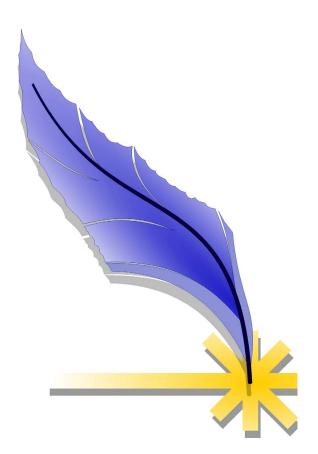


USER MANUAL



Communication Protocol 2.0



Datalogic S.r.l.

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

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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:



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



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



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 Q, 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:

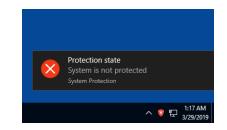
- System running Windows 7:
 - Skip to step 1
- System running Windows 10:

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



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.

Computer De	Retwork and Sharing Center		
1	Control Panel + All	Control Panel Items 🔹 Network and Sharing Center 🔹 😰 Search Control Panel	
www. Recycle Bin Ligh	File Edit View Tools Help		
Recycle bin Eigh	Control Panel Home	View your basic network information and set up connections	0
	Change adapter settings	鰔 😽 🛶 🔘 See full map	
Manuals Ligh	Change advanced sharing settings	DLA Unidentified network Internet (This computer)	
		View your active networks ————————————————————————————————————	
20		Unidentified network Access type: No Internet access	
save-data.bat Ligh - Shortcut		Public network Connections:	
2		Change your networking settings	
TeamViewer Ligh DLA		Set up a new connection or network Set up a wireless, broadband, dial-up, ad hoc, or VPN connection; or set up a router or access point.	
-		Connect to a network	
Lighter - Laser Ligh		Connect or reconnect to a wireless, wired, dial-up, or VPN network connection.	
Editor		Choose homegroup and sharing options Access files and printers located on other network computers, or change sharing settings.	
Lighter - Laser Engine		Troubleshoot problems Diagnose and repair network problems, or get troubleshooting information.	
IPG	See also		
YLP Series	HomeGroup		
Control Util	Internet Options		
2	Windows Firewall		
HTTP Test Client			
🖉 Start 🏾 🍃	<u>ai</u> 💷	π 🛛 🖉 👜 🐏	17:09

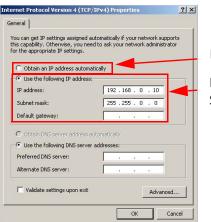
2. Click on 'Properties'.

IPv4 Connectivit	y:	No Internet access
IPv6 Connectivit	y:	No network access
Media State:		Enabled
Duration:		00:02:16
Details		
Details tivity Bytes:	Sent 2.178	Received

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...)



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:



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...)

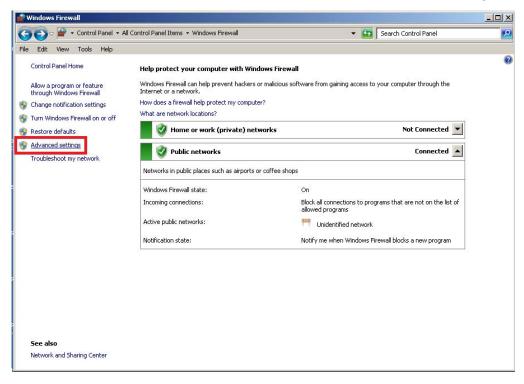


When the System Protection is disabled the system is not protected against disk corruption or malware attacks. Disable the protection only for the time necessary to make disk changes.

- 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':



OIDOJATACO

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

Windows Firewall with Advanced S	Inbound Rules						Actions	
Inbound Rules 1.	Name	Group 🔺	Profile	Enabled	Action	0.	Inbound Rules	
Connection Security Rules	C Enable Echo Ping Request		All	Yes	Allow	Nc	New Rule	-
Monitoring	🕜 LaserEngine Control		All	Yes	Allow	Nc	And and a second se	2.
Artonicoring	🛛 🕜 LaserEngine Control		All	Yes	Allow	Nc	Filter by Profile	
	🕜 LaserEngine Ethernet Protocol		All	Yes	Allow	Nc	Filter by State	
	🖉 LaserEngine Signal		All	Yes	Allow	Nc	and the second sec	
	Q LaserEngine Transfer		All	Yes	Allow	Nc	Filter by Group	
	BITS Peercaching (Content-In)	BITS Peercaching	All	No	Allow	Nc	View	
	BITS Peercaching (RPC)	BITS Peercaching	All	No	Allow	Nc	Rect	
	BITS Peercaching (RPC-EPMAP)	BITS Peercaching	All	No	Allow	Nc	Refresh	
	BITS Peercaching (WSD-In)	BITS Peercaching	All	No	Allow	Nc	Export List	
	BranchCache Content Retrieval (HTTP-In)	BranchCache - Content Retrie	All	No	Allow	Nc	Help	
	BranchCache Hosted Cache Server (HTTP-In)	BranchCache - Hosted Cache	All	No	Allow	Nc	Неір	
	BranchCache Peer Discovery (WSD-In)	BranchCache - Peer Discovery	All	No	Allow	Nc		
	Core Networking - Destination Unreachable (ICI	MPv6-In) tworking	All	Yes	Allow	Nc		
	Ore Networking - Destination Unreachable	Core Networking	All	Yes	Allow	Nc		
	Ore Networking - Dynamic Host Configurati	Core Networking	All	Yes	Allow	Nc		
	Core Networking - Dynamic Host Configurati	Core Networking	All	Yes	Allow	Nc		
	Ore Networking - Internet Group Managem	Core Networking	All	Yes	Allow	Nc		
	Core Networking - IPHTTPS (TCP-In)	Core Networking	All	Yes	Allow	No		
	Core Networking - IPv6 (IPv6-In)	Core Networking	All	Yes	Allow	Nc		
	Ore Networking - Multicast Listener Done (I	Core Networking	All	Yes	Allow	Nc		
	Core Networking - Multicast Listener Ouery (All	Yes	Allow	Nc		
	Core Networking - Multicast Listener Report	Core Networking	All	Yes	Allow	Nc		
	Ore Networking - Multicast Listener Report		All	Yes	Allow	Nc		
	Ore Networking - Neighbor Discovery Adve		All	Yes	Allow	Nc		
	Core Networking - Neighbor Discovery Solicit		All	Yes	Allow	Nc		
	Core Networking - Packet Too Big (ICMPv6-In)		All	Yes	Allow	Nc		
	Ore Networking - Parameter Problem (ICMP	State and State State and State .	All	Yes	Allow	Nc		
	Ore Networking - Router Advertisement (IC		All	Yes	Allow	No		
	Ore Networking - Router Solicitation (ICMP		All	Yes	Allow	Nc		
	Ore Networking - Teredo (UDP-In)	Core Networking	All	Yes	Allow	Nc		
	Core Networking - Time Exceeded (ICMPv6-In)		All	Yes	Allow	Nc		
	Distributed Transaction Coordinator (RPC)	Distributed Transaction Coordi	Privat	No	Allow	No		
	Distributed Transaction Coordinator (RPC)	Distributed Transaction Coordi		No	Allow	Ne -		
		1				- F		

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

瓣 New Inbound Rule Wizar	d	×
Rule Type Select the type of firewall rule to	create.	
Select the type of firewall rule to Steps: Protocol and Ports Action Profile Name	create. What type of rule would you like to create? Program Rule that controls connections for a program. Port Rule that controls connections for a TCP or UDP port. Predefined: BITS Peercaching Rule that controls connections for a Windows experience. C Custom Custom rule.	T
	Learn more about rule types K Back Next > C	ancel

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).

Protocols and Por	rts Scope Advanced	User
General	Programs and Services	Computers
Programs		
	rograms that meet the specified condition:	
E constantin	program:	
		rowse
1.01		104436
Services		
Specify applies.	the services to which this rule S	ettings
applies.		
earn more about pr	rograms and services	
eam more about pr	rograms and services	
eam more about pr	rograms and services	
eam more about pr	rograms and services	
eam more about pr	rograms and services	
eam more about pr	rograms and services	

ganize 🔻 New folder			HE - TI (
- A Favorites	Name +	Date modified	Туре
📃 Desktop	Docs .	3/15/2019 12:06 PM	File folder
鷆 Downloads	🔒 Help	3/15/2019 12:01 PM	File folder
📃 Recent Places	imageformats	3/15/2019 12:01 PM	File folder
libraries	Resources	3/15/2019 12:01 PM	File folder
Documents	sqldrivers	3/15/2019 12:01 PM	File folder
Music	🔒 tools	3/15/2019 12:01 PM	File folder
Pictures	assistant.exe	3/22/2017 3:22 PM	Application
📕 Videos	LaserController.exe	3/13/2019 11:40 AM	Application
	LaserEditor.exe	3/13/2019 11:40 AM	Application
Computer	🔎 LaserEngine.exe	3/13/2019 11:40 AM	Application
DATA (D:)		J/13/2019 12:01 PM	Application
🖣 Network	- <u> </u>		
Eila	name: LaserEngine.exe	▼ Programs (*.exe)	

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

🍻 New Inbound Rule Wizar	d	X
Action Specify the action to be taken w	when a connection matches the conditions specified in the rule.	
Steps: Protocol and Ports Action Profile Name	 What action should be taken when a connection matches the specified conditions? Allow the connection This includes connections that are protected with IPsec as well as those are not. Allow the connection if it is secure This includes only connections that have been authenticated by using IPsec. Connections 	
	will be secured using the settings in IPsec properties and rules in the Connection Security Rule node. Customize Customize	
	Learn more about actions < Back	

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

🎡 New Inbound Rule Wizar	d	×
Profile Specify the profiles for which th	is rule applies.	
Steps: Prule Type Protocol and Ports	When does this rule apply?	
 Action Profile 	Domain Applies when a computer is connected to its corporate domain.	
Name	Private Applies when a computer is connected to a private network location.	
	Public Applies when a computer is connected to a public network location. Learn more about profiles	
	< Back Next >	Cancel

7. Give this rule a recognizable name.

Name	
Specify the name and description	of this rule.
Steps:	
 Rule Type Protocol and Ports Action 	
Profile	Name: LaserEngine Inbound
Name	
	< Back Finish Cancel

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 <code>'Save-Data.bat'</code> icon, present in the Desktop of the Laser Marker

10	03
2	- 10 F
sav	e-data

- Restart Windows.

- System running Windows 10:
 - Close all the open windows

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



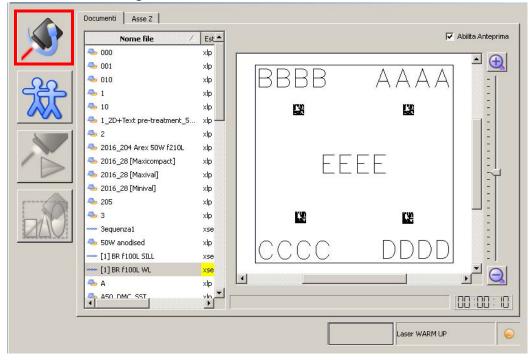
When the System Protection is disabled the system is not protected against disk corruption or malware attacks. Disable the protection only for the time necessary to make disk changes.

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



Set Laser Engine in remote mode

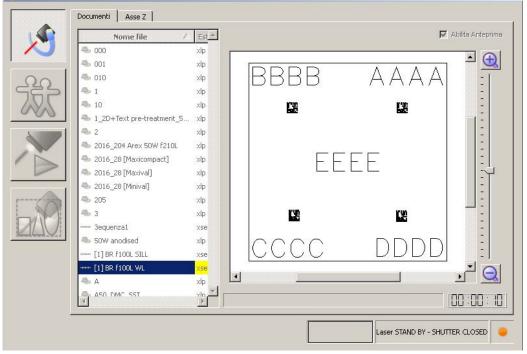
At this point, to enable the Laser Marker for EtherNet/IP communication with the PLC, it is sufficient to set Laser Engine in Remote Mode, by clicking on the indicated Push Button from the Laser Engine GUI:



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 ProfiNet 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...)



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:

Control Panel + All Contro	Panel Items 👻	👻 🚱 Search Control Panel
Adjust your computer's settings		View by: Small icons 💌
PAction Center	C Administrative Tools	autoPlay
Backup and Restore	RitLocker DriveAdministrative Tools	lanagement
🧧 Credential Manager	Configure administra	tive settings for your Programs
📑 Desktop Gadgets	📇 Device Manager	Revices and Printers
🔄 Display	Sase of Access Center	Folder Options
A Fonts	🜏 HomeGroup	La Indexing Options
Intel® HD Graphics	💮 Internet Options	Ceyboard Keyboard
💯 Location and Other Sensors	Mouse	💱 Network and Sharing Center
Rotification Area Icons	arental Controls	Performance Information and Tools
Personalization	🛄 Phone and Modem	Power Options
Programs and Features	Recovery	🔗 Region and Language
5 RemoteApp and Desktop Connections	Sound	🔞 Sync Center
🕎 System	🔔 Taskbar and Start Menu	📧 Troubleshooting
😣 User Accounts	📑 Windows CardSpace	🔗 Windows Firewall
Windows Mobility Center	Windows Update	

COLOUATACO

2. Select the 'Task Scheduler':

Control P	anel • All Control Panel Items • Administrative Tools	- G	Search Administr	ative Tools
ganize 👻 💽 Open)II • 🛄 🕼
7 Favorites	Name *	Date modified	Туре	Size
💻 Desktop 🎉 Downloads	Component Services	11/9/2016 2:18 AM	Shortcut	2 KB
	🛃 Computer Management	11/9/2016 2:15 AM	Shortcut	2 KB
🔢 Recent Places	👸 Connection Manager Administration Kit	11/9/2016 2:16 AM	Shortcut	2 KB
Libraries	Data Sources (ODBC)	11/9/2016 2:18 AM	Shortcut	2 KB
Documents	🔝 Event Viewer	11/9/2016 2:18 AM	Shortout	2 KB
J Music	Internet Information Services (IIS) 6.0 Mana	11/9/2016 2:17 AM	Shortcut	2 KB
Pictures	濻 Internet Information Services (115) Manager	11/9/2016 2:17 AM	Shortcut	2 KB
Videos	😹 ISCSI Initiator	11/9/2016 2:18 AM	Shortcut	2 KB
	🔁 Local Security Policy	11/9/2016 2:18 AM	Shortcut	2 KB
Computer	Performance Monitor	11/9/2016 2:15 AM	Shortcut	2 KB
DATA (D:)	👘 Print Management	11/9/2016 2:15 AM	Shortcut	2 KB
STORE N GO (F:)	🔊 Scan Management	11/9/2016 2:17 AM	Shortcut	2 KB
	💣 Services for Network File System (NFS)	11/9/2016 2:18 AM	Shortcut	2 KB
Network	Services	11/9/2016 2:15 AM	Shortcut	2 KB
	😥 System Configuration	11/9/2016 2:18 AM	Shortcut	2 KB
	🔊 Task Scheduler	11/9/2016 2:18 AM	Shortcut	2 KB
	🔗 Windows Firewall with Advanced Security	11/9/2016 2:17 AM	Shortcut	2 KB
	Windows Memory Diagnostic	11/9/2016 2:18 AM	Shortcut	2 KB

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'.

🕑 Task Scheduler	
File Action View Help	
(* *) 2 T 2 T	
🕑 Task Scheduler (Local) 🔺 Name Last Run T	Actions
🖂 🎲 Task Scheduler Library	Maintenance 🔺
Run Run	A STATISTICS AND A STATISTICS
E Mindows End	🕑 Create Basic Task
	👌 Create Task
Contraction of the second s	Import Task
Application Expr	
Bluetooth	Display All Running Tasks
CertificateServi	📓 Enable All Tasks History
Customer Exper	New Folder
Defrag	
Diagnosis	X Delete Folder
DiskDiagnostic General Triggers Actions Conditions Settings History (disabled)	View 🕨
Codouri Trigger Details Status	a Refresh
Manarybiagnos Weekly At 1:00 AM every Sunday of every week, starting 1/1/2008 Enabled	And a second sec
	🛛 Help
i Muz	Selected Item
🖀 Multimedia	Selected Item
NetTrace NetTrace	🕨 Run
NetworkAccess	End End
Ciffine Files	
B PLA	🖶 Disable
Res Res	Export
Rejstry	Properties
🚰 RemoteApp anc	
🗎 RemoteAssistar	X Delete
Server Manager	🛛 Help
Shell	
SideShow	

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...)



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

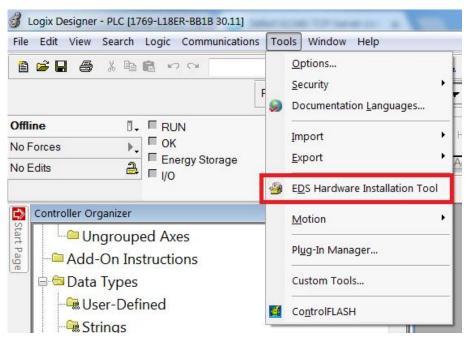
All the CompactLogix[™] 5370 PLC configuration described in this manual is made using Studio 5000 Logix Designer[®] v.30 Standard Edition.

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.

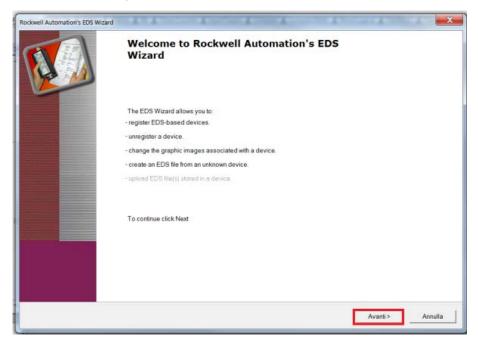
To get the EDS file suitable for Lighter[™] Suite, visit www.datalogic.com > Products > Laser Marking Systems, or consult DATALOGIC "Technical Support" on page vi.

Importing a New Module using the EDS file

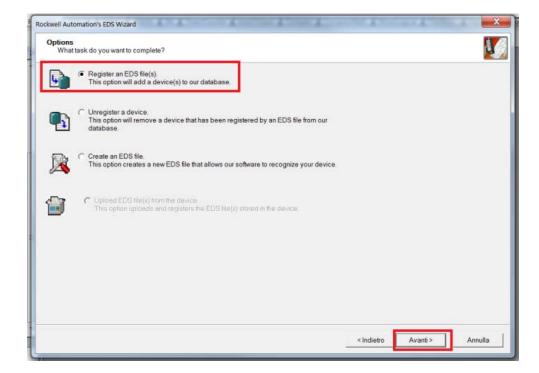
1. Select the 'EDS Hardware Installation Tool' from the Tools Menu.



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



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

Rockwell Automation's EDS Wizard	- 1	C	10.270		X
Registration Electronic Data Sheet file(s) will be added to you	ır system for use in Rockwe	Il Automation applicati	ons.		
 Register a single file Register a directory of EDS files 	Look in subfolders ■				
Named:		Browse			
1					
* If there is an icon file (.ico) with the same image will be associated with the device.	name as the file(s) you are	registering then this			
		To perform an ins	stallation test on t	ne file(s), click Next	
			< Indietro	Avanti >	Annulla

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

Rockwell Automation's EDS Wizard		
	You have successfully completed the EDS Wizard.	
	Fine	

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

	ogix Designer - PLC [1769-L18ER-BB1B 30.11]			
File	Edit View Search Logic Communications Tools Windo	W	Help	
8		•	B B 8	4 1/2
	Path: AB_ET	HIP-	1\192.1	68.0
Offli		4	Ĥ	harl
No F	orces			
No E	Edits	_	+ 1	Fav
				-
S	Controller Organizer		▼ Ţ	×
🕜 Start Page	Ungrouped Axes			^
age	- Add-On Instructions			
	🖨 🔤 Data Types			
	- 🕞 User-Defined			
	- 🖼 Strings			
	Add-On-Defined			
	🕀 🖼 Predefined			
	🗄 📾 Module-Defined			
	Trends			
	- 🔚 Logical Model			
	🗄 🔤 I/O Configuration			
	e PointIO			
	- 🗊 [0] 1769-L18ER-BB1B PLC			Ξ
	🖶 🖴 Embedded I/O			
	[1] Embedded Discrete_IO			
	Expansion I/O, 0 Modules			
	➡ 器 Ethernel New Module			
	IT769- Import Module			
				-

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

talogo Discovery module Preferiti			
Immettere testo di ricerca per tipo di Cancell			Nascondi filtria
Module Type Category Filters Analog		Nodule Type Vendor Filters Ilen-Bradley	<pre>^</pre>
CIP Motion Converter		dvanced Energy Industries, Inc.	
Communication		atalogic, Inc.	
Communications Adapter	- E	ndress+Hauser	-
 Catalog Number Description 	Vendor	Category	

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

New Module General Connec Type:	tion Module Info Internet Protocol Port C DATALOGIC Device Laser Marker	onfiguration	×
Vendor:	Datalogic, Inc.		
Parent	Local		
Name:	1	Ethernet Address	
Description:		Private Network: 192.168.1. Private Network: 192.168.1. Host Name:	
Module Definit			
Revision:	1.003		
Electronic Key	ing: Compatible Module		
Connections:	Exclusive Owner		
		Change	
tatus: Creating		OK Cancel	Help

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:

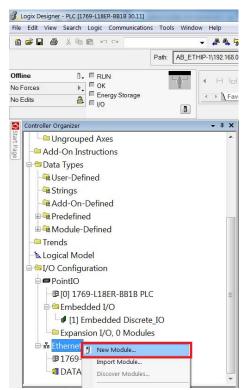
2
🖮 🔤 I/O Configuration
e PointIO
🐨 🕮 [0] 1769-L18ER-BB1B PLC
🖻 😂 Embedded I/O
[1] Embedded Discrete_IC
Expansion I/O, 0 Modules
🖮 🖶 Ethernet
1769-L18ER-BB1B PLC
I DATALOGIC Device AREX

OIDOJATACO

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':

generic	ancella filtri			Nascondi filtri
Module Type Category Filters		le Type Vendor Fil	ters	
Analog CIP Motion Converter	Advar	Bradley nced Energy Indust	ries, Inc.	
Communication Communications Adapter		ogic, Inc. ss+Hauser		
Catalog Number	Description	Vendor	Category	
ETHERNET-BRIDGE	Generic EtherNet/IP CIP Bridge	Allen-Bradley	Communication	
ETHERNET-MODULE				
ETHERNET-SAFETY-STANDARD-MODULE	Generic Ethernet Module Generic EtherNet/IP Safety and Standard M	Allen-Bradley 1 Allen-Bradley	Communication Safety.Other	

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:

Type: Vendor: Parent:	ETHERNET-MODULE Generic Ethernet Module Allen-Bradley Local				
Name:	AREX	Connection Parar	Assembly		
Description:	DL LM device		Instance:	Size:	
		Input	100	256	(8-bit)
	Ψ.	Output:	112	256	(8-bit)
Comm Format	Data - SINT 💌	Configuration:		0	(8-bit)
Address / Ho	stName	Configuration.		¥	(0-Dit)
IP Addres	IS: 192 . 168 . 0 . 10	Status Input:			
) Host Nam	IE:	Status Output:			

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).



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.

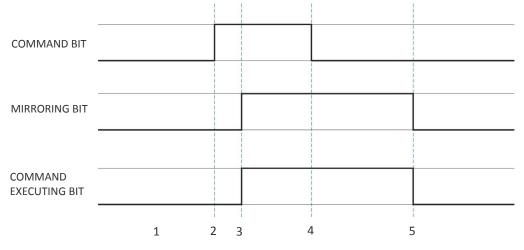
In order to make sure that the command is fully executed by the laser, a simple protocol must be respected by the PLC programmer. Here are the 5 steps:

- 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.
- 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 <u>if necessary</u> also enter the necessary data in the Request Data field and Request Data size.

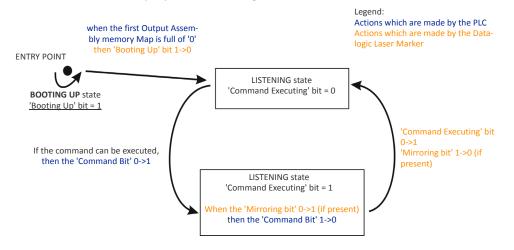
3. If the requested command is executable and fulfills the syntax of such command, the Laser starts executing it: when this happens, the Command Executing bit on the Input Memory Map will pass 0->1 - along with the Mirroring Bit, if present for the requested command.

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 LIS-TENING 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	BITO
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 Shut- ter Closed
2						Protocol Error	Command Error	Command Exe- cuting
3	Protocol Boot Up							
4		•	•	Command	Error Code	•	•	
5				Protocol I	Error Code			
6 to 9				Rese	rved			
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			•	Rese	rved			
18			Set Focus Dis- tance Reference	Stop Autofocus	Start Autofocus	Stop Axis	Reset Axis	Move Axis
19				Rese	rved			
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 avail- able	Z Axis is on Focus	R Axis Move- ment	Z Axis Move- ment	Y Axis Move- ment	X Axis Move- ment
22 to 23				Rese	rved		•	•
24							Reset Output	Set Output
25		•	•	Rese	rved	•	·	·
26				I/O Port Digital O	utput Status (07)			
27				I/O Port Digital Ou	tput Status (815)			
28					nput Status (07)			
29				-	put Status (815)			
30 to 33				-	rved			
34				Get ID Marvis Result	Set ID Marvis Configuration	Get ID Marvis Configuration	Get ID Match Result	
35				Rese	rved			
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				Rese	rved			
38				Marvis Status Error	Marvis Status Warning	Marvis Status Busy	Marvis Status Available	
39 to 53				Rese	rved			
54				Response	Data Size			
55				Rese	rved			
56 to 255				Respon	se 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	Laser Off		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		
0	4	Laser Standby Shutter Closed	(Regarding each bit)	Laser Engine is in Standby Shutter Closed State (KEY=1, ENABLE=0, after the Warm Up stage)		
	5	Laser Ready	0: Laser Engine is not currently in this state; 1: Laser Engine is currently in	Laser Engine is in Laser Ready State (KEY=1, ENABLE=1)		
	7	Laser Emission	this state	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				
	2	Laser Error		Laser Engine is in Laser Error State		
	0	Command Executing	(Regarding each bit) 0: Protocol is not	Lighter™ is executing a command		
2	1	Command Error	currently in this phase; 1: Protocol is currently in this phase	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 com- pletely 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		
6 to 9			code of the Protocol Error Rese	"Protocol Error" on page 32)		
0107	0	Start Marking	nese:	Informs about the execution of the Start Marking command		
10	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. <u>Response Data Field</u> : <eipprotocolversion></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. <u>Response Data Field</u> : <laserengineversion></laserengineversion>		
	0	Open Document From Device		Informs about the execution of the Open Document From Device com- mand		
	1	Save Document		Informs about the execution of the Save Document command		
	2	Get Data Field Value	(Regarding each bit) 0 -> 1: Laser is executing the com-	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. <u>Response Data Field</u> : <objectvalue></objectvalue>		
	3	Set Data Field Value	mand; 1 -> 0 Laser has executed the	Informs about the execution of the Set Data Field Value command		
12	4	Get Global Counter Value	command	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. <u>Response Data Field</u> : <globalcountervalue></globalcountervalue>		
	5	Set Global Counter Value	1	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. <u>Response Data Field</u> : <globalstringvalue></globalstringvalue>		
	7	Set Global String Value		Informs about the execution of the Set Global String Value command		
	0	Enable Data Field		Informs about the execution of the Enable Data Field command		
13	1	Disable Data Field		Informs about the execution of the Disable Data Field command		
14	0	Move and rotate docu- ment		Informs about the execution of the Move and Rotate Document com- mand		
	1	Move Data Field		Informs about the execution of the Move Data Field command		
15 to 17		•	Rese	rved		
	0	Move Axis		Informs about the execution of the Move Axis command, along with the bit of the Axis Movement at address 21		
	1	Reset Axis	(Regarding each bit) $0 \rightarrow 1$ laser is executing the com-	Informs about the execution of the Reset Axis command, along with the bit of the Axis Home at address 20		
18	2	Stop Axis	0 -> 1: Laser is executing the com- mand; 1 -> 0 Laser has executed the	Informs about the execution of the Stop Axis command		
	3	Start Autofocus	command	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 Refer- ence		Available only for Arex™400. Setting the current distance as Reference for the next Start Autofocus executions		



INPUT ASSEMBLY MEMORY MAP

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES		
19			Reser	rved		
	0	X Axis Enabled		Notifies if the X Axis is enabled or not		
	1	Y Axis Enabled	0: Axis not enabled; 1: Axis enabled	Notifies if the Y Axis is enabled or not		
	2	Z Axis Enabled		Notifies if the Z Axis is enabled or not		
20	3	R Axis Enabled		Notifies if the R Axis is enabled or not		
	4	X Axis Home		Notifies if the X Axis is in its Home position or not		
	5	Y Axis Home	0: Axis not in Home position; 1: Axis in Home position	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 X Axis Movement		Notifies if the R Axis is in its Home position or not 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	0: Axis not moving; 1: Axis moving	Notifies if the Z Axis is moving or not		
	3	R Axis Movement		Notifies if the R Axis is moving or not		
21	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 (avail- able only if the Focus Distance Sensor is enabled)		
	5	Focus Distance Sensor is available	0: Focus Distance Sensor is not avail- able; 1: Focus Distance Sensor is avail- able	Available only for Arex™ 400. Notifies if the Focus Distance Sensor is available or not		
22 to 23			Reser	rved		
	0	Set Output	(Regarding each bit)	Setting the status of the Digital Output signal of the DB25 Axis Connector		
24	1	Reset Output	0 -> 1: Laser is executing the com- mand; 1 -> 0 Laser has executed the command	indicated at Address 24 and 25 of Output Memory Map Resetting the status of the Digital Output signal of the DB25 Axis Connec- tor indicated at Address 24 and 25 of Output Memory Map		
25			Reser			
26	0 to 7	I/O port Laser Output Status (07)	(Regarding each bit) 0: the matching Output is not being pulled up; 1: the	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		
27	0 to 7	I/O port Laser Output Status (815)	matching Output is being pulled up	binary format), it means output2 is HIGH, while if address 27 has value 4, it means output10 is HIGH)		
28	0 to 7	I/O port Laser Input Sta- tus (07) I/O port Laser Input Sta-	(Regarding each bit) 0: the matching Input is not being pulled up; 1: the	Pulling up Input N where N is the position of the HIGH bit inside these addresses		
29	0 to 7	tus (815)	matching Input is being pulled up			
30 to 33			Reser			
	1 Get ID Match Result			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. <u>Response Data Field</u> : <symbolreadpassfail><codematchpass- Fail><lf><receivedtext><lf><configuredtext> For the object specified in the Request Data Field, it returns the Verifica-</configuredtext></lf></receivedtext></lf></codematchpass- </symbolreadpassfail>		
34	2 Get	Get ID Marvis Configura- tion	(Regarding each bit) 0 -> 1: Laser is executing the com- mand; 1 -> 0 Laser has executed the	tion flag, its Overall Grade and the value of each metric. <u>Response Data Field</u> : Verification> <overall><cellcontrast><cellmodula- tion><axialnonuniformity><unusederrorcorrection><print- Growth><minimumreflectance><fixedpatterndamage><gridnonunifor mity></gridnonunifor </fixedpatterndamage></minimumreflectance></print- </unusederrorcorrection></axialnonuniformity></cellmodula- </cellcontrast></overall>		
	3	Set ID Marvis Configura- tion	command	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. <u>Response Data Field</u> : <symbolreadpassfail><codematchpassfail><grade-passfail><recoverall><configoverall><recmetrics><configmet- rics><metricspassfail><lf><receivedtext><lf><configuredcode><lf></lf></configuredcode></lf></receivedtext></lf></metricspassfail></configmet- </recmetrics></configoverall></recoverall></grade-passfail></codematchpassfail></symbolreadpassfail>		
35			Reser	rved		
	0	Marvis Result OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Result; 1 -> 0: when	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		
	1	Marvis Result Fail	a new 'Start Marking' command is exe- cuted			
	2	Symbols Read OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Symbol Read; 1 -> 0:	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 [™] Verifica-		
36	3	Symbols Read Fail	when a new 'Start Marking' command is executed	tion, the Symbol Read will be OK if during the verification a general Data- matrix is found		
	4	Symbol Grade Result OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Symbol Grade	Notifies if the last MARVIS [™] verification of all the objects marked with		
	5	Symbol Grade Result Fail	Result; 1 -> 0: when a new 'Start Mark- ing' command is executed	Verification enabled have passed the Grade threshold or not		
	6	Symbol Match Result OK	(Regarding each bit) 0 -> 1: The latest MARVIS™ acquisition has produced this Symbol Match	Notifies if in the last MARVIS [™] verification the content of all the objects marked with Verification enabled match the content of the objects foun		
	7	Symbol Match Result Fail	Result; 1 -> 0: when a new 'Start Mark- ing' command is executed	by MARVIS™		
37			Reser	ved		

CYCLIC COMMUNICATION BETWEEN THE PLC AND THE DATALOGIC LASER MARKER

ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES	
	1 Reader Status Available			Laser Engine is not connected to the Reader, as connection happens after every marking session of an XLP which has to undergo a MARVIS™ verifi- cation	
38	2	Reader Status Busy	(Regarding each bit) 0: MARVIS is not currently in this state; 1: MARVIS is currently in this state	Laser Engine is connected to the Reader and the $MARVIS^IM$ 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	1	Reader is in Error State	
39 to 53			Reser	rved	
54	0 to 7	Response Data Size	"Response Data" field usable length	Notifies about how many usable bytes starting from Address 56 are avail- able for the PLC to read.	
55			Reser	rved	
56 to 255	0 to 7 (for each address Byte)	Response Data Field	Each byte represents an ASCII charac- ter that the laser is reporting towards the PLC		

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	BITO	
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				Rese	rved		• •		
8			Set Focus Dis- tance Sensor Reference	Stop Autofocus	Start Autofocus	Stop Axis	Reset Axis	Move Axis	
9				Rese	rved		<u>.</u>		
10					R Axis	Z Axis	Y Axis	X Axis	
11 to 21				Rese	rved		<u>.</u>		
22							Reset Output	Set Output	
23				Rese	rved				
24				I/O Port Digita	l Output (07)				
25				I/O Port Digital	Output (815)				
26 to 31				Rese	rved				
32				Get ID Marvis Result	Set ID Marvis Configuration	Get ID Marvis configuration	Get ID Match Result		
33 to 53				Rese	rved		• •		
54	Request Data Size								
55				Rese	rved				
56 to 255				Reque	st Data				

Description of the Output Assembly Memory Map

ADDDECC	DIT		VALUE	
ADDRESS	BIT	NAME	0 -> 1 Start Marking ; 1 -> 0 as soon as	DESCRIPTION AND EXAMPLES This action starts the Marking process (in order to have Laser emission,
0 -	0	Start Marking	the mirroring bit is HIGH	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
-	0	Get EIP Protocol Version	0 -> 1 Requesting the Ethernet/IP Pro- tocol version; 1 -> 0 as soon as the mir- roring bit is HIGH	Gets the Ethernet protocol version currently running inside the Laser Engine
1	1	Get Laser Engine Version	0 -> 1 Requesting the Laser Engine ver- sion; 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
	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" exten- sion must be included); the document must be in the Laser Engine default filepath (D:/Data/Docs/Layouts) <u>Request Data Field</u> : <documentname></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 mir- roring bit is HIGH	Requests the content of the object which ID is specified in the Request Data Field. <u>Request Data Field</u> : <objectid></objectid>
	3	Set Data Field Value	0 -> 1 Sets the content of the specified Data Field ; 1 -> 0 as soon as the mir- roring bit is HIGH	Sets the content of the object which ID is specified in the Request Data Field. <u>Request Data Field</u> : <objectid><lf><newvalue></newvalue></lf></objectid>
2	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. <u>Request Data Field</u> : <globalcountername></globalcountername>
	5	Set Global Counter Value	0 -> 1 Setting the value of the Global Counter; 1 -> 0 as soon as the mirror- ing bit is HIGH	Sets the value of the Global Counter specified in the Request Data Field. <u>Request Data Field</u> : <globalcountername><lf><newglobalcounter- Value></newglobalcounter- </lf></globalcountername>
	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 mir- roring bit is HIGH	Requests the value of the Global String specified in the Request Data Field. <u>Request Data Field</u> : <globalstringname></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. <u>Request Data Field</u> : <globalstringname><lf><newglobalstringvalue></newglobalstringvalue></lf></globalstringname>
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. <u>Request Data Field</u> : <objectid></objectid>
Ŭ -	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. <u>Request Data Field</u> : <objectid></objectid>
,	0	Move and Rotate Docu- ment	0 -> 1 Moves and/or rotates the docu- ment; 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. <u>Request Data Field</u> : <x>,<y>,<angle></angle></y></x>
4 -	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. <u>Request Data Field</u> : <fieldid><lf><newxpos>,<newypos></newypos></newxpos></lf></fieldid>
5 to 7			Reser	rved
	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></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
8	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 Sen- sor 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 ref- erence value for all the following Autofocus executions
9		·	Reser	rved

CYCLIC COMMUNICATION BETWEEN THE PLC AND THE DATALOGIC LASER MARKER

ADDDECC	DIT	NAME	VALUE	
ADDRESS	BIT	NAME	VALUE	DESCRIPTION AND EXAMPLES
	0	X Axis Y Axis	0 -> 1 indicates that the operation requested at address 8 must be made	
10	2	Z Axis	on the selected Axis; 1 -> 0 as soon as	Indicated the axis on which the command requested at address 8 must be executed
	3	R Axis	the selected Axis Movement bit is HIGH	
11 to 21			Reser	rved
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
22	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 Out- put Status' mask turns to the desired mask	Requesting to reset the digital outputs indicated at address 24 and 25
23			Reser	rved
24	0 to 7	I/O port Laser Output (07)	(Regarding each bit) 0 -> 1: asking for the matching I/O to be set or reset, depending on the command bit	Indicating a single or a multiple I/O in relation to the command reported
25	0 to 7	I/O port Laser Output (815)	selected on address 22; 1 -> 0: as soon as the mirroring of the command bit selected at address 22 is HIGH	at address 22
26 to 31			Reser	rved
	1	Get ID Match Result	0 -> 1 Requests the Match Result and content of the latest MARVIS verifica- tion; 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 spec- ified in the Request Data Field. <u>Request Data Field</u> : <objectid></objectid>
	2	Get ID Marvis configura- tion	0 -> 1 Requests the MARVIS Configura- tion 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. <u>Request Data Field</u> : <objectid></objectid>
32	3	Set ID Marvis Configura- tion	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:
	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. <u>Request Data Field</u> : <objectid></objectid>
33 to 53			Reser	-
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		l	Reser	rved
56 to 255	0 to 7 (for each address Byte)	Request Data Field	Each byte represents an ASCII charac- ter 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 com- mand

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*).

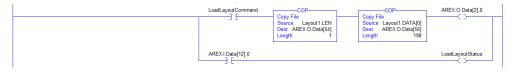
In order to place the string containing the name of the XLP file which needs to be loaded, let's define a string (in the example here called 'Layout1').

Tile Edit View Search Logic Communications Tools		E E E E C Q Q Select la		- 9						- 8
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n Run 🚺 📮 Run Modo	4 H H									
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Edito A Energy Storage OK	· · [Tavo	Antes & Man on & Manns & Bit & Inner	Consider V is	breauthr V cambare V cambreman V way	acogea A racaas	V. V. Lincionin V. Soda	ancer A Program o	din .		
l (o ok										
Controller Organizer	- 9 X	Scope: MainProgram - Sh	ow: All Tag	5		▼ ¥.//ate	r Nomo / iltor			
🖶 😂 Controller PLC	-	Name	In Usage	Value + F	Force Mask + Sty	le Data Type	Description	Constant	Properties	
- Controller Tags		cleanOutpuBuller	Local	0	Der	simal BOOL			1 21 II F	Extended Proper
Controller Fault Handler		CommandErrorClearCommand	Local	0	Der	imal BOOL			Call 2. General	1
Power-Up Handler		+ CommandErrorCode	Local			simal SINT			Name	Leyout1
a 🖨 Tasks		+ contERR	Local	0		DINT			Description	
		ExecutionStatus	Local	1		amal BOOL			Usage	Local
🗎 🛱 Main Task		LaserBootUp	Local	0		simal BOOL		E	Туре	Base
🖨 🌤 MainProgram	=	LaserError	Local	0		simal BOOL			Alias For Base Tag	
Parameters and Local Tags		+ LaserState	Local	- 4		imal SINT			Data Type	STRING
MainRoutine		LaserWarning	Local	0		imal BOOL			Scope	A MainProgra
Generation and the second seco		- Layout1	Local	'3.xlp'	{}	STRING			External Access	Read/Write
e Motion Groups		+ Layout1 LEN		5		simal DINT		-	Style	
		+ Layout1.DA1A		[]	[] ASI				Constant Required	No
- Ungrouped Axes		* U*	Local		{}	STRING		121	Visible	
- Add-On Instructions		LoadLayoutCommand	Local	0		timal BOOL	_		I Data	
🖻 🚟 Data Types		LoadLayoutStatus		0		imal BOOL	_		E Produced Cons	
Get User-Defined		+ nullChar + ObjectD	Local	0 11		SINT STRING	-		🗄 Consumed Con	
- Strings		+ ObjectD + ObjectNewData	Local		{}	STRING			Parameter Con	mections (0.0)
			Local	'Pierpaolini'	{}	singl BOOL	_			
- Add-On-Delined		output_gen outputBit	Local	0		smol BOOL				
🖶 🖼 Predefined		+ ProtocolErrorCode	Local			smal SINT				
Module-Defined		+ ProtocolErroruode + RequestedData	Local	'1\$lPierpaolini'	{}	STRING				
	*	+ neguestedData	Local	. IsiPierpaolini.		imal DINT				
		SetDataFieldCommand	Local			imal BOOL				
		SetDataFieldStatus	Local	0		imal BOOL				
		StartMarkingCommand	Local	0		timal BOOL				
		StartMarkingStatus	Local			amal BOOL				
		Start eat	Local			amal BOOL				
*	F	step1	Local			imal BOOL				
Controller Organizer Logical Organizer		+ > Monitor Tags / Edit Tags /				11				

This local variable properties are here shown:

Name	== 4 U	Jsage	Value +	Force Mask 🔸	Style	Data Type	Description	Constant
E-Layout1	L	ocal	'3.xlp'	{}		STRING		
E Layout1.LEN			5		Decimal	DINT		
Layout1.DATA			{}	{}	ASCII	SINT[82]		
E Layout1.DATA[0]			'3'		ASCII	SINT		
+ Layout1.DATA[1]			1.1		ASCII	SINT		
+ Layout1.DATA[2]			'x'		ASCII	SINT		
E Layout1.DATA[3]			'1'		ASCII	SINT		
+ Layout1.DATA[4]			'p'		ASCII	SINT		
+ Layout1.DATA[5]			\$00'		ASCII	SINT		
E Layout1.DATA[6]			\$00'		ASCII	SINT		
+ Layout1.DATA[7]			\$00'		ASCII	SINT		
± Layout1.DATA[8]			\$00'		ASCII	SINT		
E 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 'Load-LayoutStatus' 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></lf>		1 byte
59	Received Text		N bytes
59+N	<lf></lf>		1 byte
59+N+1	Configured Text		M bytes
59+N+M+1	<lf></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	Overall Grade A=30,,F=34,CUSTOM=35 Hex Only if it is a DPM code	
58	Cell Contrast		
59	Cell Modulation		
60	Axial NON-Uniformity		
61	Unused Error Correction	Metrics Threshold A=30,,F=34 Only if is a DPM code	8 bytes
62	Print Growth	Only it is a DPWI code	
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			
61	Cell Contrast				
62	Cell Modulation	Metrics received.			
63	Axial NON-Uniformity	Value: A=30,,F=34,N=36 Hex.	8 bytes		
64	Unused Error Correction	Received is shown only if Overall Grade	,		
65	Print Growth	Configured is CUSTOM, otherwise NA. NA will be returned for each metric if			
66	Minimum Reflectance	Overall Grade Configured is not CUS-			
67	Fixed Pattern Damage	TOM or the relative symbol is not found			
68	Grid Nonuniformity				
69	Cell Contrast				
70	Cell Modulation	Metrics configured.			
71	Axial NON-Uniformity	Value: A=30,,F=34,N=36 Hex.			
72	Unused Error Correction	Configured is shown only if Overall	0 hu ta s		
73	Print Growth	Grade Configured is CUSTOM, otherwise NA. NA will be returned for each metric	8 bytes		
74	Minimum Reflectance	if Overall Grade Configured is not CUS-			
75	Fixed Pattern Damage	TOM or the relative symbol is not found			
76	Grid Nonuniformity				
77	Cell Contrast				
78	Cell Modulation				
79	Axial NON-Uniformity	Metrics Pass/Fail.			
80	Unused Error Correction	Pass = 31 Hex, Fail =30 Hex. NA=36 Hex			
81	Print Growth	will be returned for each metric if the symbol is not found or is not a DPM	8 bytes		
82	Minimum Reflectance	Code			
83	Fixed Pattern Damage				
84	Grid Nonuniformity				
85	<lf></lf>		1 byte		
	Received Code		N bytes		
86+N	<lf></lf>				
86+N+1	Configured Code		M bytes		
86+N+1+M	<lf></lf>		1 byte		
255					

Table 3: Get ID Marvis Result Response

ADDRESS OMM	INFO	DESCRIPTION	FIELD LENGTH
56	Object ID		N bytes
57+N	<lf></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

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