DATALOGIC

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Datalogic Lighter built-in ProfiNet I/O for Laser Marking Systems

PROFI® INDUSTRIAL ETHERNET NET

Installation and User Manual

April 2019

REVISION 1.0

Master Revision History

Revision	Date	Author(s)	Change Description
1.0	18.04.2019	M. Pierpaolini	Beta Site Release

INDEX

Datalogic S.r.l. recommends to read this User Manual carefully before performing any kind of operation both on the PLC and the Laser Marker. I case of any doubts, please contact your local Datalogic Technical Support or fill in the Support Webform on the Datalogic s.r.l website at the following link.

1. Introduction to this User Manual

This User manual has been developed for PLC programmers who intend to connect a Datalogic Laser Marker to a PLC via ProfiNet/IO, in order to handle the Laser Marker and its operations following the flow of the Production Chain.
All the screenshots and tests made as a reference for the creation of this User Manual were made using the following versions of HW and SW:

Element used	Versioning
PLC	**Siemens S7-1200 CPU 1214C DC/DC/DC Article no. 6ES7 214-1AG31-0XB0 Firmware rev. 3.0**
PLC programming SW tool	**TIA Portal v.13 SP1**
Datalogic Laser Marker	**Arex430**
Lighter version	**Lighter 7.2.0 Alpha 8**

2. Setup over ProfiNet/IO Network

In order to have ProfiNet/IO connection between the PLC and the Datalogic Laser Marker, it is necessary to set up both elements: this chapter want to show the necessary steps and the choices which the PLC programmer can make according to his needs, in order to have communication between these two ProfiNet/IO devices.

2.1. Configuring the Laser Marker for use over PNIO

Some operations must be made on the Laser in order to have it working on an Profinet/IO network; PLC programmers will need to assign on each Laser Marking a **Device Name** and make changes to the **Firewall Rules**: moreover, the User, according to his application will have to choose the **dimension of the Input and Output Memory Areas**. These changes are described in the following paragraphs.

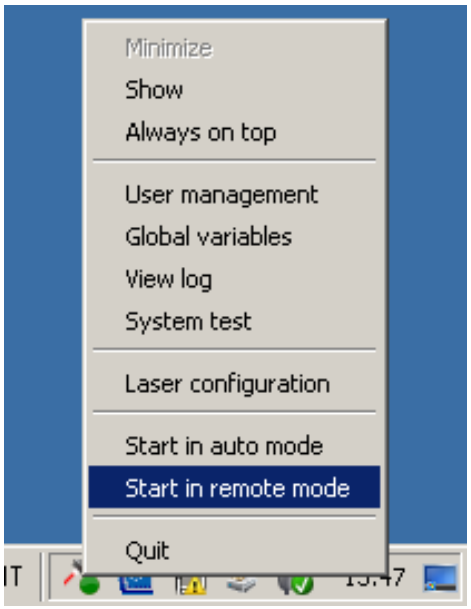
Basic net settings of the Laser Marker

The Datalogic Laser Marking systems can be discovered on an ProfiNet/IO network only if a number of parameters on the Laser Marker and on the PLC match. The parameters which should match are the following:

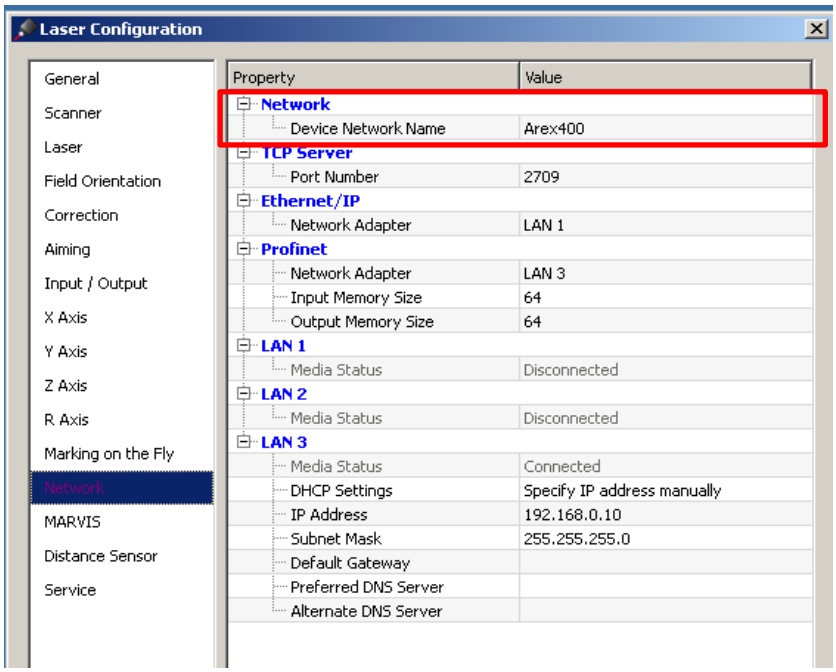
- Device Name;
- Size of Input and Output memory maps.

The Device Name of the Laser Marker can be changed following these steps:

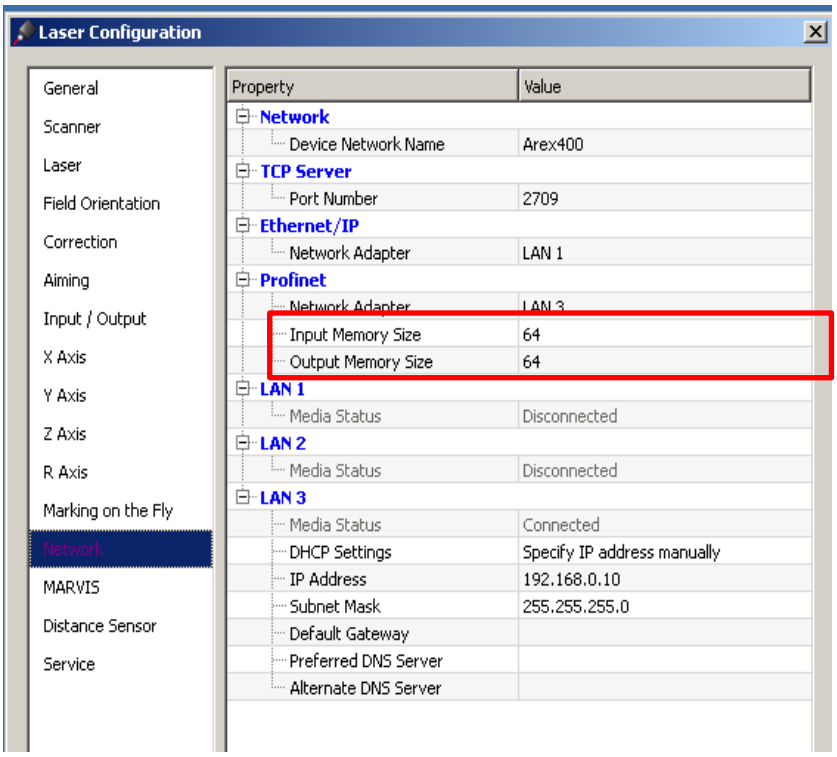
a) Open the 'Laser Configuration' on the Laser Marking System, by right-clicking the Laser Engine icon in the Windows tray bar.



b) Once the Laser Configurator is open, select the 'Network' voice of the menu from the left side of the interface and the Device Name can be found under the voice 'Device Network Name'.



c) The size of the Input and Output Memory Maps has to be set also inside the 'Profinet' section, choosing from the 3 possible sizes expressed in Bytes (64, 128 or 254).



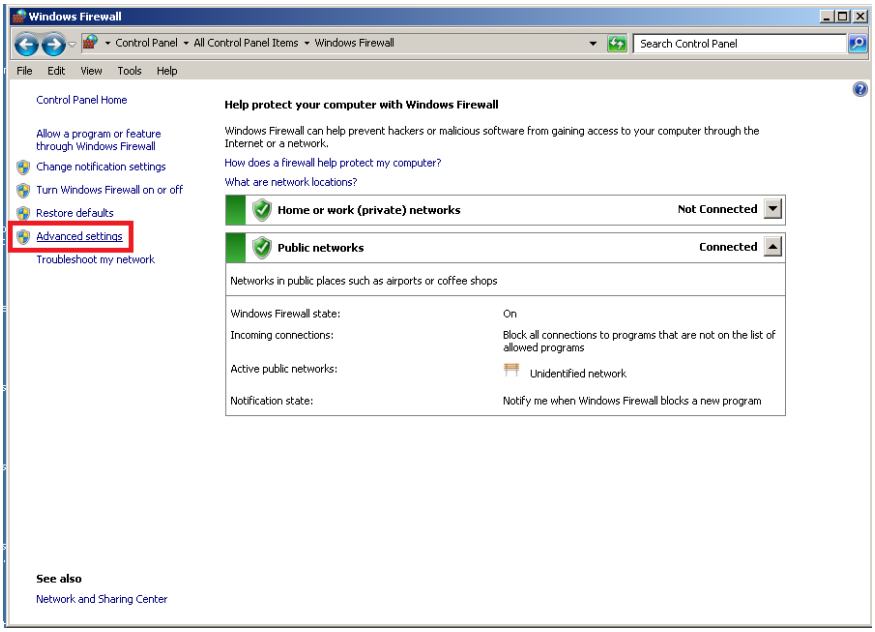
d) Once these parameters have been set, press 'Apply' followed by 'OK' on the bottom of the Interface.

Advanced net settings of the Laser Marker

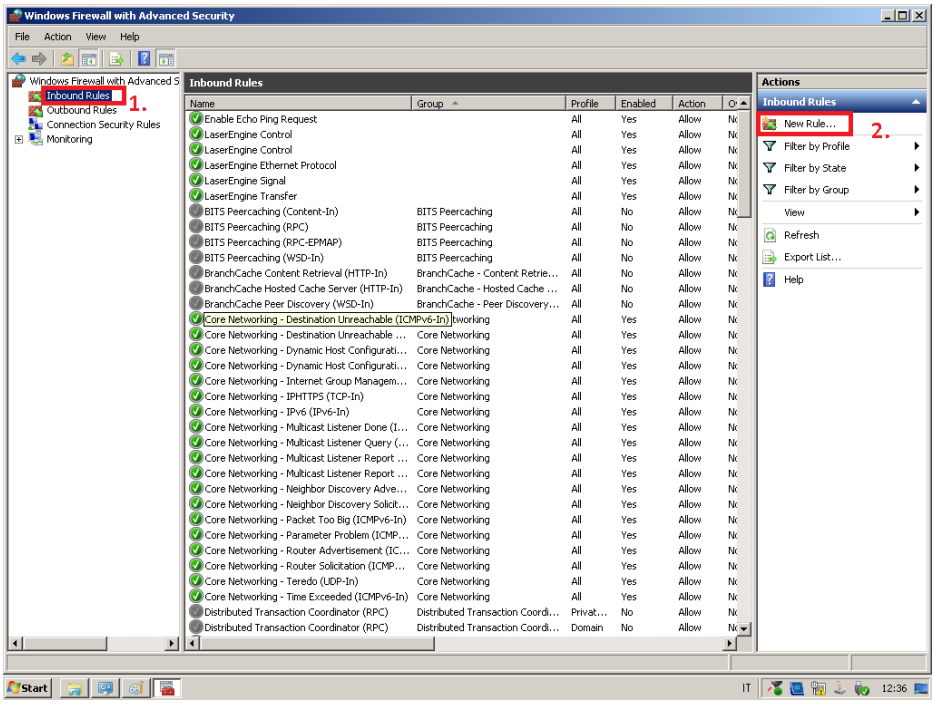
All Datalogic Laser Marking devices are controlled by the Windows Firewall, which by default settings does not allow Inbound and Outbound ProfiNet/IO traffic; in order to establish a ProfiNet/IO connection between the PLC and the Laser Marker, the user can either completely disable the control of the Windows Firewall, or **allow all Inbound and Outbound traffic regarding 'LaserEngine.exe'**.

To create these Inbound and outbound rules regarding the Windows Firewall, the User can follow this procedure on the Laser Marker:

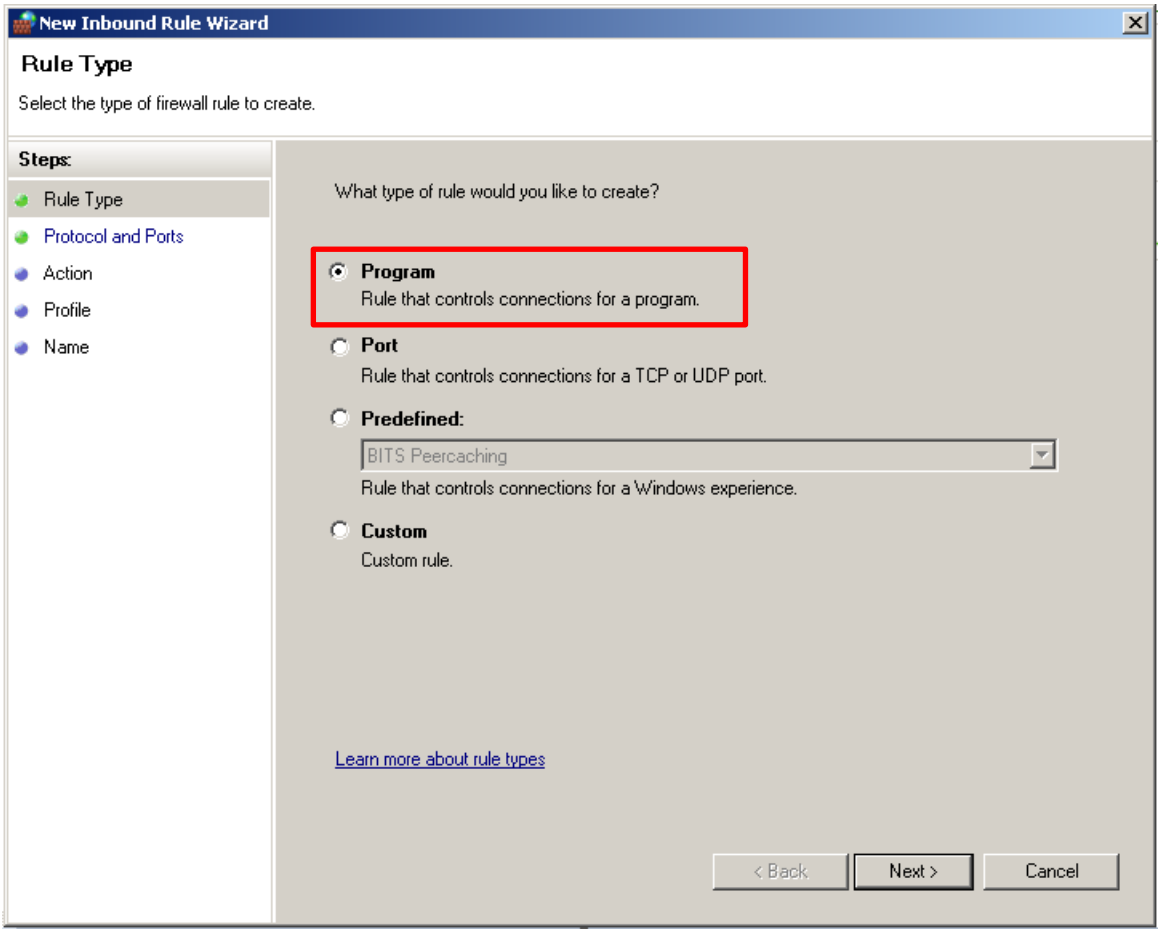
1. Enter the Control Panel and select 'Advanced settings'.



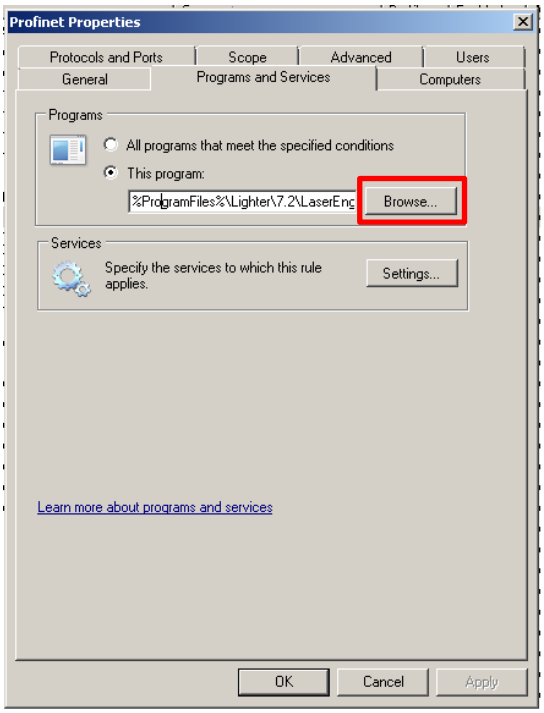
2. New Inbound and Outbound rules need to be set for the 'LaserEngine.exe' program: click on 'Inbound Rule' and then select 'New Rule…'.

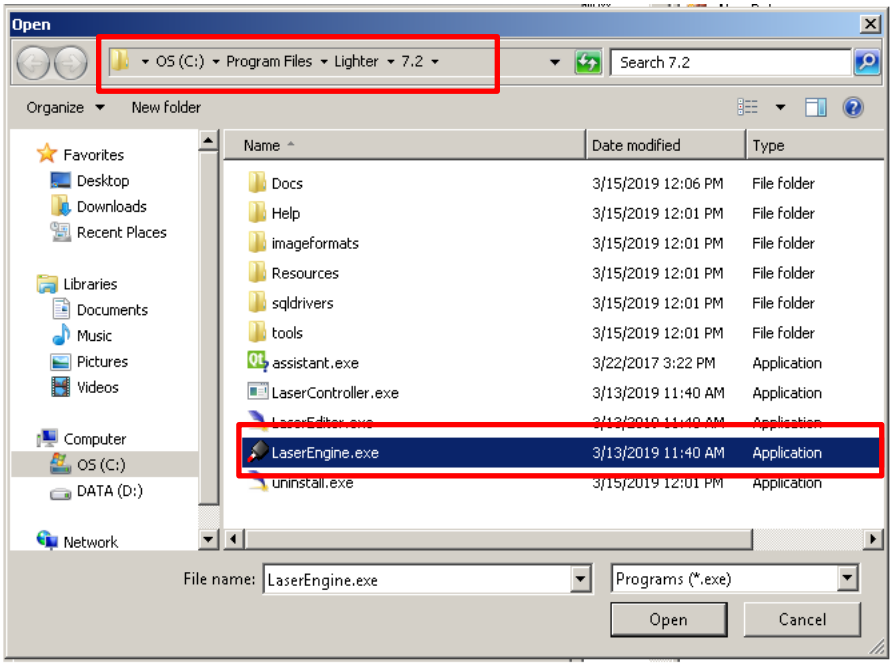


3. A Wizard GUI will guide you through the procedure: select 'Program'.

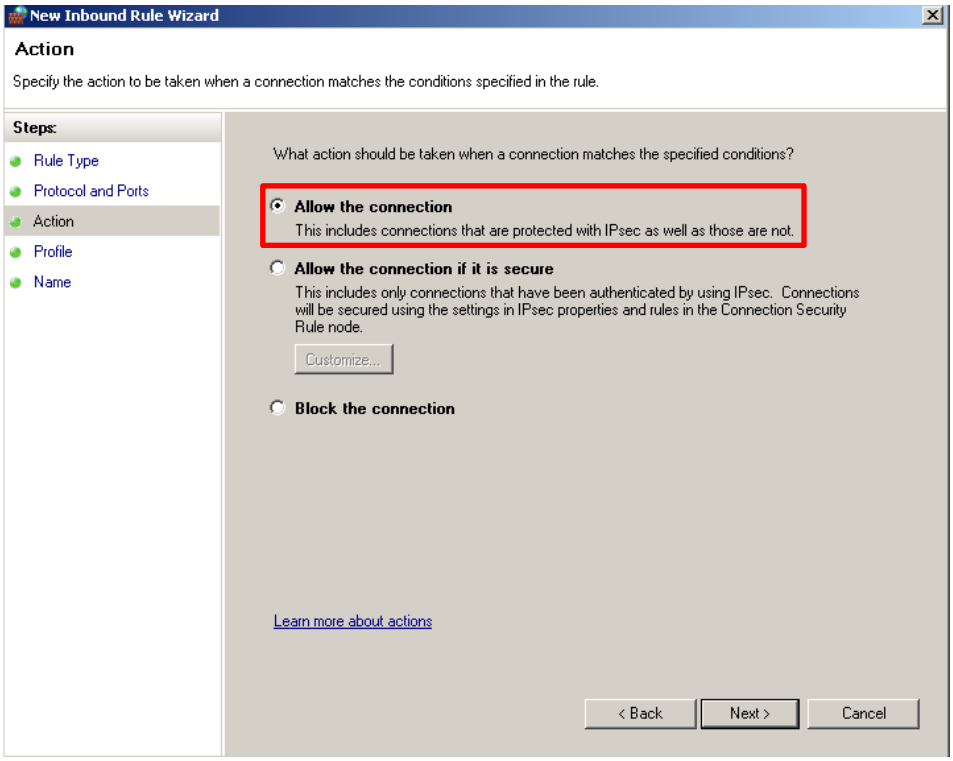


4. In the Program And Services tab, browse towards the 'LaserEngine.exe' application, present in *C:|ProgramFiles|Lighter|7.2*.

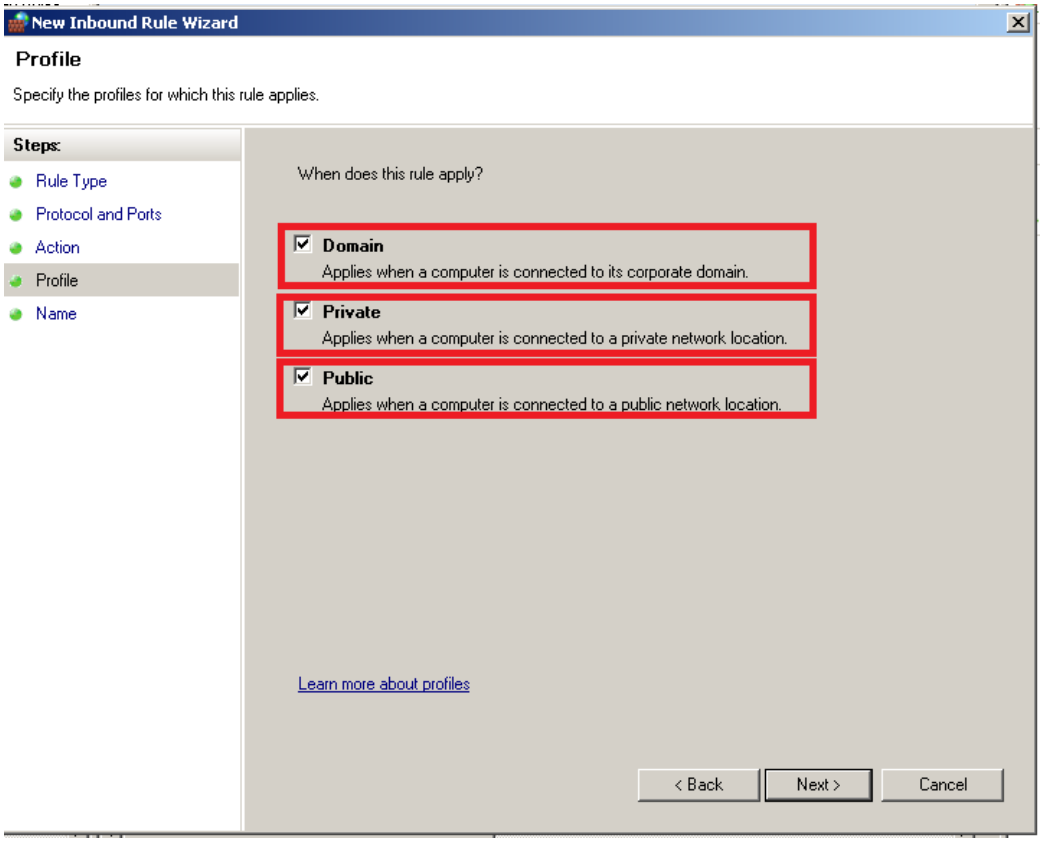




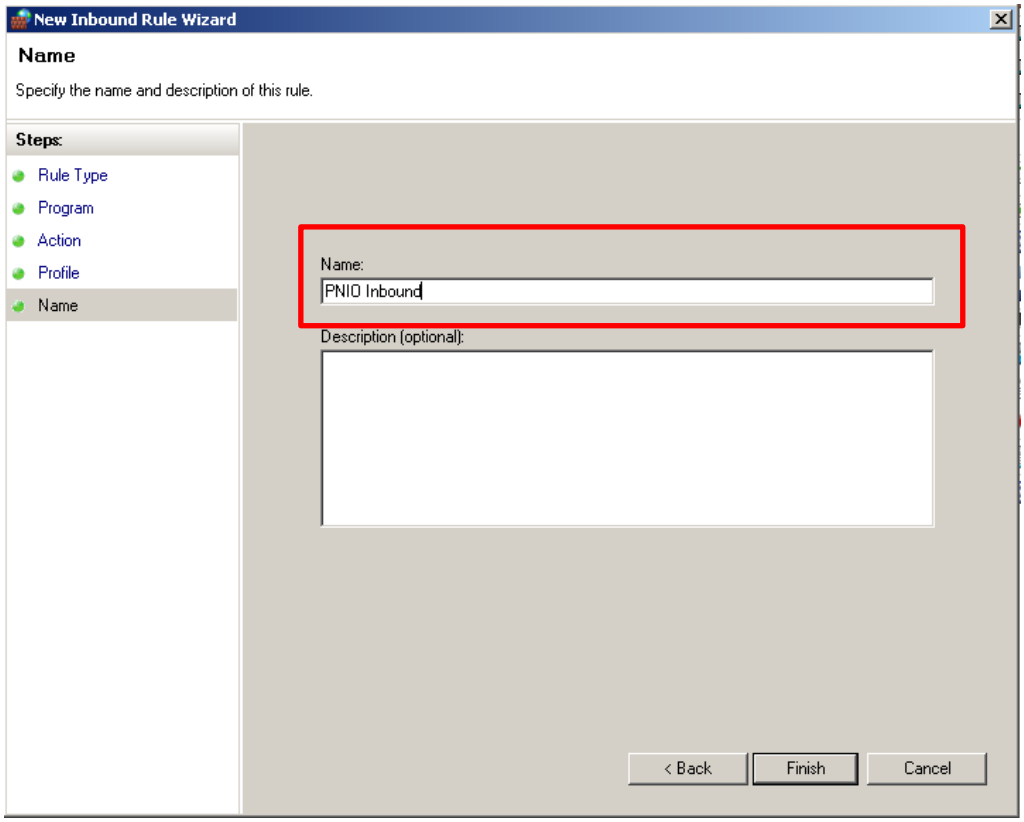
5. Select ‘Allow the connection’, then press ‘Next’.



6. Select all 3 types of Network.

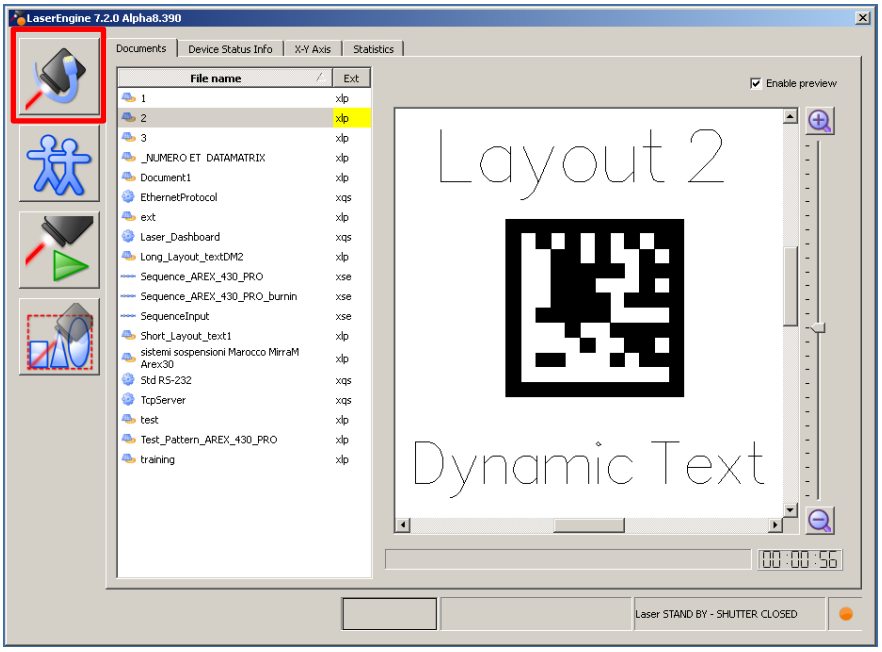


7. Give this property a recognizable name.

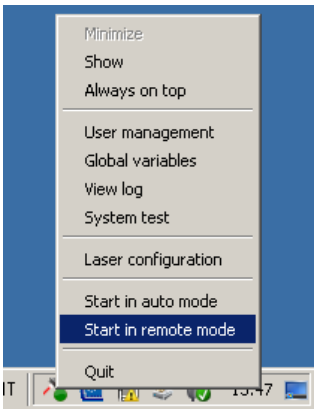


8. Now the Outbound rule must be set, making sure that all connection would be allowed also in an Output direction. Basically, the procedure must be repeated from point 2 to point 9, selecting 'Outbound Rules' at point 2 of the procedure. Once this is done, the created input and output rules will be seen along with all the other firewall rules.

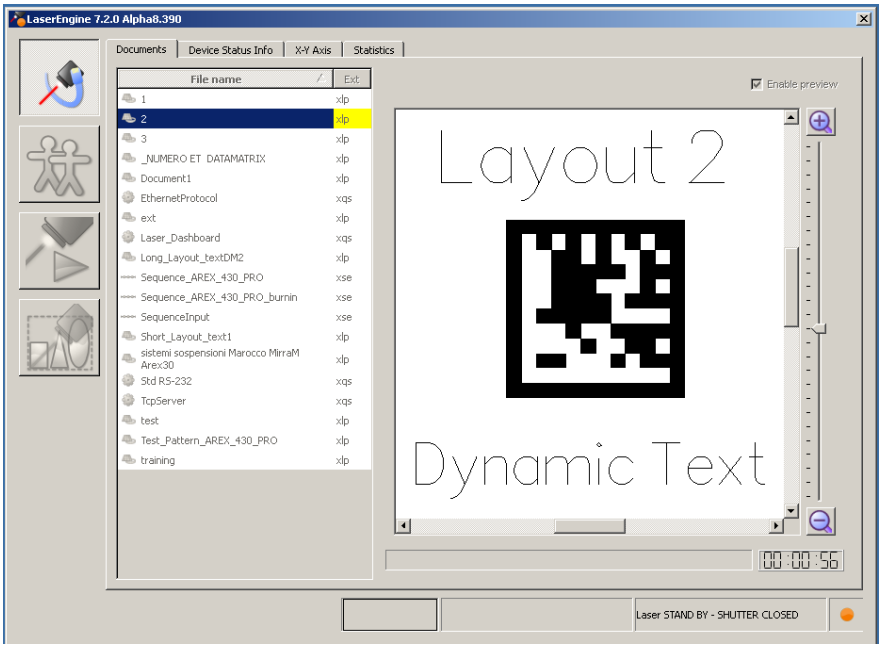
Once all these settings have been entered, in order to make them permanent on the Laser Marking System, please double click on the 'Save-Data.bat' icon, present on the Desktop of the Laser Marker.
At this point, to activate ProfiNet/IO communication on the Datalogic Laser Marker side, it is sufficient to set Laser Engine in Remote Mode, by clicking on the indicated Push Button from the Laser Engine GUI:



In order to have the Laser Engine starting in Remote Mode also after the Laser Marker has rebooted, click 'Start in remote mode' from the Laser Engine icon in the Windows tray bar.



When in Remote Mode, the Laser Engine GUI will look like this (having all the Push Buttons disabled except for the one which brings Laser Engine back to Local Mode).

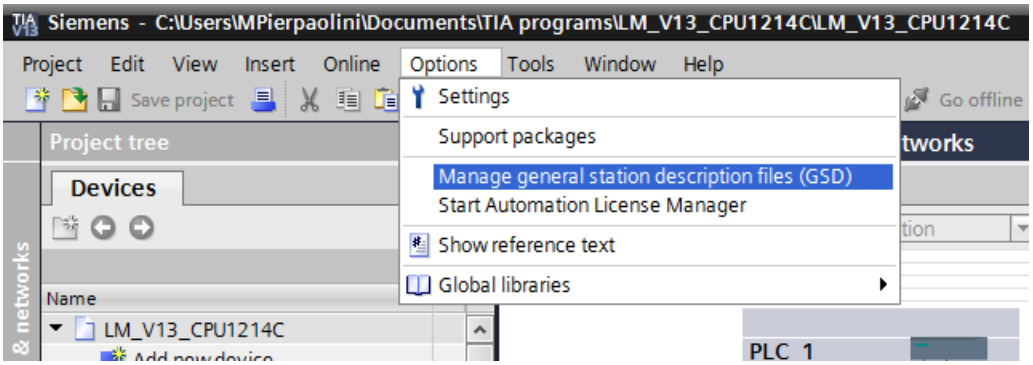


2.2. Configuring the Siemens™ S7-1200 Controller for use over PNIO

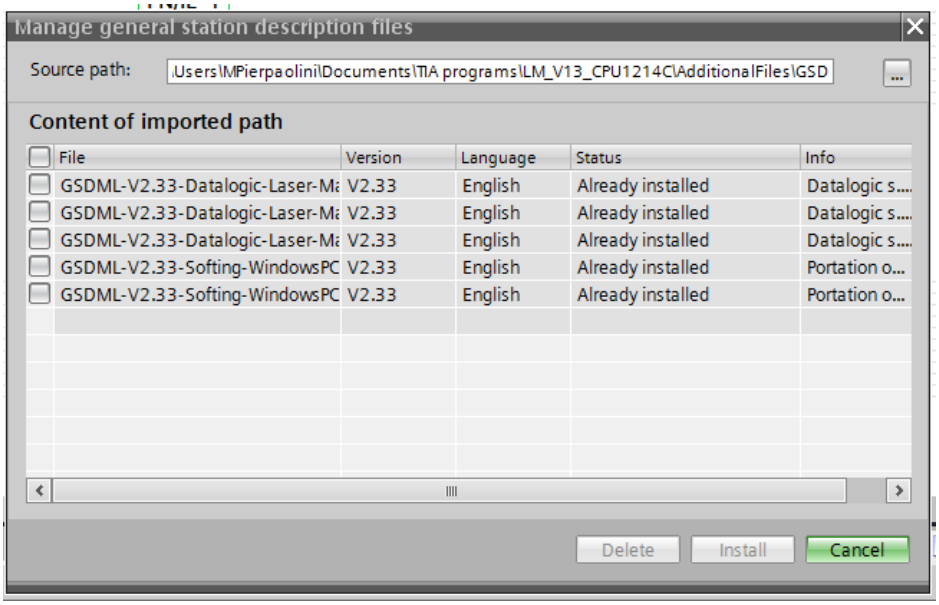
In order to create a Datalogic Laser Marker new ProfiNet/IO node in an already existing TIA Portal project, it is necessary to install the GSDML file.
Once the new ProfiNet/IO node has been imported inside the project, there are some parameters which need to be set before starting to work on the data exchange between the PLC and the Laser Marker.

Creating a PNIO node using the GSDML file

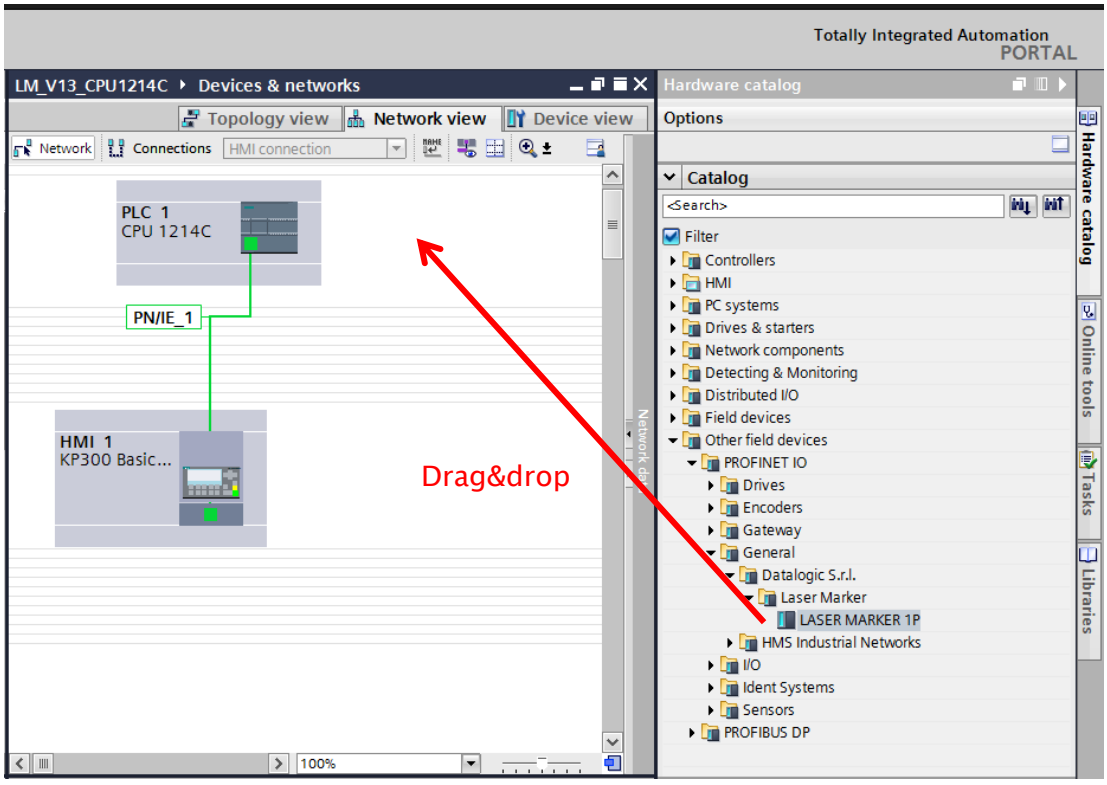
- Select the 'Manage general station description files (GSD)' from the Options Menu.



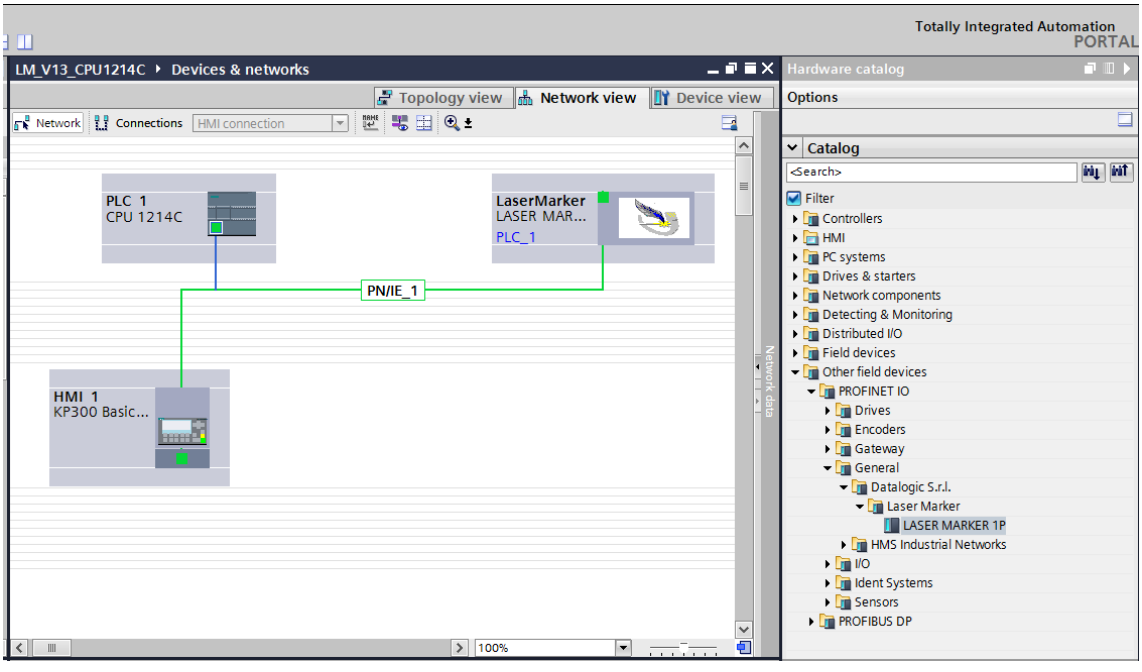
- Now follow the steps in order to install the GSDML file, indicating the filepath of the GSDML file on the PC where TIA is running.



- Once the GSML installation is complete, you will be able to import a 'Laser marker' device from the HW catalog under this filepath: Other field devices -> PROFINET IO -> General -> Datalogic S.r.l. -> Laser Marker -> LASER MARKER 1P. To do so, drag&drop the device from the Hardware Catalog into the HW configuration of the device.



- Once you have imported the device into the HW configuration of your project, you will need to link it to the PLC which will communicate with the Datalogic Laser Marker



Configuring the Laser Marker PNIO node on TIA Portal

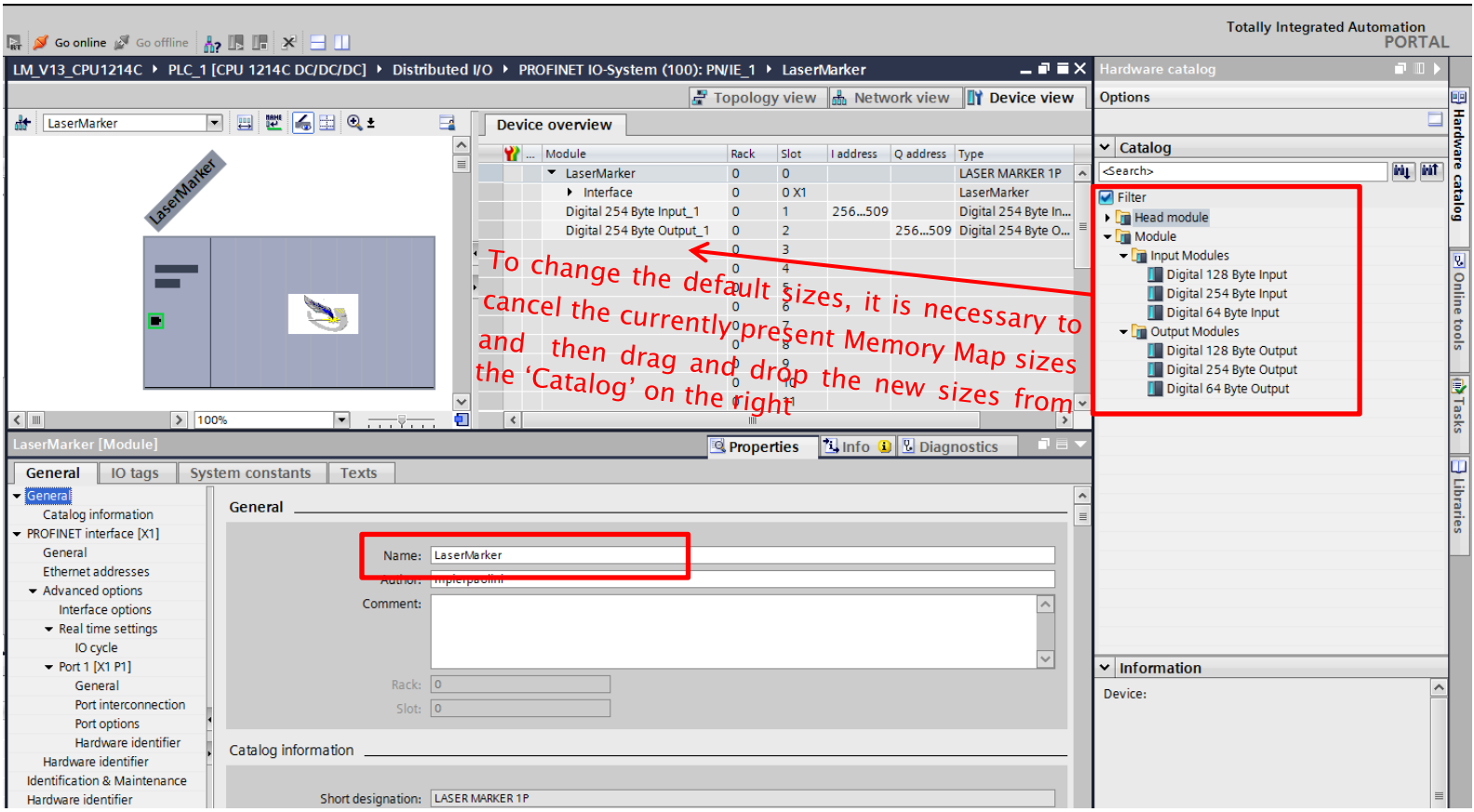
Once the Laser Marker node has been imported, the user could want to check or change the settings of this node.

By double clicking on the Laser Marker from the 'Network View' of the HW configuration, the interface will switch to Device View. From here the user is able to:

- assign a new **Device Name** to the Laser Marker PNIO node;
- choose the **size** (64, 128 and 254 Bytes) **of the Input and/or Output Memory Maps.**

A new Device Name can be entered in the Module properties in the section 'General'->'Name'.

Regarding Input and Output Memory sizes, users will be able to check the dafult size of both areas (254 bytes) from the 'Device Overview': if the user wants to change such memory sizes, he can cancel the default settings from the 'Device overview' and then drag and drop into the Device Overview one of the possible sizes for the Input and Output Modules.



⚠ Both the Device Name and the sizes of the Input and Output memory Maps must be the same as the ones set inside the Laser Configurator (page 6 of this manual).

3. Cyclic communication between the PLC and the Datalogic Laser Marking System

A ProfiNet/IO network allows the PLC to monitor and command each device which is connected: in order to do so, there needs to be a continuous flow of information between the PLC and each device on the network. After every Update Time whole memory areas are exchanged from the Laser Marker in one way (Laser Marker→PLC) and in the other (PLC→Laser Marker) so to accomplish this behavior. In order to properly command the Laser Marker and to give the PLC an appropriate feedback, all the information must be entered in precise portions of these memory maps exchanged periodically between the devices.
The memory area which is generated by the Laser Marker towards the PLC will be called **Input Assembly Memory Map**, while the memory area generated by the PLC towards the Laser Marker will be called **Output Assembly Memory Map**.
Once connection is established between the PLC and the Datalogic Laser Marker, most certainly the PLC programmer will want to program the PLC so to command the Laser System by giving it an automatic flow of commands: this process will include the handling of a simple protocol handshake, regarding the use of different bits, both on the Input and Output Assembly Memory Map:

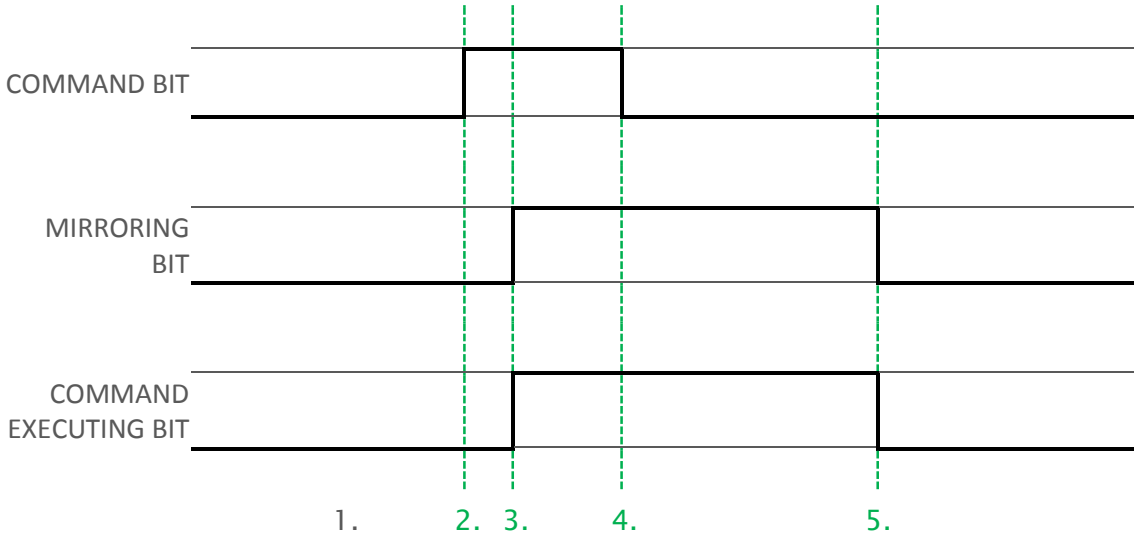
- **Command Bit**: single bit (part of a group of bits) which are present on the Output Assembly Memory Map and according to its position, it will represent the command which the PLC wants the Laser Marker to execute.
- **Mirroring Bit**: single bit (part of a group of bits) which are present on the Input Assembly Memory Map and according to its position, it will inform the PLC that the requested command has been started (when HIGH) and that it has been completed (when LOW) if the Handshake is followed.

 Nearly all Command Bit have a matching Mirroring Bit: this means that whatever command the PLC requests the laser to execute by setting a Command Bit 0→1, there will nearly always be a dedicated Mirroring bit which informs the PLC about the stage of the command execution.

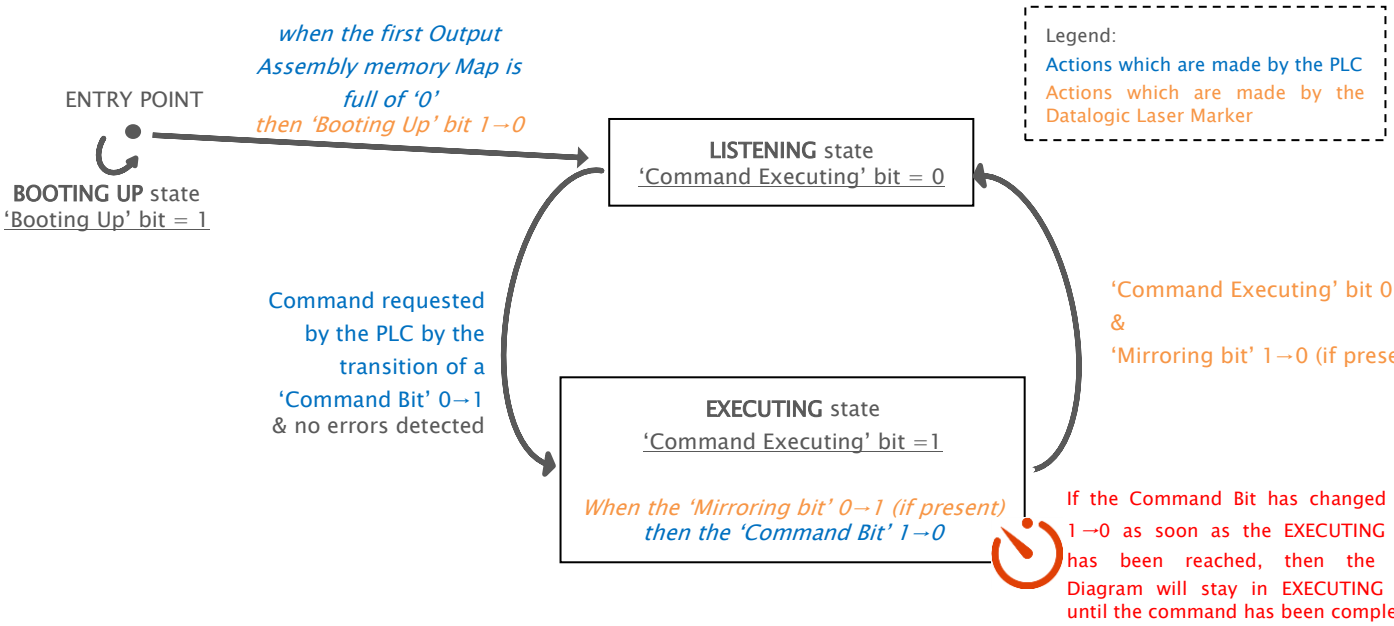
In order to make sure that the command is fully executed by the laser, a simple Handshake must be respected by the PLC programmer. Here are the 5 steps:

1. Check the State of the Laser System (address 0 and 1 of the Input Memory Map) and that the protocol is still running correctly (address 2 and 3 must be '0' in DEC format): see the list of possible errors at paragraph 2.3.
2. Set the *Command Bit* 0→1 (e.g. if the requested command is to Start Marking, then the Command Bit is bit 0 at Address 0, which must now pass 0→1), and if necessary also the Request Data field along with the Request Data size.
3. As soon as the Laser starts executing the command requested by the PLC, both the *Mirroring Bit* and the *Command Executing* bit on the Input Memory Map pass 0→1.

4. The PLC must reset the *Command Bit* 1→0 as soon as it detects the *Mirroring Bit* and the *Command Executing bit* are changing state 0→1 (e.g. the Mirroring Bit for the 'Start Marking Command' is at Address 10 Bit 0). If the command does not have a Mirroring Bit, then the PLC should reset the *Command Bit* 1→0 when the only *Command Executing* bit changes state 0→1.
5. When the *Mirroring bit* and the *Command Executing* bit pass 1→0, it means that the requested command has been completed: the Laser System is ready to start again from step 1 with another command.



This behavior is summed up by this State Diagram:



As soon as the connection is established, the State diagram is positioned at its Entry Point: the protocol will not accept any command from the PLC before receiving an Output Assembly Memory Map fully made of '0'. Until this condition is fulfilled, the

Laser State Diagram will remain in BOOTING UP state and the 'Booting Up' bit=1 (the 'Booting Up' bit is bit 7 address 3 of the Input Assembly Memory Map).
When this condition is achieved, the 'Booting Up' bit passes 1→0, meaning that the LISTENING state has been reached. Now the PLC can request the execution of a command to the Laser Marker.
The execution of the command is underway when the *Command Executing bit* and the *Mirroring Bit* change state 0→1; moreover, **as soon as the *Command Executing bit* and the *Mirroring Bit* change state 0→1, the PLC must reset the *Command Bit* 1→0**. If the selected *Command Bit* doesn't have a matching *Mirroring Bit*, then the *Command Bit* can be pulled down whenever *Command Executing bit* changes state 0→1.
If, by any chance, the *Command Bit* is not pulled down when the *Mirroring Bit* and *Command Executing* bit turns 0→1, then the *Command Executing bit* and the *Mirroring Bit* will not turn to 0 when the command is ended. The Protocol State will pass in LISTENING as soon as the *Command Executing bit* passes 1→0.

3.1. Input Assembly Memory Map

The input Assemby Memory Map has been developed in order to structure all the data coming from the Datalogic Laser Marker towards the PLC. Depending on the information that the Laser is returning at every Update Time, the PLC could need to check a single bit or multiple bytes from the following memory map.

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Laser Emission	Laser Ready Shutter Closed	Laser Ready	Laser Standby Shutter Closed	Laser Standby	Laser Wait for start	Laser Warm Up	Laser Off
1						Laser Error	Laser Warning	Laser Busy Shutter Closed
2						Protocol Error	Command Error	Command Executing
3	Protocol Boot Up							
4	Command Error Code							
5	Protocol Error Code							
6							Auto Mode	Manual Mode
7 to 9	Reserved							
10			Set to Auto mode	Set to Manual mode			Stop Marking	Start Marking
11							Get Laser Engine Version	
12	Set Global String Value	Get Global String Value	Set Global Counter Value	Get Global Counter Value	Set Data Field Value	Get Data Field Value	Save Document	Open Document From Device
13							Disable Data Field	Enable Data Field
14							Move data field	Move and rotate document

15 to 53	Reserved
54	Response Data Size (Low Bite)
55	Response Data Size (High Bite)
56 to 63/127/253	Response Data

Description of the Input Assembly Memory Map

According to the logic state of the following bits, the PLC is constantly informed about the Datalogic Laser System state, in addition to the state of a requested command.

Address	Bit	Name	Value	Description
0	0	Laser Off	0=not LE current state; 1=LE current state	USB connection with Ulyxe not established
	1	Laser Warm Up		Laser is in Warm Up State (KEY=1, ENABLE=0)
	2	Laser Wait For Start		Laser is in Wait For Start State (KEY=0, ENABLE=0)
	3	Laser Standby		When one of the two Enables has been closed
	4	Laser Standby Shutter Closed		Laser is in Standby Shutter Closed State (KEY=1, ENABLE=0, after the Warm Up stage)
	5	Laser Ready		Laser is in Laser Ready State (KEY=1, ENABLE=1)
	6	Laser Ready Shutter Closed		N.A.
	7	Laser Emission		Laser is in Laser Emission State (KEY=1, ENABLE=1)
1	0	Laser Busy Shutter Closed	0=not LE current state; 1=LE current state	Laser is in Laser Busy Shutter Closed State (KEY=1, ENABLE=0)
	1	Laser Warning		Laser is in Laser Warning State
	2	Laser Error		Laser is in Laser Error State
2	0	Command Executing	0: Protocol is not currently in this phase; 1: Protocol is currently in this phase	Lighter is executing a command
	1	Command Error		Lighter has generated a Command Error. Check address 4 for the Command Error Code
	2	Protocol Error		Lighter has generated a Protocol Error. Check address 5 for the Protocol Error Code
3	7	Protocol Boot Up		Lighter PNIO is in BOOTING UP phase: it will end as soon as a completely empty Output memory map is generated from the PLC towards the Laser Marker
4	0 to 7	Command Error Code	See error paragraph 3.3	Gives information about the Command Error
5	0 to 7	Protocol Error Code	See error paragraph 3.3	Gives information about the Protocol Error
6	0	Manual Mode	0: not LE current operating mode; 1: LE current operating mode	Laser Engine is currently in Manual Mode
	1	Auto Mode		Laser Engine is currently in Auto Mode
7 to 9	Reserved			
10	0	Start Marking	1:Laser started Marking; 0:Laser is not marking	Informs on the marking process, and turns to 0 when this has ended
	1	Stop Marking	1:Laser marking has been stopped; 0:Laser marking has not been stopped	Informs whether the marking process has been stopped
	4	Set to Manual Mode	1:Laser Engine operating mode is being changed; 0: Laser Engine operating mode has been changed	Informs whether the Laser Engine has switched operating mode
	5	Set to Auto Mode		Informs whether the Laser Engine has switched operating mode
11	1	Get Laser Engine Version	0: Not executing this command; 1:Executing this command	Returning the Laser Engine Version

12	0	Open Document From Device	0: Not executing this command; 1:Executing this command	Loading a document which is present inside the Laser Engine default filepath D:\Data\Docs\Layouts
	1	Save Document		Saving the loaded and/or modified document
	2	Get Data Field Value		Returning the content of the object with the specified ID
	3	Set Data Field Value		Setting the content of the object with a specified ID
	4	Get Global Counter Value		Returning a Global Counter value
	5	Set Global Counter Value		Setting a Global Counter value
	6	Get Global String Value		Returning a Global String value
	7	Set Global String Value		Setting a Global String value
13	0	Enable Data Field		Enabling the specified Data Field
	1	Disable Data Field		Disabling the specified Data Field
14	0	Move and rotate document		Moving and rotating a document
	1	Move Data Field		Moving the specified Data Field to the given position, in relation to the center of the marking field
15 to 53	Reserved			
54	0 to 7	Response Data Size (Low Byte)	"Response Data" field usable length (Low and High byte)	Reporting the PLC how long the usable data is inside the Response Data field.
55	0 to 7	Response Data Size (High Byte)		
56 to 63/127/253	0 to 7 (for each address Byte)	Response Data	Each byte represents an ASCII character that the laser is reporting towards the PLC	From Address 56 for a number of bytes specified by the 'Response Data Size' fields, the PLC can find the data returned by the Laser Marker

3.2. Output Assembly Memory Map

The Output Assembly Memory Map has been developed in order to structure all the data coming from the PLC towards the Datalogic Laser System. The PLC will need to set a single bit or multiple bytes in the following memory map.

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0			Set to Auto Mode	Set to Manual Mode			Stop Marking	Start Marking
1	Protocol Error Clear						Get Laser Engine Version	
2	Set Global String Value	Get Global String Value	Set Global Counter Value	Get Global Counter Value	Set Data Field Value	Get Data Field Value	Save Document	Open Document from Device
3							Disable Data Field	Enable Data Field
4							Move data field	Move and rotate document
5 to 53	Reserved							
54	Request Data Size (Low Byte)							
55	Request Data Size (High Byte)							
56 to 63/127/253	Request Data							

Description of the Output Assembly Memory Map

Address	Bit	Name	Value	Description & examples
0	0	Start Marking	0→1 Start Marking ; 1→0 as soon as the mirroring bit is HIGH	This action starts the Marking process (in order to have Laser emission, the Laser Marker must be in Laser Ready State before this bit goes HIGH)
	1	Stop Marking	0→1 Stop Laser Emission; 1→0 as soon as the mirroring bit is HIGH	This action stops the Marking process.
	4	Set to Manual Mode	0→1 Sets Laser Engine in Manual Mode; 1→0 as soon as the mirroring bit is HIGH	Sets the Laser Engine in Manual mode. The command will be completed also if Laser Engine is already in Manual Mode.
	5	Set to Auto Mode	0→1 Sets Laser Engine in Auto Mode; 1→0 as soon as the mirroring bit is HIGH	Sets the Laser Engine in Auto mode. The command will be completed also if Laser Engine is already in Auto Mode.
1	1	Get Laser Engine Version	0→1 Asking the Laser Marker to reply with the Laser Engine version ; 1→0 as soon as the mirroring bit is HIGH	Gets the Laser Engine Version running on the PC communicating with the PLC.
	7	Protocol Error Clear	0→1 Sets back into 'Listening' state after a 'Protocol Error' ; 1→0 as soon as the 'Command Error' bit is HIGH	Sets the Laser Marker back to 'Listening' state after that a Command Error is notified to the PLC. No 'Mirroring bit' has been implemented for this command
2	0	Open Document From Device	0→1 Asking to load an XLP ; 1→0 as soon as the mirroring bit is HIGH	Loads the document specified in the Request Data Field (".xlp" extension must be included); the document must be in the Laser Engine default filepath D:\Data\Docs\Layouts
	1	Save Document	0→1 Save current document; 1→0 as soon as the mirroring bit is HIGH	Overwrites the current *.xlp file
	2	Get Data Field value	0→1 Gets the content of the Data Field specified inside the Requested Data Field; 1→0 as soon as the mirroring bit is HIGH	Requests the content of the object which is present in the currently loaded *.xlp. Request Data Field: <FieldID>
	3	Set Data Field Value	0→1 Sets the content of the specified Data Field ; 1→0 as soon as the mirroring bit is HIGH	Sets a new content to a specified object which is present in the currently loaded *.xlp. Request Data Field: <FieldID><LF><NewValue>
	4	Get Global Counter Value	0→1 Asking to return the value of the Global Counter; 1→0 as soon as the mirroring bit is HIGH	Requests the base10 value of the specified Global Counter. Request Data Field: <GlobalCounterName>
	5	Set Global Counter Value	0→1 Setting the value of the Global Counter; 1→0 as soon as the mirroring bit is HIGH	Sets the base10 value of the specified Global Counter. Request Data Field: <GlobalCounterName><LF><NewValue>
	6	Get Global String Value	0→1 Asking to return the value of the Global String; 1→0 as soon as the mirroring bit is HIGH	Requests the value of the specified Global String. Request Data Field: <GlobalStringName>
	7	Set Global String Value	0→1 Setting the value of the Global String; 1→0 as soon as the mirroring bit is HIGH	Sets the value of the specified Global String. Request Data Field: <GlobalStringName>

3	0	Enable Data Field	0→1 Enables the specified Data Field; 1→0 as soon as the mirroring bit is HIGH	Enables the laser object with the specified ID. Request Data Field: <FieldID>
	1	Disable Data Field	0→1 Disables the specified Data Field; 1→0 as soon as the mirroring bit is HIGH	Disables the laser object with the specified ID. Request Data Field: <FieldID>
4	0	Move and Rotate Document	0→1 Moves and/or rotates the document; 1→0 as soon as the mirroring bit is HIGH	Moves the document's origin and then rotates it according to the specified offsets Request Data Field: *<X>,<Y>,<Angle>* (HEX example byte per byte of the Request Data field when using this command with offsets <0>, <10>, <+45°>*: 30 2C 31 30 2C 34 35)*
	1	Move Data Field	0→1 Moves the specified Data Field to the position specified inside Request Data Field; 1→0 as soon as the mirroring bit is HIGH	Moves the laser object with a specified ID to the specified position. The movement is done considering the object's origin. Request Data Field: <FieldID><LF><X>,<Y>
5 to 53	Reserved			
54	0 to 7	Request Data Size (Low Byte)	"Response Data" field usable length (Low and High byte)	Low/High Byte which must reflect the length of the Request Data field. Example: Low Byte=12 in DEC format (in BIN format, address 54 from bit 7 to bit 0 is '0001100'), High Byte=0 in DEC format, means that the laser will need to take into account only the first 12 bytes of the Request Data Field starting from address 56 onwards
55	0 to 7	Request Data Size (High Byte)		
56 to 63/127/253	0 to 7 (for each address Byte)	Request Data	Each byte represents an ASCII character that the PLC is reporting towards the Laser Marker, which the Laser Marker will interpret depending on the Command Bit which has been pulled 0→1	

3.3. Possible Errors

There are 2 kinds of error which can turn up during the normal use of a Datalogic Laser Marker via ProfiNet/IO:
-Command Error;
-Protocol Error.
The PLC is informed by 2 bits in the Input Assembly Memory Map if any kind of error happens: these 2 bits are bits 1 and 2 in Address 2 (respectively 'Command Error' and 'Protocol Error').
Both kinds of error should be monitored constantly and we advise the PLC programmer to think about a routine which will manage these errors.

Command Error

A Command Error is notified to the PLC when the requested command cannot be executed.
In addition to the single 'Command Error' notification bit, a whole byte (address 4) of the Input Assembly Memory Map describes the reason of such an error. The values which address 4 can have when a Command Error is notified, are summed up in the following table.

Value	Description
1	Command not recognized
2	Invalid date value
3	File does not exist
4	File opening error
5	Invalid I/O port
6	Global variable does not exist
7	Global variable is not a counter
8	Global variable is not a string
9	Bad command
10	Invalid field
11	No document loaded
12	No document saved
13	Laser already stopped
14	Command not allowed by device status

15	Invalid Field Symbol Object ID
16	Invalid reader result
17	Result not found
18	Symbol not found
19	Bad Grade required validation
20	MARVIS is not enabled
21	MARVIS License is not enabled
22	Focal Distance Sensor Unavailable
24	Focal Distance Sensor Focus Error
25	Focal Distance Sensor Reference Invalid
26	Focal Distance Sensor Out Of Range
27	Focal Distance Sensor Connection Error
28	Focal Distance Sensor Communication Error
29	Focal Distance Sensor Invalid Focus Search
100	Command exceeds memory area

Command Error are not blocking errors which request an acknowledgement from the PLC: after that any kind of Command Error is reported, the PLC will be able immediately request a new command to the Laser Marker, which will try to execute it normally.

Protocol Error

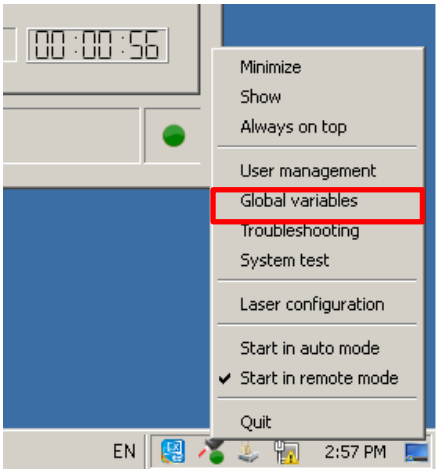
A Protocol Error is notified to the PLC when the Laser Marking System is not able to correctly determinate a single command to execute.
In addition to the single 'Protocol Error' notification bit, a whole byte (address 5) of the Input Assembly Memory Map describes the reason of the error:

Value	Description
1	Command conflict: more than 1 command bit is set to 1
2	Unknown command: bit(s) in a reserved area is/are set to 1
3	Busy: Protocol in Executing state when Command bit is set to 1 (except for STOP command bit)
255	Critical: Protocol state machine is faulted

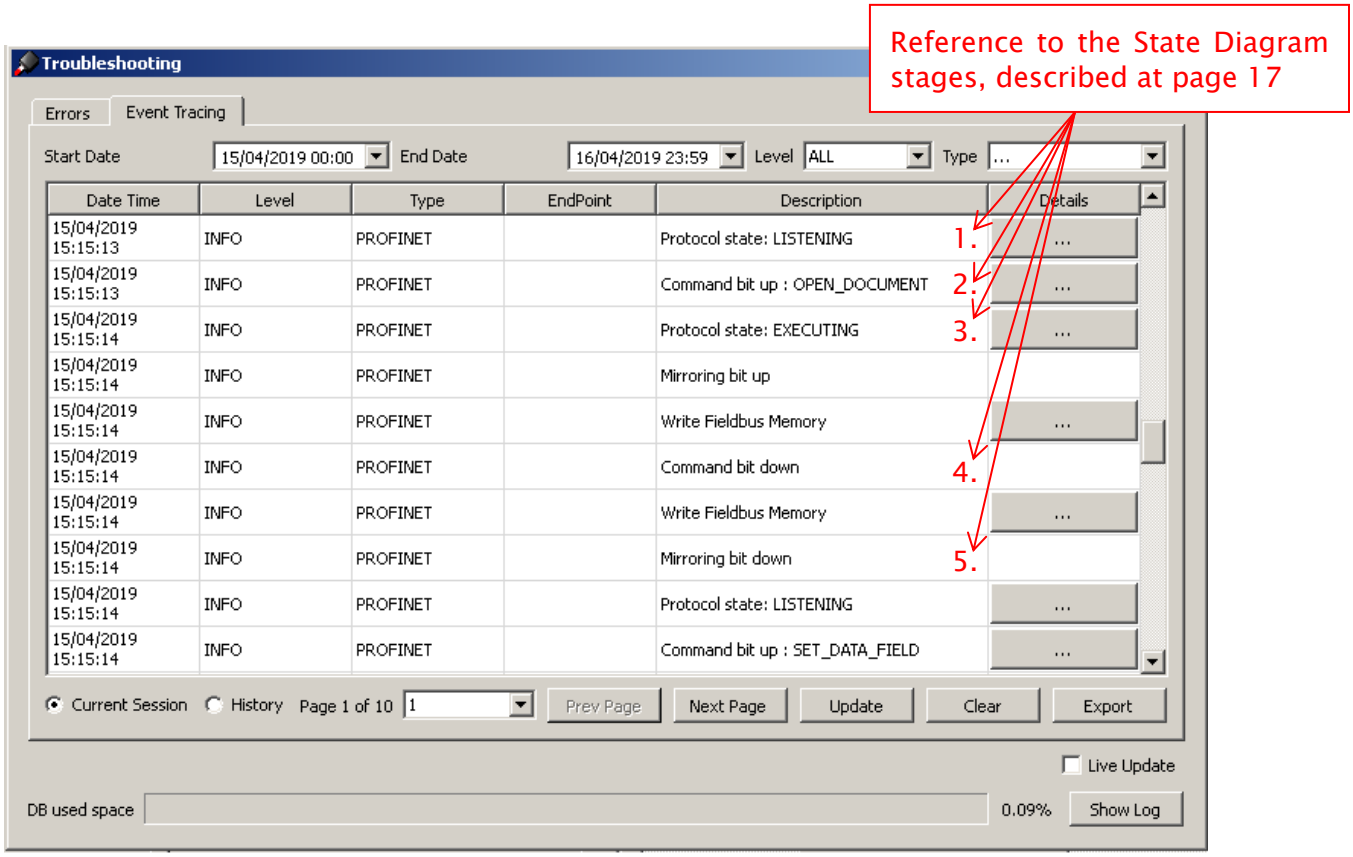
When a Protocol Error is notified, in case 1, 2 and 3 it is necessary for the PLC to set the 'Protocol Error Clear' bit (Address 1 bit 7), which sets the Protocol back into LISTENING state. This operation will not work if the value returned by the Protocol Error is point 4.: in this case, the ProfiNet/IO connection must be closed and then re-established between the Laser System and the PLC.

4. Troubleshooting

Each command which the PLC requests the Laser Marker is logged in detail in the Troubleshooting database, which can be opened as shown:



If opened, the user will find all the errors and the Event Tracking, depending on the selected tab: when the Event Tracing is selected, the user can check the details of each command which the Laser Marker has executed via ProfiNet/IO.



By clicking on the '…' button in the4 Details column, the user can find the Data and the reported length which was either necessary to execute the command (present on the Request Data area) or the data which has been returned to the PLC along with its length.