Novanta

Version 1.0 – 08/04/2025

Integrator Package Quick Start Guide
MOVIA with CO_2 Laser

1 Introduction

1.1 Integrator Package

Our Integrator Package is designed to streamline your machine integration process, saving you valuable engineering time and effort. This comprehensive solution includes our high-performance Novanta CO2 lasers, precision scanning heads and Controller/Software technology, along with all necessary power supplies, optics, and mechanical components are combined in this product.

Key features of the Integrator Package:

- **Complete Integration Solution**: Includes Laser, Scanning Head, Controller, and Software.
- **Ready-to-Use Components**: Pre-calibrated and aligned for immediate use.
- **Comprehensive Accessories**: All required wiring, optics, and mechanical parts for seamless commissioning and functional testing.
- **Optimized Performance**: Carefully selected accessories and factory pre-calibration ensure the best performance and reliability.

1.2 Main Components

The CO_2 lasers are a type of gas laser that uses carbon dioxide as the lasing medium. It produces a beam of infrared light, typically at a wavelength of 10.6 micrometers. All Novanta CO_2 lasers are available with the standard wavelength of 10.6µm. Some lasers are available with 9.3 or 10.2µm. Depending on their power level, different cooling options are available, like air, fan or water cooling. At higher power (> 100W) all lasers are water-cooled.

The MOVIA is a 2-axis scanning head with 10mm aperture that steers the laser beam to accurately cut, mark or machine your material. It is the next generation analog scan head, that can be controlled through xy2-100 protocol and carries a vector tune. It features an ultra-compact, industrial design with improved throughput and uptime. The scan head includes an optional F-theta lens with lens spacer.

The ScanMaster Controller (SMC) synchronizes the scan head, laser and control signals from the machine's PLC. It supports remote control via Ethernet and integrates with factory automation equipment. The Controller includes all cables and adapters needed for basic commissioning and functional testing.

ScanMaster Designer (SMD) is software for Novanta's ScanMaster Controller (SMC), enabling the creation and scanning of images, text, barcodes, and graphics. It includes ScanScript, a versatile scripting language for various laser scanning scenarios.

NOTICE

Due to the numerous laser combinations available in the integrator's package, this guide provides a general example. For more detailed information specific to your laser, please refer to the corresponding manual.

2 Unpacking

Upon arrival, inspect all shipping containers for signs of damage. If you discover any damage, document it with photographs if possible. Immediately notify the shipping carrier, as they are responsible for any transportation damage, and inform Novanta.

Keep All Foam and Packaging, you will need to re-use it when moving your laser to prevent damage that could void your warranty.

2.1 Inventory

The Integrator Package comes in several boxes. Additionally, both power supplies are shipped in their individual packaging.

Laser equipment	☐
• CO_2 Laser mounted and aligned on alignment feet	☐
• BNC cable and quick start plug	☐
• Cooling tubes and adapters	☐
Scan head equipment	☐
• MOVIA scan head	☐
• Power/ communication cable	☐
• Lens spacer with f-theta lens (lens is optional)	☐
Controller equipment	☐
• ScanMaster Controller	☐
• Communication cable to laser	☐
• Communication cable to scan head	☐
• SMC power cable	☐
Mechanical equipment	☐
• Mounting rail	☐
• Scan head mounting bracket	☐
• Beam expander and beam expander mount	☐
Power supply 1 – Laser	☐
2 x Power supply 2 – MOVIA + SMC	☐

Please check the contents of the delivery using the list above, if things are missing contact your Novanta support.

2.2 Laser Unpacking

Carefully unpack the contents from the laser box. Start by removing the small hardware accessories that are shipped with the laser, like Quick Start Plug and replacement fuse. Before lifting the laser, locate the wire harness and slide it out of the foam, to avoid it getting stuck. Remove the upper foam layer to gain access to the laser. If the laser is water cooled, the cooling tubes can be found at the bottom of the box.

Figure 1: Content of the laser box with laser in the middle, small hardware accessories in the upper right and water tubing at the bottom of the box.

Figure 2: Laser after removing top foam and small hardware accessories.

Carefully, lift the laser out of the box. The laser is lifted correctly by holding it in the middle or on its handles, do not carry laser by the mounting feet, as this can disturb alignment.

Figure 3: Example of lifting a ti series laser by holding it in the middle, do not carry laser by the mounting feet.

2.3 Scan head and Controller Unpacking

Carefully unpack the contents from the scan head box. Leave any protective covers in place for as long as possible to keep the mirrors clean.

Figure 4: Packaging of the MOVIA scan head.

Novanta

NOTICE

The electronic hardware contains semiconductor components that are sensitive to electrostatic discharge (ESD). Improper handling can severely damage the electronic hardware.

The ScanMaster Controller is packaged in an ESD protected bag inside the shipping container. Keep the controller sealed until they are located at an ESD safe place. The complete content of the shipping box is shown below in Figure 5.

Figure 5: Content of the SMC controller box (clockwise from the upper left)– Flyer with First Steps and Download information, Command Cable, SMC power cable, Hardware accessories (connector kit), Laser adapter cable, ScanMaster Controller.

3 Setup and Installation

3.1 Mechanical Mounting

The following parts are needed to assemble the Integrator Package on the rail and fix the components:

- Mounting Rail
- Scan head mounting bracket
- Beam expander and beam expander mount
- Laser
- Scan head
- Corresponding Screws

Figure 6 shows a schematic of a mechanically assembled Integrator package. For details on the individual assembly steps please see the following subsections.

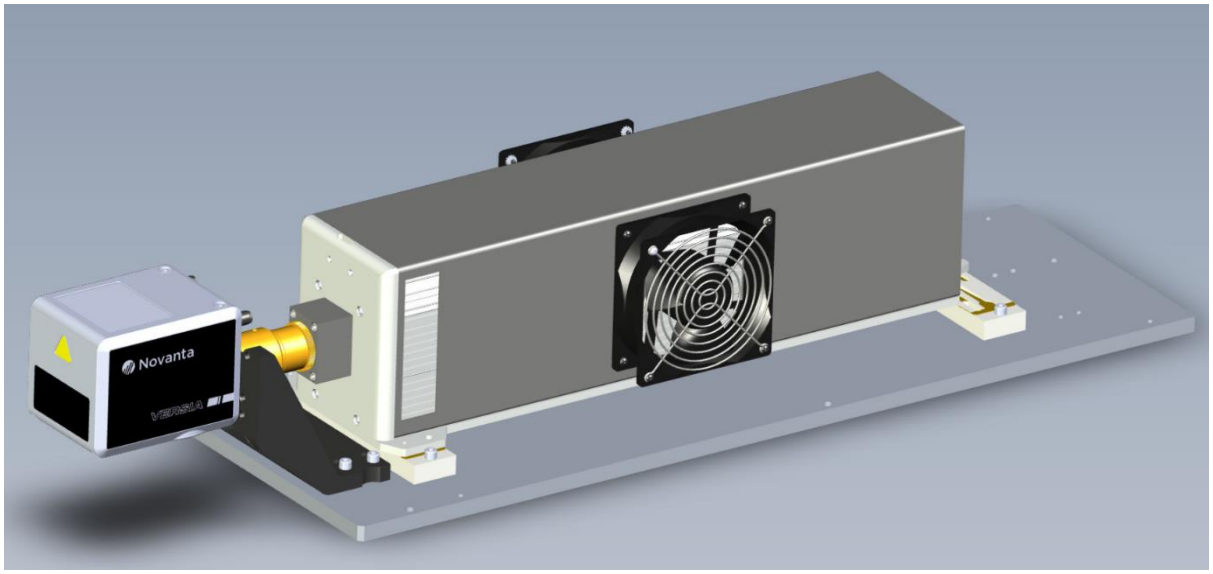

Figure 6: Drawing of the assembled Integrator package containing a ti100 laser and a VERSIA scan head.

3.1.1 Laser

Begin the assembly by unwrapping the mounting rail and set it on a firm surface. Orient the rail so that the Scan head mounting bracket can be placed on the notch end of the rail. Secure the rail to the surface and make sure that the bottom of the scan head housing is parallel to the part marking surface.

Figure 7: Laser mounting rail after unboxing and unwrapping.

The laser is lifted correctly by holding it in the middle or by its handles, do not carry laser by the mounting feet, this can disturb alignment.

Place the laser onto the rail with the front end facing the side of the rail with the notch. Carefully move the laser along the rail until the mounting feet holes align with their respective holes on the rail. Install and tighten the four ¼-20 x 1" UNC cap screws through the baseplate.

NOTICE

The laser's mounting feet are precisely aligned and shimmed at the factory to ensure alignment between the marking head and the Mounting Rail. Do not loosen or remove the mounting feet from the laser.

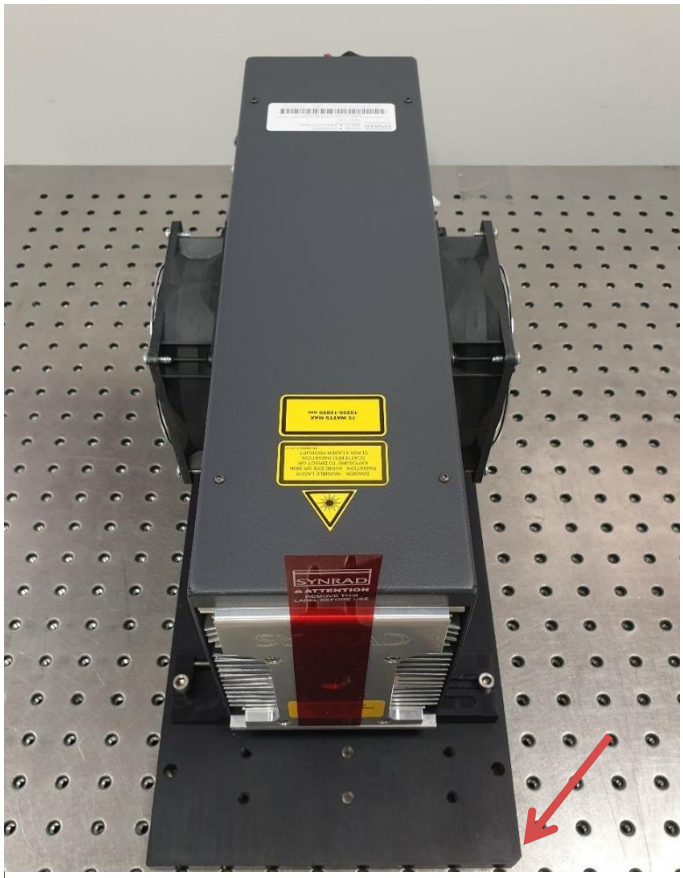

Figure 8: Laser fixed on the mounting rail with four 1/4-20 UNC cap screws (the position of the notch is highlighted)

3.1.1.1 Beam expander

Before installing the beam expander make sure the aperture seal is removed. Depending on the laser type either a fixed or a translational beam expander mount is shipped with the Integrator Package. Install the beam expander mount at the front plate of the laser. Ensure to not touch the laser output window with the fingers or tools, this can damage the laser and dramatically reduce its lifetime. Screw the beam expander into the adapter. The pictures below show the mounting steps for both types of beam expander mounts.

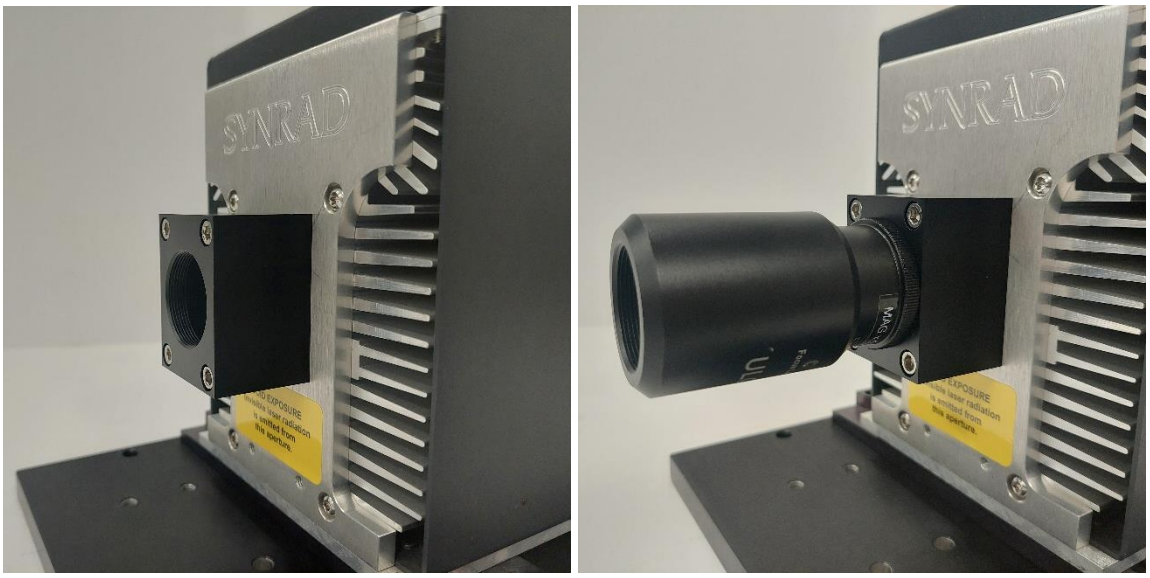

Figure 9: Fixed beam expander mount – Beam expander mount fixed to the laser (Left); Beam expander mount with installed beam expander (Right).

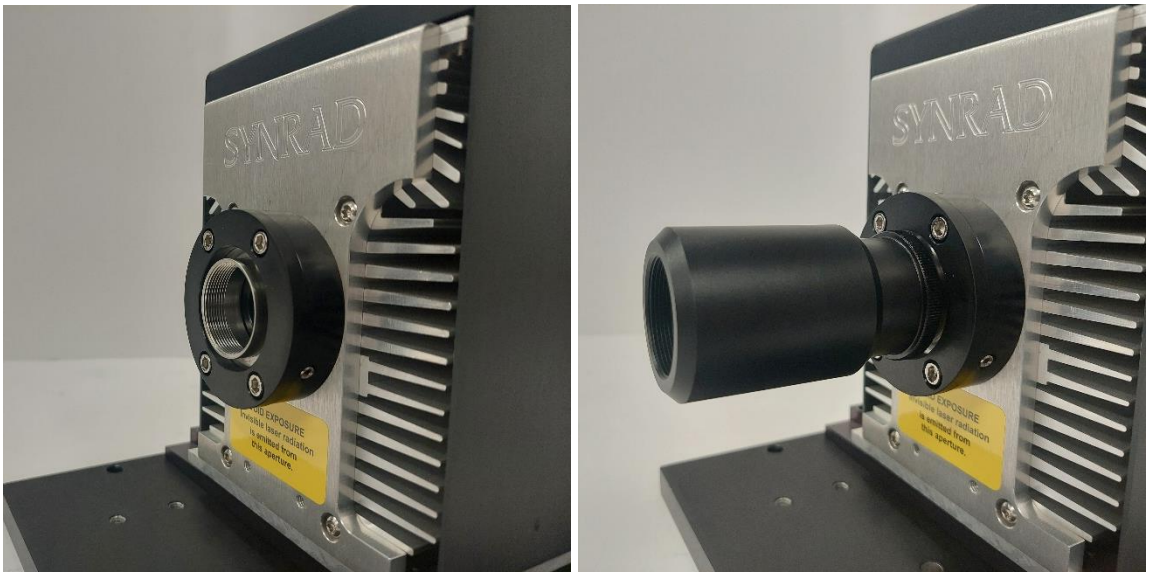

Figure 10: Translational beam expander mount – Beam expander mount fixed to the laser (Left); Beam expander mount with installed beam expander (Right).

3.1.2 Scan head

Before installing the scan head remove the covers on the laser input aperture and the output opening. Continue by installing the f-theta lens at the output. The lens is already mounted within a threaded lens spacer, which can be easily screwed into the scan head output opening. Thread the spacer fully into the scan head. Ensure to not touch the lens during this or the following steps, this can contaminate the surface and shorten the lifetime of the lens and reduce the quality of the laser process.

Figure 11: MOVIA scan head with installed lens spacer containing f-theta

To mount the scan head to the scan head mounting bracket, remove the front mounting plate from the mounting bracket by removing the four screws highlighted in Figure 11 on the right. This plate must be fixed to the back of the scan head with four M5 screws. Be aware of the orientation of the mounting plate, so the laser beam input is not blocked. The mounted plate is shown in Figure 11 on the left, with the M5 mounting screws highlighted. Reattach the Scan head mounting bracket to the scan head – mounting plate assembly by fixing the four screws, as highlighted in Figure 11 on the right.

The scan head – mounting plate assembly can be rotated in 90 deg steps relative to the side supports of the mounting bracket. There are 4 possible positions the scan head can be mounted: down, either side, and up. Some examples are shown in Figure 13.

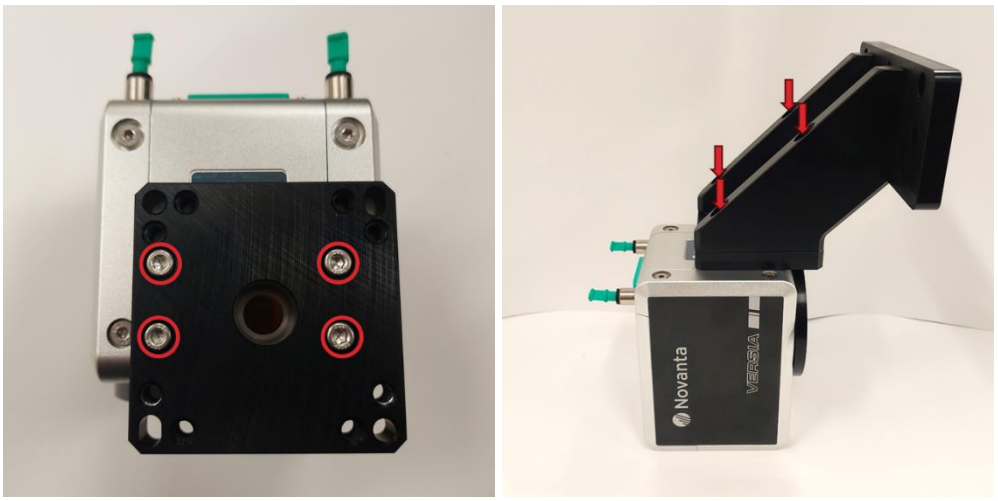

Figure 12: Left: Scan head with mounting plate fixed to its back, with four M5 screws (highlighted); Right: Complete Scan head – Mounting-bracket assembly

Place the scan head mounting bracket at the front of the laser and slightly shift it until the dowel pins protruding from the bottom engage the dowel holes in the Mounting Rail. Fasten the Scan head mounting bracket to the using the four 1/4-20 x ¾" UNC socket head cap screws.

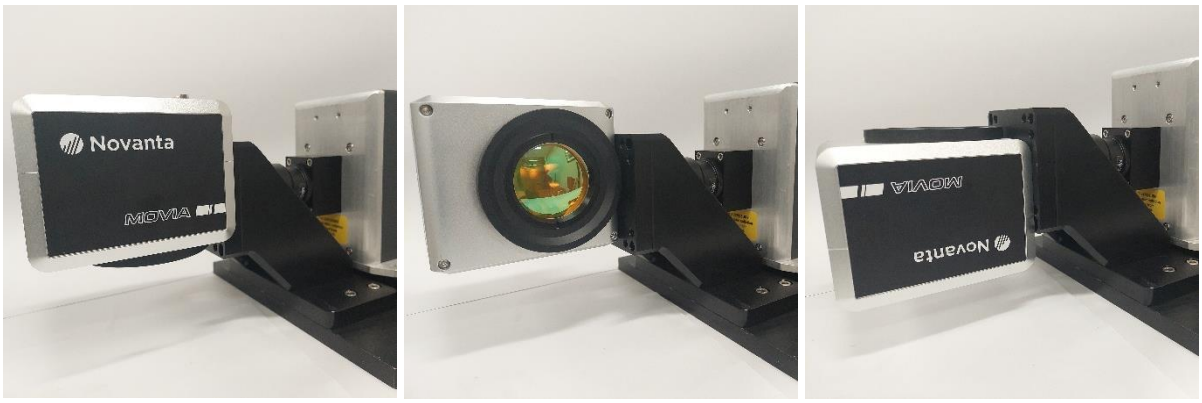

Figure 13: Scan head mounting bracket with MOVIA scan head fixed on the mounting rail, with the scan head oriented in different directions

After finishing the steps above the resulting Integrator Package should look like the example system shown in Figure 14.

Figure 14: Mechanical mounting of a VERSIA - vi30+ Integrator Package

3.2 Water Connections

Water cooling is only required for higher power systems. The scan head is not water cooled. All tubing and adapters to connect the laser are provided within the Integrator package. To connect the tubing to the chiller adapters might be needed, which are not included. The chiller is not part of the Integrator Package.

3.2.1 Laser cooling

The laser has ½-inch cooling fittings at its rear end. The Integrator Package contains the right 12mm tubing to connect to these fittings. The cooling connections on the laser are labeled as "water out" and "water in". The WATER IN Port provides the cooling water inlet to Laser's water-cooling system from the Chiller. The WATER OUT Port sends the water from the laser back to the chiller.

Novanta recommends the laser's cooling fluid contain at least 90% distilled water by volume. In closed-loop systems, use a corrosion inhibitor/algaecide such as Opti shield® Plus, Nalco 7330 & 73199 or equivalent as required. If tap water is used, chloride levels should not exceed a concentration of 25 parts per million (PPM) and total hardness should be below 100 PPM. Install a filter on the chiller's return line and inspect frequently.

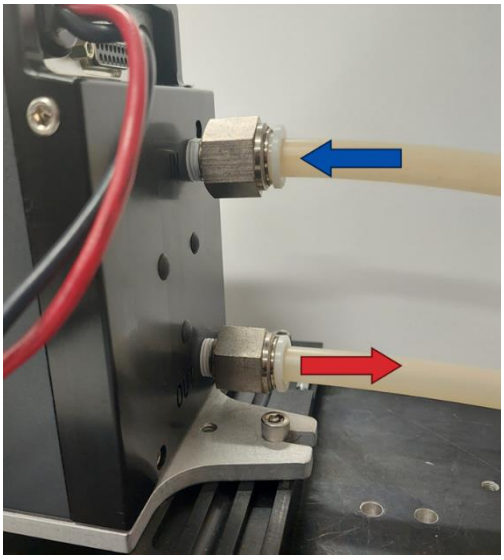

Figure 15: Water cooling connection from the chiller to the laser (blue) and back (red).

CAUTION

Do NOT use deionized (DI) water as a coolant. DI water is unusually corrosive and is not recommended for mixed material cooling systems. Avoid glycol-based additives because they reduce the coolant's heat capacity and high concentrations may affect power stability.

The optimal coolant temperature should be maintained between 18°C and 22°C. It is essential that the coolant temperature remains above the environmental dew point and always above 18°C, while not exceeding 28°C.

Please refer to the respective laser manual for the correct flow rate and water pressure for your laser.

3.3 Electrical Connections

The required AC/DC power supplies are included in the Integrator Package. One power supply should be connected to the laser, while the scanning head and the controller share a set of two power supplies. Alle cables to connect laser, scan head and controller to their respective power supply are included in the Integrator Package.

Before connecting the components to their respective power supplies, ensure that the power supplies are disconnected from the main power and no voltage is applied.

NOTICE

Hot plugging can damage the Equipment.
Before connecting or disconnecting, ensure that no voltage is being applied to the laser, scan head or SMC.

3.3.1 Laser

Different lasers have different power requirements. The correct power supply will be provided to you within the Integrator package. Please refer to the laser manual for the detailed electrical requirements. The DC power connections are located at the rear end of the laser.

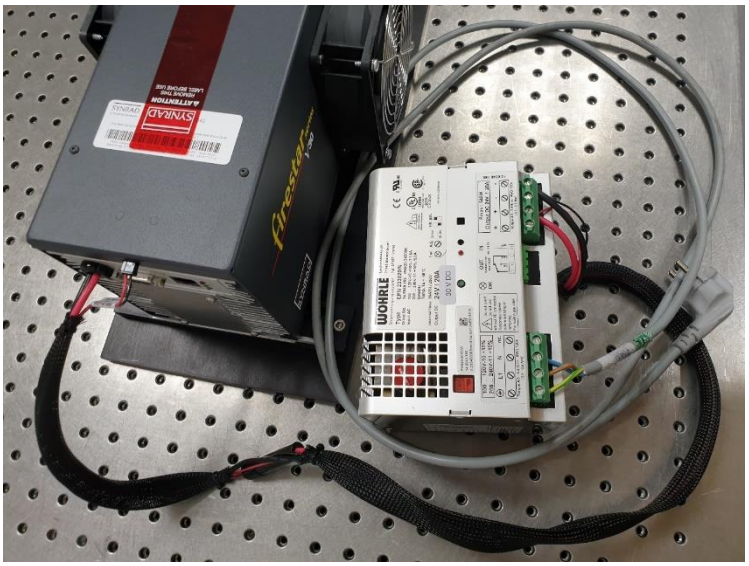

Figure 16: Wiring of v30 laser to a 30 VDC power supply.

Connect the DC power cables into the laser's power supply. Attach the red (+) wire(s) from the DC Power cable to the positive (+) 48 VDC output terminal and attach the black (-) wire(s) from the DC Power cable to the negative (-) 48 VDC output terminal.

Because AC input connections and requirements vary from facility to facility, customers must provide the AC power cable or wiring. Connect the laser power supply to the main power line.

3.3.2 Scan head and Controller

Two 15VDC 10A power supplies are provided in the Integrator Package for the MOVIA scan head and the SMC. MOVIA and SMC need to always be hooked up to the same DC power supply system to avoid grounding loop issues, potentially damaging the components. Do not use separate DC supplies for each.

Figure 17 shows a schematic of the final electronic wiring of MOVIA and SMC to two 15V 10A power supply. For details on the individual connection please see the following subsections.

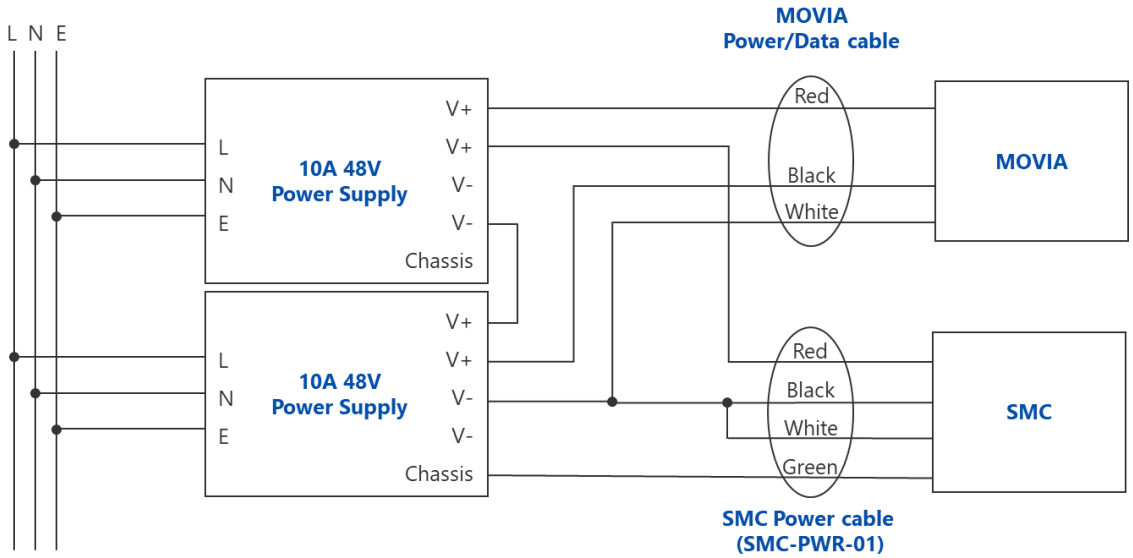

Figure 17: Schematic wiring of the MOVIA and the SMC with the DC power supplies.

The MOVIA scan head has a D-sub25-pin electrical Interface connector. The provided power/data cable has a D-sub25-pin plug, which needs to be connected to the scan head. The other end of the cable consists of two parts, a D-sub25-pin plug and an open cable with three wires. The open cable needs to be connected to the power supplies as shown in the picture below.

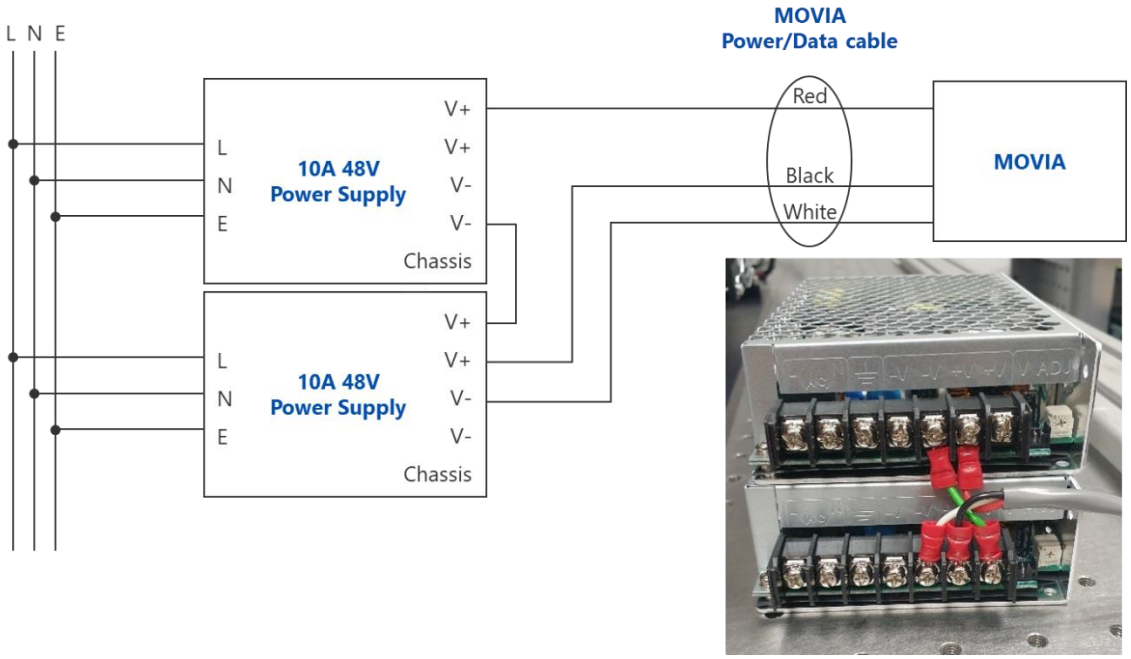

Figure 18: Wiring of the MOVIA power cable to the power supply.

The Controller has a dedicated power connection at connector J1 (see Figure 22). The provided power cable (SMC-PWR-01) connects to the J1 connector and has an open cable with four wires on the other side. The wiring of the SMC power cable is shown in Figure 19.

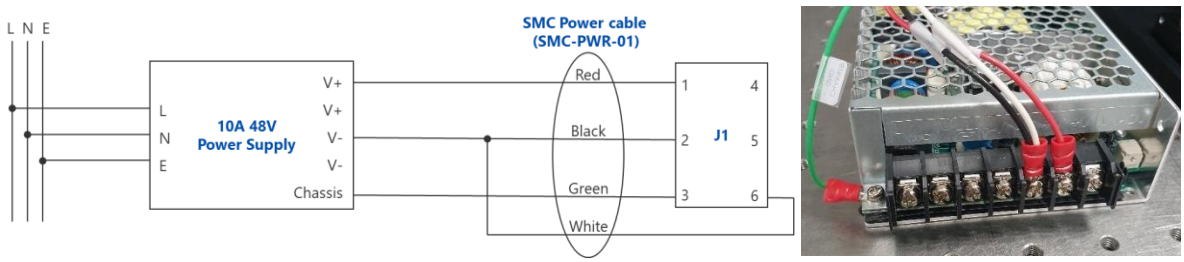

Figure 19: Wiring of the SMC power cable to the power supply.

Because AC input connections and requirements vary from facility to facility, customers must provide the AC power cable or wiring. Connect the Scan head/Controller power supply to the main power line.

The final wiring of the MOVIA scan head and the SMC to the power supply is shown in Figure 20.

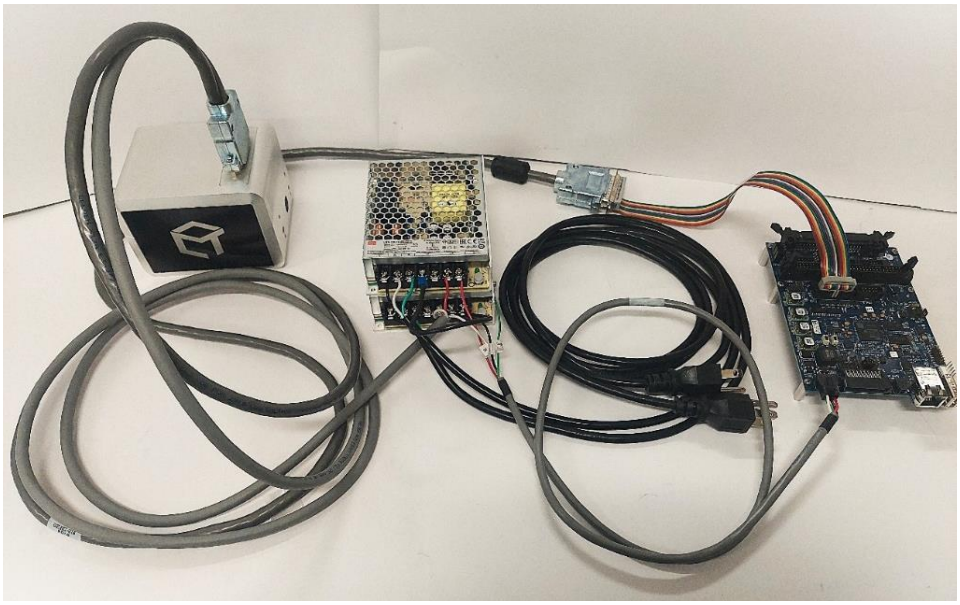

Figure 20: Final wiring of the DC power supply system to MOVIA and SMC.

Control Connections

All cables and connectors included in the Integrator Package facilitate basic commissioning and functional testing. To achieve full automation capabilities and integrate the System into the machine's safety functions, additional cabling of the ScanMaster Controller and the laser is necessary.

3.3.3 Laser

WARNING

The use of the Quick Start Plug bypasses the laser's safety interlock function, potentially exposing personnel in the area to invisible infrared laser radiation.

The Quick Start Plug is intended only for initial testing and troubleshooting by qualified personnel. In normal operation, the laser's Remote Interlock input should be connected to the machine's safety interlock circuitry.

All laser control connections made through the User I/O connector on the laser's rear panel. The size and wiring of the connector depend on the selected laser model. Connect the included BNC cable to the control input via the provided Quick Start Plug.

For more information on laser control signals, please refer to the "User I/O connections" segment within the laser Manual.

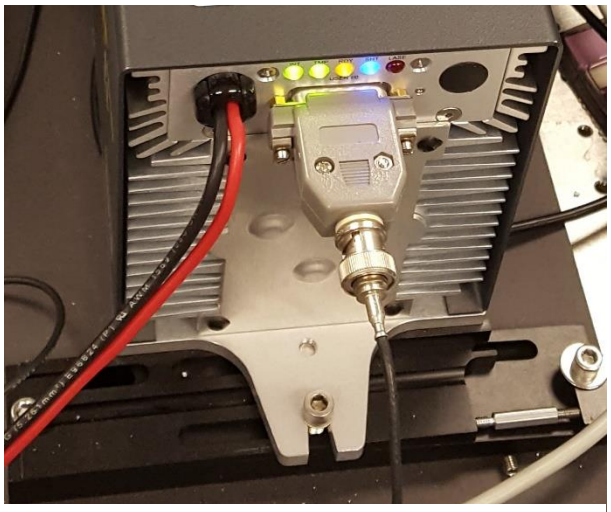

Figure 21: Rear end of a fan-cooled ti series laser with Quick Start Plug and BNC cable.

3.3.4 Scan head and Controller

The SMC is configured with a XY2-100 interface (marked as J11 in Figure 22) to allow communication with the MOVIA scanner. The SMC is shipped with a 12-inch XY2-100 command cable, which has a 16-pin IDC connector on one end that connects to the J11 connector on the SMC and a DB25 female connector on the other end. The DB25 connector needs to be connected to the DB25 plug from the MOVIA power/data cable.

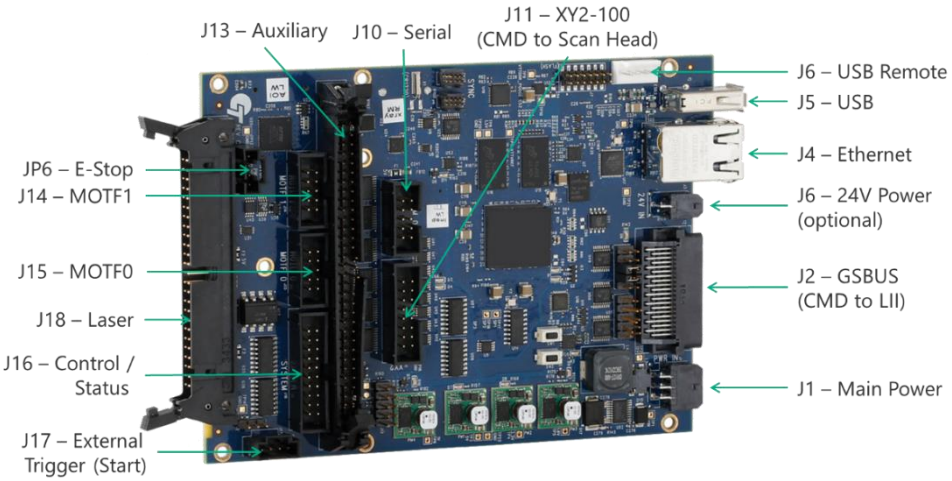

Figure 22: SMC board and its connectors.

A laser adapter cable is included to connect the SMC with the laser via the J18 Connector. The adapter is prepared for the connection to the CO2 laser via a BNC cable and a Quick Start Plug as described above.

Connect an Ethernet cable from SMC (J4) to the Computer running the SMD-Software.

For detailed information on automation, please refer to the "SMC Hardware Reference Manual" which includes definitions for Connectors J13-J17 and JP6.

In Figure 23 all the connections described above SMC are shown.

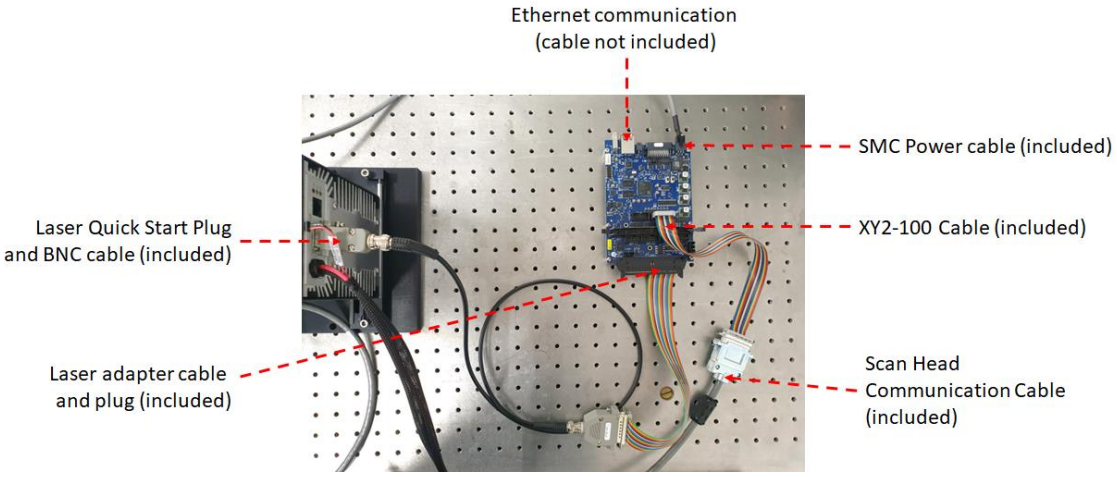

Figure 23: Command connection between SMC, v30+ laser and scanner

3.4 SMC Software configuration

Please download and read application note AN00002 Cambridge Technology Software Suite Setup for detailed instructions on how to download and install this software. You can download all the SMC-related software and manuals from the customer download website (https://novantaphotonics.com/secure-download-scanmaster/). Download and unzip the following software on your computer:

- SMC SDK Installer (SMC firmware and utilities tools)
- ScanMaster API Installer
- CalWizard Installer (for calibration)
- ScanMaster Designer Installer (for creating and running jobs)
- Dual-axis Correction Tables (pre-designed correction tables for standard CT scan heads

Install the Scan Master Software in the following order and restart the computer afterwards. Make sure that you have the administrator's rights bevor installing the software.

1. SM SDK
2. SM API
3. SMD

The SMC has a default IP address of 192.168.100.20. In the computer settings make sure to set the TCP/IPv4 to 192.168.100.x.

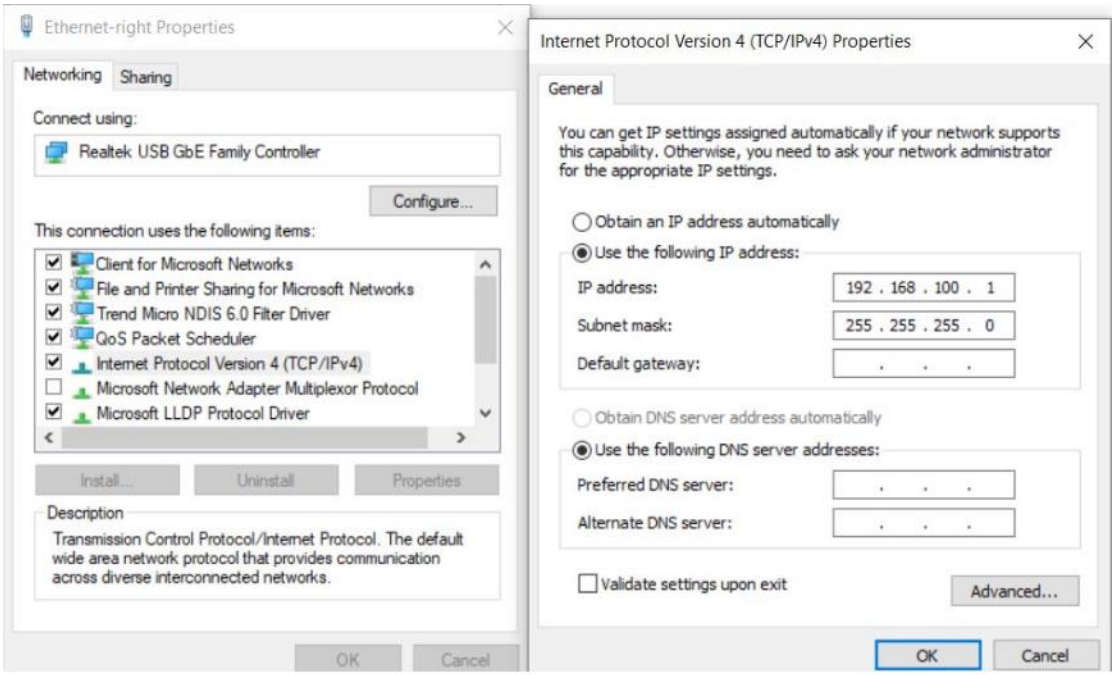

Figure 24: Configuring the Ethernet properties

Because the Cambridge Technology controllers are network-based devices, Cambridge Technology applications must have permission to go through the Windows Firewall to work properly. Please enable firewall access to the Home/Work, and Public network categories for all Cambridge software products. It may also be necessary to enable the Domain category at some sites. The following Applications need to be enabled in the firewall settings:

- CT Calibration Wizard
- CTIFirmwareLoaderUI
- ScanMaster Desinger
- SMCAPiTuner
- SMCBroadcastMonitor

To configure the SMC software, the SMC and the scan head need to be powered on. Before powering the system for the first time, confirm that you have correctly configured and connected the system.

4 Getting Started

This chapter helps you to get started with some basic tasks. For more detailed information refer to the training material or the respective manual or contact your Novanta customer support for Training.

4.1 Basic SMD Control

ScanMaster Designer is a software application that is designed to support Novanta's Scan Controllers. With this program you can create and scan virtually any image using text, linear barcodes, 2D data matrix barcodes, QR-Codes, or imported graphics. ScanMaster Designer also features ScanScript, a scripting language with a comprehensive library of commands for supporting any laser scanning scenario.

The following figure contains an overview of the Graphical User Interface (GUI) elements of ScanMaster Designer.

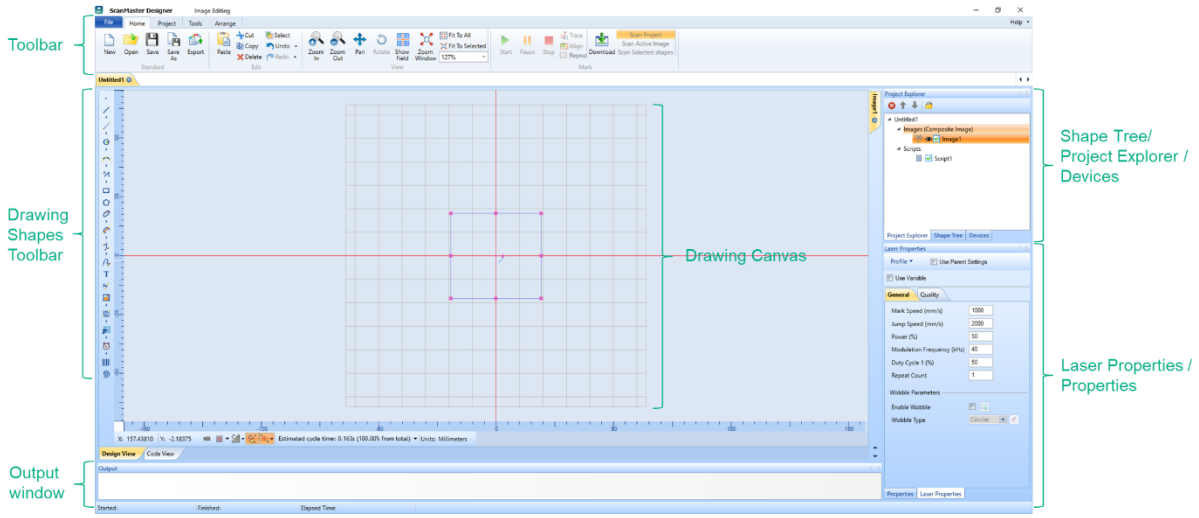

Figure 25: Overview of the Graphical User Interface (GUI) elements of ScanMaster Designer

4.2 Application Preferences

After Downloading or Updating the SMD software and before starting the first project, some preferences need to be defined. Go to File and Click on Preferences in the lower right corner. The "Application Preferences" Window opens. Here you can set the preferences, which will be saved and applied to every new Job.

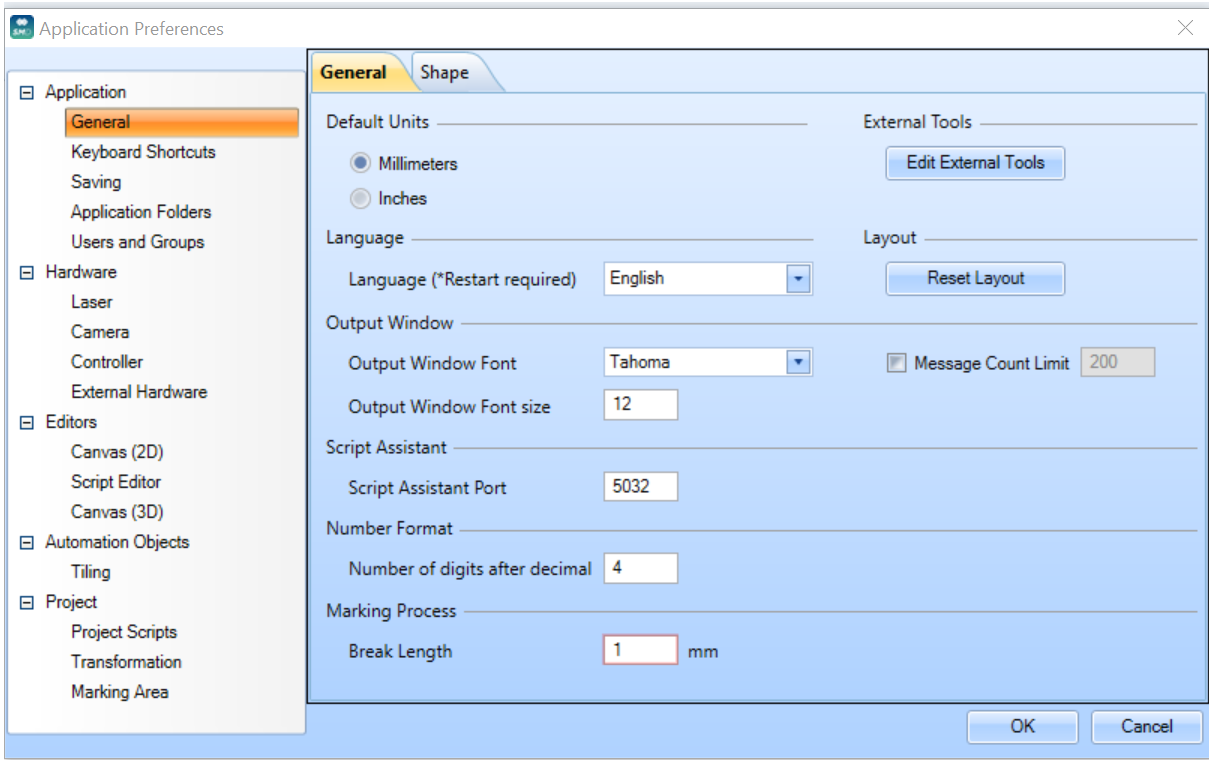

Figure 26: Application Preferences Window

Some recommended settings are:

- General – Default Units: Set choose our preferred unit
- Hardware – Laser – Laser Type: "Synrad CO2 Laser"
- Project – Marking Area – Base Field Dimension: Click on "Get from Device" to receive the field dimension
  - This is only possible if connected to the SMC controller

4.3 Running a sample Program in SMD

Before powering the system for the first time, confirm that you have correctly configured and connected the system and installed the required software. Applying power to the laser can result in the emission of invisible infrared radiation. Please be aware of the beam path and the laser working area, below the scan head exit.

WARNING

In this section the laser gets activated. Ensure that all necessary laser safety precautions have been fulfilled before continuing.

The SMC provides three user interfaces (one GUI and two APIs). The GUI is ScanMaster Designer (SMD), and the APIs are ScanMaster API (SMAPI) and XMLAPI. The following subsections explain how to verify the system functionality by running the Demo program with SMD.

- Switch on laser and scan head/SMC
- Place a marking paper at the right working distance below the scan head
- Open SMD
- Connect the SMC by left clicking "Connect" in the Devices Tab in the GUI (Step 1 Figure 27)
  - Symbol is showing if connection is successful
- Start a new project by left clicking "New" (see Step 2 in Figure 27)
- Select the Box shape and draw a box on the Canvas (see Step 3 in Figure 27)
- Set up the shape and laser properties (see Step 4 in Figure 27)
- Start with the following parameters:
  - Mark = 2000 mm/s
  - Jump = 2000 mm/s
  - Frequency =75 kHz
  - Power = 20%
- Left click "Start" (see Step 5 in Figure 27)
- Verify the marking result when it is completed

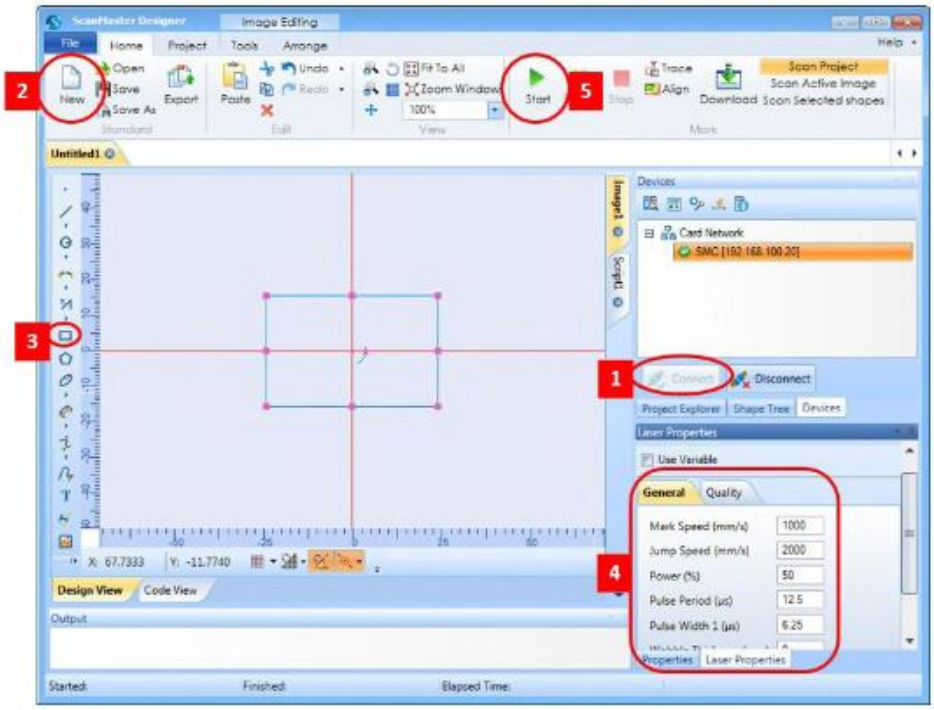

Figure 27: Setting up a simple job in ScanMaster Designer

Delay parameter settings are variable because application's requirements vary and the controllers that are used fluctuate. Use the delay settings outlined in the table below as a starting point, then fine tune the settings as needed. For additional information on delay settings, see Cambridge Technology's CalWizard manual P0900-0157, Appendix A contact your Novanta customer support for Training.

RECOMMENDED DELAY SETTINGS FOR INITIAL USE	
MARK DELAY	130µs
JUMP DELAY	260 µs
POLYGON DELAY	65 µs
LASER ON	Laser-dependent
LASER OFF	Laser dependent

4.4 Calibrate the scanning system

The Integrator Package comes with a preloaded calibration file. As the setup in the final machine often differs from the factory settings, where the calibration takes place, the calibration accuracy can vary between 2-5%. It is advised to check the marking quality and recalibrate the scan head if needed. There are three different methods to calibrate the scan head: hand calibration, flatbed scanner method, and metrology method. For more information on the different calibration methods see our white paper "Calibration Accuracy for Laser & Scan Head Sub-Systems" on the Novanta Photonics website.

Novanta provides a dedicated software called CalWizard for calibrating the scanning system. The manual calibration with CalWizard is covered in the Integrator Package Training and results in approximately 2% calibration accuracy. More details of this calibration method can be found in Application Note AN00038 "Calibration of 2-Axis Scan Heads with CalWizard".

Higher system accuracy can be achieved with the flatbed scanner or metrology method. These methods are more complex and need dedicated equipment. For more information on these methods contact your local customer support.

If a lens is used that is not part of the Integrator Package, the Calibration must be done from scratch.

5 Resources

Please visit our website if you need more detailed information: https://novantaphotonics.com/

Here you can find all product manuals in the respective product section. Additionally, Application notes can be found in the Application notes section under Resources. SMC-related software and manuals can be found on the customer download website.

In case you have further questions or problems contact your local customer support team.