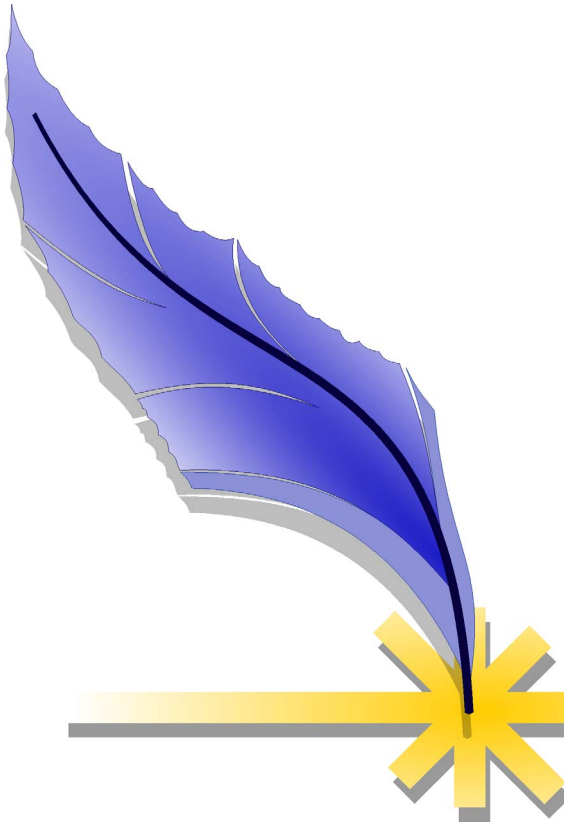
EtherNet/IP

USER MANUAL



Communication Protocol 2.0

DATALOGIC

Datalogic S.r.l.
Via S. Vitalino, 13
40012 Calderara di Reno (BO)
Italy
Tel. +39 051 3147011
Fax +39 051 3147205

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Ed: 03/2020

This manual refers to Lighter™ Suite software version 7.3 and later.

TABLE OF CONTENTS

PREFACE

ABOUT THIS MANUAL

This User Manual (UM) provides users with information on how to use the communication protocol. Other publications associated with this product can be downloaded free of charge from the website listed on the back cover of this manual.

Manual Conventions

The symbols listed below are used in this manual to notify the reader of key issues or procedures that must be observed when using the laser marker:

NOTE

Notes contain information necessary for properly diagnosing, repairing and operating the laser marker.

CAUTION

The CAUTION symbol advises you of actions that could damage equipment or property.

WARNING

The WARNING symbol advises you of actions that could result in harm or injury to the person performing the task.

TECHNICAL SUPPORT

Support Through the Website

Datalogic provides several services as well as technical support through its website. Log on to (www.datalogic.com).

For quick access, from the home page click on the search icon, and type in the name of the product you're looking for. This allows you access to download Data Sheets, Manuals, Software & Utilities, and Drawings.

Hover over the Support & Service menu for access to Services and Technical Support.

CHAPTER 1

SETUP OVER ETHERNET/IP NETWORK

In order to establish EtherNet/IP communication between the PLC and the laser marker, it is necessary to set up both elements.

Clearly both the PLC and the laser must be working on the same Subnet. All Datalogic Laser Markers are factory-configured in order to have a single IP address working on the same Subnet. These default values are available in the user manual of the Laser Marker.

Nevertheless, it is possible to change these values according to the ICT needs of the plant where the Laser Marker is working.

CONFIGURING THE LASER MARKER FOR USE OVER ETHERNET/IP

Some operations must be made on the Laser Marker in order to have it working on an EtherNet/IP network; both the IP address and the Subnet of the Laser Marker have to be known in the setup phase. Please get this information from the IT technician before proceeding.

Basic network setting of the Laser Marker

The Laser Marker which can be used on an EtherNet/IP network contains an Embedded PC, with Windows Embedded as an O.S., so changing the IP address and the Subnet mask of the Datalogic Laser Marker is very simple:

- System running Windows 7:

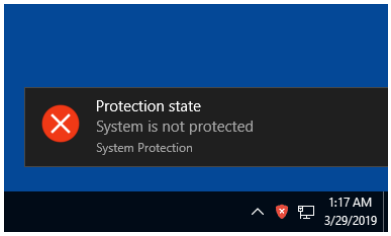
  - Skip to step 1
- System running Windows 10:

  - **Disable system protection** (see laser marker User's Manual -> Disable the system protection...)

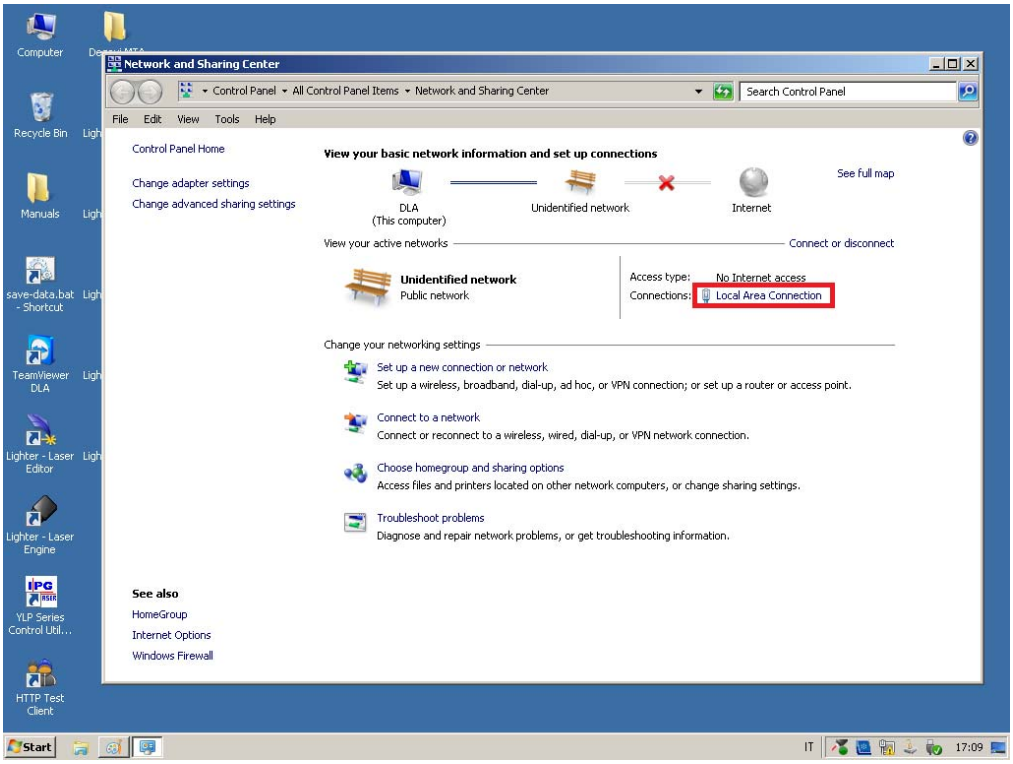
NOTE

When the System Protection is disabled the system is not protected against disk corruption or malware attacks. Disable the protection only for the time necessary to make disk changes.

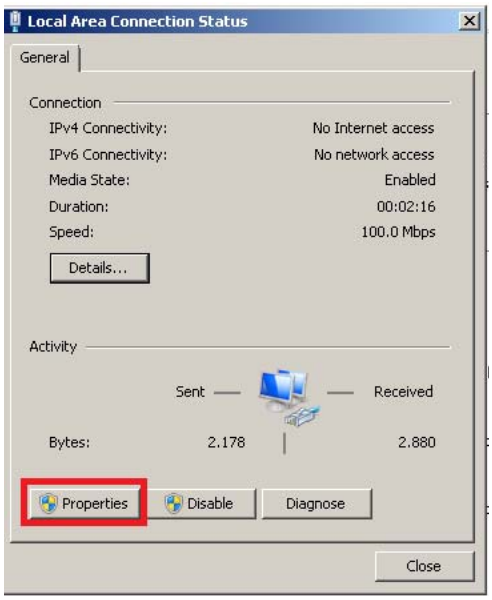
- Wait for the operating system to restart
- Check that the System protection is disabled (red icon):



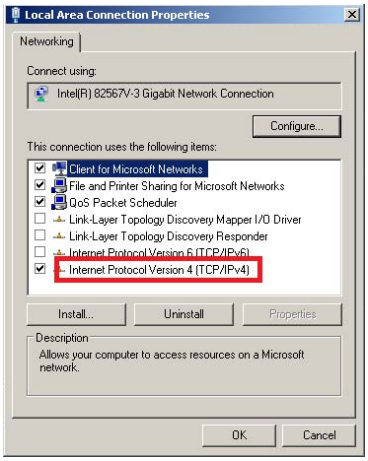
1. Open the '**Network and Sharing Center**' on the Laser Marker, and then click on the '**Local Area Connection**' inside the window, as shown.



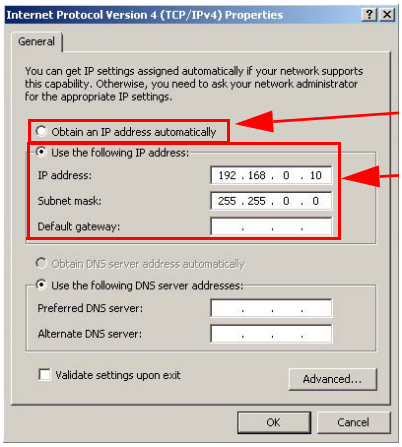
2. Click on '**Properties**'.



3. Double click '**Internet Protocol Version 4 (TCP/IPv4)**'.



4. Enter IP address and the Subnet Mask.



Must be unchecked

Enter IP address and Subnet Mask here

In order to have a single IP address which distinguishes the Laser Marker on the production site at all times (e.g. also after rebooting) , EtherNet/IP does not allow connection to devices which use DHCP to obtain an IP address. This means that it is forbidden to set the option 'Obtain an IP address automatically'; users should give the laser a single IP address and a matching Subnet Mask (by entering the data in the 2 editable lines which follow the 'Use the following IP address:' section).

To make all these settings permanent on the Laser Marker, please follow this procedure:

- System running Windows 7:

  - Close all the open windows

  - Double click on the '`Save-Data.bat`' icon, present in the Desktop

  - Restart Windows.

- System running Windows 10:

  - Close all the open windows

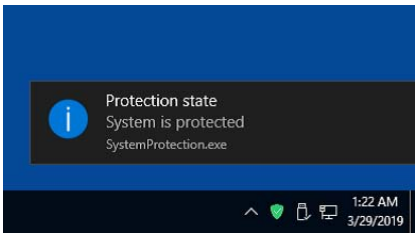
  - **Enable system protection** (see laser marker User's Manual -> Enable the system protection...)

NOTE

When the System Protection is disabled the system is not protected against disk corruption or malware attacks.

  - Wait for the operating system to restart

  - Check that the System protection is enabled (green icon):



Advanced network settings of the Laser Marker

All Datalogic Laser Markers are controlled by the Windows Firewall; in order to establish an Ethernet/IP connection between the PLC and the Laser Marker, the user should **allow all Inbound and Outbound traffic regarding** "`LaserEngine.exe`".

Check that the firewall settings are correct and that the Inbound and Outbound rules regarding "`LaserEngine.exe`" are present, otherwise follow the procedure below:

NOTE

A major Lighter™ Suite upgrade requires modification of the firewall Inbound and Outbound rules regarding "`LaserEngine.exe`" due to the change of the "`LaserEngine.exe`" folder.

- System running Windows 7:

  - Skip to step 1

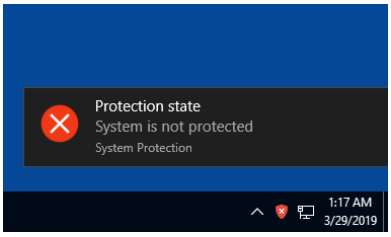
- System running Windows 10:

  - **Disable system protection** (see laser marker User's Manual -> Disable the system protection...)

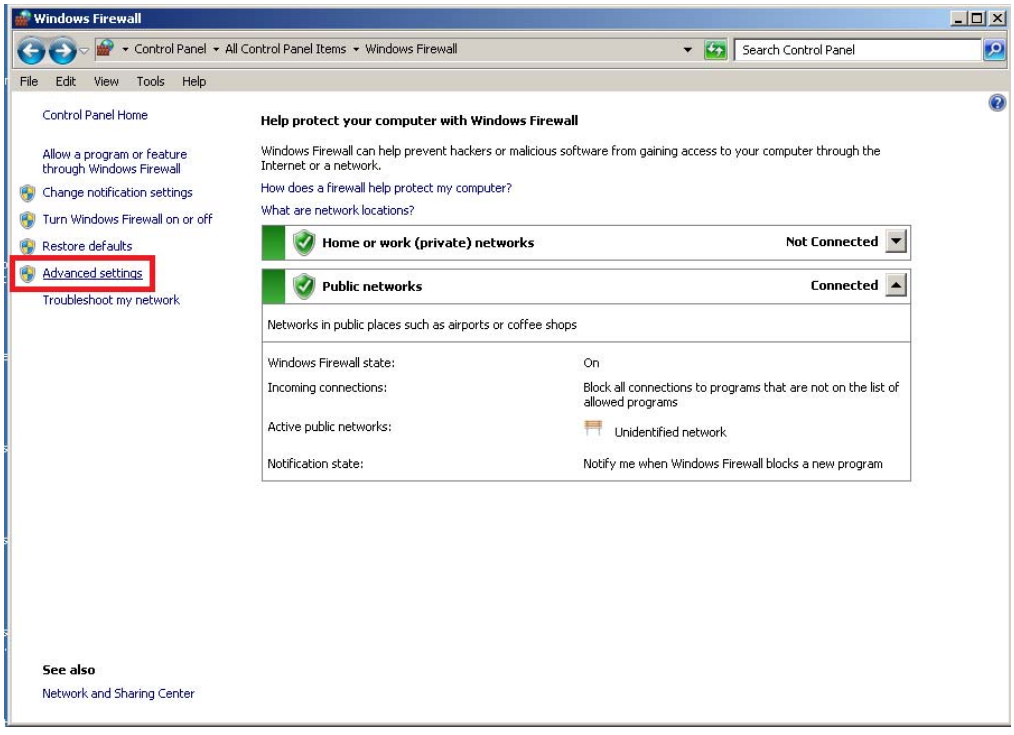
NOTE

When the System Protection is disabled the system is not protected against disk corruption or malware attacks. Disable the protection only for the time necessary to make disk changes.

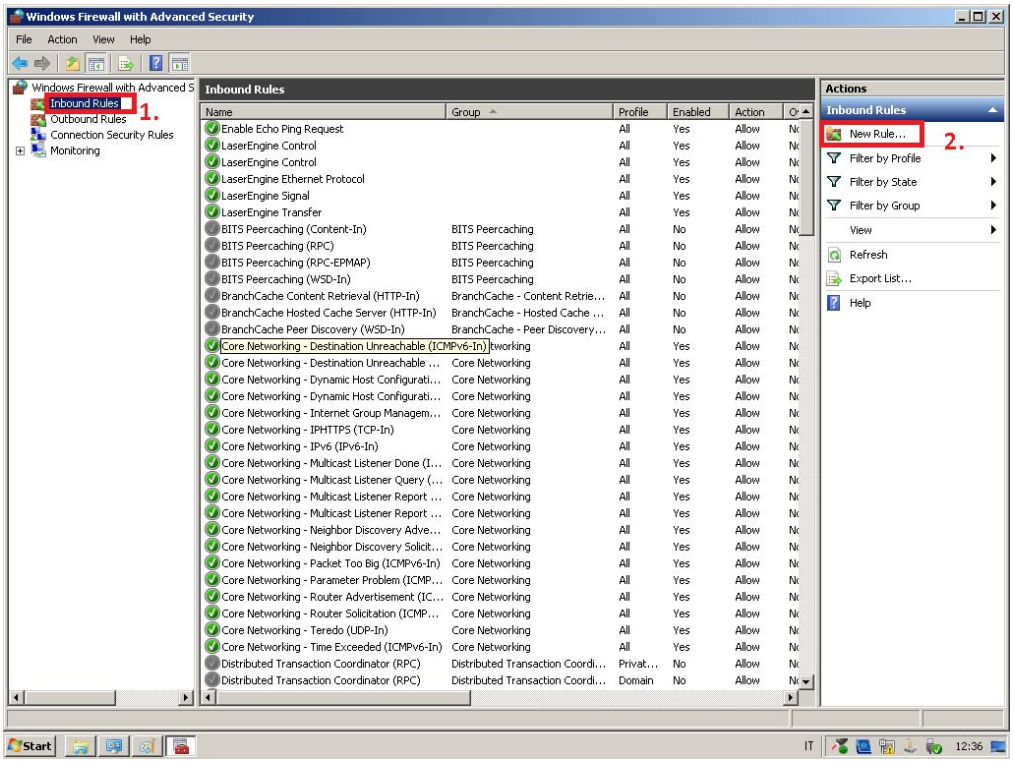
- Wait for the operating system to restart
- Check that the System protection is disabled (red icon):



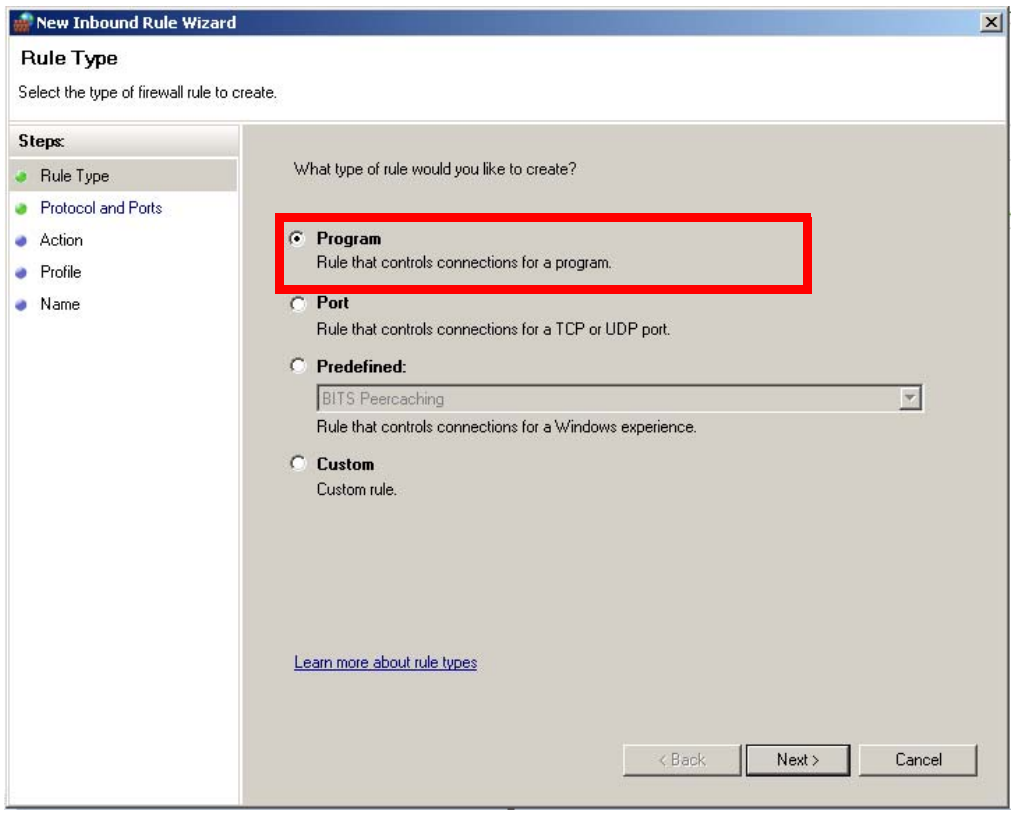
1. Go to **Control Panel -> Windows Firewall** and then select '**Advanced settings**':



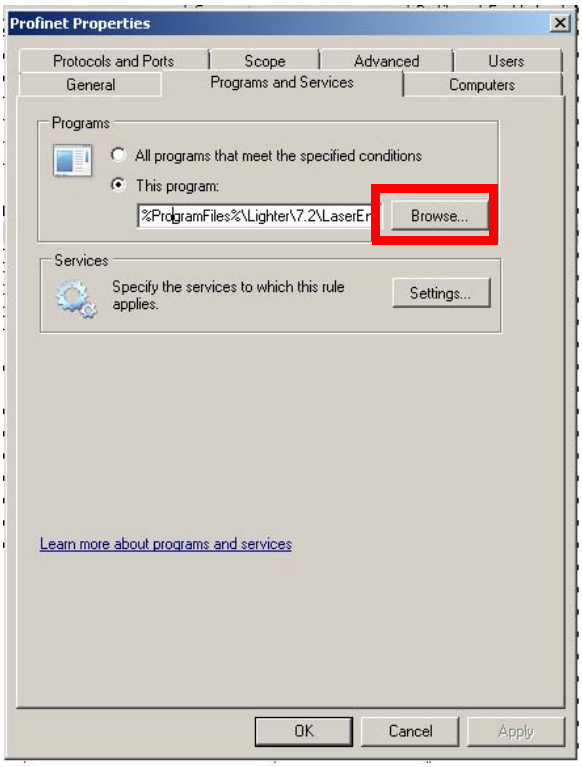
2. New Inbound and Outbound rules need to be set for the '`LaserEngine.exe`' program click on '**Inbound Rules**' and then select '**New Rule...**':

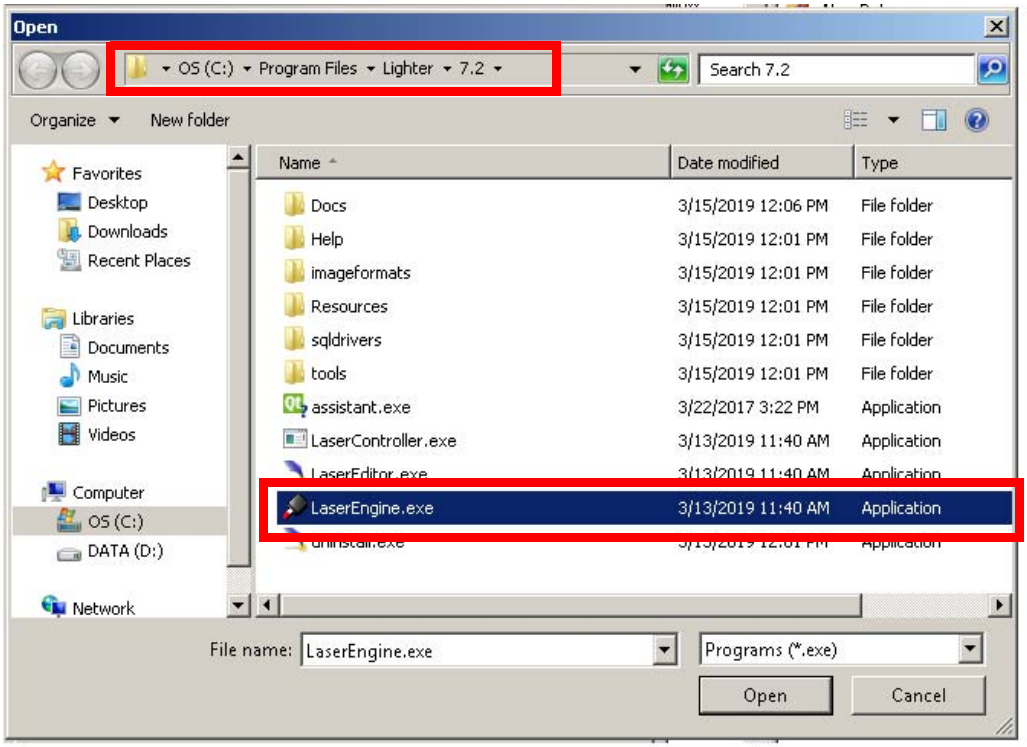


3. A Wizard GUI will guide you through the procedure: select '**Program**'.

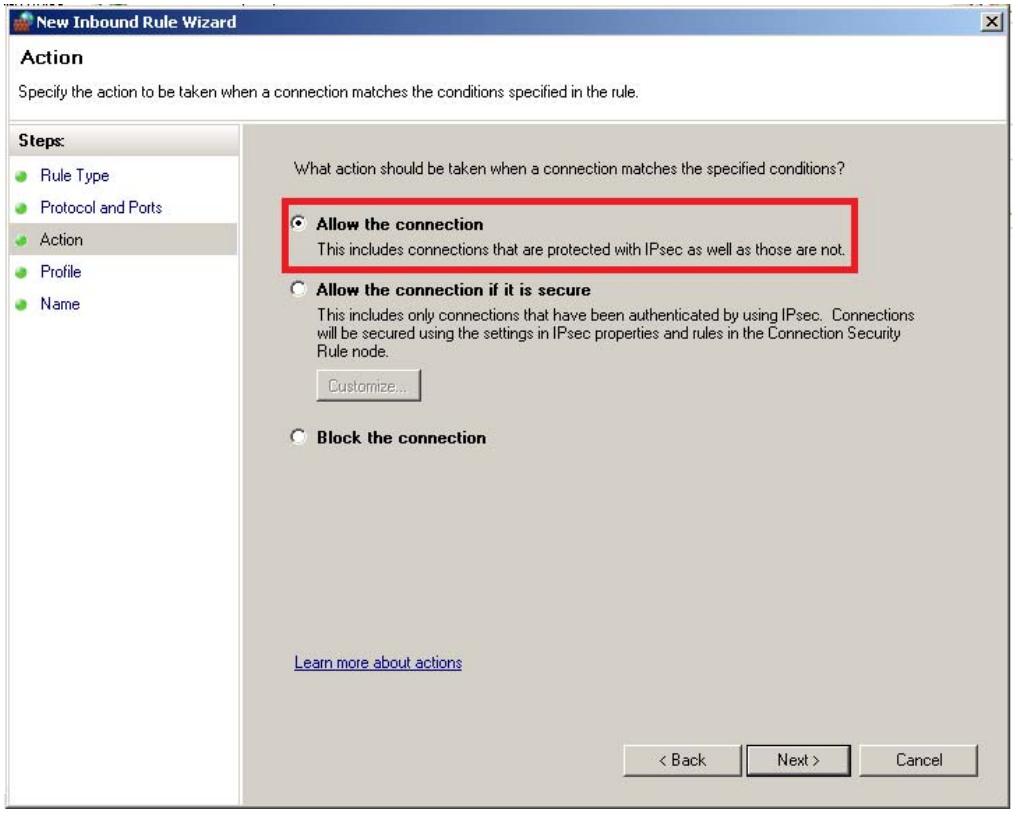


4. In the **Program And Services** tab, browse towards the 'LaserEngine.exe' application (*C:\Program Files\Lighter\X.x* for systems running Windows7 and *C:\Program Files (x86)\Lighter\X.x* for systems running Windows 10).

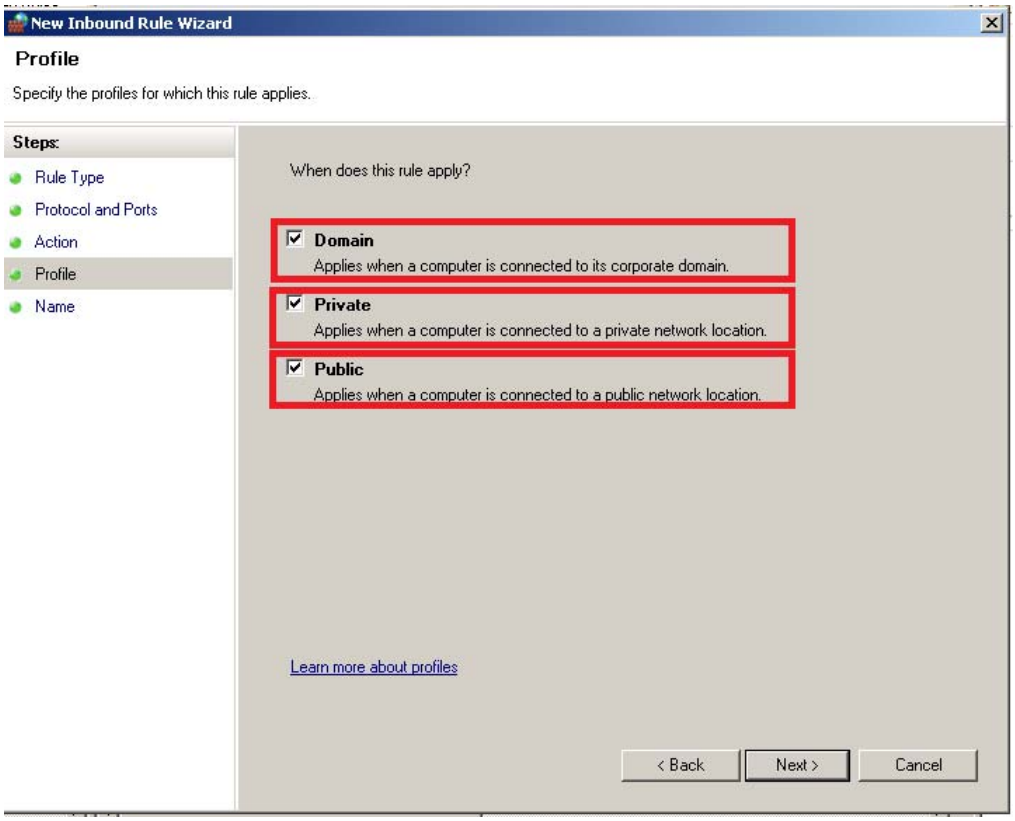




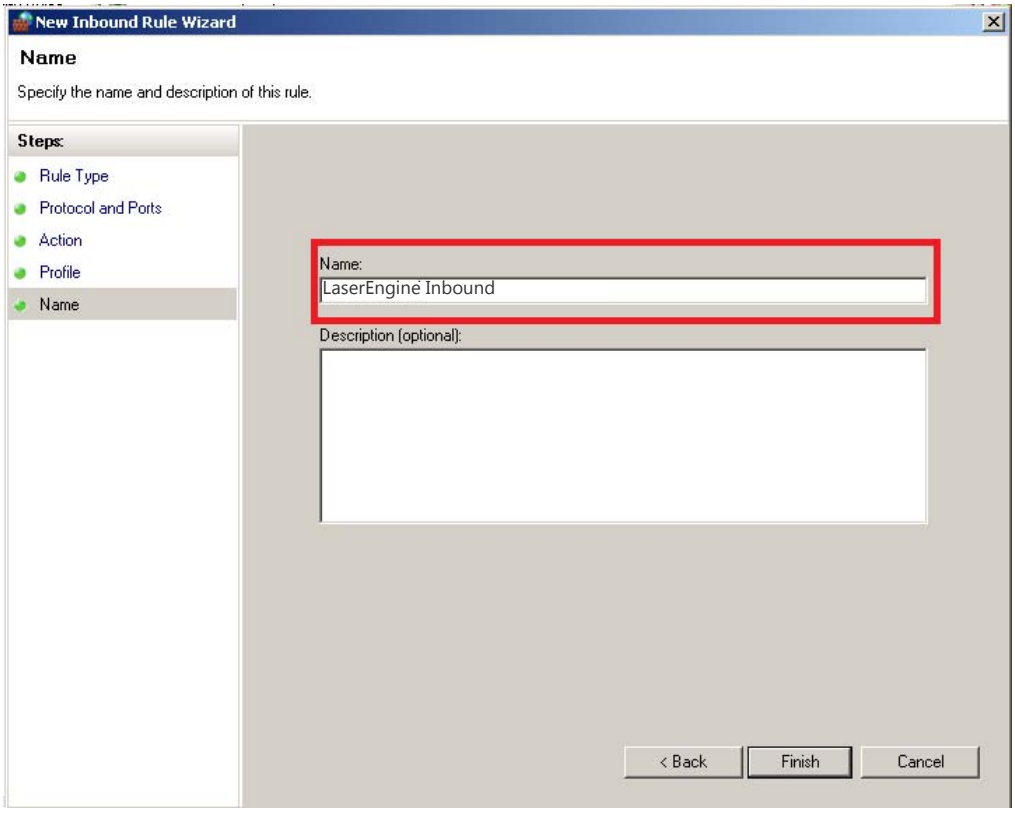
5. Select '**Allow the connection**', then press '**Next**'.



6. Select '**Domain**', '**Private**' and '**Public**', then press '**Next**'.



7. Give this rule 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 7, 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.

To make all these settings permanent on the Laser Marker, please follow this procedure:

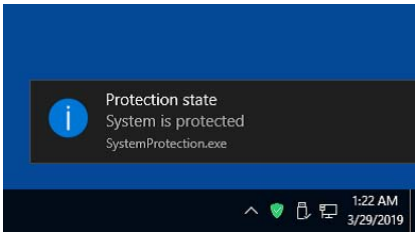
- System running Windows 7:
  - Close all the open windows
  - Double click on the '`Save-Data.bat`' icon, present in the Desktop of the Laser Marker

  - Restart Windows.

- System running Windows 10:
  - Close all the open windows
  - **Enable system protection** (see laser marker User's Manual -> Enable the system protection...)

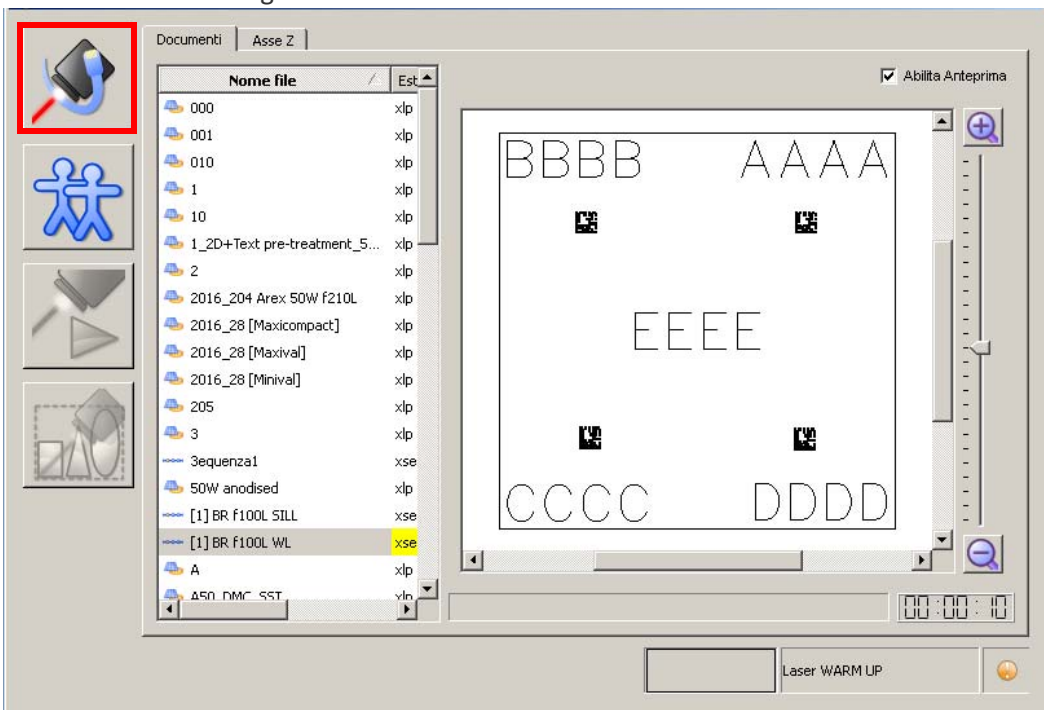
NOTE **When the System Protection is disabled the system is not protected against disk corruption or malware attacks. Disable the protection only for the time necessary to make disk changes.**

- Wait for the operating system to restart
- Check that the System protection is enabled (green icon):



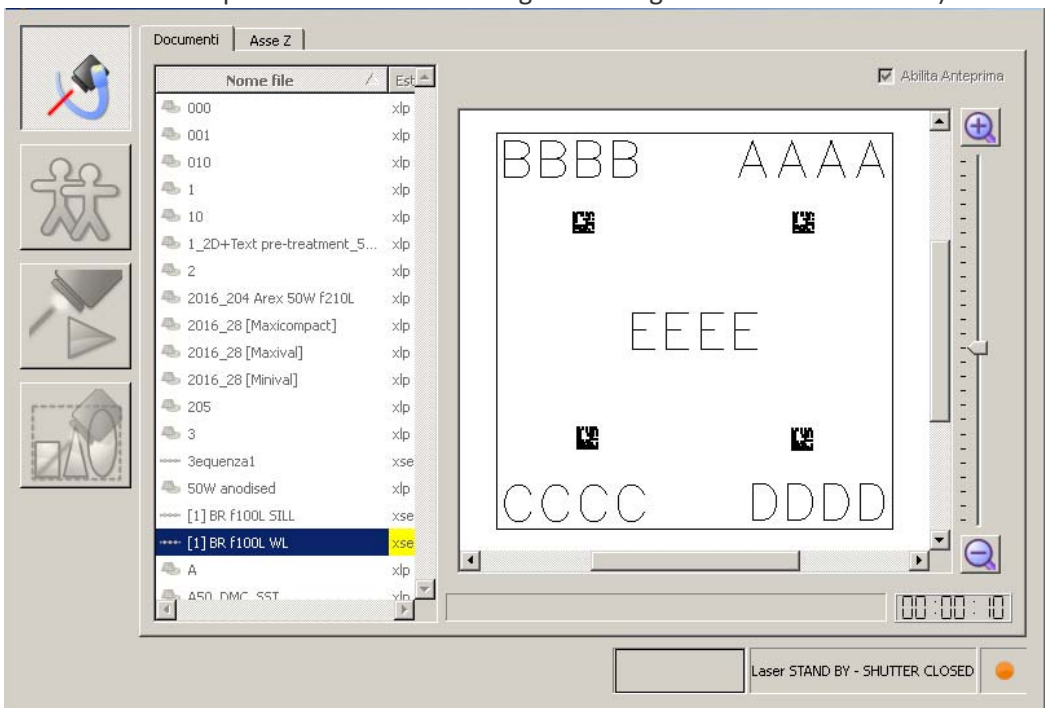
Set Laser Engine in remote mode

At this point, to enable the Laser Marker for EtherNet/IP communication with the PLC, 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, enable '**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).



Disabling the WinSAT task

WinSAT is a Windows Scheduled Task, which is executed weekly every Sunday at 1 AM (by default, on our Embedded PCs): more information about this task can be found at the following link https://en.wikipedia.org/wiki/Windows_System_Assessment_Tool

The execution of this Task can create issues to the Laser Marker during communication with PLC, as it interferes with the communication stacks which are included inside Lighter: because of this, if the Laser Marker is going to be connected to the PLC via Profi-Net I/O, Ethernet IP, TcpServer, the user must manually disable this scheduled task, so to be sure that the PC on board the Laser Marker doesn't execute such task.

Check that the Laser Marker has the WinSAT task disabled. If not, follow these steps:

- System running Windows 7:

  - Skip to step 1

- System running Windows 10:

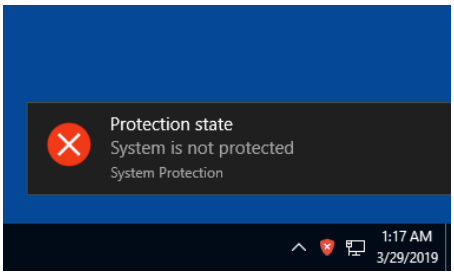
  - **Disable system protection** (see laser marker User's Manual -> Disable the system protection...)

NOTE

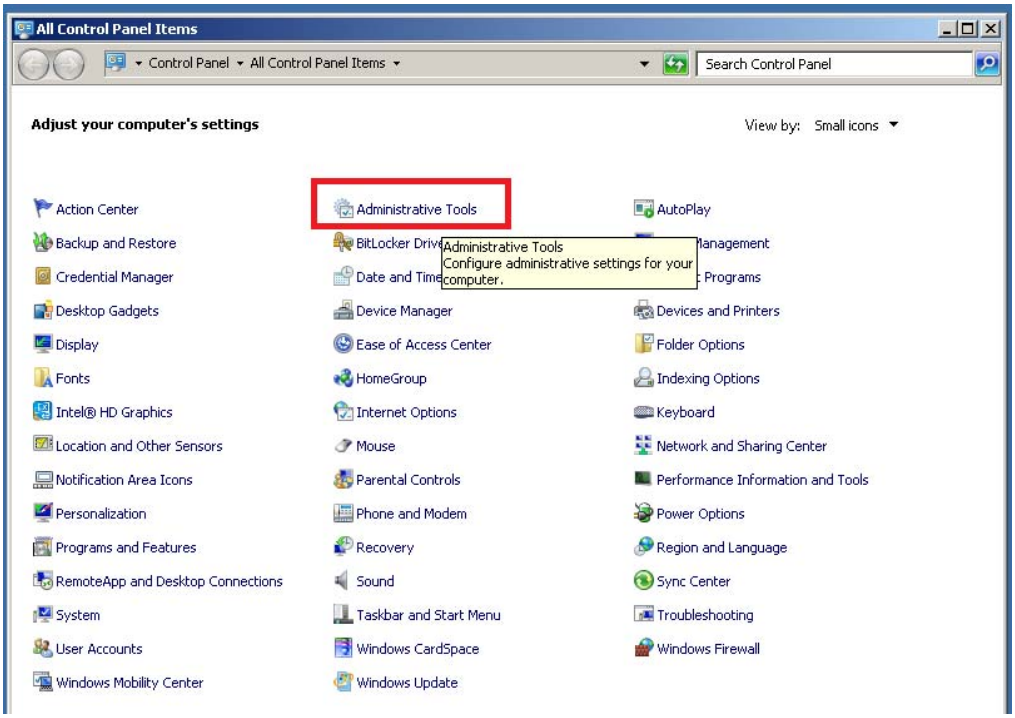
When the System Protection is disabled the system is not protected against disk corruption or malware attacks. Disable the protection only for the time necessary to make disk changes.

- Wait for the operating system to restart

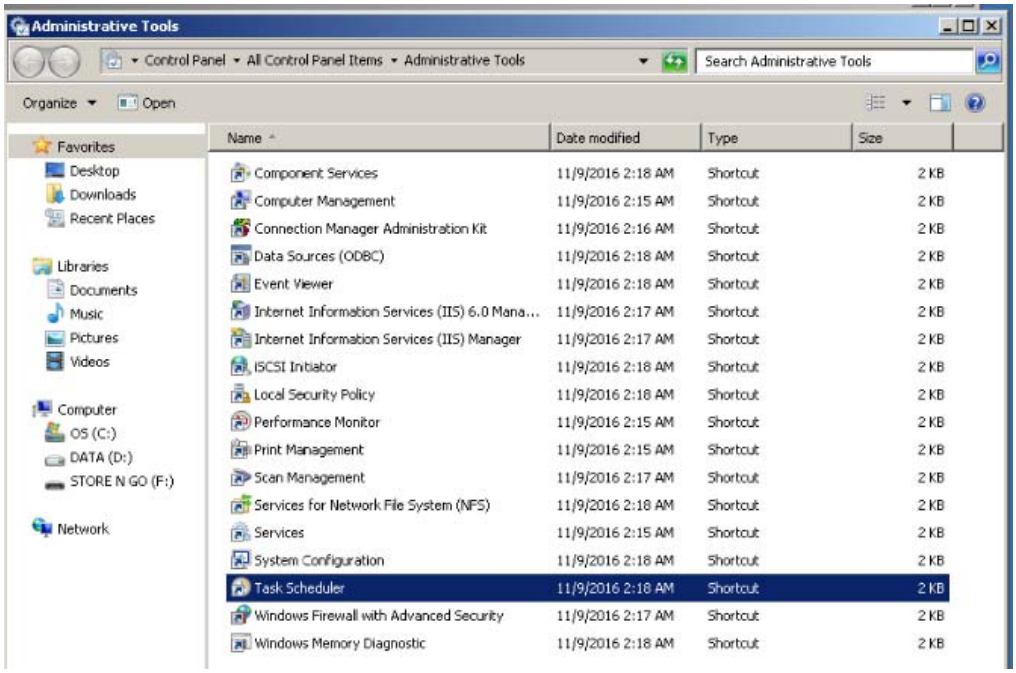
- Check that the System protection is disabled (red icon)



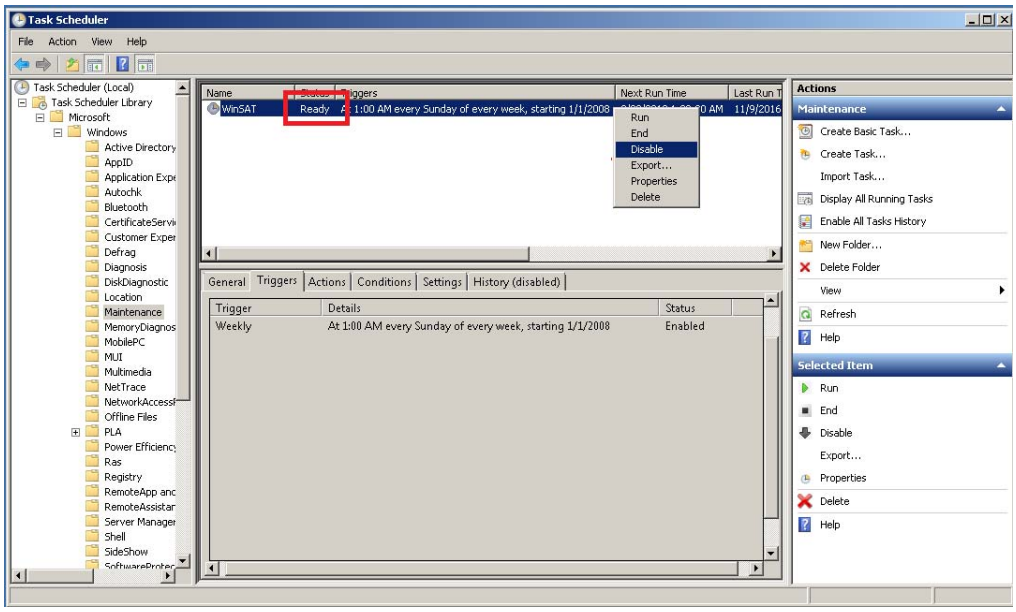
1. Open the "**Administrative Tools**" from the Control Panel:



2. Select the '**Task Scheduler**':



3. Follow the filepath Task Scheduler *(Local)\Task Scheduler Library\Microsoft\Windows\Maintenance* and check WinSAT. If the Status is '**Ready**', then right-click on the WinSAT task and select '**Disable**'.



To make all these settings permanent on the Laser Marker, please follow this procedure:

- System running Windows 7:
  - Close all the open windows
  - Double click on the '`Save-Data.bat`' icon, present in the Desktop

  - Restart Windows.

- System running Windows 10:

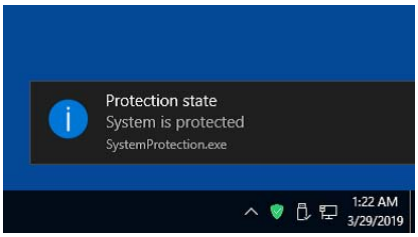
  - Close all the open windows

  - **Enable system protection** (see laser marker User's Manual -> Enable the system protection...)

NOTE **When the System Protection is disabled the system is not protected against disk corruption or malware attacks.**

  - Wait for the operating system to restart

  - Check that the System protection is enabled (green icon):



CONFIGURING THE COMPACTLOGIX™ 5370 CONTROLLER FOR USE OVER ETHERNET/IP

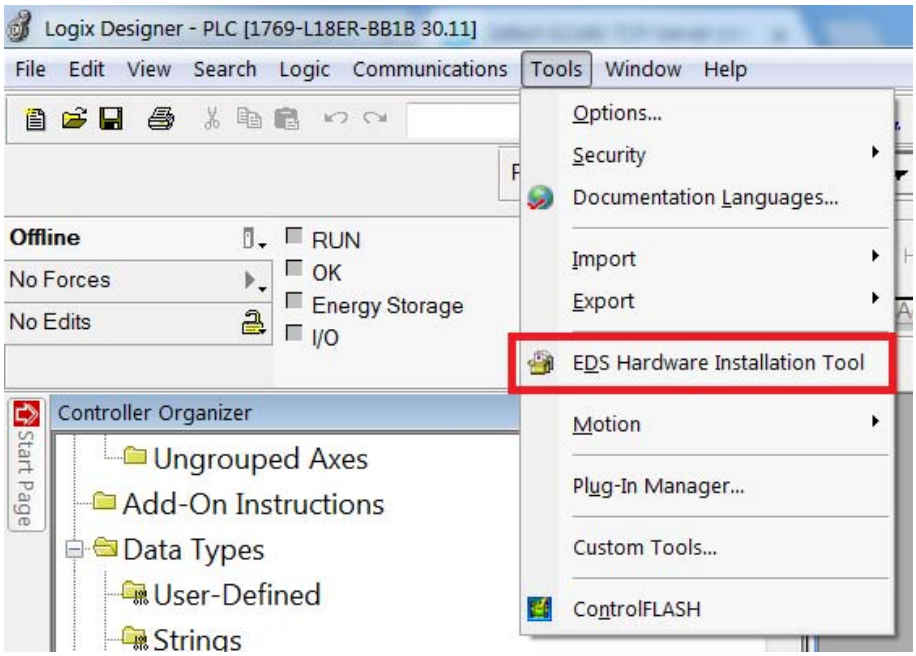
All the CompactLogix™ 5370 PLC configuration described in this manual is made using Studio 5000 Logix Designer® v.30 Standard Edition.

In order to create a Datalogic Laser Marker new module in an already existing project, Studio 5000 allows to import an EDS file or to create one by using the default Generic Ethernet Module.

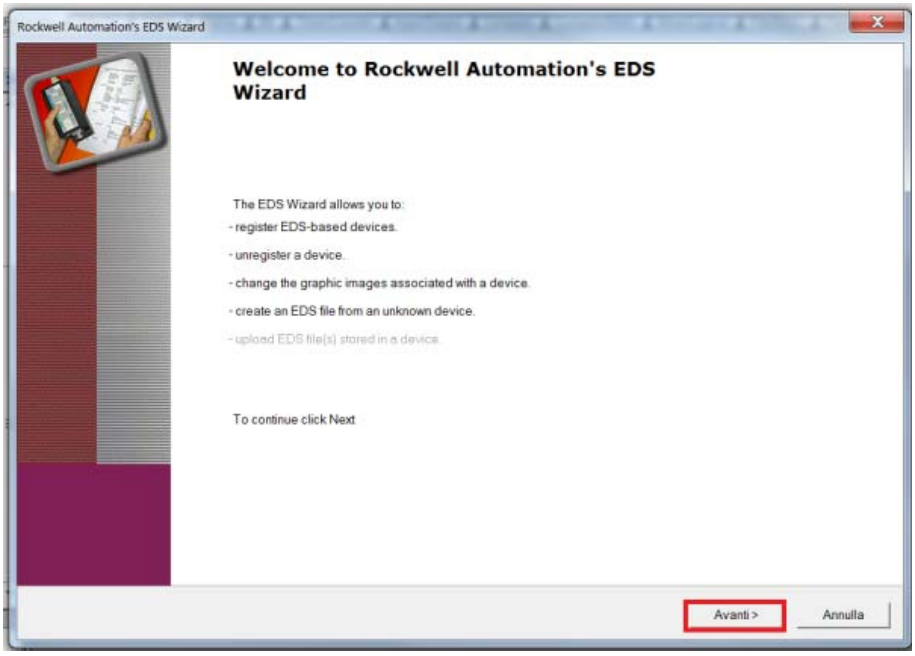
To get the EDS file suitable for Lighter™ Suite, visit www.datalogic.com > Products > Laser Marking Systems, or consult DATALOGIC "Technical Support" on page vi.

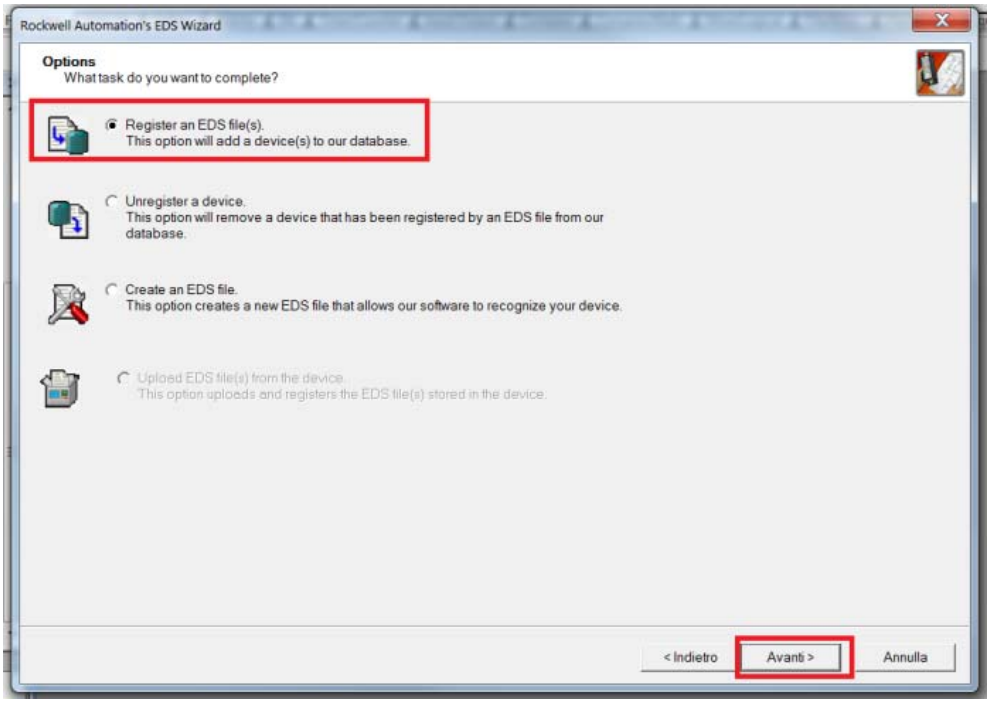
Importing a New Module using the EDS file

1. Select the '**EDS Hardware Installation Tool**' from the Tools Menu.

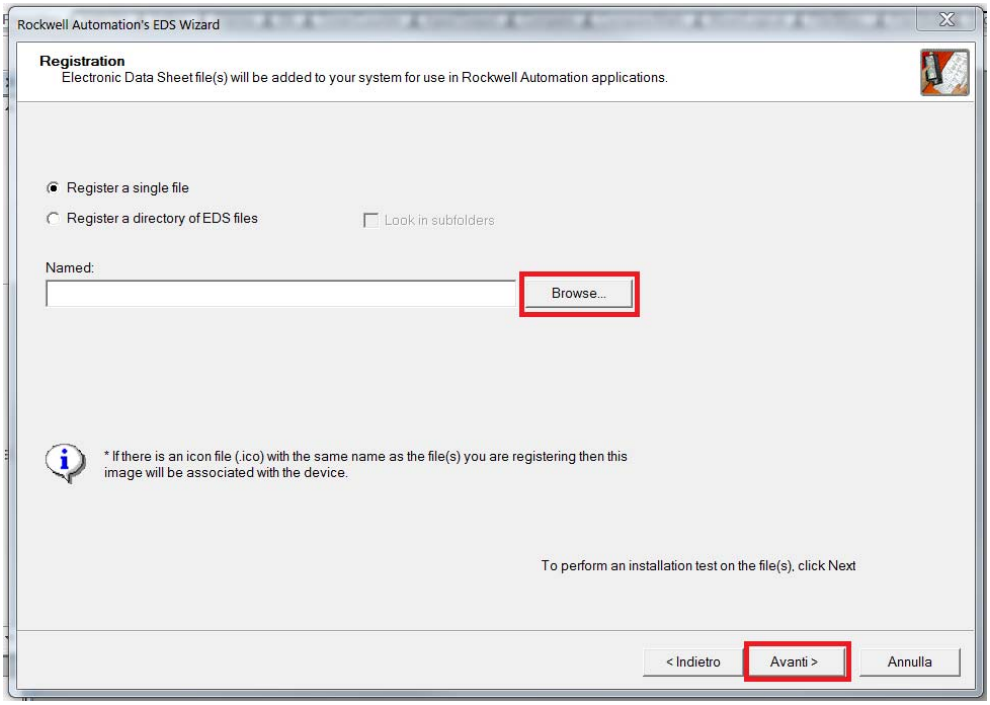


2. Now follow the steps in order to find the EDS file:

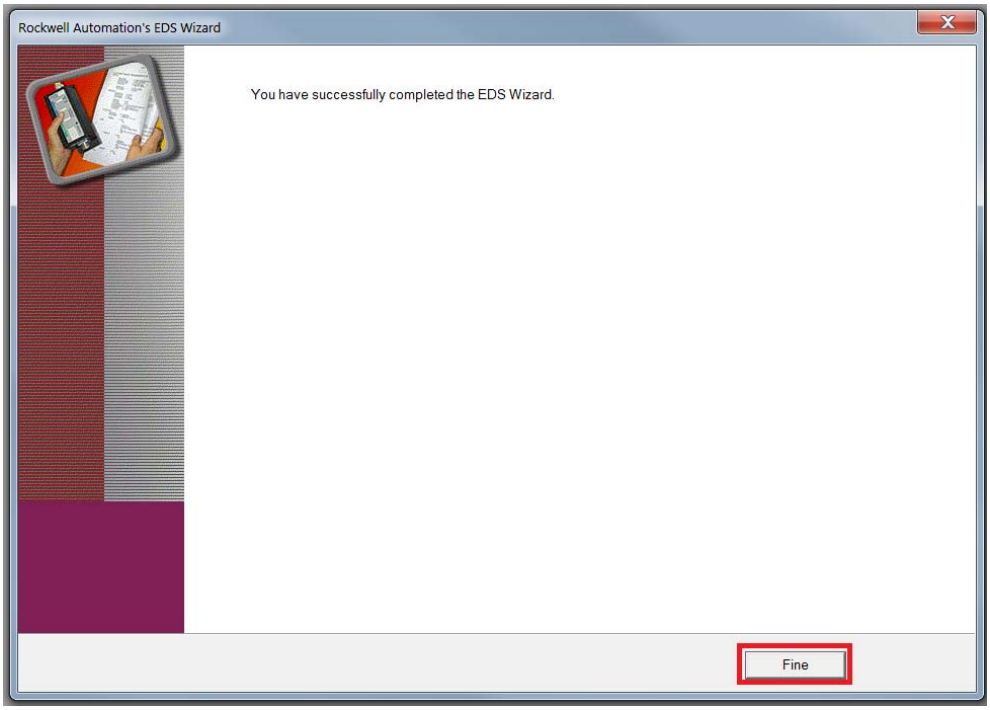




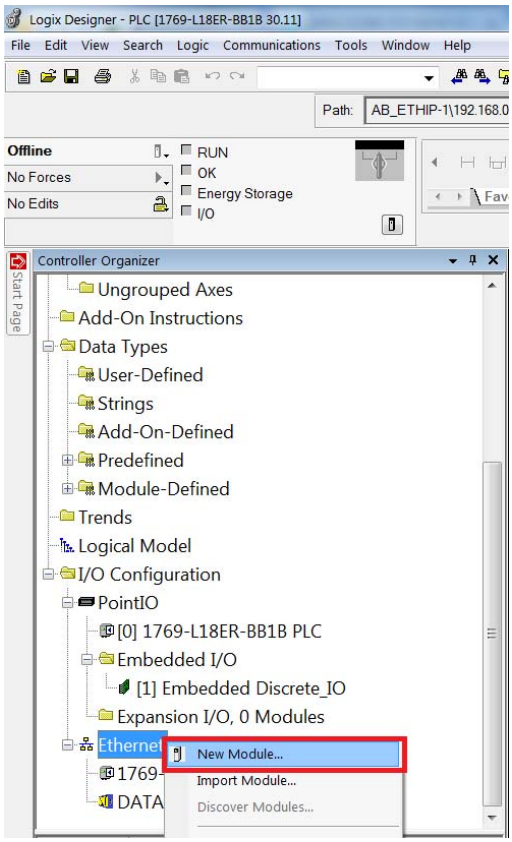
3. Press '**Browse...**' in order to select the Lighter_6.4_EDS_1.3_S5000_v1.eds file, then press 'Forward':



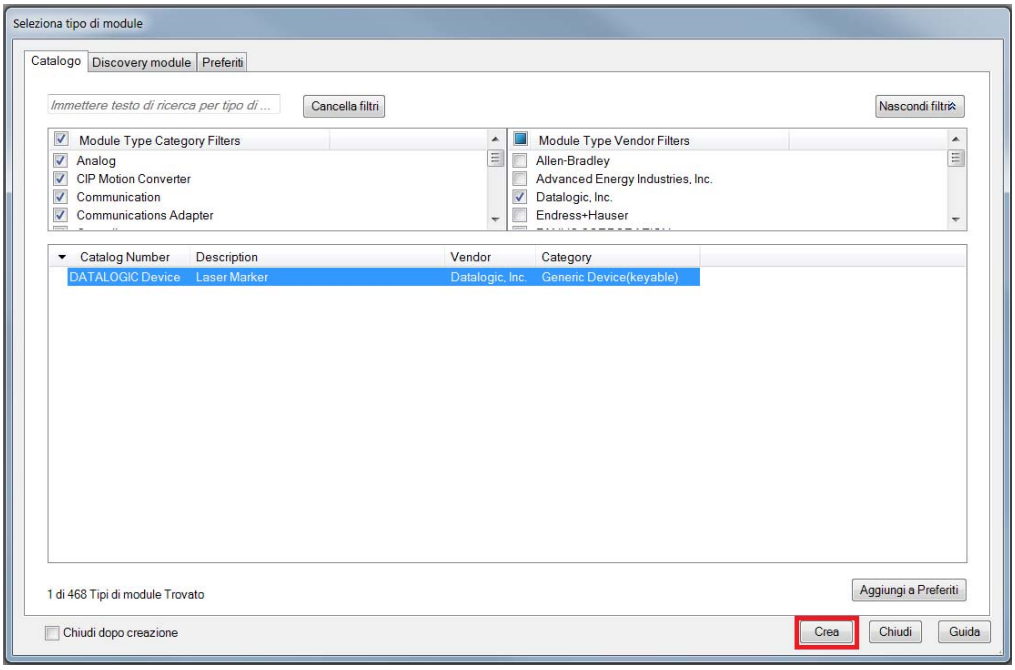
4. Press '**Finish**' to complete the EDS installation:



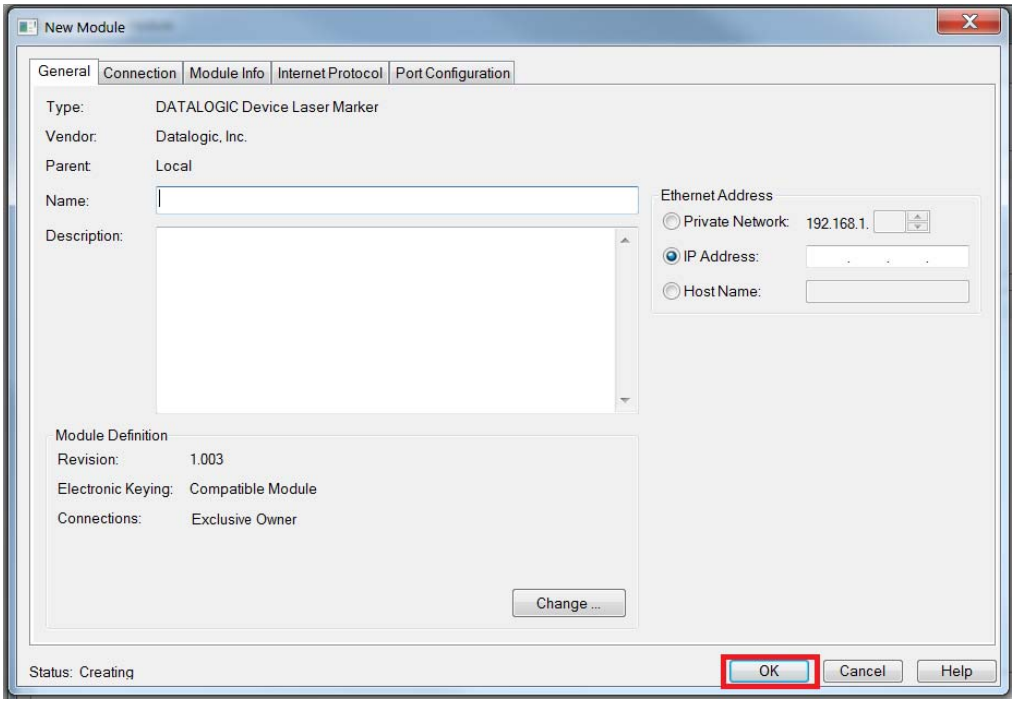
5. Right-click the '**Ethernet**' icon under the 'I/O Configuration' folder, and select '**New Module**':



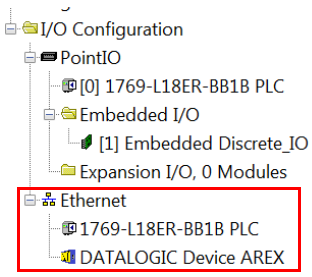
6. Select the **Datalogic Laser Marker**, as shown here:



7. Give the Laser Module a '**Name**' and enter the IP address which has been set on the laser:



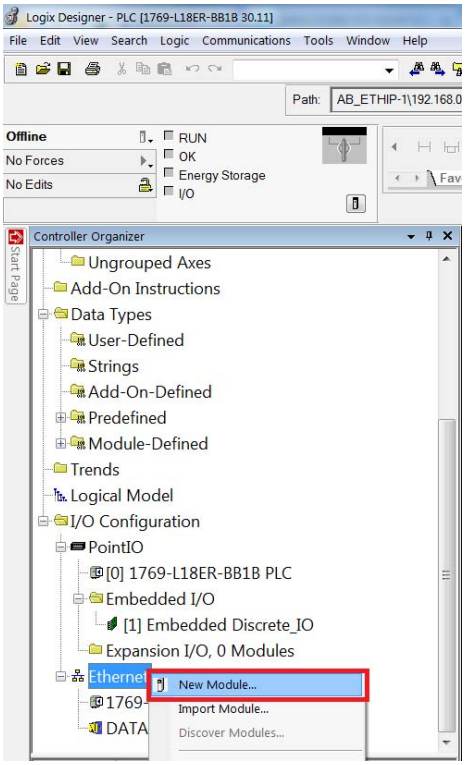
During the rest of this document, references will be made to a module called 'AREX': if the user decides to type 'AREX' inside the Name field and the IP Address entered is correct, this is what will be found as Ethernet connections inside the Studio 5000 project:



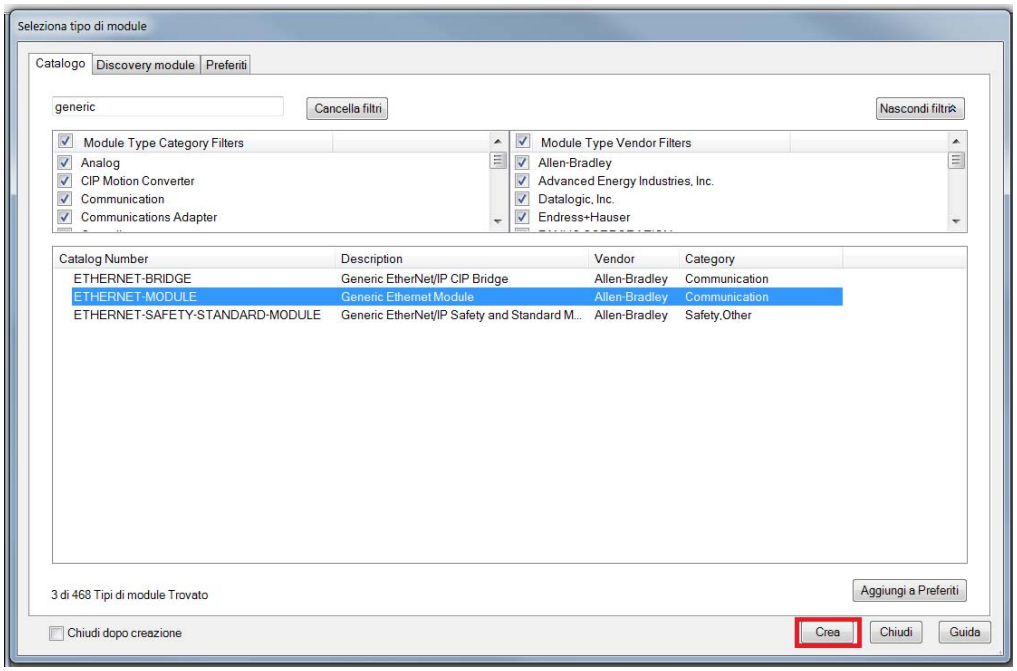
Importing a New Module using the predefined 'Generic Ethernet Module'

Studio 5000 allows the user to interface the PLC also with devices which are not provided with EDS files: in order to do so, the user will have to enter some information which is necessary for the program to interact correctly with the device. In case the user does not have the EDS file on him, it can be useful to know how to import a Generic Ethernet Module which represents the Laser Marker.

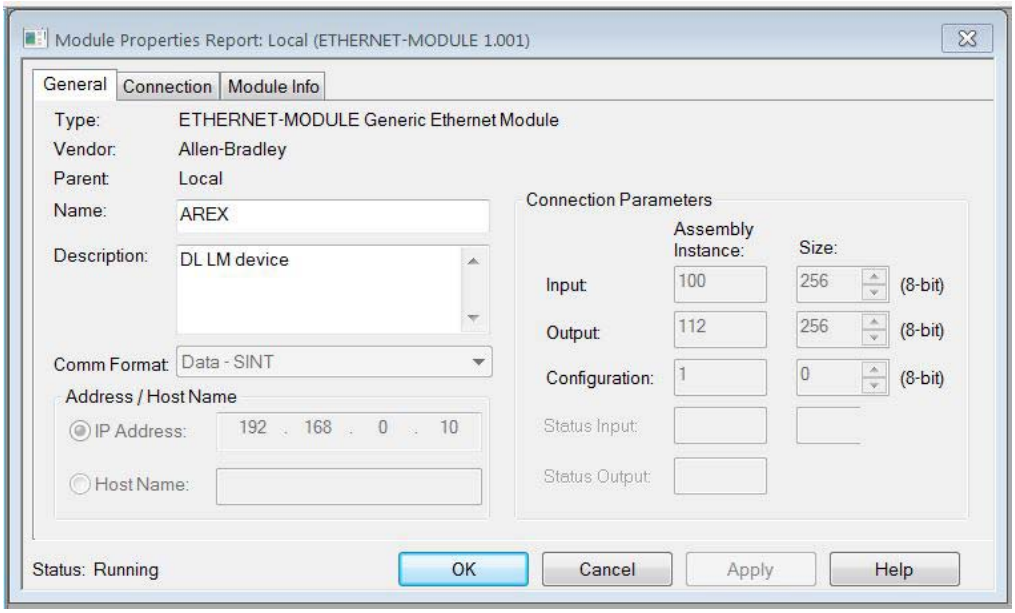
1. Right click on '**Ethernet**' and select '**New Module**':



2. Select the '**Generic Ethernet Module**', as shown here, then press '**Create**':



3. Enter the name of the device (during the rest of the document, references will be made to a module called 'AREX', so please use this Name), as well as the Assembly Instances and the Sizes of each Memory area reserved for the Laser Marker:



CHAPTER 2

CYCLIC COMMUNICATION BETWEEN THE PLC AND THE DATALOGIC LASER MARKER

An EtherNet/IP network allows a PLC to monitor and command each device to which it 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. At each Requested Packet Interval (RPI), whole memory areas are exchanged from the devices in one way (Laser Marker->PLC) and 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 System, 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, regarding the use of different bits, both on the Input and Output Assembly Memory Map:

- **Command Bit**: this bit will be present on the Output Assembly Memory Map and according to its position, it will indicate the action which the PLC wants the Laser System to execute.
- **Mirroring Bit**: this bit will be present on the Input Assembly Memory Map and according to its position, it will indicate when the requested operation has been started (when HIGH) and when it has been terminated (when LOW).

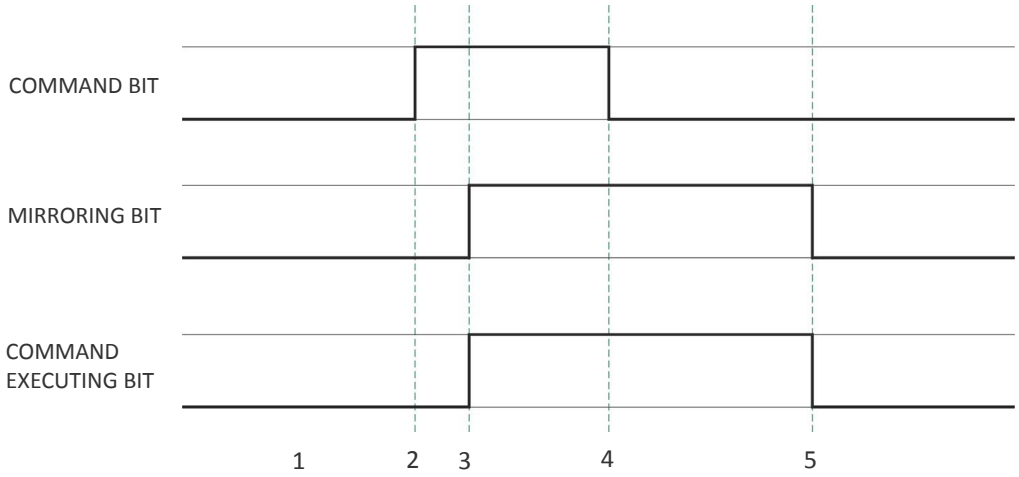
NOTE

Every Command Bit has a matching Mirroring Bit: this means that whatever command the PLC requests the Laser Marker to execute by setting a Command Bit 0->1, there will always be a dedicated Mirroring bit which informs the PLC about the stage of the command execution.

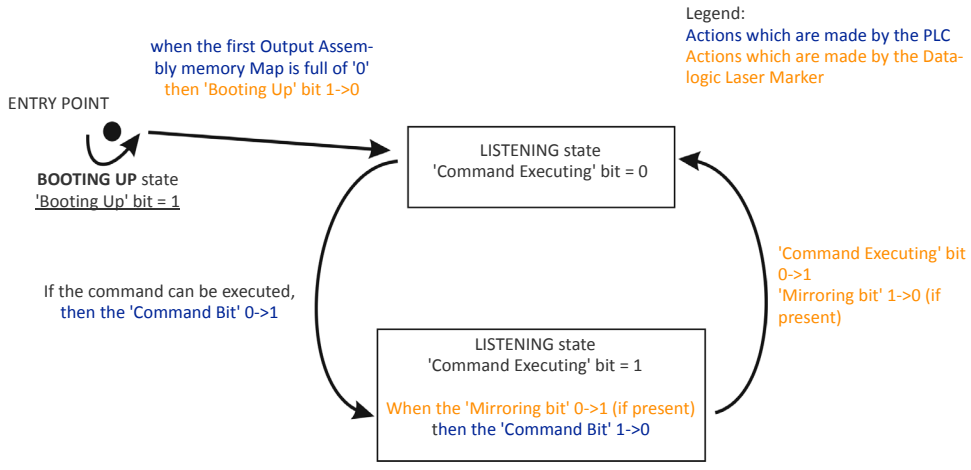
In order to make sure that the command is fully executed by the laser, a simple protocol must be respected by the PLC programmer. Here are the 5 steps:

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 “Possible errors” on page 31.
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 value must now pass 0->1), and if necessary also enter the necessary data in the Request Data field and Request Data size.

3. If the requested command is executable and fulfills the syntax of such command, the Laser starts executing it: when this happens, the Command Executing bit on the Input Memory Map will pass 0->1 - along with the Mirroring Bit, if present for the requested command.
   If the requested command is not executable, then an Error - see “Possible errors” on page 31 for further information - will be reported from the laser towards the PLC. When an error occurs during a command execution, the Command Executing bit has value 0, while the Command Error bit or the Protocol Error bit passes 0->1. Usually point 3 comes just after a single Requested Packet Interval (RPI) has passed since the actions described at point 2.
4. The PLC must reset the Command Bit 1->0 as soon as it detects the Mirroring Bit passing 0->1 (e.g. the Mirroring Bit for the 'Start Marking Command' is at Address 10 Bit 0), if the selected command has a 'Mirroring bit': otherwise, just check that the 'Command Executing' bit passes 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 ask the Laser Marker to execute a command.

The execution of the command is underway when the 'Command Executing' bit passes 0->1; moreover, as soon as the 'Mirroring Bit' of the requested command passes 0->1, the PLC must set 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=1.

If, by any chance, the 'Command Bit' is not pulled down before the 'Mirroring Bit' turns 1->0, then the 'Command Executing' 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.

INPUT ASSEMBLY MEMORY MAP

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

The addresses 34, 36 and 38, relative to the Marvis functionality, are available from Ethernet-IP Protocol Version 1.04.00.

ADDRESS	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
0	Laser Emission		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 to 9	Reserved							
10							Stop System	Start Marking
11							Get Laser Engine Version	Get EIP Protocol 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 17	Reserved							
18			Set Focus Distance Reference	Stop Autofocus	Start Autofocus	Stop Axis	Reset Axis	Move Axis
19	Reserved							
20	R Axis is Home	Z Axis is Home	Y Axis is Home	X Axis is Home	R Axis Enabled	Z Axis Enabled	Y Axis Enabled	X Axis Enabled
21			Focus Distance Sensor is available	Z Axis is on Focus	R Axis Movement	Z Axis Movement	Y Axis Movement	X Axis Movement
22 to 23	Reserved							
24							Reset Output	Set Output
25	Reserved							
26	I/O Port Digital Output Status (0..7)							
27	I/O Port Digital Output Status (8..15)							
28	I/O Port Digital Input Status (0..7)							
29	I/O Port Digital Input Status (8..15)							
30 to 33	Reserved							
34				Get ID Marvis Result	Set ID Marvis Configuration	Get ID Marvis Configuration	Get ID Match Result	
35	Reserved							
36	Symbol Match Result Fail	Symbol Match Result OK	Symbol Grade Result Fail	Symbol Grade Result OK	Symbol Read Fall	Symbol Read OK	Marvis Result Fail	Marvis Result OK
37	Reserved							
38				Marvis Status Error	Marvis Status Warning	Marvis Status Busy	Marvis Status Available	
39 to 53	Reserved							
54	Response Data Size							
55	Reserved							
56 to 255	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 Marker state, along with the state (completed, in execution or not executable) of the requested command.

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES
0	0	Laser Off	(Regarding each bit) 0: Laser Engine is not currently in this state; 1: Laser Engine is currently in this state	Available only for ULYXE. USB connection not established
	1	Laser Warm Up		Laser Engine is in Warm Up State (KEY=1, ENABLE=0)
	2	Laser Wait For Start		Laser Engine is in Wait For Start State (KEY=0, ENABLE=0)
	3	Laser Standby		Available only for EOX. When one of the two Enables has been closed
	4	Laser Standby Shutter Closed		Laser Engine is in Standby Shutter Closed State (KEY=1, ENABLE=0, after the Warm Up stage)
	5	Laser Ready		Laser Engine is in Laser Ready State (KEY=1, ENABLE=1)
	7	Laser Emission		Laser Engine is in Laser Emission State (KEY=1, ENABLE=1 and the Laser has received a Start Marking command)
1	0	Laser Busy Shutter Closed		Laser Engine is in Laser Busy Shutter Closed State (KEY=1, ENABLE=0 and the Laser has received a Start Marking command)
	1	Laser Warning		Laser Engine is in Laser Warning State
	2	Laser Error		Laser Engine is in Laser Error State
2	0	Command Executing	(Regarding each bit) 0: Protocol is not currently in this phase; 1: Protocol is currently in this phase	Lighter™ is executing a command
	1	Command Error		Notifies a Command Error (see “Command Error” on page 31)
	2	Protocol Error		Notifies a Protocol Error (see “Protocol Error” on page 32)
3	7	Protocol Boot Up	0: Protocol is not currently in this phase; 1: Protocol is currently in this phase	Lighter EIP is in booting-up stage: this stage will end as soon as a completely empty memory map is sent to the Laser
4	0 to 7	Command Error Code	The value of this byte represents the code of the Command Error	Gives information about the Command error which has been notified (see “Command Error” on page 31)
5	0 to 7	Protocol Error Code	The value of this byte represents the code of the Protocol Error	Gives information about the Protocol error which has been notified (see “Protocol Error” on page 32)
6 to 9	Reserved			
10	0	Start Marking	(Regarding each bit) 0 -> 1: Laser is executing the command; 1 -> 0 Laser has executed the command	Informs about the execution of the Start Marking command
	1	Stop System		Informs about the execution of the Stop System command
11	0	Get EIP Protocol Version		Informs about the execution of the Get EIP Protocol Version command. When the command is completed, the requested data is available in the Response Data Field. Response Data Field: <EIPProtocolVersion>
	1	Get Laser Engine Version		Informs about the execution of the Get Laser Engine Version command. When the command is completed, the requested data is available in the Response Data Field. Response Data Field: <LaserEngineVersion>
12	0	Open Document From Device		Informs about the execution of the Open Document From Device command
	1	Save Document		Informs about the execution of the Save Document command
	2	Get Data Field Value		Informs about the execution of the Get Data Field Value command. When the command is completed, the requested data is available in the Response Data Field. Response Data Field: <objectValue>
	3	Set Data Field Value		Informs about the execution of the Set Data Field Value command
	4	Get Global Counter Value		Informs about the execution of the Get Global Counter Value command. When the command is completed, the requested data is available in the Response Data Field. Response Data Field: <GlobalCounterValue>
	5	Set Global Counter Value		Informs about the execution of the Set Global Counter Value command
	6	Get Global String Value		Informs about the execution of the Get Global String Value command. When the command is completed, the requested data is available in the Response Data Field. Response Data Field: <GlobalStringValue>
	7	Set Global String Value		Informs about the execution of the Set Global String Value command
13	0	Enable Data Field		Informs about the execution of the Enable Data Field command
	1	Disable Data Field		Informs about the execution of the Disable Data Field command
14	0	Move and rotate document		Informs about the execution of the Move and Rotate Document command
	1	Move Data Field		Informs about the execution of the Move Data Field command
15 to 17	Reserved			
18	0	Move Axis	(Regarding each bit) 0 -> 1: Laser is executing the command; 1 -> 0 Laser has executed the command	Informs about the execution of the Move Axis command, along with the bit of the Axis Movement at address 21
	1	Reset Axis		Informs about the execution of the Reset Axis command, along with the bit of the Axis Home at address 20
	2	Stop Axis		Informs about the execution of the Stop Axis command
	3	Start Autofocus		Available only for Arex™400. Informs about the Start Autofocus Command
	4	Stop Autofocus		Available only for Arex™400. Informs about the Stop Autofocus Command
	5	Set Focus Distance Reference		Available only for Arex™400. Setting the current distance as Reference for the next Start Autofocus executions

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES
19	Reserved			
20	0	X Axis Enabled	0: Axis not enabled; 1: Axis enabled	Notifies if the X Axis is enabled or not
	1	Y Axis Enabled		Notifies if the Y Axis is enabled or not
	2	Z Axis Enabled		Notifies if the Z Axis is enabled or not
	3	R Axis Enabled		Notifies if the R Axis is enabled or not
	4	X Axis Home	0: Axis not in Home position; 1: Axis in Home position	Notifies if the X Axis is in its Home position or not
	5	Y Axis Home		Notifies if the Y Axis is in its Home position or not
	6	Z Axis Home		Notifies if the Z Axis is in its Home position or not
	7	R Axis Home		Notifies if the R Axis is in its Home position or not
21	0	X Axis Movement	0: Axis not moving; 1: Axis moving	Notifies if the X Axis is moving or not
	1	Y Axis Movement		Notifies if the Y Axis is moving or not
	2	Z Axis Movement		Notifies if the Z Axis is moving or not
	3	R Axis Movement		Notifies if the R Axis is moving or not
	4	Z Axis is on Focus	0: Z Axis is not on Focus; 1: Z Axis is on Focus	Available only for Arex™ 400. Notifies if the Z Axis is on Focus or not (available only if the Focus Distance Sensor is enabled)
	5	Focus Distance Sensor is available	0: Focus Distance Sensor is not available; 1: Focus Distance Sensor is available	Available only for Arex™ 400. Notifies if the Focus Distance Sensor is available or not
22 to 23	Reserved			
24	0	Set Output	(Regarding each bit) 0 -> 1: Laser is executing the command; 1 -> 0 Laser has executed the command	Setting the status of the Digital Output signal of the DB25 Axis Connector indicated at Address 24 and 25 of Output Memory Map
	1	Reset Output		Resetting the status of the Digital Output signal of the DB25 Axis Connector indicated at Address 24 and 25 of Output Memory Map
25	Reserved			
26	0 to 7	I/O port Laser Output Status (0..7)	(Regarding each bit) 0: the matching Output is not being pulled up; 1: the matching Output is being pulled up	Pulling up Output N where N is the position of the HIGH bit inside these addresses (example: if address 26 has value 4 (equal to 00000100 in binary format), it means output2 is HIGH, while if address 27 has value 4, it means output10 is HIGH)
27	0 to 7	I/O port Laser Output Status (8..15)		
28	0 to 7	I/O port Laser Input Status (0..7)	(Regarding each bit) 0: the matching Input is not being pulled up; 1: the matching Input is being pulled up	Pulling up Input N where N is the position of the HIGH bit inside these addresses
29	0 to 7	I/O port Laser Input Status (8..15)		
30 to 33	Reserved			
34	1	Get ID Match Result	(Regarding each bit) 0 -> 1: Laser is executing the command; 1 -> 0 Laser has executed the command	For the object specified in the Request Data Field, it returns the Symbol Read and Code Match results, along with the Received and Configured Text. Response Data Field: <SymbolReadPassFail><CodeMatchPassFail><LF><ReceivedText><LF><ConfiguredText>
	2	Get ID Marvis Configuration		For the object specified in the Request Data Field, it returns the Verification flag, its Overall Grade and the value of each metric. Response Data Field: <Verification><Overall><CellContrast><CellModulation><AxialNonUniformity><UnusedErrorCorrection><PrintGrowth><MinimumReflectance><FixedPatternDamage><GridNonUniformity>
	3	Set ID Marvis Configuration		Notifies if the command has been completed or not.
	4	Get ID Marvis Result		For the object specified in the Request Data Field, it returns all the detailed information about the configured vs. received metrics, and the Received vs. Configured Text. Response Data Field: <SymbolReadPassFail><CodeMatchPassFail><GradePassFail><RecOverall><ConfigOverall><RecMetrics><ConfigMetrics><MetricsPassFail><LF><ReceivedText><LF><ConfiguredCode><LF>
35	Reserved			
36	0	Marvis Result OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Result; 1 -> 0: when a new 'Start Marking' command is executed	Notifies if the last MARVIS™ verification has been OK or not: it will only be OK if Symbol Read, Symbol Grade Result and the Symbol Match Result are OK
	1	Marvis Result Fail		
	2	Symbols Read OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Symbol Read; 1 -> 0: when a new 'Start Marking' command is executed	Notifies if the last MARVIS™ verification has produced a Symbol Read or not of all the objects marked with Verification enabled. After marking a document which contains a Datamatrix with enabled MARVIS™ Verification, the Symbol Read will be OK if during the verification a general Datamatrix is found
	3	Symbols Read Fail		
	4	Symbol Grade Result OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Symbol Grade Result; 1 -> 0: when a new 'Start Marking' command is executed	Notifies if the last MARVIS™ verification of all the objects marked with Verification enabled have passed the Grade threshold or not
	5	Symbol Grade Result Fail		
	6	Symbol Match Result OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Symbol Match Result; 1 -> 0: when a new 'Start Marking' command is executed	Notifies if in the last MARVIS™ verification the content of all the objects marked with Verification enabled match the content of the objects found by MARVIS™
	7	Symbol Match Result Fail		
37	Reserved			

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES
38	1	Reader Status Available	(Regarding each bit) 0: MARVIS is not currently in this state; 1: MARVIS is currently in this state	Laser Engine is not connected to the Reader, as connection happens after every marking session of an XLP which has to undergo a MARVIS™ verification
	2	Reader Status Busy		Laser Engine is connected to the Reader and the MARVIS™ verification is undergoing
	3	Reader Status Warning		Reader has returned 1 MARVIS™ Result Fail (it will stay in this state until Laser Engine will reconnect to the Reader)
	4	Reader Status Error		Reader is in Error State
39 to 53	Reserved			
54	0 to 7	Response Data Size	"Response Data" field usable length	Notifies about how many usable bytes starting from Address 56 are available for the PLC to read.
55	Reserved			
56 to 255	0 to 7 (for each address Byte)	Response Data Field	Each byte represents an ASCII character that the laser is reporting towards the PLC	Starting from Address 56, the PLC will find here the Response to the command he has requested (if the executed command returns such data). The number of bytes which the PLC will need to read is specified at Address 54

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 Laser Marker. The PLC will need to set a single bit or multiple bytes in the following memory map.

The address 32 relative to the Marvis functionality is available from EtherNet/IP Protocol Version 1.04.00.

ADDRESS	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
0							Stop system	Start Marking
1	Protocol Error Clear						Get Laser Engine Version	Get EIP Protocol 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 Filed	Enable Data Field
4							Move Data Field	Move and Rotate Document
5 to 7	Reserved							
8			Set Focus Distance Sensor Reference	Stop Autofocus	Start Autofocus	Stop Axis	Reset Axis	Move Axis
9	Reserved							
10					R Axis	Z Axis	Y Axis	X Axis
11 to 21	Reserved							
22							Reset Output	Set Output
23	Reserved							
24	I/O Port Digital Output (0..7)							
25	I/O Port Digital Output (8..15)							
26 to 31	Reserved							
32				Get ID Marvis Result	Set ID Marvis Configuration	Get ID Marvis configuration	Get ID Match Result	
33 to 53	Reserved							
54	Request Data Size							
55	Reserved							
56 to 255	Request Data							

Description of the Output Assembly Memory Map

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND 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 System	0 -> 1 Stops the System; 1 -> 0 as soon as the mirroring bit is HIGH	This action stops the Marking and/or the axis movement process in course
1	0	Get EIP Protocol Version	0 -> 1 Requesting the Ethernet/IP Protocol version; 1 -> 0 as soon as the mirroring bit is HIGH	Gets the Ethernet protocol version currently running inside the Laser Engine
	1	Get Laser Engine Version	0 -> 1 Requesting 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 the Laser Engine back into 'Listening' state after a 'Protocol Error' ; 1 -> 0 after a minimum of 1 RTI since 0->1 of this same bit	Sets the Laser Marker back to 'Listening' state after that a Protocol Error is notified to the PLC
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*) Request Data Field: <DocumentName>
	1	Save Document	0 -> 1 Save current document; 1 -> 0 as soon as the mirroring bit is HIGH	Overwrites the currently loaded document
	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 ID is specified in the Request Data Field. Request Data Field: <objectID>
	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 the content of the object which ID is specified in the Request Data Field. Request Data Field: <objectID><LF><NewValue>
	4	Get Global Counter Value	0 -> 1 Asking to return the value of the Global Counter specified in the Request Data Field ; 1 -> 0 as soon as the mirroring bit is HIGH	Requests the value of the Global Counter specified in the Request Data Field. 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 value of the Global Counter specified in the Request Data Field. Request Data Field: <globalCounterName><LF><newGlobalCounterValue>
	6	Get Global String Value	0 -> 1 Asking to return the value of the Global String specified in the Request Data Field ; 1 -> 0 as soon as the mirroring bit is HIGH	Requests the value of the Global String specified in the Request Data Field. 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 Global String specified in the Request Data Field. Request Data Field: <globalStringName><LF><newGlobalStringValue>
3	0	Enable Data Field	0 -> 1 Enables an object inside the loaded layout; 1 -> 0 as soon as the mirroring bit is HIGH	Enables the object which ID is specified in the Request Data Field. Request Data Field: <objectID>
	1	Disable Data Field	0 -> 1 Disables an object inside the loaded layout; 1 -> 0 as soon as the mirroring bit is HIGH	Disables the object which ID is specified in the Request Data Field. Request Data Field: <objectID>
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 its content of the given offsets and then rotates it of the given angle. The rotation is done considering the new origin of the document. Request Data Field: <X>,<Y>,<Angle>
	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 object which ID is specified in the Request Data to the given position. The X,Y coordinates refer to the center of the marking area. The object's positioning is done considering the object's origin. Request Data Field: <FieldID><LF><NewXPos>,<NewYPos>
5 to 7	Reserved			
8	0	Move Axis	0 -> 1 Moves the Axis specified in address 10 to the position reported in Request Data Field; 1 -> 0 as soon as the mirroring bit is HIGH	Moves the axis reported at address 10 into the position specified inside the Requested Data field. Request Data Field: <NewAxisPosition>
	1	Reset Axis	0 -> 1 Moves the Axis specified at address 10 in Home position; 1 -> 0 as soon as the mirroring bit is HIGH	Moves the axis reported at address 10 into Home Position
	2	Stop Axis	0 -> 1 Stops the movement of the Axis specified at address 10; 1 -> 0 as soon as the mirroring bit is HIGH	Stops the movement of the axis specified at address 10 Note: It is recomended to perform a "Reset Axis" command after the "Stop Axis" command.
	3	Start Autofocus	0 -> 1 Starts the Autofocus; 0 -> 1 when the Mirroring bit is HIGH	Available only for Arex™ 400. Starts the Autofocus process: the Autofocus functionality is available only on the Z axis
	4	Stop Autofocus	0 -> 1 Stops the Autofocus; 1 -> 0 when the Mirroring bit is HIGH	Available only for Arex™ 400. Stops the Autofocus process
	5	Set Focus Distance Sensor Reference	0 -> 1 Sets the current position as a reference for the following Autofocus commands; 1 -> 0 when the Mirroring bit is HIGH	Available only for Arex™ 400. Sets the axis current position as distance reference value for all the following Autofocus executions
9	Reserved			

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES
10	0	X Axis	0 -> 1 indicates that the operation requested at address 8 must be made on the selected Axis; 1 -> 0 as soon as the selected Axis Movement bit is HIGH	Indicated the axis on which the command requested at address 8 must be executed
	1	Y Axis		
	2	Z Axis		
	3	R Axis		
11 to 21	Reserved			
22	0	Set Output	0 -> 1 Sets the Outputs selected by the mask at the address 24 and 25; 1 -> 0 as soon as the 'I/O port Laser Output Status' mask turns to the desired mask	Requesting the set the digital outputs indicated at address 24 and 25
	1	Reset Output	0 -> 1 Resets the Outputs selected by the mask at the address 24 and 25; 1 -> 0 as soon as the 'I/O port Laser Output Status' mask turns to the desired mask	Requesting to reset the digital outputs indicated at address 24 and 25
23	Reserved			
24	0 to 7	I/O port Laser Output (0..7)	(Regarding each bit) 0 -> 1: asking for the matching I/O to be set or reset, depending on the command bit selected on address 22; 1 -> 0: as soon as the mirroring of the command bit selected at address 22 is HIGH	Indicating a single or a multiple I/O in relation to the command reported at address 22
25	0 to 7	I/O port Laser Output (8..15)		
26 to 31	Reserved			
32	1	Get ID Match Result	0 -> 1 Requests the Match Result and content of the latest MARVIS verification; 1 -> 0 as soon as the mirroring bit turns to 1	Gets the last Match result and the content for the object, which ID is specified in the Request Data Field. Request Data Field: <objectID>
	2	Get ID Marvis configuration	0 -> 1 Requests the MARVIS Configuration of an object; 1-> 0 as soon as the mirroring bit turns to 1	Requests the configuration of the specified object. Returns the MARVIS verification status, the Overall Grade threshold value and, if the code object is a DPM code with Overall Grade='Custom', also the thresholds for each metric. Request Data Field: <objectID>
	3	Set ID Marvis Configuration	0 -> 1 Requests to set the MARVIS Configuration of an object; 1 -> 0 as soon as the mirroring bit turns to 1	Requests to set the MARVIS configuration of the specified object. Sets the following MARVIS parameters for the specified object: • <Verification> MARVIS verification on the specified object (0: Verification disabled, 1: Verification enabled) • <Overall> grade threshold value can be used only if the object is a DPM code (0=Grade A, 1=Grade B, 2=Grade C, 3=Grade D, 4=Grade F, 5=Grade Custom) • <Metrics> to be set only if <Overall>=5, it describes the threshold value for each metric (0=Grade A, 1=Grade B, 2=Grade C, 3=Grade D, 4=Grade F) Request Data Field (if non DPM code): <objectID><LF><Verification> Request Data Field (if DPM code with <Overall>!=Custom): <objectID><LF><Verification><Overall> Request Data Field (if DPM code with <Overall>=Custom): <objectID><LF><Verification><Overall><CellContrast><CellModulation><AxialNonUniformity><UnusedErrorCorrection><PrintGrowth><MinimumReflectance><FixedPatternDamage><GridNonUniformity>
	4	Get ID Marvis Result	0 -> 1 Requests the latest MARVIS results of the specified object; 1 -> 0 as soon as the mirroring bit turns to 1	Requests the Grade, Symbol result, Match result and the Value of the last MARVIS acquisition for the specified object. Request Data Field: <objectID>
33 to 53	Reserved			
54	0 to 7	Request Data Size	'Request Data Field' usable length	Matches the length of the usable data entered in the Request Data Field. When the Laser Marker is requested to execute a command which needs additional information to the Command Bit , the PLC must: • Enter the Information inside the Request Data Field • Enter the number of bytes of such information in the Request Data Size E.g.: Request Data Size=12 in DEC format (in BIN format, from bit 7 to bit 0 the address 54 value is '0001100') means that the command requests to take into account only the first 12 bytes starting from address 56 onwards
55	Reserved			
56 to 255	0 to 7 (for each address Byte)	Request Data Field	Each byte represents an ASCII character that the PLC is reporting towards the Laser Marker	According to the command which has been requested to execute, the PLC must place from Address 56 onwards the additional data (if requested) following the syntax which can be found in the description of the command

POSSIBLE ERRORS

There are 2 kinds of error which can turn up during the normal use of a Datalogic Laser Marker via EtherNet/IP:

- “Command Error” on page 31
- “Protocol Error” on page 32

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').

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 the address 4 byte can have when a Command Error is notified, are summed up in the following table

.

VALUE	DESCRIPTION
0001	Command not recognized
0002	Invalid date value
0003	File does not exist
0004	File opening error
0005	Invalid I/O port
0006	Global variable does not exist
0007	Global variable is not a counter
0008	Global variable is not a string
0009	Bad command
0010	Invalid field
0011	No document loaded
0012	No document saved
0013	Laser already stopped
0014	Command not allowed by device status
0015	Invalid Field Symbol Object ID
0016	Invalid reader result
0017	Result not found
0018	Symbol not found
0019	Bad Grade required validation
0020	MARVIS™ is not enabled
0021	MARVIS™ License is not enabled
0022	Focal Distance Sensor Unavailable
0024	Focal Distance Sensor Focus Error
0025	Focal Distance Sensor Reference Invalid
0026	Focal Distance Sensor Out Of Range
0027	Focal Distance Sensor Connection Error
0028	Focal Distance Sensor Communication Error
0029	Focal Distance Sensor Invalid Focus Search
0030	Command exceeds memory area

Protocol Error

A Protocol Error is notified to the PLC when the Laser Marker 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
0001	Command conflict: more than 1 command bit is set to 1
0002	Unknown command: bit(s) in a reserved area is/are set to 1
0003	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 'Command Error Clear' bit (Address 1 bit 7), which sets the Protocol back into Listening state. This operation will not work if the reason of the Protocol Error is represented by value "255": in this case, the Ethernet/IP connection must be closed and then re-established between the Laser System and the PLC.

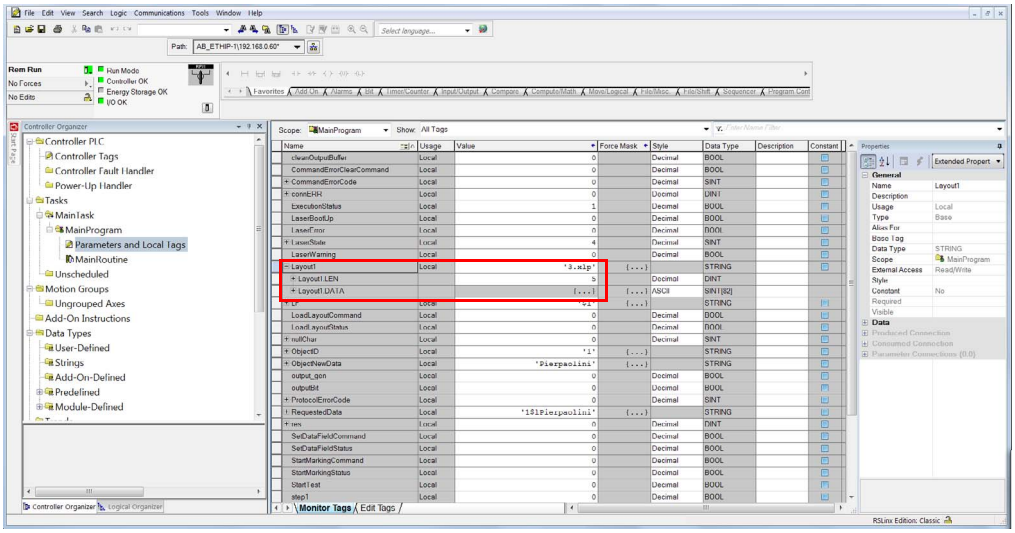
CHAPTER 3
STUDIO 5000 PROGRAM EXAMPLE

After describing the protocol that allows to interface a Datalogic Laser Marker to a PLC, the user can find in this chapter an example of a Diagram Program, developed on Studio 5000 v. 30.0.0 Standard Edition by *© 2016 Rockwell Automation Technologies, Inc. All Rights Reserved*.

EXAMPLE OF 'LOAD LAYOUT' COMMAND

This command makes the Laser Marker load a layout which must be present inside the Laser Marker in the default Laser Engine filepath (*D:\Data\Docs\Layouts*).

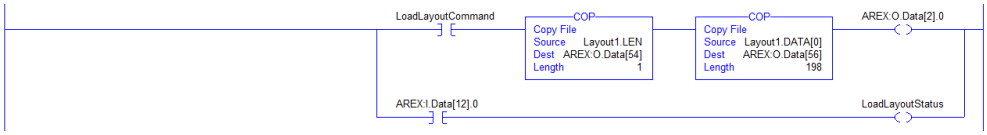
In order to place the string containing the name of the `XLP` file which needs to be loaded, let's define a string (in the example here called 'Layout1').



This local variable properties are here shown:

Name	Usage	Value	Force Mask	Style	Data Type	Description	Constant
Layout1	Local	'3.xlp'	{...}		STRING		
Layout1.LEN		5		Decimal	DINT		
Layout1.DATA		{...}	{...}	ASCII	SINT[82]		
Layout1.DATA[0]		'3'		ASCII	SINT		
Layout1.DATA[1]		'.'		ASCII	SINT		
Layout1.DATA[2]		'x'		ASCII	SINT		
Layout1.DATA[3]		'l'		ASCII	SINT		
Layout1.DATA[4]		'p'		ASCII	SINT		
Layout1.DATA[5]		'$00'		ASCII	SINT		
Layout1.DATA[6]		'$00'		ASCII	SINT		
Layout1.DATA[7]		'$00'		ASCII	SINT		
Layout1.DATA[8]		'$00'		ASCII	SINT		
Layout1.DATA[9]		'$00'		ASCII	SINT		
Layout1.DATA[10]		'$00'		ASCII	SINT		
Layout1.DATA[11]		'$00'		ASCII	SINT		
Layout1.DATA[12]		'$00'		ASCII	SINT		
Layout1.DATA[13]		'$00'		ASCII	SINT		

The variable is 198 bytes long, but the '.LEN' string property allows to count only the characters which are different from '$00', in this case 5; and it contains the string '3.xlp', which is the name of the layout we want to load.



As soon as the 'LoadLayoutCommand' local variable is set to 1, this ladder rung sets the following data inside the Output Assembly memory map:

- Address 54: copies here the length of the Layout1 variable.
- Address 56 onwards: copies byte-per-byte each character of the Layout 1 variable.
- Address 2 bit 0: Sets the 'Command Bit' to 1, and in this case of a 'Load Layout' command, the Command Bit is bit 0 at address 2.

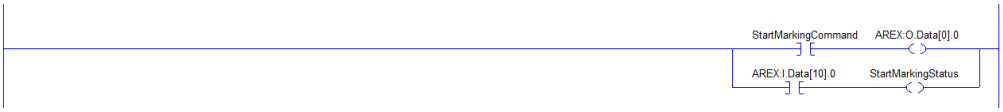
Moreover, in parallel to these instructions but still on the same Rung, we suggest to code the status of the 'Mirroring Bit': the Mirroring Bit in case of a 'Load Layout' command is bit 0 at Address 12 of the Input Assembly Memory Map. By doing so, the status of the interested mirroring bit will always be available inside the program as a local variable, called 'LoadLayoutStatus'.

The automation will have to reset 0->1 the 'LoadLayoutCommand' as soon as the 'LoadLayoutStatus' variable passes 1->0. A new command can be given to the Laser Marker as soon as the 'Command Executing' bit passes 1->0.

EXAMPLE OF 'START MARKING' COMMAND

In order to have Laser Emission from the Laser Marker, before sending a 'Start Marking' command it is necessary that the Laser Engine state is Laser Ready: this means that bit 5 at Address 0 on the Input Assembly Memory map must be HIGH before sending this command.

As for the first example, we suggest to handle the Start Marking 'Command Bit', which is bit 0 address 0, by using a Local Variable (in this case 'StartMarkingCommand'). Moreover, the 'Mirroring Bit', bit 0 address 10 of the Output Assembly Memory map, state should also be reflected into a Local Variable (in this case 'StartMarkingStatus').



By doing so, inside the program it is possible to set the 'StartMarkingCommand' variable in order to start Laser Emission. As soon as this operation starts, the Laser Engine Status will pass from Laser Ready to Laser Emission ; if the Start Marking is executed while the Laser Engine status is Laser Standby Shutter Closed, the process will take the exact time, but Laser Engine will go in Laser Busy Shutter Closed.

The automation will have to reset 0->1 the 'StartMarkingCommand' as soon as the 'StartMarkingStatus' variable passes 1->0. A new command can be given to the Laser Marker as soon as the 'Command Executing' Bit passes 1->0.

CHAPTER 4
MARVIS™ COMMANDS APPENDIX

ADDRESS IMM	INFO	DESCRIPTION	FIELD LENGTH
56	Symbol Read/ No Read	Positive = 31 Hex, Negative=30 Hex	1 byte
57	Code Match/No Match	Positive = 31 Hex, Negative=30 Hex	1 byte
58	<LF>		1 byte
59	Received Text		N bytes
59+N	<LF>		1 byte
59+N+1	Configured Text		M bytes
59+N+M+1	<LF>		1 byte
...			
255			

Table 1: Get ID Match Result Response

ADDRESS IMM	INFO	DESCRIPTION	FIELD LENGTH
56	ID Verification	Positive = 31 Hex, Negative=30 Hex	1 byte
57	Overall Grade	A=30,..,F=34,CUSTOM=35 Hex Only if it is a DPM code	1 byte
58	Cell Contrast	Metrics Threshold A=30,..,F=34 Only if is a DPM code	8 bytes
59	Cell Modulation		
60	Axial NON-Uniformity		
61	Unused Error Correction		
62	Print Growth		
63	Minimum Reflectance		
64	Fixed Pattern Damage		
65	Grid Nonuniformity		
66			
...			
255			

Table 2: Get ID Marvis Configuration Response

ADDRESS IMM	INFO	DESCRIPTION	FIELD LENGTH
56	Symbol Read/ No Read	Positive = 31 Hex, Negative=30 Hex	1 byte
57	Code Match/No Match	Positive = 31 Hex, Negative=30 Hex	1 byte
58	Grade Threshold Pass/ Fail	Positive = 31 Hex, Negative=30 Hex	1 byte
59	Overall Grade Received	A=30,..,F=34,CUSTOM=35,N=36 Hex NA if the Symbol is non DPM or is not found	1 byte
60	Overall Grade Configured	A=30,..,F=34,CUSTOM=35,N=36 Hex NA if the Symbol is non DPM or is not found	8 bytes
61	Cell Contrast	Metrics received. Value: A=30,..,F=34,N=36 Hex. Received is shown only if Overall Grade Configured is CUSTOM, otherwise NA. NA will be returned for each metric if Overall Grade Configured is not CUSTOM or the relative symbol is not found	
62	Cell Modulation		
63	Axial NON-Uniformity		
64	Unused Error Correction		
65	Print Growth		
66	Minimum Reflectance		
67	Fixed Pattern Damage		
68	Grid Nonuniformity		
69	Cell Contrast	Metrics configured. Value: A=30,..,F=34,N=36 Hex. Configured is shown only if Overall Grade Configured is CUSTOM, otherwise NA. NA will be returned for each metric if Overall Grade Configured is not CUSTOM or the relative symbol is not found	8 bytes
70	Cell Modulation		
71	Axial NON-Uniformity		
72	Unused Error Correction		
73	Print Growth		
74	Minimum Reflectance		
75	Fixed Pattern Damage		
76	Grid Nonuniformity		
77	Cell Contrast	Metrics Pass/Fail. Pass = 31 Hex, Fail =30 Hex. NA=36 Hex will be returned for each metric if the symbol is not found or is not a DPM Code	8 bytes
78	Cell Modulation		
79	Axial NON-Uniformity		
80	Unused Error Correction		
81	Print Growth		
82	Minimum Reflectance		
83	Fixed Pattern Damage		
84	Grid Nonuniformity		
85	<LF>		1 byte
	Received Code		N bytes
86+N	<LF>		
86+N+1	Configured Code		M bytes
86+N+1+M	<LF>		1 byte
...			
255			

Table 3: Get ID Marvis Result Response

ADDRESS 0MM	INFO	DESCRIPTION	FIELD LENGTH
56	Object ID		N bytes
57+N	<LF>		1 byte
56+N+1	ID Verification	Positive = 31 Hex, Negative=30 Hex	1 byte
56+N+2	Overall Grade	A=30,..,F=34,CUSTOM=35 Hex	1byte
56+N+3	Cell Contrast	Metrics Threshold A=30,..,F=34 Hex	8 bytes
	Cell Modulation		
	Axial NON-Uniformity		
	Unused Error Correction		
	Print Growth		
	Minimum Reflectance		
	Fixed Pattern Damage		
	Grid Nonuniformity		
56+N+3+8			
...			
255			

Table 4: Set ID Marvis Configuration Request

DATALOGIC

www.datalogic.com

Datalogic S.r.l.
Via S. Vitalino, 13 | 40012 Calderara di Reno | Bologna - Italy
Tel. +39 051 3147011 | Fax +39 051 3147205

Ed. 03/2020