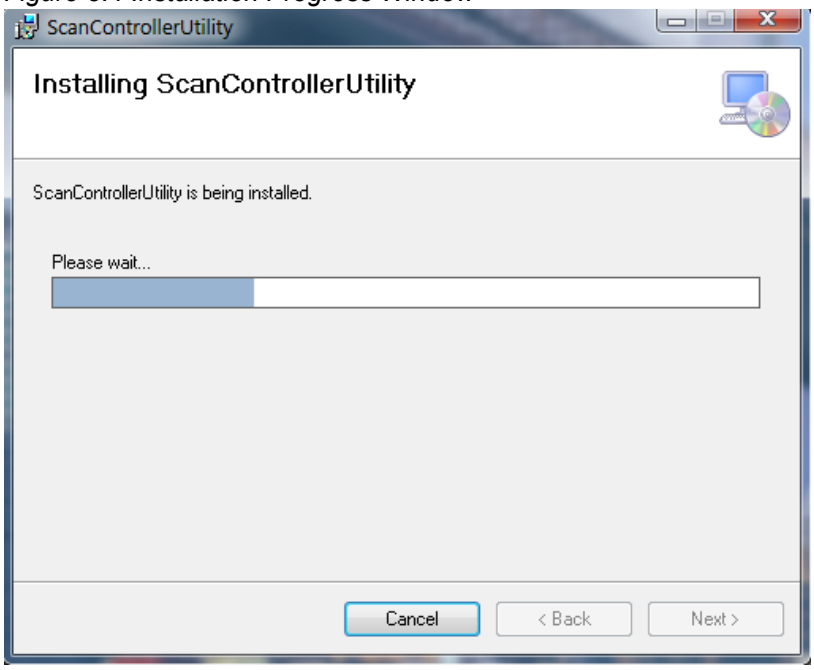
8. Click "**Next"** to accept the default folder.
    a. Click **Browse** if you want to change the default folder to another location.
    b. Click **Everyone** to allow all users to access the Scan Controller Utility or **Just me** if only you want access.
9. Click "**Next".** The Confirm Installation window appears as shown in Figure 3.3.

Figure 3.3 Confirm Installation Window



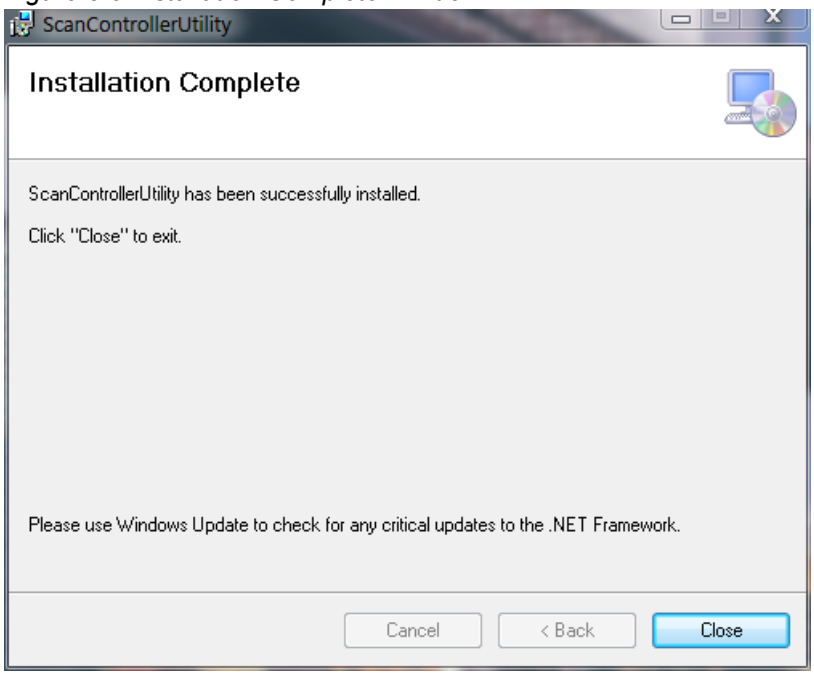
10. Click "**Next"** to continue with installation. The installation progress window appears as shown in Figure 3.4.

Figure 3.4 Installation Progress Window



11. Click "**Close**" to complete installation as shown in Figure 3.5.

Figure 3.5 Installation Complete Window

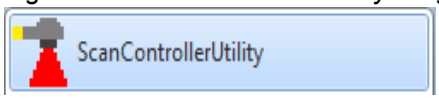


3.2 Running the Scan Controller Utility

To run the Scan Controller Utility:

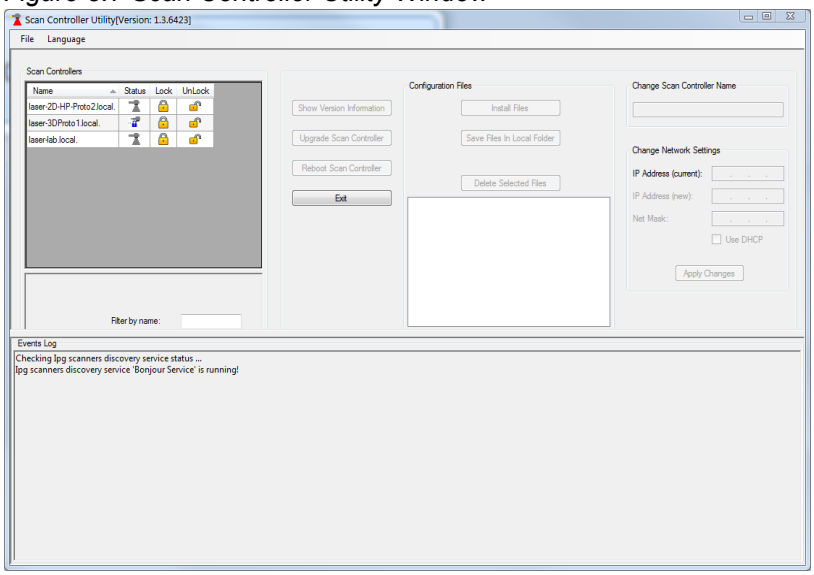
1. Select All Programs →Scan Controller Utility (Figure 3.6).

Figure 3.6 Scan Controller Utility Program



2. The Scan Controller Utility window appears as shown in Figure 3.7. The Scan Controller hostname automatically appears in the Scan Controllers List (this may take several seconds). Lock a scan controller to enable the controls to the right.

Figure 3.7 Scan Controller Utility Window



3. See “**Loading the Configuration Files**” for instructions on selecting a scanner and loading the configuration file for use with IPGScan.
4. Apply Changes button is only for changing the IP Address. In order to change the scanner’s name you must press “**Enter”**.
5. “To use a static IP Address for the Scan Controller, navigate to the **Change Network Settings** box on the right. Enter an IP address in the **IP Address** box. Then enter a Net Mask in the **Net Mask** box underneath**.** Click **“Apply”.**
6. Click “**Exit”** to close the Scan Controller Utility.

3.2.1 Loading Configuration Files

To load the laser configuration files:

1. Start the Scan Controller Utility.The Scan Controller Utility window appears as shown in Figure 3.7.
2. Select a scanner from the list.
3. Click the “**Lock**” icon for the selected scanner.
4. To install the configuration file for the laser, click **Install Files**. The select file window will appear.
5. Go to the following path: **C:\ProgramData\IPGP\ScanPack\Default\Lasers** and select the folder for the laser you are using. Within that folder, select the **LaserSpecifications** file and click “**Open**”.
6. Once the configuration file is transferred, click exit to close the Scan Controller Utility.

If the **focus lens** is changed, the lens configuration files will need to be changed. To install the configuration files for the focus lens, follow the same steps above, except, load files “Calibration 1” and “Calibration 2” under **C:\ProgramData\IPGP\ScanPack\Default\Lenses.**

Note: Both files are required! One file is for the actual laser beam, while the other is for the guide beam.

Note: If you are using different lasers or focus lenses with your scanner, you need to change the configuration file each time you change the laser or the focus lens. Make sure to back up old configuration files before reloading new files.

4.0 System Security

4.1 Overview

IPGScan offers the ability for Users and Groups to have different levels of access. The primary user has the ability to choose what privileges each group has, whether operator, technician, supervisor, or engineer. A Windows user with administrative rights is required to create and assign users to groups.

4.2 Setting-Up Users and Groups

Before starting the IPGScan software, you need to set up groups using Windows Manager. Groups can be differentiated based on frequency of use, subsets of product functions used, technical expertise, security, privilege levels, educational level, or experience.

Options and features available in IPGScan are configurable based on groups. If preferred, this option may be omitted with the "**Bypass User Security"** option shown in Section 2.2.

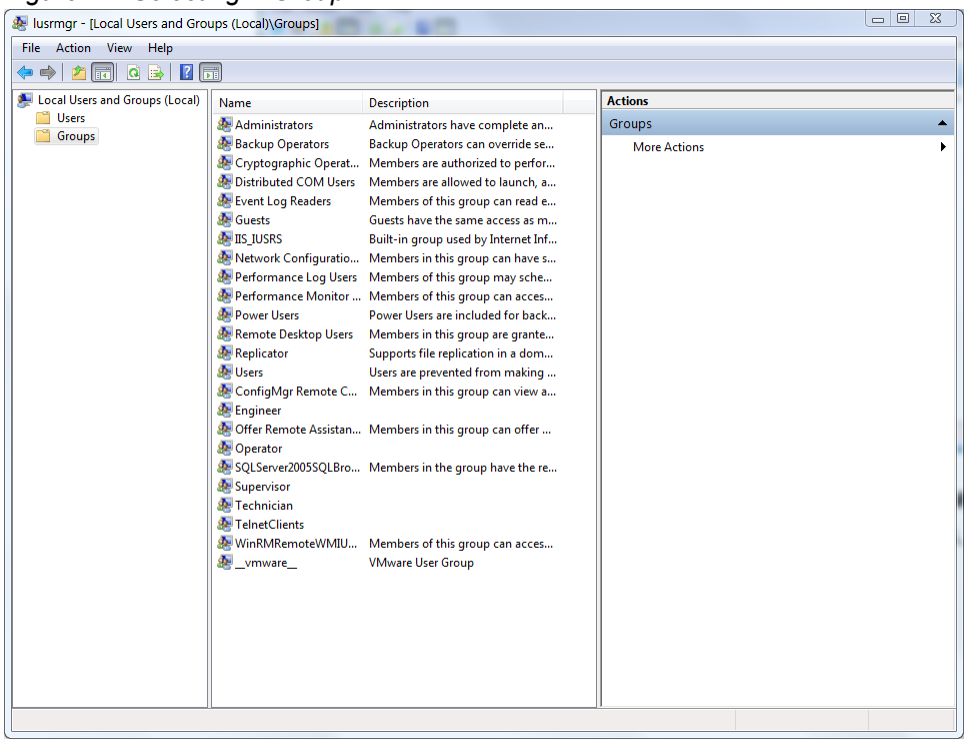
Note: In IPGScan/IPGWeld versions 1.0.0.5045 or newer, the installer creates the four user groups automatically. In this case, you can skip Section 4.2.1.

4.2.1 Manually Adding User Groups Using Windows Manager

To add user groups:

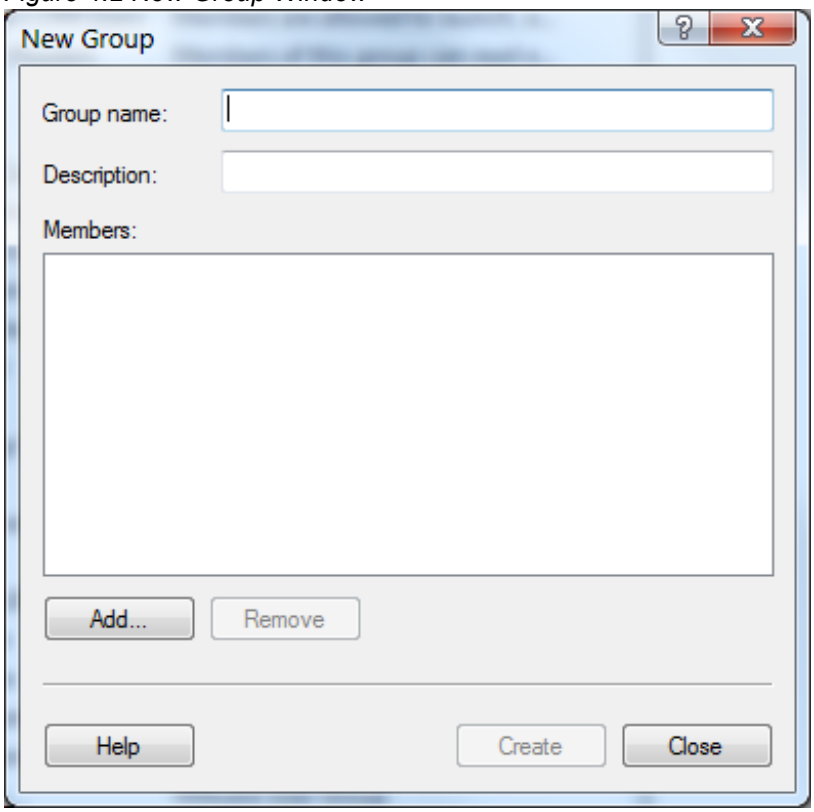
1. Ensure you have Administrator rights.
2. Open Windows User Manager by clicking the **Start Menu** → **Run** and entering: **lusrmgr.msc.**
3. Click on the "**Groups**" folder in the left pane as shown in Figure 4.1.

Figure 4.1 Selecting A Group



4. Right click and select “**New Group**”. The **New Group** window, Figure 4.2, will appear. You need to create the following four groups. Each groups is a different security level in IPGScan.

Figure 4.2 New Group Window



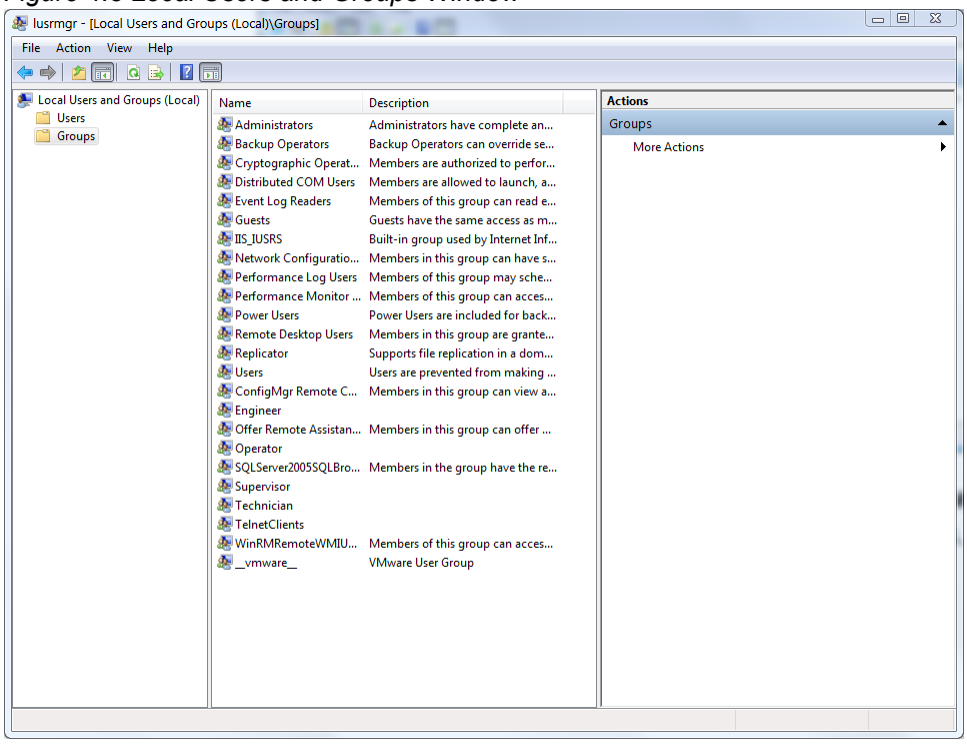
5. For each new group, Click “**Create**” on the **New Group** window to create the group, Figure 4.2.
6. To add users, see Section 4.2.2, Step 6.

4.2.2 Adding Users Using Windows Manager

Both network and local users can be used. To add users to Windows groups:

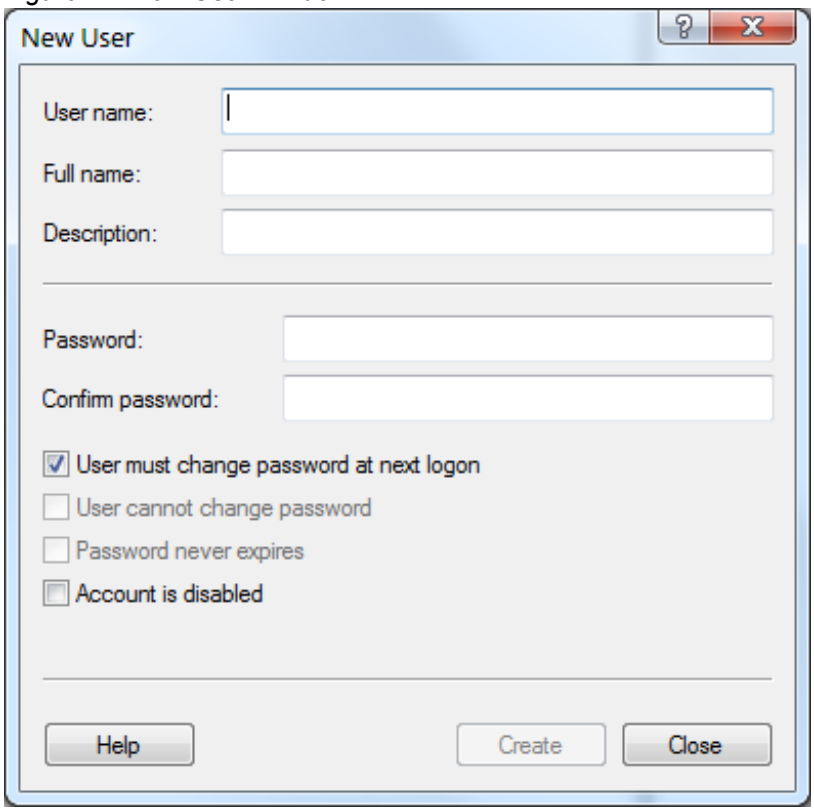
1. Ensure you have Administrator rights.
2. Open Windows User Manager by clicking the **Start Menu** → **Run** and entering: **lusrmgr.msc**.The following window will appear:

Figure 4.3 Local Users and Groups Window



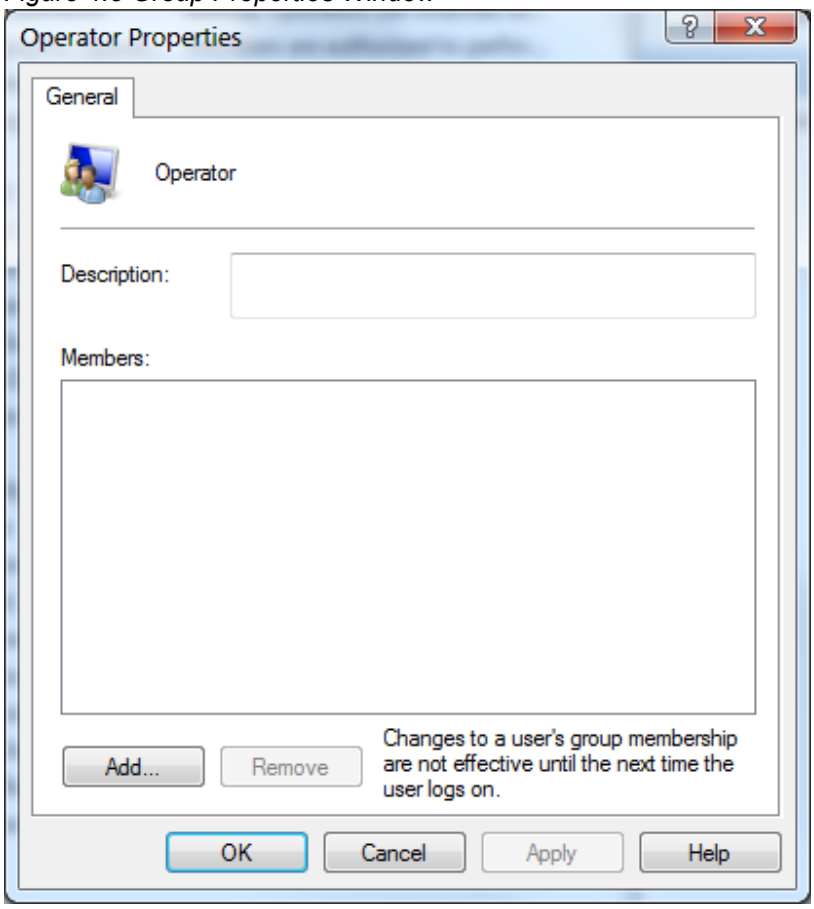
3. Click the "**Users"** folder in the left panel.
4. Right-click and select "**New User...**". The New User window appears as shown in Figure 4.4.

Figure 4.4 New User Window



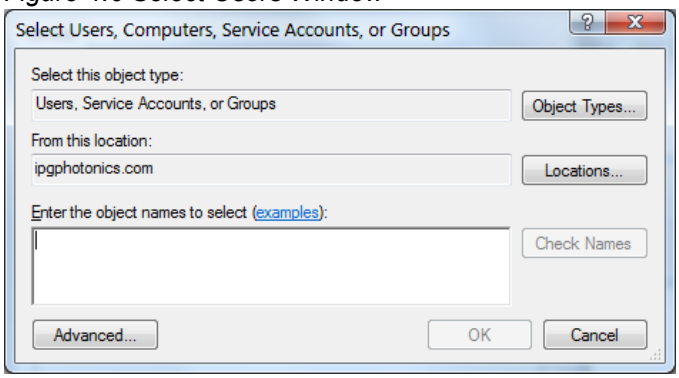
5. Enter a **Username**, **Password** and **Confirmed Password**. Click “**Create**”.
6. Once all users are created, click on the “**Groups**” folder in the left panel.
7. Double click on any of the four groups (**Engineer, Supervisor, Technician, Operator**) to add a user.
8. The group properties window will appear, shown in Figure 4.5.

Figure 4.5 Group Properties Window



9. Click “**Add**”.
10. Enter the names of the users on your **network** or **local** machine (Figure 4.6) on the Select Users Window.

Figure 4.6 Select Users Window



11. Click “**OK**” to complete.

12. Re-login into Windows or restart the computer for changes to take effect.

4.3 Security Settings in IPGScan

There are four security levels in IPGScan. From lowest security setting to highest:

- **Operator** - only can perform operations assigned to Operator
- **Technician** - only can perform operations assigned to Operator or Technician
- **Supervisor** - only can perform operations assigned to Operator, Technician or Supervisor
- **Engineer** - can perform any operations

Examples of different security settings:

1. If a processes permission level is set to Operator, all users with higher access (Technician, Supervisor and Engineer) will also be able to complete the process.
2. If a processes permission level is set to Supervisor, only Supervisors and Engineers can perform the process.

By default all settings are set to Engineer level. You can select View → Options → Security within IPGScan to modify these privileges.

5.0 IPGScan Software

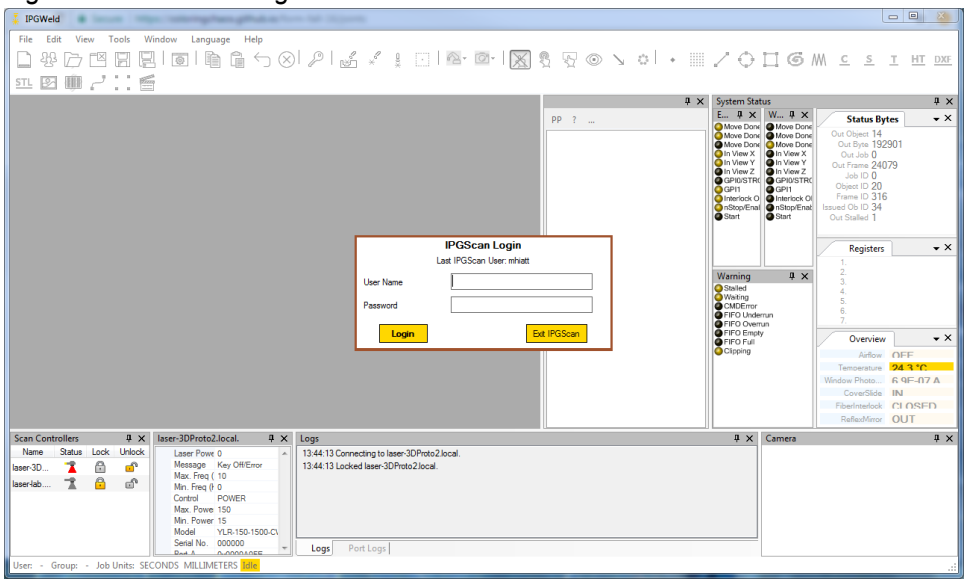
5.1 Starting the IPGScan Software

The IPGScan software lets you create and modify welding, cleaning and marking jobs. You can create and modify welding objects such as text, shapes, and imported vector files.

To start the IPGScan program:

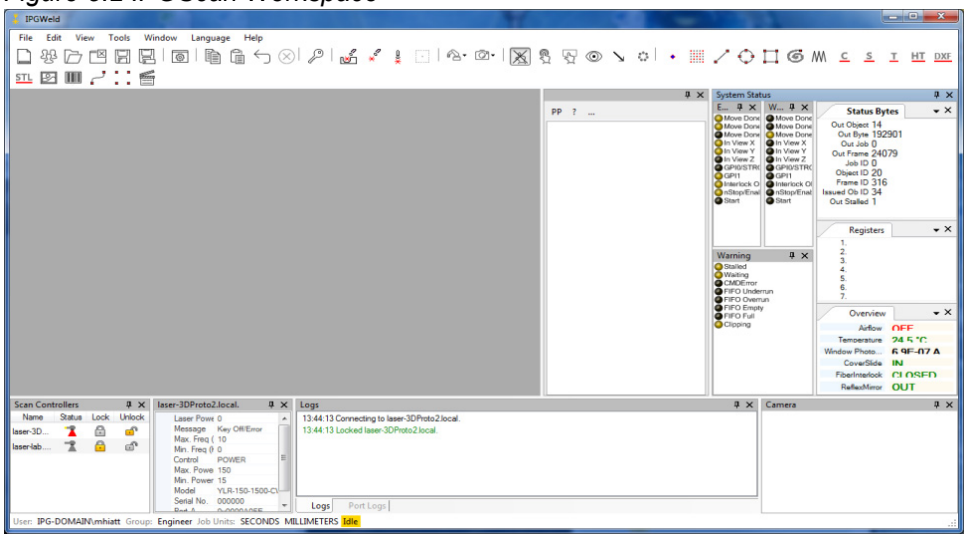
1. Ensure “**Setting-Up Users and Groups**”, Section 4.2 has been completed.
2. Go to Window’s Start Menu. Under **All Programs** → **IPG Photonics** folder.
3. Select **IPGScan**. The IPGScan Login window will appear, as shown in Figure 5.1.

Figure 5.1 IPGScan Login Window



4. Enter your user name and password.
    a. If you added users on your **network**, enter the network domain name in the user name in the User Name box. *Example: XYZCompany-Domain\jsmith.*
    b. If you added users on your **local drive**, enter the local computer name in the user name in the User Name box. *Example: MyPC\jsmith*.
    c. If you were the last user logged in it will not ask you to login again.
5. Click “**Login”**. The IPGScan Workspace appears, as shown in Figure 5.2.

Figure 5.2 IPGScan Workspace



5.2 IPGScan Overview

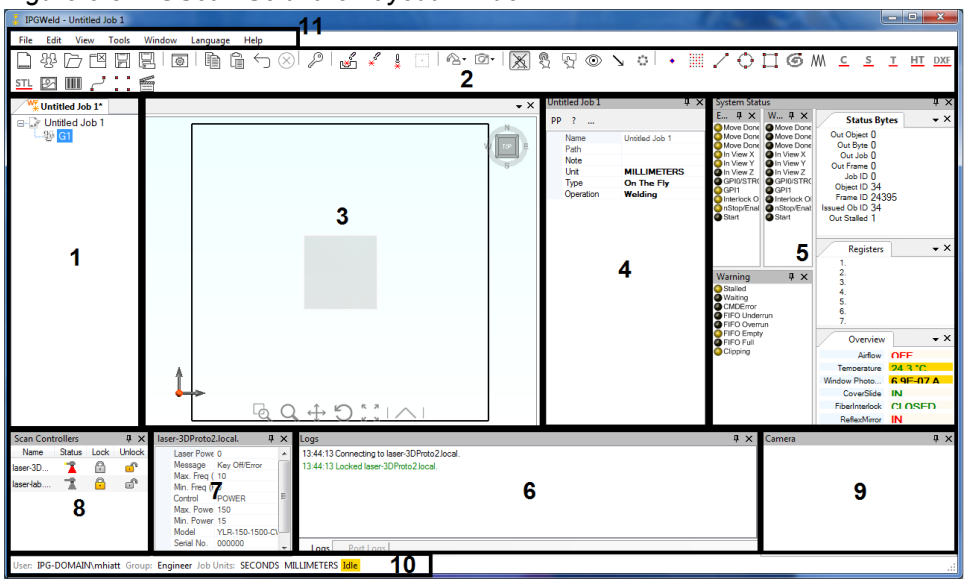
This chapter explains how to use the IPGScan software for remote welding, cleaning or marking. IPGScan allows users to create jobs and operate the scanner in production. Users can also configure a digital camera.

Before you begin, ensure you have met the following requirements:

- Installed IPG ScanPack as explained in "**Installing IPG ScanPack**" (Section 2.1)
- Install IPGScan software as explained in "**Installing IPGScan Software**" (Section 2.2)
- Have your protective eyeglasses ready to wear when operating the laser.

The following Figure shows the **IPGScan Software main window layout.**

Figure 5.3 IPGScan Software Layout Window



Refer to Table 5.1 for IPGScan Software Layout Descriptions.

Table 5.1 New User Window

Number	Description
1	Job Tree
2	Tool Bar
3	Canvas Field of View
4	Data/Parameter Window
5	System Status
6	Logs
7	Laser System
8	Scan Controllers
9	Camera Window
10	Program Information
11	File Menu

5.3 System Settings

Before creating an IPGScan Program, it is important to have an understanding of the system settings and how users can adjust settings in IPGScan to fit their needs.

In order to access the IPGScan Options:

1. Click on "**View**".
    a. In the dropdown menu, users will find options for resetting the IPGScan lay-out.
    b. The ability to open any status windows that may have been closed.
    c. The "Options" (Alt+O) menu.

Under the Options menu, the following settings can be adjusted:

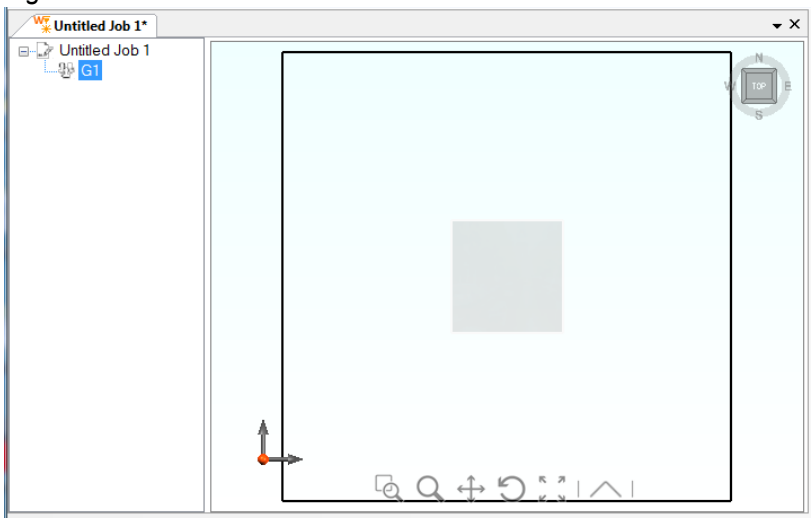
- **Settings**: The option menu contains a number of settings that the user can modify. Settings include:
    - IPGScan colors
    - Units (metric or standard)
    - Shape Parameter defaults
    - TCP/IP server information
    - Viewport settings
- **Canvas**: The canvas settings are where the user can go to adjust their InView window size. The canvas size can also be obtained by clicking the "Get Canvas Size" button under this menu.
- **Camera**: IPGScan has the ability to interface with an Ethernet camera. These settings are only needed for camera integration and setup. See Section 6 for Camera setup.
- **Robot**: The robot settings are only required for Robotic On-The-Fly. When using Point and Shoot, the user does not need to change any of these settings. See Section 9.0 for instructions on how to set up Robotic On-The-Fly.
- **Security**: The security settings are where privileges can be set for given user levels. By clicking on the setting name a description of the setting will show up at the bottom of the settings box. See Section 4.3 for more information.
- **Shapes Enabler**: This allows the user to select which features they would like to have displayed in the Tool Bar and Tool Menu.

5.4 Creating a Job

This section explains how to create a new job in IPGScan.

1. Select **File** → **New** to create a new job file. An unsaved and untitled job will as appear as shown in Figure 5.4.

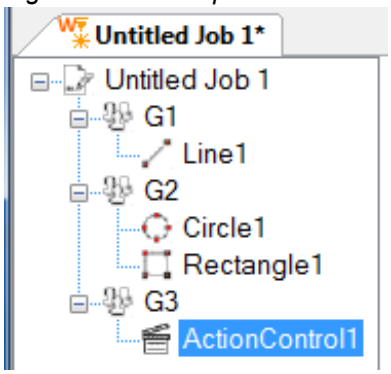
Figure 5.4 New Job Window



The Job Explorer pane displays the new job. When the job is selected, the type of job is listed in the Properties window to the right. Job types (Default / On The Fly) can be changed in this menu.

When you create multiple groups within a job, the job is divided into groups of objects. The default group names are G1, G2 and G3 shown in Figure 5.5. You can rename a group by double-clicking on it.

Figure 5.5 Job Explorer Pane



2. Select a group in the Job Explorer pane.
3. Select an object from the Tools menu to draw an object. Tool icons are available from the menu bar on the top right-side of the Main window.
    a. Select the type of file (such as DXF and STL) from the Tools menu if you want to import a vector file. The Open dialog box appears where you can select the file to import.
4. Select **File** → **Save** to save and name your job.

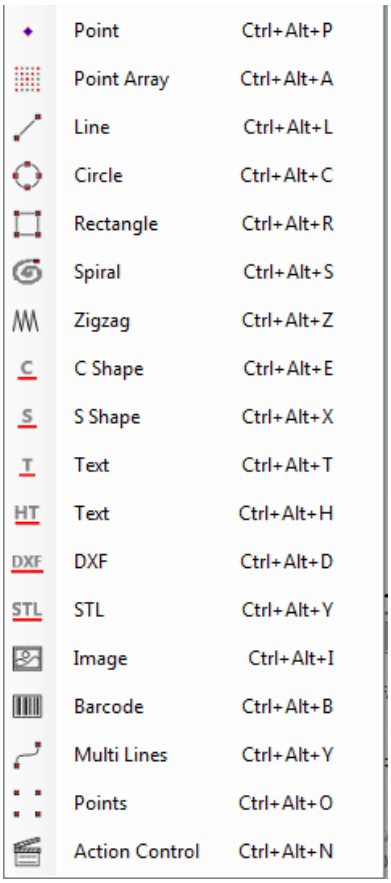
5.5 Process Features and Tools

IPGScan includes a number of standard objects and features that can be used in the creation of jobs. Objects can be found in the Tool Bar, shown in Figure 5.6.

Figure 5.6 Tool Bar

Objects can also be found by clicking the "**Tools**" menu (Figure 5.7). Keyboard shortcuts for each object are also listed in the Tool Menu.

Figure 5.7 Tool Menu



Clicking on a shape in either menu will place one of the selected shape onto the canvas. Action Controls will appear in the Job Tree to the left, but not on the canvas.

Other basic features are in Table 5.2.

Table 5.2 IPGScan Features and Shortcuts

Operator	Shortcut	Icon
New	Ctrl + N	
Open	Ctrl + O	
Close	Ctrl + F4	
Save	Ctrl + S	
Save As		
Options	Alt + O	
Copy	Ctrl + C	
Paste	Ctrl + V	
Undo		
Delete	(Delete button on Keyboard)	

5.5.1 Copy and Pasting Objects

To copy and paste objects:

1. Highlight one or more objects in the Job Explorer pane.
2. Select **Edit** → **Copy** or press **Ctrl+C**.
3. Select a group in the Job Explorer pane to paste the copied objects.
4. Select **Edit** → **Paste** or press **Ctrl+V**.
5. To delete an object, highlight one or more objects in the Job Explorer pane and press the **Delete** key on your keyboard.

Note: Only objects (Shapes and Action Controls) can be copied. Groups can not be copied.

5.5.2 Moving an Object

There are five options for moving an object:

Object Pose - Center and Rotation

- This allows the user to use a direct entry method by inputting coordinates that correspond to the scanners field of view.

Nudge

- A button with four arrows can be found at the top of the parameter window. This provides the user with a prompt box that allows the feature to be moved.

Manual Selection of Objects

- This method allows the user to click on the feature in the field of view and drag it using a mouse. (You cannot preview with the guide beam and use select by pick)

Guide Laser Positioning (Preview Positioning)

- Guide laser positioning allows users to display the objects feature(s) using the guide beam in the scanners field of view.

Robot Positioning

- This option can be found by holding “**Ctrl**” and clicking then Processing Window icon. This will open up a modified Processing Window, where users can align the shapes based on a robot current position. More information on this is in Section 9.9 .

5.5.2.1 Object Properties

The following options can be found in the property menu for each shape object (Figure 5.8).

- The **Object Pose** alters the objects position relative to the objects center.
- The **Global Pose** alters the objects position relative to the center of the canvas. Only for OTF jobs.
- The **Center** sub-sections of Object and Global Poses translate the object in the X,Y, and Z directions.
- The **Rotation** sub-sections of Object and Global Poses rotates the object in the X,Y, and Z directions.

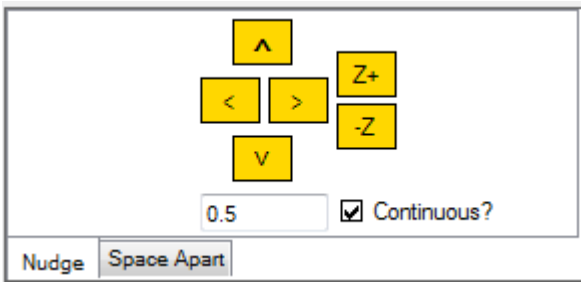
Figure 5.8 Object Location Parameters

Object Pose	
◢ Center	**0, 0, 0**
X	**0**
Y	**0**
Z	**0**
◢ Rotation	**0, 0, 0**
X	**0**
Y	**0**
Z	**0**
Global Pose	
◢ Center	**0, 0, 0**
X	**0**
Y	**0**
Z	**0**
◢ Rotation	**0, 0, 0**
X	**0**
Y	**0**
Z	**0**

5.5.2.2 Nudge Tool

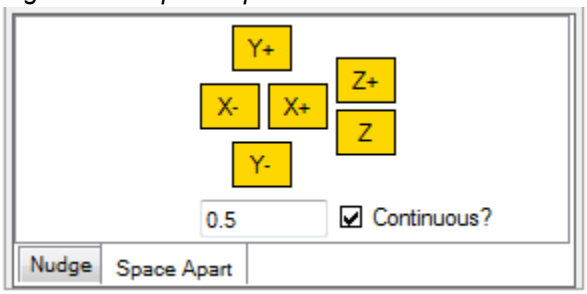
Above the properties menu, select the  button to display the Nudge Window. The Nudge tab will move the objects the specified increment in the direction of the arrows (Figure 5.9).

Figure 5.9 Nudge Tab



The Space Apart tab will equally space apart multiple objects by the specified amount (Figure 5.10).

Figure 5.10 Space Apart Tab



5.5.2.3 Manual Selection of Objects

Users can manually manipulate the objects on the canvas with the following tools.

The **Select by Pick** feature allows users to manually manipulate the coordinates of the object on the canvas. It does not affect the rotation of the object.

The **Select by Rectangle** feature allows the user to drag and drop the rectangle in the field of view to select multiple objects.

The **Show Selected** feature will show only the selected object in the job tree. All other objects on the canvas will disappear. Note that this does not affect processing: this is only for assisting the users visually.

The **Show Curve Direction** feature displays the direction in which object vectors will be preformed.

The **Show Vertices** feature shows all the vertices in the object.

5.5.2.4 Guide Laser Positioning

Guide Laser Positioning or Preview Positioning, allows users to position objects by displaying them with the guide laser.

While the guide beam is displaying the objects, users can move an object using the arrow keys on their keyboard. This method of object placement allows users to accurately place objects real-time on the physical part.

5.6 Modifying Object Properties

Once an object feature has been created, the object properties may need to be changed. Object properties can be changed by selecting the desired object or by selecting multiple objects with a "**Ctrl/Shift**" Click in the Job Tree.

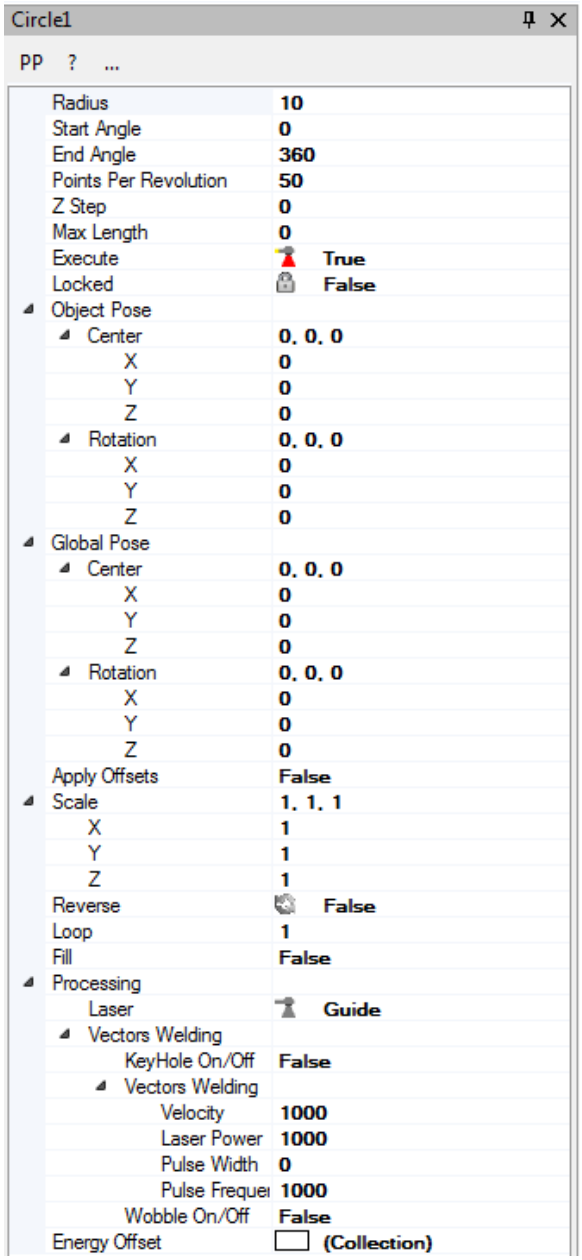
You can modify the different processing properties in the Properties pane.

Note: When selecting multiple features, the parameters displayed in the parameter window will be reduced to the parameters that are common between the weld features. Also, if a variable (i.e. power, length, travel speed etc.) has differing inputs between the selected features, it will appear as an empty box.

5.6.1 General Properties

1. Click on the **object name** (for example: Circle1) in the Job Explorer pane. The Properties pane will update with data from the selected object as shown in Figure 5.11.

Figure 5.11 Properties Pane



2. General Properties include:

    a. **Descriptions** of a selected property can be found by clicking on the button at the top of the properties window.
    b. **Execute** determines whether or not an object will be performed when cycling the program.
    c. **Locked** prevents anyone from changing parameters on a specific object.
    d. **Reverse** changes the direction that the object is performed in.
    e. **Loop** defines the number of times a feature is performed.

3. **Fill** fills the object based on the following parameters. Default is False (OFF).

a. **Beam Diameter** – compensation for the diameter of the beam in the fill pattern.
b. **Fill Angle** – the angle of the fill lines.
c. **Fill Pitch** – the pitch between laser lines for fill.
d. **Shape Outline** – if the shape will be outlined (True) or not (False).
e. **Fill Direction** – direction of the fill lines.
f. **Fill Type** – the type of fill.

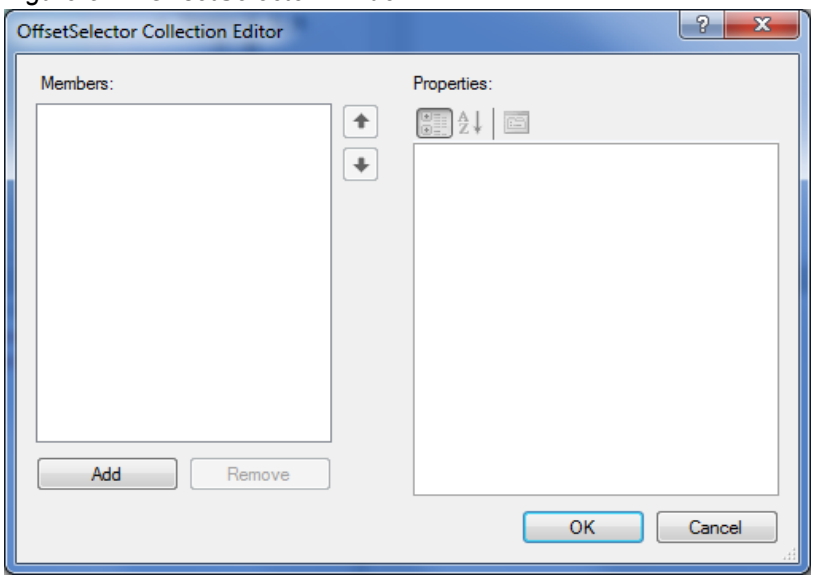
5.6.1.1 Applied Offsets

When Apply Offsets is set to true, users have the ability to apply changes to parameters (position, rotation, and process parameters) through the utilization of register values.

The following outlines how to apply offsets.

1. Select the desired features(s) in the job tree.
2. Set Apply Offsets to True in the parameter window.
    a. This causes Offset properties to appear.
3. Click on the "**...**" box in the Offset Properties. The OffsetSelector Window will appear, Figure 5.12.

Figure 5.12 OffsetSelector Window



4. In the OffsetSelector Window, click "**Add**". Offsets can be applied to the following parameters:
    a. Object.Pose.Center.X
    b. Object.Pose.Center.Y
    c. Object.Pose.Center.Z
    d. Object.Pose.Rotation.X
    e. Object.Pose.Rotation.Y
    f. Object.Pose.Rotation.Z
    g. Scale.X
    h. Scale.Y
    i. Scale.Z
    j. Velocity
    k. Power
    l. Pulse Width

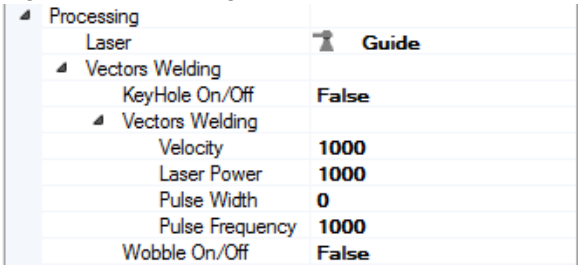
m. Pulse Frequency
n. Keyhole Time
o. Energy
p. Pitch
q. Relative Speed
r. Frequency

5. Once a parameter has been selected for offset, set the variable that will be referenced for the offset data.
    a. For loading data into registers, please refer to Section 5.8.10.
    b. Offsets are applied as a scalar value. Not as a percentage or multiple.
6. Repeat steps 4 and 5 until all desired offsets are applied to the features(s).
7. Once all desired offsets are applied, close the OffsetSelector Window box by clicking "**OK**".

5.6.2 Welding Properties

1. **Processing** - contains a dropdown menu to select **welding** profiles.

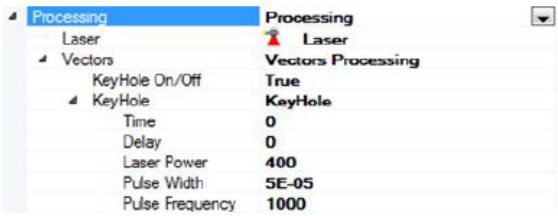
Figure 5.13 Welding Parameters



a. **Laser** - select the guide or laser beam to be used for each object in the work-space.
b. **Vectors** - modify the parameters to define the process settings (welding, laser power, and pulse settings) for the job.
    i. **Velocity**: velocity of the scanner moment in user units/sec. (This is for all shapes, **except** Points and Point Arrays)
    ii. **Time**: The time to which the laser will be on for the point (in job units). This is **only** for Points and Point Arrays.
    iii. **Power**: Laser power
    iv. **Pulse Frequency**: the frequency to which to fire the laser
    v. **Pulse Width**: length of time the laser will be on for each pulse. Pulse Width has to be lower than 1/Pulse Frequency
    vi. **Wobble**: please see wobble section
c. **KeyHole** - set the KeyHole On/Off to "True" to enable the KeyHole feature, Figure 5.14. Set to "False" to disable the KeyHole. Modify the parameters for a dwell period to initiate to initiate the keyhole in the workpiece before the actual process begins.
d. **Wobble** - Click the Type drop-down menu to display the four Wobble modes with amplitudes and frequencies (Circle, Line, Eight and Infinity). Use these modes to improve the quality and consistency of the welds. (See Section 5.6.2.1).
e. **Energy Offset** – click the ellipsis button to access Energy Offset window. Ramp up and down profiles for the laser power used in the welding pro-cess.See Section 5.6.2.2.

Figure 5.14 KeyHole Parameters

Figure 5.16 KeyHole Parameters

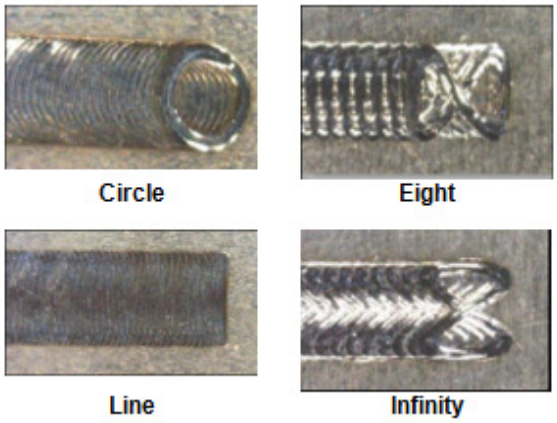


5.6.2.1 Wobble

The Wobble feature allows users to add a wobble to the weld seam. The wobble causes the TCP speed of the beam to speed up, but still allowing the weld feature to maintain a commanded linear speed. The wobble will never change the amount of time it takes to finish a weld.

Refer to Figure 5.15 for all wobble types.

Figure 5.15 Wobble Types

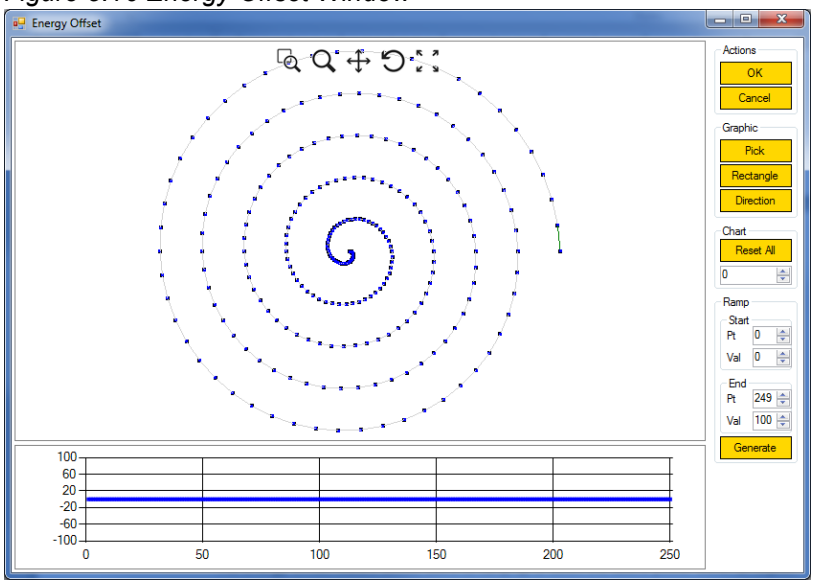


- Amplitude controls the width of the wobble. For example, if a circle was used then the amplitude would be the diameter of the wobble.
- Delay is the amount of time it takes wobbling to begin. The use of a negative number causes the wobble to start early.

5.6.2.2 Energy Offset

The Energy Offset feature allows users to ramp up or down the lasers power within an object. The percentage is based on the laser power that the users input (where 0% is the laser's power).

Figure 5.16 Energy Offset Window

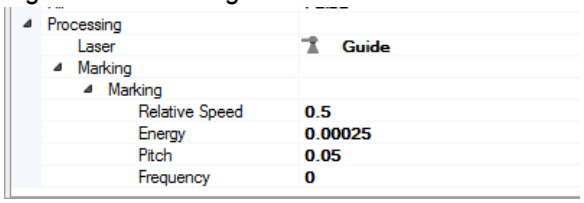


- Users can drag points individually on the bottom graph.
- To create a linear progression of power between points, users can use the "**Ramp**" functionality. Under "**Ramp**" users can specify the starting and ending points and their values. Then click **generate** to create a linear ramp of weld points.
- Users can also select points on the shape using the "**Pick**" or "**Rectangle**" buttons.
- The "**Direction**" button shows the direction of the welds.

5.6.3 Marking Properties

1. **Processing** - contains a dropdown menu to select **marking** profiles.

Figure 5.17 Marking Parameters



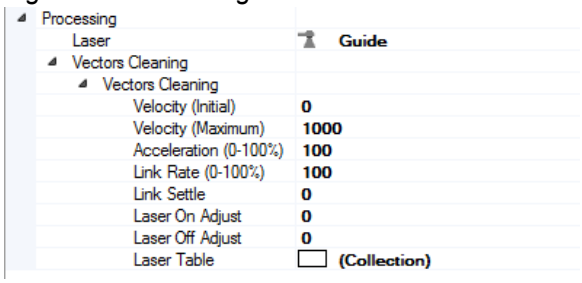
a. Laser – select the guide or laser beam to be used for each object in the work-space.
b. Relative Speed – relative speed of the laser from 0 to 1.
c. Energy – energy of the laser in J.
d. Frequency – frequency of the laser.
e. Pitch – distance between the pulses on the workpiece.

These properties are applicable for any shape EXCEPT for Marking points. For Marking Points, only the Energy property is applicable from those above.

5.6.4 Cleaning Properties

1. **Processing** - contains a dropdown menu to select **cleaning** profiles.

Figure 5.18 Cleaning Parameters



a. **Laser** – select the guide or laser beam to be used for each object in the work-space.
b. **Velocity** – Specifies at which velocity the mirrors are moving at the initial (beginning) and maximum (end) of each vector scanning in units/sec (mm/sec, inch/sec, etc). Depending on the length and acceleration of the vector, this velocity may not be achieved. This is only used in OTF mode: should be set to 0 otherwise.
c. **Acceleration** – percentage of the maximum acceleration allowed by the scanner. A lower value increases time between Velocity (Initial) to Velocity (Maximum), defined above.
d. **Link Rate** – Percentage of maximum speed allowed by the scanner for a jump (i.e. when the scanner moves from one point to another).
e. **Link Settle** – Specifies how long until the scanner settles on a given position in units of scanner time constants. The software will limit the value to a safe maximum. Usually, a value between 3 and 6 should be used.
f. **Laser On/Off Adjust** – adjustment on the calculated time between when the scanner reaches the point and the laser begins to fire. Only positive values are allowed.

5.6.4.1 Laser Table

During an actual vector scanning, IPGClean has to manage three laser control signals. These signals are:

- **Laser Power** (in Watts)
- **Pulse Frequency** (in Hertz), assuming the pulse laser is being controlled
- **Pulse Width** (in Seconds), assuming the pulse width can be varied

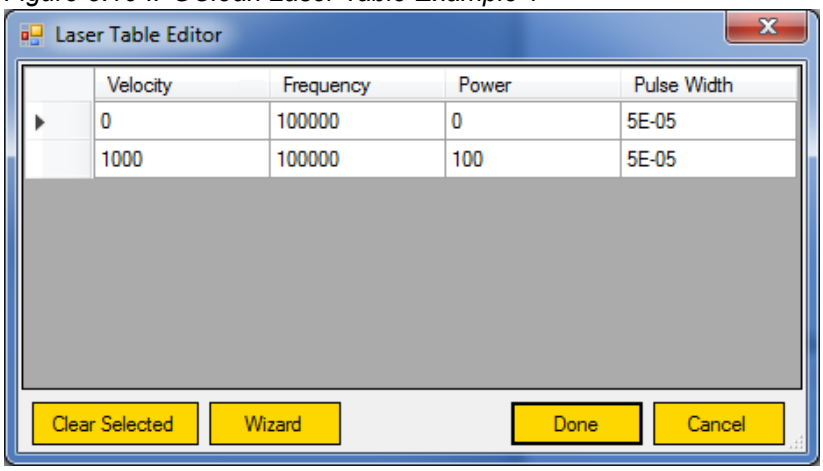
These signals may change with time and they are synchronized with the galvo mirrors movement. All signals above have to be specified in terms of the scanning velocity. This is to ensure that either:

- A **constant pulse spacing** OR
- A **constant deposition of energy per linear unit**

is maintained even if the galvos are accelerating. This is achieved by the Laser Table Feature. The Laser Table feature specifies the Power, Frequency, and Pulse Width for specific Velocities.

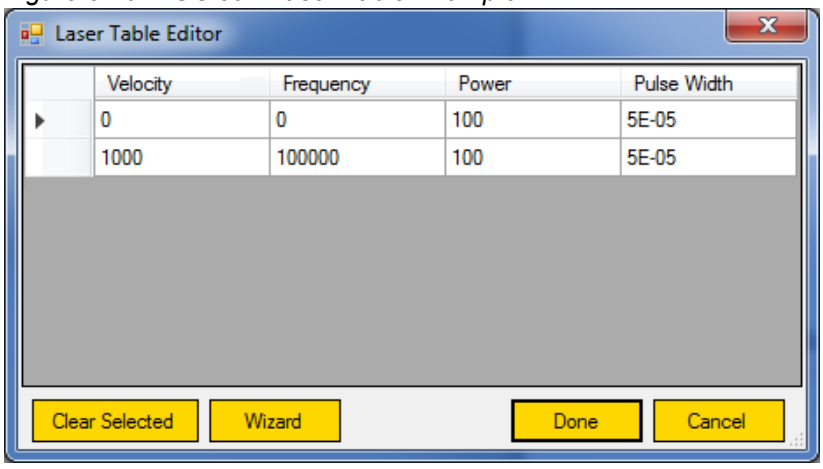
For example, for **constant laser energy per linear distance**, increase the laser power from 0 to 100 W at a constant pulse width (50% duty cycle) and constant frequency (100 kHz) (Figure 5.19).

Figure 5.19 IPGClean Laser Table Example 1



For equally spaced pulses increase the pulse frequency from 0kHz to 100kHz at a constant power and pulse width (Figure 5.20).

Figure 5.20 IPGClean Laser Table Example 2



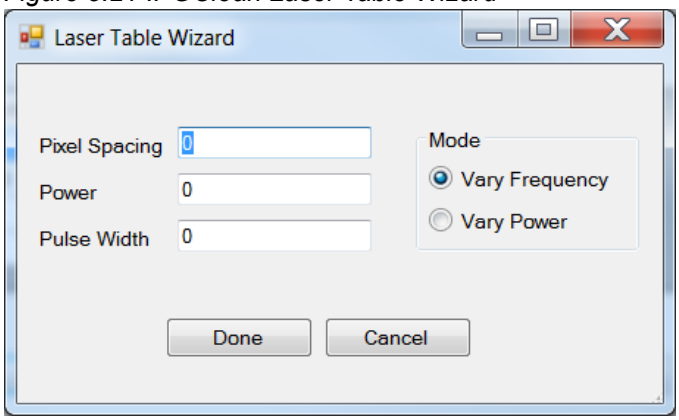
Note: The pulse distance on the surface being cleaned is simply the ratio between velocity and frequency.

Note: The initial and maximum velocities may not need to be equal to those on the laser table. The software will interpolate and find correspondent values in the line that passes through all values in the laser table.

The laser table editor also offers a wizard that populates the laser table based on Maximum Velocity parameter and uses the pulse distance as the input parameter.

Clicking on the Wizard button, the following dialog appears:

Figure 5.21 IPGClean Laser Table Wizard



- Vary Frequency - a table will be created in which the pulse spacing is kept constant by varying the frequency as in Example 2 above.
- Vary Power - a table will be created in which the energy per linear distance is kept constant by increasing power with increasing velocity as in Example 1 above.

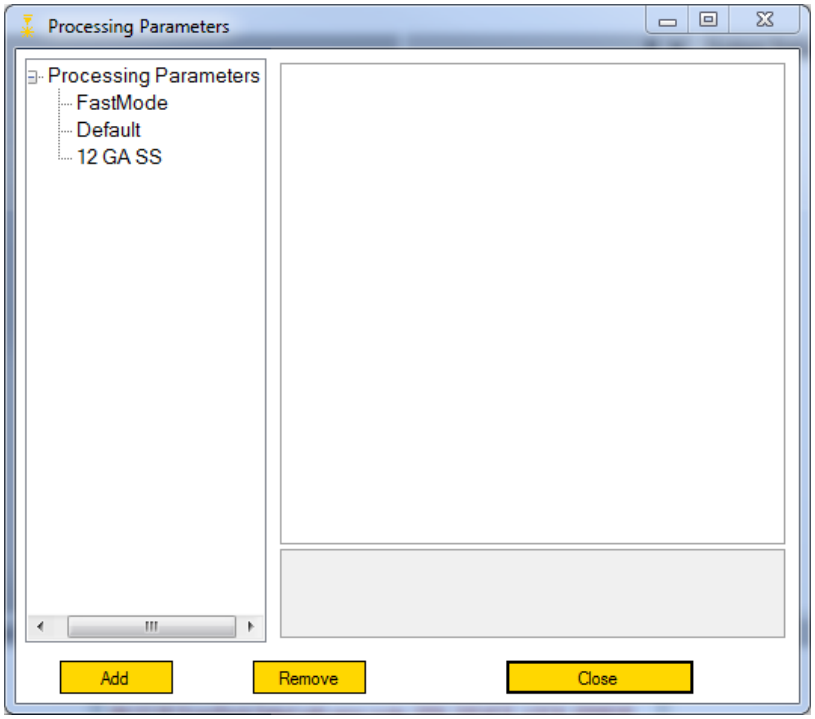
5.7 Creating a Parameter Profile

You can create a parameters profile for frequently used materials/parameters.

To create a Parameter Profile:

1. Select **View** → **Processing Parameters**.

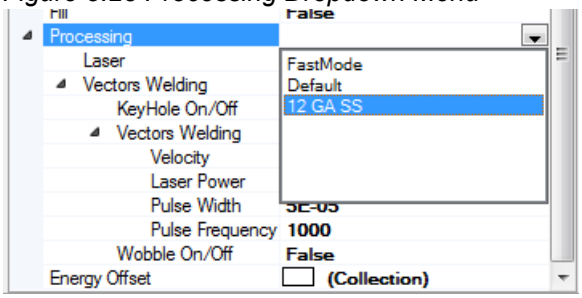
Figure 5.22 Welding/Marking/Cleaning Parameters



2. Click **Add** to add a new profile.
3. Rename the profile to a desired custom name as needed.
4. Modify the process parameters as needed.

5. Click **OK** to save your changes. Close the Parameters window.
6. In the Data/Parameter Window, after selecting an object, under Processing, select the profile from the drop-down menu as shown in Figure 5.23.

Figure 5.23 Processing Dropdown Menu



Note: The fields for the parameters are auto-filled based on the template you selected. Further modifying the shapes parameters after selecting a profile will not change the profile.

5.8 Action Controls and Groups

All Action Controls can be **locked**. This prevents other users from easily editing the Action Control. This property is at the bottom of the properties list, unless set to true.

Most actions have an **Action Timeout** function. ***Action Timeout** terminates the job if task is not completed after the specific timeout. To disable, set Action Timeout value to -1.

5.8.1 No Action

This performs no action: the program will not be affected in any way.

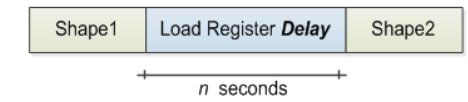
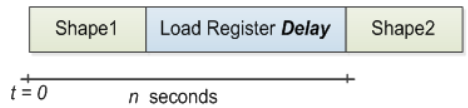
5.8.2 User Action

Provides a pop-up message for users.

Prompt	Message which will appear to the users. User must click OK on message box to continue the job.
Action TimeOut	*See above**.

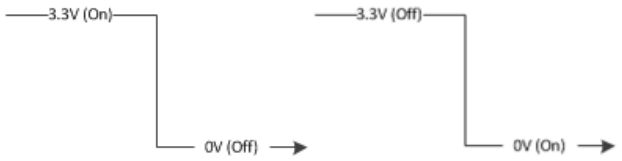
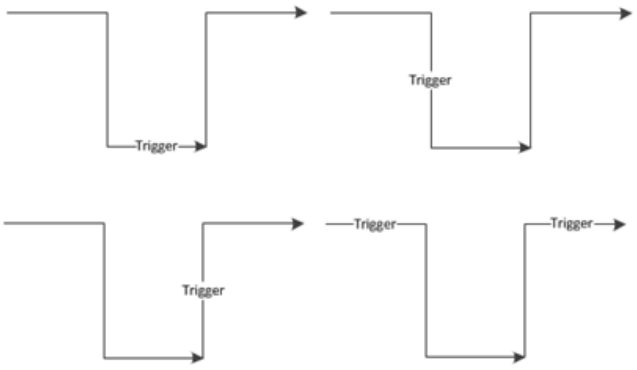
5.8.3 Delay Action

Delays the program. Delay is set in seconds. This is the fixed time unit for jobs.

Delay	Delay set in seconds.
Absolute	**True** – The overall delay from the beginning of the job. **False** – the overall delay from the end of the previous object. Absolute - **False**  Absolute - **True** 

5.8.4 Streaming Data Action

Sends data down to the buffer. Causes no processing delay in IPGScan.

Function Call	***Set Port C*** – Sets port C value. ***Clear Port C*** – Clears port C value. ***Set Wait On Event*** - When event occurs on START, GPIO1 or GPIO2, the streaming action will start. User selects START, GPIO1 or GPIO2. ***Set Wait Invert*** – Sets the specified input active level to low (Clear) or high (Set). User selects Set or Clear option and START, GPIO1 or GPIO2.  **Set Wait Edge** – Sets the detection of the specified input to level detection (Clear) or edge detection (Set). User selects Set or Clear option and START, GPIO1 or GPIO2. 
Action TimeOut	*See above*.*

5.8.5 Reset Tracking

Resets the coordination that is set by the Set Coordination Mode Action.

Action TimeOut	*See above*.*

5.8.6 Set Coordination Flags

Sets the Coordination Flags in Hex. Used with On-The-Fly (Section 8 & 9).

Coordination Flag	Coordination Flag in Hex.
Action TimeOut	*See above*.*

5.8.7 Set Coordination Mode

Sets the tracking mode for Scan Pack and IPGScan. This action is important if the Scan Head is attached to a system which can move.

Coordination Mode	***Stage Tracking*** - Selects robot mode for the stage. This means that the stage will move to fire the laser. ***Robot Tracking*** - Start robot tracking. ***Robot Stationary*** - If a robot is connected but not moving. ***Stage Auto*** - Automatically selects between coordinated or robot mode for the stage. Coordinated move will fire the laser when the stage is stationary before moving the stage. ***Coordination Off*** - Turns off coordination mode.
Action TimeOut	*See above*.*

5.8.8 Wait

Waits for the buffer to empty or Port A Bit Action to be true/false (1/0).

WaitFor MethodType	***Wait for Done*** - Waits for the buffer to be empty. ***Port A Bit Action*** - Waits for the specified bit to be true or false (1 or 0). User will set this condition (true or false)
Action TimeOut	*See above*.*

5.8.9 Go To Group

Goes to a specific object group in the IPGScan job. This Group ID can be from a register, stored in Variables 1 to 10, or provided as a constant by the programmer.

GoToGroup Method	***Register*** – Will obtain the Group number from one of the registers (Variables 1 to 10). ***Constant*** – Manually set group number.

5.8.10 Write Register

Writes a register over Ethernet or to a file.

WriteRegister Method	***Ethernet*** – Writes to an Ethernet client set by the user from IPGScan Registers, Variable 1-10. ***File*** – Writes to a file set by the user from IPGScan Registers, Variable 1-10. File format is ".log", so recorded data will also contain a date and time stamp.
Action TimeOut	*See above*.*

5.8.11 Park At Action

Parks the scanner output at the specified coordinates.

Park At	X, Y and Z Coordinates
Action TimeOut	*See above*.*

5.8.12 Load Register

Loads a register with a value. For any TCP functions, set IP/Port in **Options →Settings**.

Load Register Using	***Port A*** – User must set the Shift (bit shift), Width (bit mask), and Destination Register. ***Serial Port*** – Reads a command over the Serial Port. User must set all COM port settings. The properties Command and End Delimiter must also be set. Command is the message that will be sent from IPGScan. End Delimiter is used to signify command completion from the serial device. Acknowledgement is optional. Destination Register must be set. ***User*** – Stores the operator's response from the prompt into a Destination Register. Both Prompt and Destination register must be set. ***Ethernet*** – Reads/loads a command over Ethernet. The properties Command and End delimiter must be set. Command is the message that will be sent from IPGScan. End Delimiter is used to signify command completion from Ethernet device. Acknowledgement is optional. Destination Register must be set. To change other Ethernet settings, see the options menu. ***Constant*** – Loads a constant into the Destination Register. Constant and Destination Register must be set. ***Concatenate*** – Combines two registers together. Note that this function doesn't add. (e.x "4" and "5" → "45"). Operand 1 and 2, and Destination Register must be set. ***RegEx*** – Allows a RegEx pattern to be applied from the source register to the designation. Search online for more information about RegEx patterns if needed. Pattern, Source Register and Destination Register must be set. ***Math*** – Takes two register values and can add or multiply them. Operand 1 and 2, Operator, and Destination Register must be set. ***Increment*** – Increments the value in the register by the set amount. Increment By and Destination Register must be set. ***Date*** – Will load the date into the specified register. Destination Register must be set. The format is set to *mm/dd/yyyy*. ***Time*** – Will load the time into the specified register. Destination Register must be set. The format is set to *hh:MM:ss*. ***Custom Date Time*** – Will load the date and time into the specified register. Destination Register must be set. The format of the date and time can be customized: • MM – minutes • hh – hours (12) • HH – hours (24) • ss – seconds • s – decimal fraction of a second • tt – AM or PM • mm – month • dd – day • yy or yyyy – year • **:** (colon) **/** (forward slash) **,** (comma) – (dash) and **.** (period) are symbols accepted in this field. ***Timer*** – Can be started, stopped or reset. The value will be stored in the Destination Register which must be set. ***From XML*** – A file path is pulled from the registers, which can be set using the Constant function. The ID Attribute is the tag ID in the XML. The retrieved value is stored in the ID Value variable. ***TCP Client*** – Reads/loads a command over TCP. The properties Command, End delimiter, IP Addess, and Port must be set. Command is the message that will be sent from IPGScan. End Delimiter is to signify command completion from TCP Server. Acknowledgement is optional. Destination Register must be set.
Action TimeOut	*See above*.*

5.8.13 Stage Motion Action

Moves the stage to the specified coordinates.

Move to	X, Y and Z Coordinates. This is the position to move to.
Home *X, Y, Z*	Boolean values. If set to true, it will home the stage on that axis. On false it will not home axis.
Action TimeOut	*See above*.*

5.8.14 Exit Action

Ends the job. This is ignored if Loop is selected in the processing window.

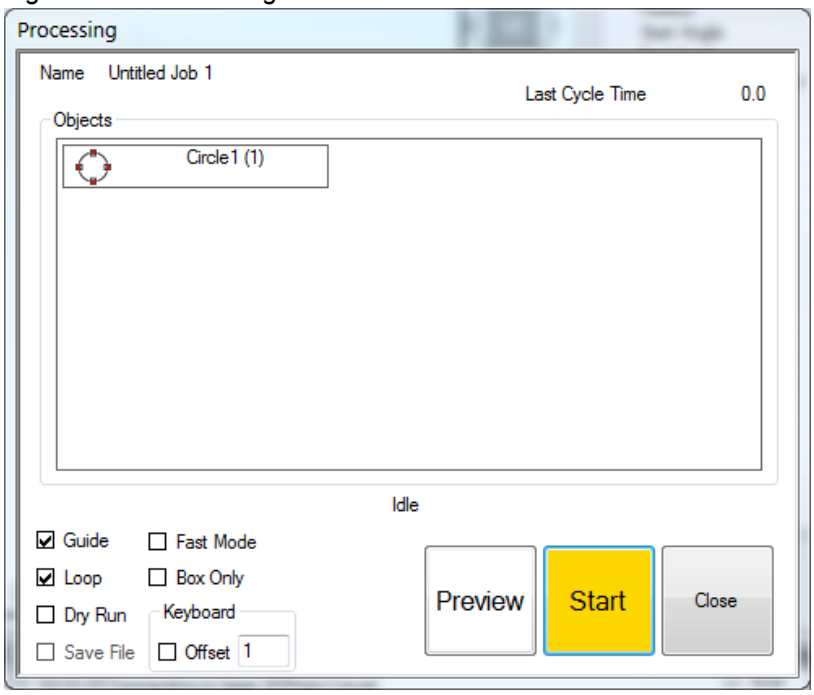
Action TimeOut	*See above*.*

5.9 Previewing and Running an IPGScan Job

To preview and run a job in IPGScan:

1. Select **Tools** → **Start Processing**.The Processing window will appear as shown in Figure 5.24.

Figure 5.24 Processing Window



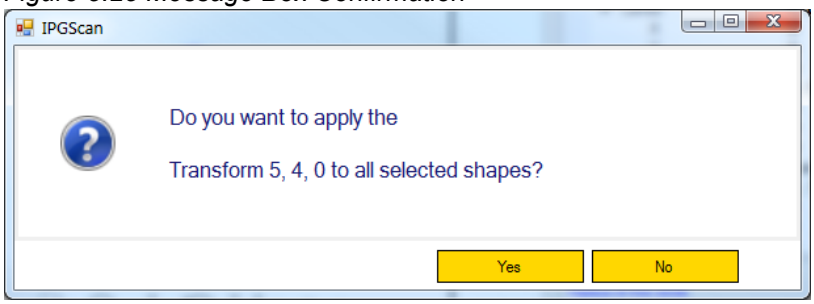
- If you leave the **Guide** checkbox disabled, the IPGScan program runs in the actual processing mode using the parameters you have defined.
- If you enable the **Guide** checkbox, the **Keyboard Offset** checkbox appears.
- Enable **Loop** to loop the job continuously. Loop is useful when placing objects with the guide.

Note: For optimal cycle time, the loop should be implemented with an action control (**GoToGroup** Action Control), not with the loop checkbox.

Note: After checking **Keyboard Offset**, a textbox appears. This textbox contains the unit each keypress represents and can be modified by the user.

2. Click **Close** to exit the Processing window. A message box appears prompting you for confirmation of the new position as shown in Figure 5.25.

Figure 5.25 Message Box Confirmation



3. Click "**Yes**" to keep the new position.

6.0 Digital Camera

6.1 Installing a Digital Camera

A digital camera provides co-axial vision of the workspace, which is useful for precisely aligning, previewing, and inspecting the workpiece.

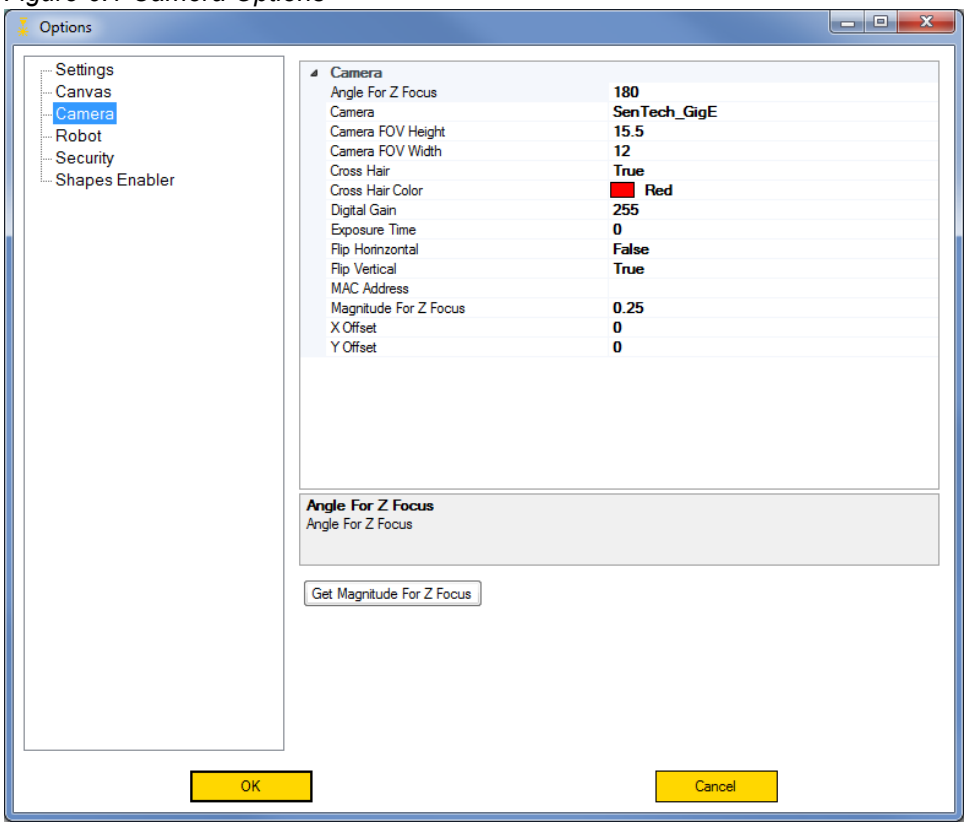
For detailed information about installing a digital camera please refer to the 2D Scanner Series User Guide (PN P21-010211).

6.2 Configuring the Digital Camera Options

To configure digital camera options:

1. Ensure that the digital camera software has been downloaded and installed.
2. Camera options can be found under the **View** → **Options**→ **Camera**. The Camera options window will appear as in Figure 6.1**.**

Figure 6.1 Camera Options



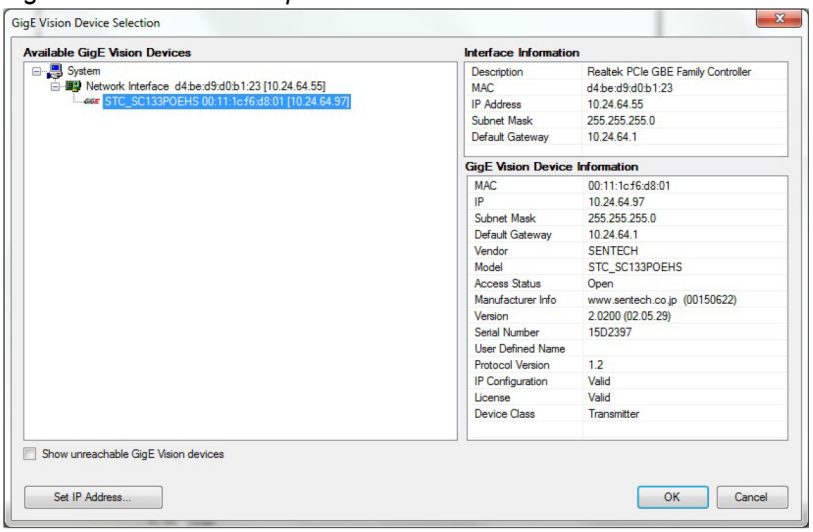
3. Set the type of camera.

6.3 Connecting to a Digital Camera

To connect to a digital camera:

1. Select **View** → **Camera**→ **Setup**. The setup window will appear as in Figure 6.2.

Figure 6.2 Camera Setup Window

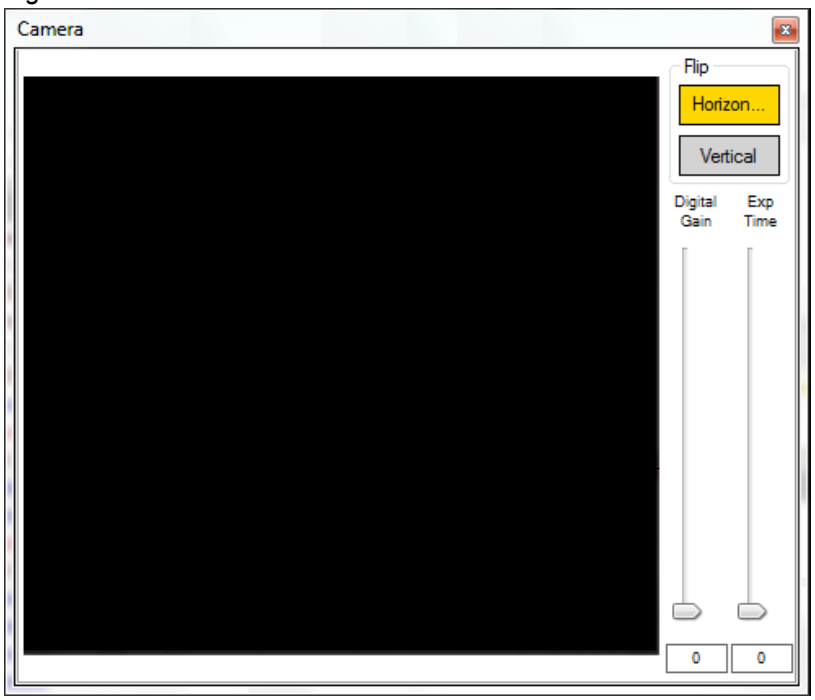


2. Click on the branches to select the camera. Interface and GigE Vision Device information is displayed in the right pane.
3. Click “**OK**” to accept your selections.

6.4 Starting the Camera

1. Select **View** → **Camera**→ **Start** to start the camera. To access the camera controls, double-click on the camera window, shown in Figure 6.3.

Figure 6.3 Camera Window Controls



2. Using the camera controls, the camera view can be flipped vertically or horizontally. The Gain and Exposure Time can also be changed to get a better view of the workspace.

Note: You can undock the camera window or expand it as needed by clicking on the top border.

Note: For detailed information about a specific digital camera, refer to the IPG accompanying digital camera documentation.

6.5 Scanning Workspace with the Camera

1. Select **View** → **Camera**→ **Scan** to scan the entire workspace.
2. Select **View** → **Camera**→ **Scan Partial** to scan part of the workspace. Click the left mouse button and hold to draw a rectangle where the scan will be.
3. For both Scan types, a message at the bottom of IPGScan window will appear: “Camera scanning in progress. Please wait.” To cancel this operation click the red Cancel button by the message.

6.6 Stopping the Camera

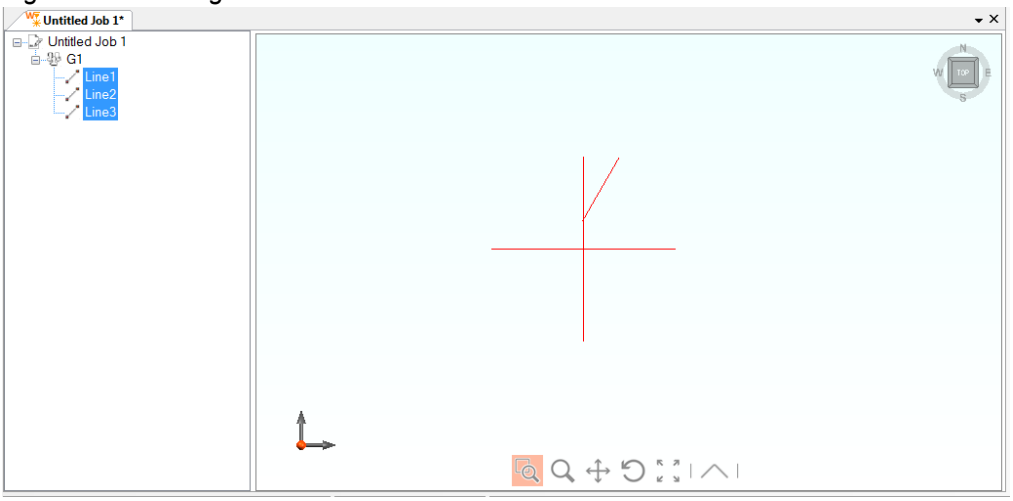
1. Select **View** → **Camera**→ **Stop** to stop the camera scan.

6.7 Adjusting the Camera Image to the Center of View

You can focus, shift, and rotate the image as necessary to align it to the scanner’s center of view. To make the image adjustments:

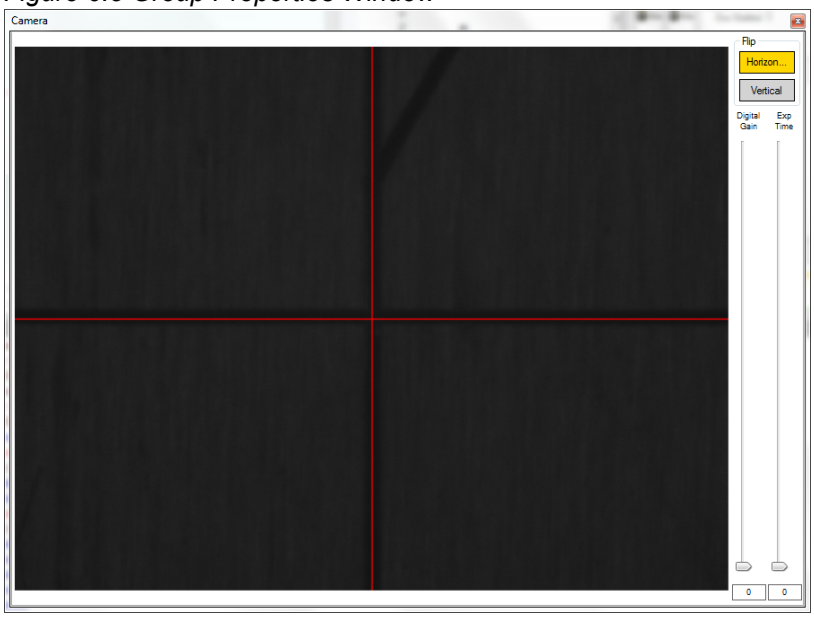
1. Make sure the scan head is set to the working distance above the workpiece. Use the focus guide to set the scanner head to correct working distance.
2. Blast a cross pattern on a suitable workpiece in the center of the field using the laser. The small arrow indicates the +Y direction to ensure the image orientation is correct (Figure 6.4).

Figure 6.4 Blasting a Cross Pattern



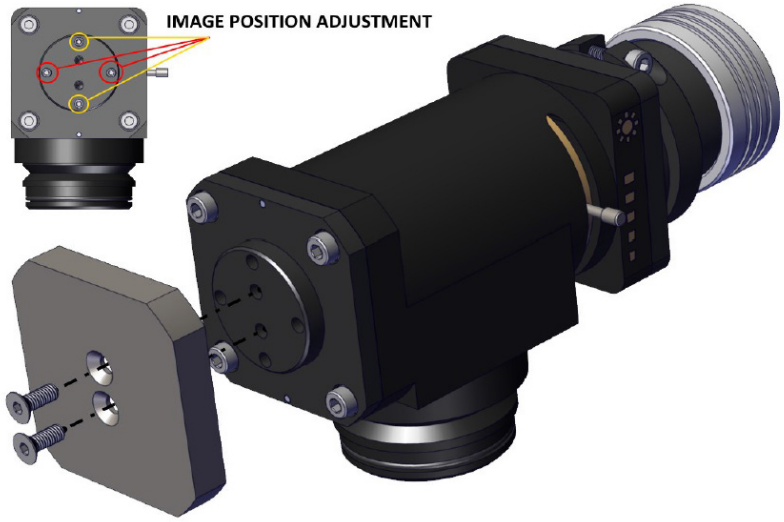
3. Align the image to the cross-hairs as shown in Figure 6.5.

Figure 6.5 Group Properties Window



4. If the image is not in focus, then the height of the head needs to be adjusted.
5. Rotate the camera until the cross and cross-hairs are square.
6. Move the Iris level to adjust the image brightness.
7. If the image is not centered in the camera, remove the cover as shown in Figure 6.6.

Figure 6.6 Camera Mounting



8. Adjust the four setscrews.
9. Repeat focus, rotation, and alignment until aligned to the cross-hair. Tighten the clamp.
10. Replace the cover.

7.0 Robotic Point & Shoot

7.1 Overview

Robotic Point & Shoot is where the scanner and the robot coordinate their processing within the work area. The robot will move and orient the scanner along the workpiece. When the scan head is in position the robot will signal the scanner to process the section. The scanner will then signal the robot when it is done processing the section.

The following chapter describes how to setup a robot and an IPGScan job for Robotic Point and Shoot. This processing method requires the 24V Robot Interface board: see 2D Scanner Series User Guide (PN P21-010211).

7.2 IPGScan Configuration Parameters

Next is to **create a Point & Shoot Job** in IPGScan. The next few steps walk though setting up the example in Figure 7.1. This example job can be found in the IPGScan Jobs folder.

Note: In the example, the action controls have been renamed to reflect their specific action (right click on the action control to rename).

1. Create a new job.
2. In Group 1 (G1) place the following **action controls**:

Wait	
WaitForMethodTypes:	**Wait For Done**
Default values for other fields.	
Wait	
WaitForMethodTypes:	**PortA Bit Action Control**
Bit:	**0**
Wait For:	**TRUE**
Default values for other fields.	
Load Register	
Load Register Using Type:	**Port A**
Shift:	**0x00000010**
Width:	**9**
Default values for other fields.	
GoToGroup	
GoToGroup Method Type:	**Register**
Default values for other fields. Note that the variable in "Go To Group At..." must be the same Register Variable as the Load Register "Destination Register" field.	

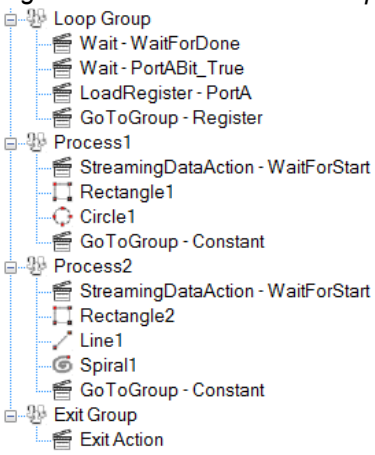
3. In the next Group, G2:

Streaming Data Action	
Function Call:	**Set Wait On Event**
Event:	**Start**
Default values for other fields.	
Shapes to Process	
Go To Group	
GoToGroupMethod:	**Constant**
GoTo:	**1**
Default values for other fields.	

4. Repeat Step 3 for as many groups as needed. In this example, there are two object groups (G2 and G3).

5. In the last Group, (G4 in this example) place one **Exit Action Control**. This will ensure the IPGScan Job will properly exit.

Figure 7.1 Point & Shoot Example Job



7.3 Robot Software

Robot functions are provided to simplify Robotic Point & Shoot. These functions can be called in the Robot's Point & Shoot program to interact with the scanner. The files can be found on the website software.ipgphotonics.com under the Scanner/Robot_Files. Table 7.1 lists 6 functions provided and a description of the purpose for each function.

Table 7.1 Robot Welding Jobs

Job	Description
IPG_EXAMPLE_WELD	This is an example job of how the full system works together.
IPG_EXECUTE_WELD	This job executes the pre-selected IPGScan group.
IPG_LASER_DIS	This job configures any I/O for disabling the laser or system. It is called in IPG_SHUTDOWN_WELD. This job is not pre-configured.
IPG_LASER_EN	This job configures any I/O for enabling the laser or system. It is called in IPG_PREP_WELD and SETUP_WELD. This job is not preconfigured.
IPG_PREP_WELD/ SETUP_WELD	This job sets up all components for use in the job. This job only needs to be called once at the beginning of the robot job. This function expects the desired timeout in milliseconds. In IPG_EXECUTE_WELD, if the robot waits longer than the timeout for the scan controller to be ready, the robot will stop. Setting the timeout to -1 will disable the timeout. IPG_PREP_WELD and SETUP_WELD are the same job; new versions are called IPG_PREP_WELD.
IPG_SELECT_WELD	This job selects the desired processing group from IPGScan. This function needs to be called before each call to IPG_EXECUTE_WELD. It is time efficient to also call IPG_SELECT_WELD before moving the robot into position for IPG_EXECUTE_WELD. This function expects the desired processing group as a parameter. This should be a decimal number between 0 and 511, inclusive.
IPG_SHUTDOWN_WELD/ CLOSE_WELD	This job turns off all I/O used in this system. This job only needs to be called once at the end of a robot program. There is a small time-based wait at the beginning of this job. This gives IPGScan time to read the I/O if the Exit Action is used. The time is small enough that it will not be noticed in a single execution. If the robot is being set-up for a looped cycle, the wait time can be removed or IPG_SHUTDOWN_WELD does not have to be called at all. IPG_SHUTDOWN_WELD and CLOSE_WELD are the same job; new versions are called IPG_SHUTDOWN_WELD.

7.3.1 Special Cases

7.3.1.1 FANUC

An additional numeric register is required for the job IPG_SELECT_WELD. By default register 2 is used. Two user alarms are used as well. Their severity is setup in IPG_SETUP_WELD. The user alarm messages must be setup by the user in the FANUC menu. By default alarm 1 is used in case of a timeout in IPG_EXECUTE_WELD and alarm 2 is used in case of an invalid group ID in IPG_SELECT_WELD.

7.3.1.2 Yaskawa Motoman

The timeout provided to IPG_PREP_WELD is in clock ticks, not milliseconds. This value is stored in a global integer variable. Default variable is I000.

7.3.1.3 KUKA

KUKA requires two additional files: IPG_EXAMPLE_WELD.dat and IPG_SCAN_VARI-ABLES.dat. The IPG_EXAMPLE_WELD.dat file contains position information used by move commands IPG_EXAMPLE_WELD. IPG_SCAN_VARIABLES.dat contains variable definitions for variables used in multiple subprograms.

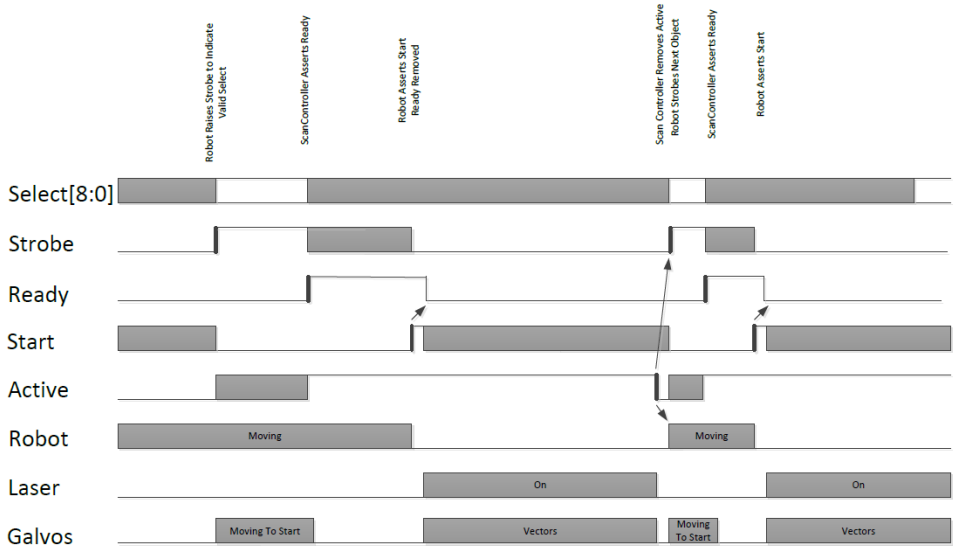
7.3.1.4 ABB

The functions for ABB are provided as a single module file with multiple procedures.

7.3.2 Sequence of Events

Figure 7.2 shows an example of the Point & Shoot handshake sequence with the 24V Robot Interface board. Though its not required, this examples shows the advantage of setting the Strobe bit before moving the robot. During robot motion, the Scan Controller can process the upcoming data and get the Scan Head ready.

Figure 7.2 Robot Signals Timing



7.3.3 Example Program

The following example shows how the jobs are utilized:

1. Call **IPG_PREP_WELD**(TMO).
    a. IPG_PREP_WELD only needs to be called once. TMO is the timeout used in IPG_EXECUTE_WELD in milliseconds. If TMO is (-1) then IPG_EXECUTE_WELD will run without a timeout.
2. Call **IPG_SELECT_WELD**(ID).
    a. Call IPG_SELECT_WELD before each group, even if the same group is being repeated. Pass the IPGScan group ID as a parameter.
    b. Perform all other operations to position the Scan Head in the desired location.
3. Call **IPG_EXECUTE_WELD**.
    a. IPG_EXECUTE_WELD waits for the laser to finish before continuing.
4. Call **IPG_SHUTDOWN_WELD**.
    a. IPG_SHUTDOWN_WELD only needs to be called when all processing has been completed.
    b. If another cycle is going to begin, the robot does not have to call IPG_SHUTDOWN_WELD or IPG_PREP_WELD again.

8.0 Coordinated Stage Motion

8.1 Overview

Coordinated Stage Motion means to mark a moving target without having the target stop for the realignment of the object.

When using a real encoder, the encoder's resolution (meters/encoder pulse) should be at equal to or less than the laser beam diameter. IPG's software also provides a simulated encoder input so a real encoder may not be needed for some applications. Throughout this chapter the terms On-The-Fly and encoder inputs are used interchangeably.

Requirements/Recommendations:

- The Stage Configuration Utility software must be installed.
- Encoder must have a quadrature output.
- Encoder reset is an option.
- The use of the 5V Motor Control Board (PN P30-003779) is needed.

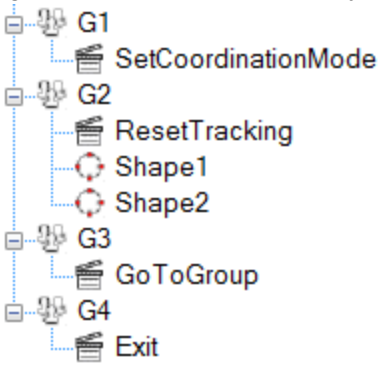
8.2 IPGScan Configuration Parameters

For information regarding hardware connections and the Stage Configuration Utility, please refer to the 2D Scanner Series User Guide (PN P21-010211). For Stage Configuration Utility details, please see Appendix D.

8.3 IPGScan Software

1. Next is to create an On-The-Fly job in IPGScan. The next few steps walk though creating the example shown in Figure 8.1.
2. In Group 1, place an Action Control.
3. Set the Action Control to "**Set Coordination Mode**". The Coordination Mode should be set to "**Stage Tracking**".
4. In Group 2, place a **Reset Tracking Action Control**. After this place desired shapes.
5. In Group 3, place a **GoToGroup Action Control**. Set the Go To field to the ID of Group 2.
6. In Group 4, place an **Exit Action Control**. This Action allows IPGScan to complete the loop.

Figure 8.1 IPGScan On-The-Fly Job Example



Note: For the best performance, logging should be disabled when performing On-The-Fly. It is disabled by default, but this option can be found under **Options →Settings →Log Level.**

9.0 Robotic On-The-Fly

9.1 Overview

This chapter goes over Robotic On-The-Fly (OTF) processing. This chapter explains the software requirements, the IPGScan Software configuration, how to create an individual OTF IPGScan job, and how to run an OTF IPGScan job.

9.2 Connections/Robot Software

Utilization of this OTF software requires additional software on the robot, additional electrical connections between the robot and the scan controller, and the 24V Robot Interface Board. For information about the additional electrical requirements and the 24V Robot Interface Board, please refer to the 2D Scanner Series User Guide (PN P21-010211).

9.2.1 Scanner Requirements

OTF coordination requires an additional configuration file for the scan controller, CoordinationParams.xml. Please contact an Applications Engineer at IPG Photonics for this file.

9.2.2 Robot Requirements

Each robot manufacturer requires additional software options for robot to PC communications. The additional options below should be purchased from the manufacturer:

- FANUC
  Either **Robot Server** or **KAREL** can be used. Robot Server is simpler as less configuration and no additional files are required. A higher number of coordination flags can be obtained with the Robot Server. Better performance and control can be obtained with KAREL.
  Package Options:
  Robot Server
  - SIT PC Interface (PCIF): RTL-PCIN
  - Robot Server: PC RTL-RSR

  KAREL
  - SIT PC Interface (PCIF): RTL-PCIN
  - KAREL: RTL-R632
  - User Socket Messaging: RTL-R648
- Yaskawa Motoman
  MotoPlus Robot Controller Option
- KUKA
  KUKA Robot Sensor Interface (KUKA.RSI)

9.3 Robot Controllers

The On-The-Fly system has been tested with the following controllers:

- FANUC R-30iB
- Yaskawa Motoman DX200
- KUKA KRC4

9.4 Robot Setup

Configuration files for all robots can be found on the website software.ipgphotonics.com under Scanner/Robot_Files.

9.4.1 FANUC

Follow the steps to configure the robot for use with Robot Server and KAREL.

1. Configure a TCP/IP Connection between the robot and the computer.
2. To check, enter the Robot's IP Address into a web browser and the robot's home page should load.

The setup is complete if using the Robot Server.

9.4.1.1 KAREL

Follow the next steps to complete KAREL setup.

1. Load the following KAREL files (.PC) onto the robot:
    a. IPG_ABORT.PC
    b. IPG_COMM.PC
    c. IPG_HC_REC.PC
2. Configure the TCP server tag. Instructions for this can be found in the KAREL Reference Manual Revision I, Section 11.3.2.
3. Select IPG_COMM.PC and view the KAREL variables in the Data menu.
    a. KAREL variables for the **user to set or modify** are prefixed by "USR…"
    b. For "USR_SRVR_TAG", enter number of the TCP Server Tag
    c. For "USR_SPRS_LOG", enter TRUE or FALSE. TRUE: logging to "CONSLOG.DG" will be suppressed. If undefined, FALSE is assumed.
4. Add IPG_COMM to "**COLD START Autoexec program**" setting on **FANUC Config Screen**.
5. Enter the port number configured in step 2 into **IPGScan Robot Options → Robot Port**.

KAREL Notes:

- IPGScan communication with the robot will not work without **IPG_COMM running**. If a **fatal error** occurs, if **aborted,** or if **not configured** to automatically start with the robot, IPG_COMM can be **started** from the Select Screen.
- IPG_COMM will not change either the "Busy" status or the Active light on the robot controller.
- IPG_COMM or IPG_HP_REC will not respond to the abort button. Run IPG_ABORT to terminate.
- Error messages are located on the "User" Screen of the Pendent. Log messages are recorded in the log "CONSLOG.DG" (if not suppressed).
- If active tool frame has changed, run IPG_ABOUT, then IPG_COMM to reinitialize.

9.4.2 Yaskawa Motoman

1. Setup MotoPlus on the robot controller.
2. On the robot controller, load "**IPG_OTF_DX200.out**" (see *MOTOPLUS APPLICATION INSTALLATION INSTRUCTIONS* from Yaskawa Motoman (PN 166687-1CD) for instructions.).
3. Connect the robot and computer using an Ethernet connection. Configure the IPv4 Windows Network Adapter properties according to the network settings on the robot.

9.4.3 KUKA

1. Configure the RSI Ethernet connection to the computer which will run IPGScan. Load the following files onto the KUKA controller to the directory specified by the KUKA RSI manual:

- IPGP_OTF_RSI.rsi
- IPGP_OTF_RSI.rsi.diagram
- IPGP_OTF_RSI.rsi.xml
- IPGP_OTF_RSI-Ethernet.xml

2. To help control RSI, the following modules can be called:
   - IPG_OTF_BEGIN_DATA_XFER.src
   - IPG_OTF_END_DATA_XFER.src
3. The following module can be used for calibration and as an example:
   - IPG_OTF_CALIBRATION.src
   - IPG_OTF_CALIBRATION.dat

9.5 Robot Options in IPGScan

The Robot options (**Options → Robot**) of IPGScan are shown in Table 9.1.

Table 9.1 Robot Options

Option	Description
Digital IO Start	The digital output from the robot, connected to the Start pin on the scan controller. This should be the software output number on the robot.
Next Button Click Bit	The output from the robot which is read by IPGScan to move to the next processing object during alignment. This should be the bit number on the scan controller. *Optional*.
Prev Button Click Bit	The output from the robot which is read by IPGScan to move to the previous processing object during alignment. This should be the bit number on the scan controller. *Optional*.
Robot	The type of robot. To turn off robot related functions, set this to 'None'.
Robot Flags	Which robot output values should be recorded and used as coordination flags in a trajectory. These do not have to be connected to the scan controller.
Robot IP Address	The IP Address of the robot.
Robot Port	The communication port to the robot. Not required for all robot types.
Save Button Click Bit	The output from the robot which is read by IPGScan to save the current position to the current processing object during alignment. This should be the bit number on the scan controller. *Optional*.
Start Stop Button Click Bit	The output from the robot which is read by IPGScan to start or stop outputting the current processing object during alignment. This should be the bit number on the scan controller. *Optional*.

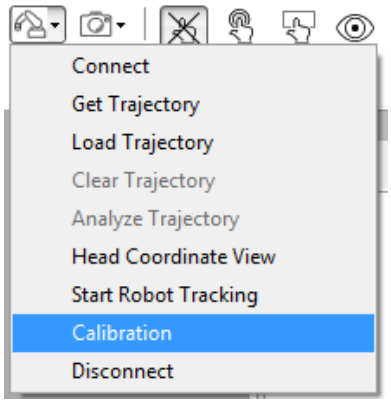
9.6 IPGScan Workspace Calibration

The calibration process creates an origin for IPGScan OTF jobs. The robot trajectory and all processing objects are in reference to this IPGScan origin.

Note: An accurate robot TCP is required for Calibration: refer to 2D Scanner Series User Guide (PN P21-010211) for more information.

1. Open the Calibration Wizard by clicking on “Calibration” in robot menu (Figure 9.1).

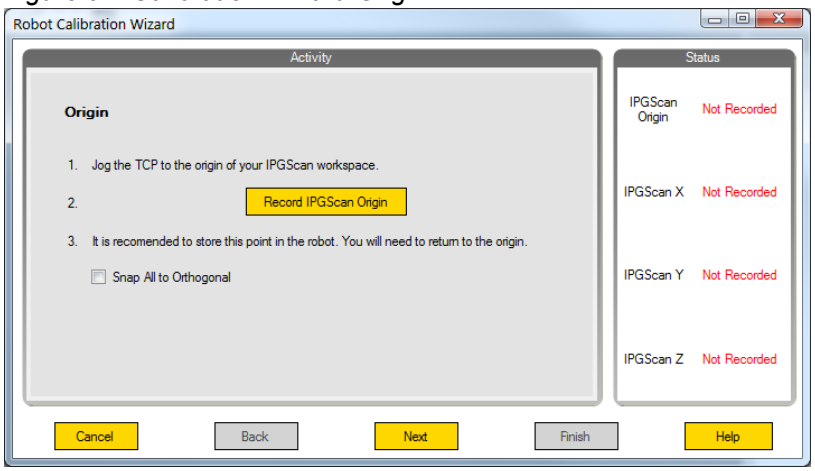
Figure 9.1 Robot Menu



2. During any point in the calibration, the “**Help**” button can be clicked, which will display further information to assist users in the calibration process.
3. On the first page the origin is recorded (Figure 9.2). The origin can be anywhere within the robot’s work area. When the robot is positioned, click “**Record IPGScan Origin**”. On the right window, it should now display that the IPGScan Origin is “**Recorded**”.

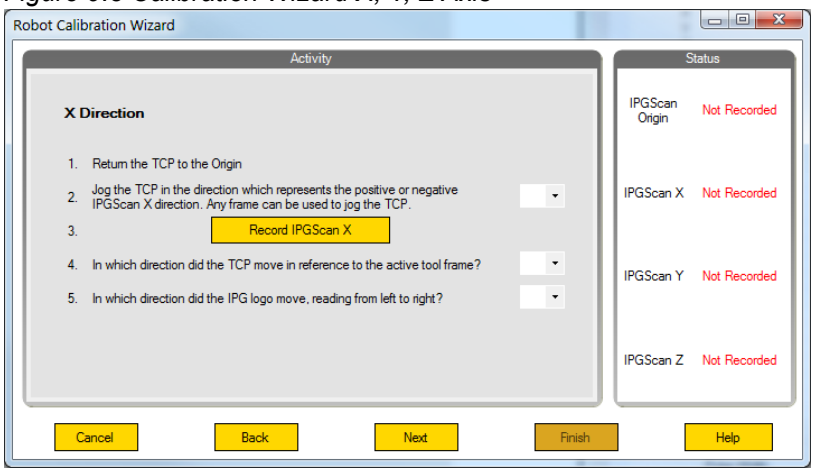
Note: Until another calibration is preformed, this point will remain the origin.

Figure 9.2 Calibration Wizard Origin



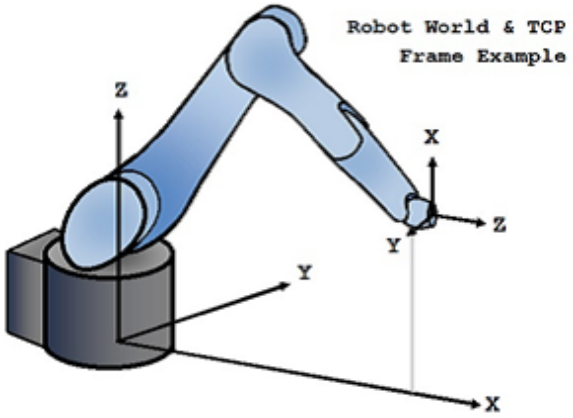
4. “**Snap All to Orthogonal**” snaps all angles to nearest multiple of 90º; this removes minor errors in the feedback. *Optional*.
5. Click “**Next**”.
6. On each of the following screens the IPGScan X, Y, and Z references are set. The robot must start at the origin before recording the new position on each page. (Figure 9.3)

Figure 9.3 Calibration Wizard X, Y, Z Axis



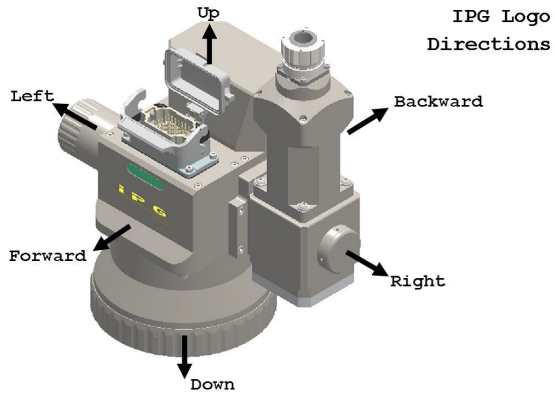
7. First, return the **robot to the origin**.
8. The second step requires the robot to be **moved** in only the X, Y, **OR** Z direction, with respect to the desired **IPGScan reference frame**.
9. When the robot is positioned click "**Record IPGScan …**" to record that axis.
10. The fourth step asks in which axis did the **robot move**, with respect to the **Robot TCP Frame**. Below is an example image of the Robot and TCP frames, Figure 9.4.

Figure 9.4 Robot World & TCP Example



11. The fifth step asks which direction did the **IPGLogo move** (Figure 9.5).
12. When all points have been recorded, click "**Finish**".

Figure 9.5 IPG Logo Directions



9.6.1 IPGScan Workspace Calibration with a KUKA Robot

When calibrating IPGScan with a KUKA robot, RSI must be started before the robot can send information to the PC. A suggested method for IPGScan workspace calibration can be found in IPG_OTF_CALIBRATION. The point P1 should be saved as the IPGScan workspace origin.

The module IPG_OTF_CALIBRATION first starts RSI and then moves to the origin. There is a 10 second wait after the first PTP move. This wait provides the robot operator time to pause execution of the module. When execution of the module is paused, the robot can be jogged and RSI will continue to facilitate communication between the robot and the PC.

9.7 Creating an IPGScan On-The-Fly Job

1. Create a new job.
2. Select the name in the Job Tree.
3. In the properties window, set the **type** to “**On The Fly**”.

Note: Type should be “**Default**” for any jobs that are **not** On The Fly. When a robot type is set to “**None**” in **Options** → **Robot** new jobs will be created as “**Default**”. Otherwise new jobs will be set to “**On The Fly**”.

4. Next, create desired processing objects using the drawing tools. The order of the processing objects in the Job Tree is the sequencing the processing objects will be output.

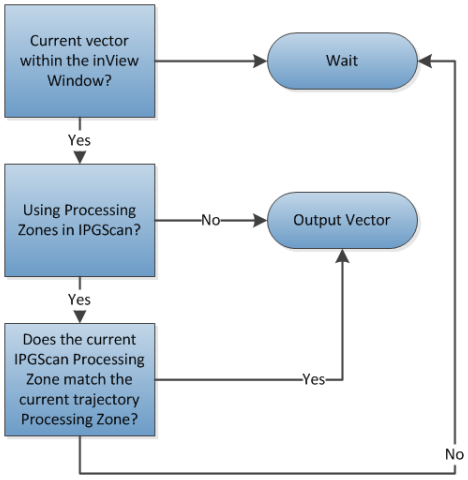
9.8 Using Coordination Flags

ActionControl → **“Set Coordination Flags”** is used to set **Processing Zones** in IPGScan. A Processing Zone is active for all processing objects following the ActionControl until: 1) **the job ends** or 2) **another Processing Zone is set**.

The active Coordination Flags in the robot trajectory must match those of the current Processing Zone in order for an object to be output. Calling “Set Coordination Flags” with the default parameter of “0x00” will ignore all Processing Zones.

The process that ScanPack uses to determine whether the upcoming processing vectors should be output is found in Figure 9.6.

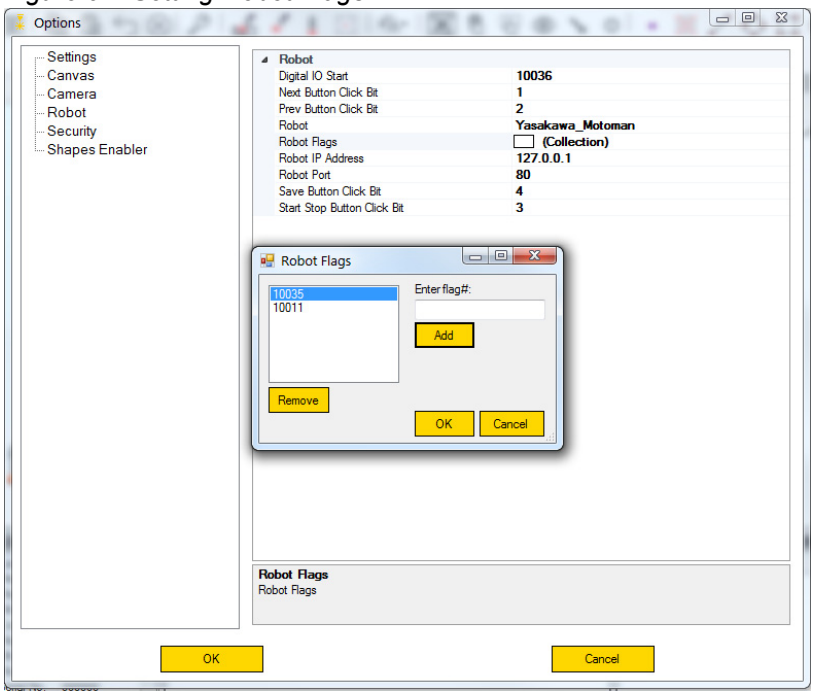
Figure 9.6 Coordination Flag Logic



9.8.1 Selecting Coordination Flags

Coordination Flags can be selected under **Options** → **Robot** → **Robot Flags** (Figure 9.7).

Figure 9.7 Setting Robot Flags



Enter values that correspond with any robot output. Coordination flags must be set **before** recording a trajectory.

9.8.1.1 FANUC

For FANUC robots, enter the output number as displayed on the robot. FANUC systems using the Robot Server are limited to 32 flags; systems using KAREL are limited to 5 flags. If more than 5 or 32 flags are set in the options menu, the first 5 or 32 values will be used, respectively. If a value is invalid it will not be used.

9.8.1.2 Yaskawa Motoman

For Yaskawa Motoman robots, enter the logical relay address number. This can be found in the Concurrent I/O manual and in the In/Out menu. Yaskawa Motoman robots are limited to 5 flags. If more than 5 flags are set in the options menu, the first 5 values will be used. If a logical relay address number is invalid it will not be used.

9.8.1.3 KUKA

For KUKA robots, enter the number of flags to record. If nothing is entered 0 is assumed. Values to be used as flags must be set in the RSI files before loading them onto the robot. The RSI files supplied are limited to 9 flags not including the Start signal.

9.8.2 Setting the Coordination Flag Action Control

In the ActionControl “Set Coordination Flags” the value of the flag is a 32-bit hexadecimal number. Each bit represents the state of one flag. Flag 0 corresponds to the first digital output listed in the IPGScan settings. The flag number does not correspond to the output number. Flags are numbered based upon their order in the options. When a flag is active, that bit is equal to 1. When a flag is inactive, that bit is equal to 0. Figure 9.8 shows the first 8 bits of the 32-bit number.

Figure 9.8 Robot Flag first 8-bits

9.9 Object Placement and Trajectory Building

IPGScan can be used to assist in positioning of processing objects and programming the robot. There are two primary modes: Snap To and Alignment.

9.9.1 Snap To

Snap to Robot allows users to position objects based on the robot’s position.

1. Enable **Robot Tracking** by selecting **Robot Menu** → **Robot tracking**.
2. Move the robot to the desired location. The movement of the robot will be reflected on the IPGScan Canvas.
3. Right click on any object and select “**Snap to Robot**”.
4. The current robot pose is now saved as the object’s global pose.

Snap to Viewport allows users to position objects based on the viewport’s current position in a trajectory.

1. Record and load a trajectory.
2. At the bottom of the canvas, scroll along the timeline by clicking on it and moving the mouse left and right.
3. When the viewport is at a desired location in the trajectory, right click on any object and select **Snap to Viewport**.
4. The current viewport pose is now saved as the object’s global pose.

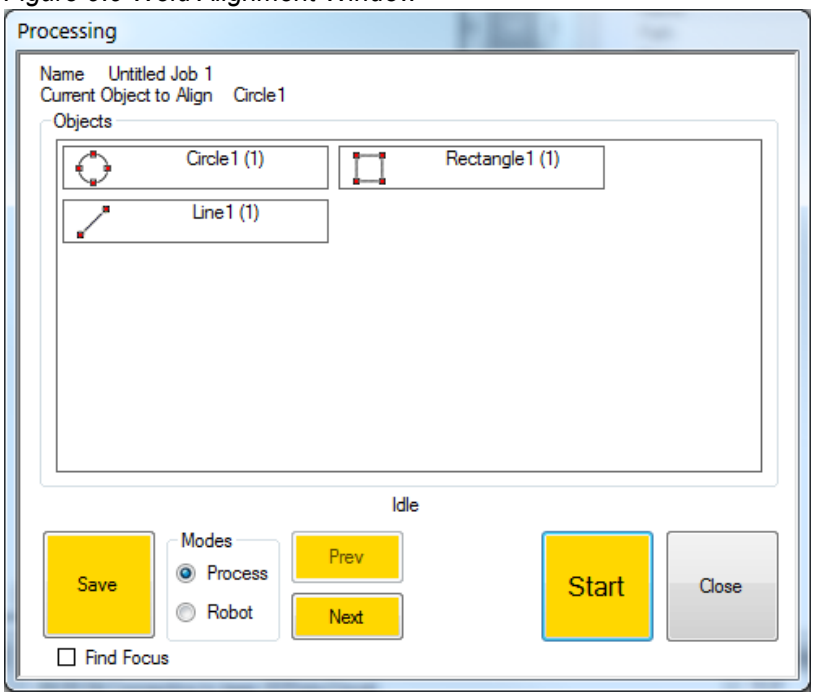
9.9.2 Alignment

There are two alignment modes:

1. **Process alignment**: assists in aligning and positioning process objects.
2. **Robot alignment**: assists in finding robot positions.

To use either alignment mode, select objects or groups to be aligned. Hold “**Ctrl**” and click “**Start Processing**” button to access these options for the selected items. Figure 9.9 shows the alignment window.

Figure 9.9 Weld Alignment Window



- Process alignment will preview the selected object with the guide beam, at the center of the scan head without any rotation.
- The robot can then be used as a pointing tool to place the object in a desired location based upon the cell and the work piece.
- Click “**Save**” to save the current pose of the robot to the global pose of the current object.
- Robot alignment will preview as much of the selected object as possible in its programmed location based upon the current location of the robot. This can be used when programming the trajectory of the robot to determine if a location will be suitable for outputting the tested object.

9.9.3 Alignment with Robot Pendent

From the robot options, the different “Bit” options refer to the alignment window. These bit options should be set to outputs on the robot connected to the scan controller. Changing the state of these outputs will trigger their corresponding button on the alignment window.

For example, if in the robot option’s “Save Button Click Bit” is set to 0 (Strobe), changing the Strobe bit will save the current pose of the robot to the current processing object. Use of these bits is optional.

Table 9.2 shows the bits of user accessible digital inputs to the scan controller from the 24V Interface Board.

Table 9.2 Bits of User Accessible Digital Inputs

Signal	Bit	Signal	Bit
SELECT0	16	SELECT5	21
SELECT1	17	SELECT6	22
SELECT2	18	SELECT7	23
SELECT3	19	SELECT8	24
SELECT4	20	STROBE	0

9.10 On-The-Fly Robot Programming Setup

IPGScan records the motion of robot program for later use in a processing job. The robot program must be setup accordingly.

The Start signal changing from inactive to active signals IPGScan to begin recording. The Start signal changing from active to inactive signals IPGScan to finish recording.

Because IPGScan works off of a recording, only time-constant functions should be used within the recorded section of the job. For example, if the robot waits for an input, the robot and scanner will be desynchronized if the input is not triggered at the same time during each cycle.

The following pseudo-code is an example robot program for OTF.

```
// reset the start signal to off in case it is on at the start of
// the program
   digitalOutput[startSignal] off
// move to a beginning home position
   moveJ pHome
// any other preparations for the trajectory can be done here
// move to the first point in the trajectory
   moveJ pBegin
// turn on the Start signal begins recording this trajectory
   digitalOutput[startSignal] on
// any number of moves can be performed
// additional operations like setting outputs or waiting based on
// time can be performed
// moves which are not time-constant should not be used because
// IPGScan will only use a recording during execution
   moveL pIntermediary1
   moveL pIntermediary2
// turning off the Start signal will end the recording of this
// trajectory
   digitalOutput[startSignal] off
// return to the home position
   moveJ pHome
```

9.10.1 KUKA On-The-Fly Programming

OTF KUKA modules need to start RSI at the beginning of the program to facilitate recording.

1. To start RSI, IPG_OTF_BEGIN_DATA_XFER should be called at the beginning of the module.
2. At the end of the program, a small time delay should be called before ending the job or ending RSI to give the robot time to send out all of the information. This delay only

needs to be called during recording. Calling it after setting the Start signal to inactive will not impact the final recording.

3. IPG_OTF_END_DATA_XFER can be used to both end RSI and add a time delay. Both modules require a Boolean parameter; true if the run will be a recording and false if the run will not be a recording. Both the RSI functions and time delay will only be called during recording.

9.11 Recording a Trajectory

To record a trajectory in IPGScan:

1. Set the information about the robot in the Options menu.
2. Select ‘Get Trajectory’ from the robot menu.
3. Press ‘Prepare’ to prepare IPGScan and the robot for recording.
4. Press ‘Start’ to begin recording the trajectory.
5. The recording will begin when the Start signal is active.
6. When the Start signal turns inactive the trajectory recording will end.
7. After completing a recording, a window will display to choose a save location and a file name for the recording file.

Note: When recording with FANUC_KAREL, the recording job on the robot has a very high priority and you may notice that the iPendant does not respond as expected to button presses. This is only during recording with FANUC_KAREL and will finish after the recording completes. If you are still having trouble, run IPG_ABORT to abort running the OTF KAREL jobs.

9.12 Loading a Trajectory

To load a trajectory in IPGScan:

1. Either create a new IPGScan job or open an IPGScan job.
2. Select ‘**Load Trajectory**’ from the robot menu.

Navigate the file system and select the desired trajectory file.

9.13 Testing an On-The-Fly Job

An OTF job can be tested with the “Dry Run” option in the processing window. With the “Dry Run” option selected, pressing “Start” will evaluate the current job for its ability to output each processing object.

Each object is evaluated sequentially in the Job Tree. Evaluation stops after the first object fails to complete its output. If a processing object fails to complete its output, an “SPK_ROBOT_TIMEOUT” log message will appear.

Successful processing objects will appear as green blocks on the timeline. The start and end of each block represents the start and end of processing for that object.

If an object will not complete its output, it appears on the timeline as a long red block. It is possible for an object to start processing, stop processing part-way through, then finish processing later in the trajectory.

A processing object might fail for two primary reasons:

1. Its position is not reachable by the scan head during the trajectory.
2. The scan head does not have enough time to fully execute the object.

Use the timeline to scroll through the positions of the robot and determine where the viewport reaches the processing object throughout the trajectory. Then adjust your robot trajectory or your weld parameters. Any modification to the robot trajectory must be re-recorded

9.14 Executing an On-The-Fly Job

To execute an OTF job, click the “Start Processing” button; then click “Start.” After starting IPGScan, the scan controller will wait for the Start signal to be active before beginning coordinated processing. Similar to recording a trajectory, assertion of the Start signal from the robot signifies the beginning of the trajectory.

9.14.1 Looping an On-The-Fly Job

To loop an OTF job, the Start signal must be set to “Edge”. This can be done with the ActionControl “Streaming Data Action” with the following settings:

- Streaming Data Action
  - Function Call = Set Wait Edge
  - Event = Start
  - State = Set

To reset the Start signal, use the same ActionControl with the following parameters:

- Streaming Data Action
  - Function Call = Set Wait Edge
  - Event = Start
  - State = Clear

For the most efficient processing, looping the job should be done in the job with ActionControls instead of using the “Loop” checkbox.

10.0 Errors

The following are error codes that may be encountered when using IPGScan and their descriptions are listed below.

- SPK_HARDWARE_STOP
  - Scanner external stop is active. This is not a hardware safety stop.
- SPK_ROBOT_MISSING_TRAJ
  - No trajectory is loaded in an OTF job.
- SPK_ROBOT_TIMEOUT
  - The OTF job failed dry run. Ensure that object positions fall within the InView Window, check if robot and vector weld speeds may need to be modified, and ensure that features are being processed in the right direction.
- SPK_INVALID_POSITION
  - Feature is outside of the field of view/processing window. Realign feature inside window to fix this error. If feature is within the window, but this error is still shown, check the z-position of the feature.
- SPK_OUTPUT_SOFTWARE_ABORT_ERROR
  - Current process was aborted.
- SPK_INVALID_INVIEW
  - CoordinationParams.xml file is missing.

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There are no operator serviceable parts inside. Pleaser refer all servicing to qualified IPG personnel.

A.1 Technical Support

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C. Product Returns

C.1 Returns to the United States

All product returns require a Return Merchandise Authorization (RMA) from IPG.

To obtain an RMA, call the Customer Service department of IPG Photonics Corporation at 508-373-1100 (US) or +49 2736 44 20 451 (Germany).

If you return a product with a RMA, please perform the following procedure:

1. Products must be carefully packed in a suitable shipping container(s). Buyer assumes all responsibility for products damaged in shipment to IPG.
2. Buyer must issue a purchase order for the value of the replaced parts/service items and IPG will issue credit or invoice when the parts/service is received. Speak to IPG Service Manager for the amount authorized under the required purchase order.
3. All requests for repair or replacement under this warranty must be made to IPG within 30 days after discovery of the defect (but not later than 7 days after warranty expiration).
4. All products returned to IPG but which meet applicable specifications, not defectively manufactured or used not in accordance with this User's Guide, will result in the Buyer being charged IPG's standard examination charge.
5. Complete packing list with product model and serial number will ensure prompt repair.
6. Be sure to include with the returned product your 'ship to' address for the return of the serviced product.

C.1.1 Shipping Instructions:

Warranty Returns

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Non-Warranty Returns

Domestic & International Buyers* pay for two-way freight costs and insurance to IPG. If shipment consists of returns that are both warranty and non-warranty, the shipment will be considered as non-warranty.

Shipping address for returns to US:

> IPG Photonics Corporation
> 50 Old Webster Road
> Oxford, MA 01540
> Attn: Product Returns
> Tel: 508-373-1100

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C.2 Returns to Germany

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6. All returns must be packaged adequately to avoid damage during shipment.
7. Complete packing list with product model and serial number will insure prompt repair, if the other terms of this form are followed.
8. See the IPG Terms and Conditions for the applicable warranty for the products before you request the return of the products.
9. RMA number will expire 31 days after the date of issue. Thereafter, units received in under the expired RMA number will result in a longer turnaround time. Include a copy of the completed RMA form with the return of your unit(s).

C.2.1 Shipping Instructions:

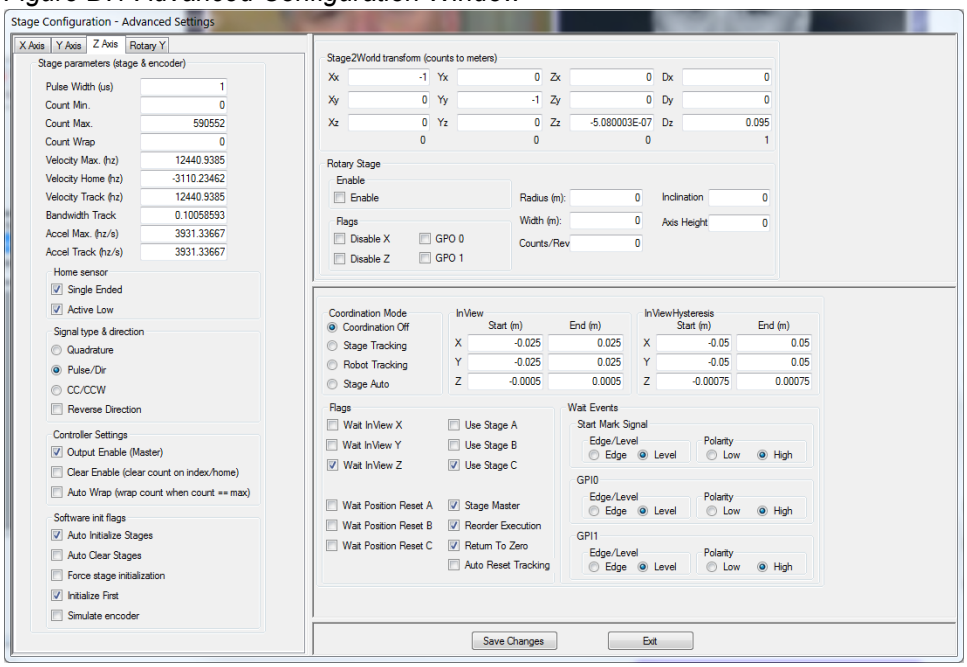
Shipping address for returns to Germany:

> IPG Laser GmbH
> Siemensstrasse 7
> D-57299 Burbach, Germany
> Attn: Product Returns
> Tel: +49-(0)2736-44-20-451

D. Stage Configuration Software

1. Open the **Stage Configuration Utility**.
2. **Lock** onto the desired scanner.
3. Once the scanner is connected, click on **File → Advanced Settings**. This will open the **Advanced Configuration Window**, Figure D.1. Below highlights the important parts of this window.

Figure D.1 Advanced Configuration Window



a. **Stage2World Transform**: defines the transformation matrix for the software. For On-The-Fly the only parameters that should not be zero are Xx, Yy and Zz. The three non-zero values are the meters per encoder count.
b. **Rotary Stage**: This is not applicable for encoder applications. All fields should be left as shown in Figure 8.1.
c. **Stage Parameters**:
   i. **Pulse Width**: not applicable for encoder input.
   ii. **Count Min/Max**: defines the process area in pulse units.
   iii. **Count Wrap**: Distance in encoder pulses before the software “Wraps” the weld.
   iv. **Velocity Max**: not applicable for encoder input.
   v. **Velocity Home**: when using the simulate encoder, Velocity Home defines the encoder velocity in pulses/sec.
   vi. **Velocity Track**: not applicable for encoder input.
   vii. **Accel Max / Accel Track**: not applicable for encoder input.
   viii. **Home Sensor**: If the encoder reset signal is single ended, Single Ended flag should be checked, otherwise encoder reset is assumed differential. Active Low: if single ended, this flag indicated if the sensor is active low.
   ix. **Signal Type & Direction**: Encoder input works in quadrature mode by definitions so Quadrature must be selected. Reverse direction is not applicable for encoder input.
   x. **Controller Settings**: Output enable flag must be off so the controller will read encoder signals. Clear Enable is optional; as it clears position count

when the encoder reset pulse is detected. Auto Wrap is optional; as it wraps the position count if the encoder pulse count is equal to Count Max.

xi. **Software Init Flags**: The only applicable flag is Simulate encoder which ensures that a simulated encoder signal (count settings taken from Stage2WorldTransform) is initiated when the software starts. Other flags not applicable for encoder input.

d. **Coordination Mode**:
   i. **Coordination Off**: When checked, coordination with external motion is disabled.
   ii. **Stage Tracking**: When checked, enabled coordination with external motion control. This setting must be selected when using On-The-Fly.
   iii. **Robot Tracking**: used with robot motion. Not applicable for encoder input.

e. InView & InViewHysteresis: Controls the size of the volume in which the scanner mirrors are allowed to move when Stage Tracking is enabled.

Note: For Most 2D applications, InView X and Y should be set from -¼ of the lens's optical field to +¼ of the lens's optical field. The InViewHysteresis should be set to – ½ of the lens's optical field to + ½ of the lens's optical field. For the Z setting, the same rule applies, however the focal depth (not the lens's optical field) is used.

f. **Flags**:
   i. **Wait in View & Use Stage**: enables or disabled each axis for encoder input. For most applications Wait in View should be checked anytime Use Stage is checked.
   ii. **Wait Position Reset**: for a moving target, waits until mirrors reset their position before outputting the next vector. Must be on for On-The-Fly.
   iii. **Stage Master**: informs the software whether to control external motion or not. Must be off for On-The-Fly since an encoder is controlling the software (software must be controlled externally).
   iv. **Split Long Vectors**: if enabled, vectors that are longer than the area specified by the InView, will be split into multiple vectors that will fit the InView window. Must be checked for On-The-Fly.
   v. **Return to Zero**: Not applicable for On-The-Fly.
   vi. **Auto Reset Tracking**: automatically resets encoder tracking when laser is enabled. Should be off when using IPGScan.

g. **Wait Events**: are not related to On-The-Fly specifically, but are included for convenience. Wait Event Flags are used to set up the behavior of the general I/O's for the scanner controller, including external start.

h. **Polarity**: defines if the signal is active high or active low. This system is active high by default.

i. **Edge/Level**: defines how the signal becomes active. Default is Level, where signal is active anytime input voltage exceeds threshold level. Edge option is where the signal becomes active anytime a transition from low to high is detected.

Note: Threshold is determined by the board being used. See 2D Scanner manual for this information.

Glossary

2D - Two dimensional.

DXF - CAD file format.

exe - executable file format.

I/O - Input/Output.

OTF - On The Fly.

STL - CAD file format.

TCP - in reference to the robot, Tool Point Center.

TCP/IP - Communication methods; Transmission Control Protocol / Internet Protocol.

To learn more, visit www.ipgphotonics.com